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A DIRECTORY OF

COMPUTER SOFTWARE APPLICATIONS

Electrical & Electronics Engineering

1970-September, 1978

NTIS U.S. DEPARTMENT OF COMMERCE—National Technical Information Service

PB-284 924

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Electrical and electronics engineering reports that list computer programs and/or their documentation are cited. These software applications pertain to topics, such as computer aided design and computer aided analysis of electrical and electronic materials, components, and systems. The directory contains complete bibliographic data for each report as well as a subject and a corporate author index.

The computer software offered by NTIS was created by a variety of Federal agencies to meet their diverse but quite specific objectives. It is provided without installation, support, or maintenance services and sometimes requires customer modifications to run effectively in customer environments.

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For the note "For abstract, see Star . . . ." please refer to Scientific and Technical Aerospace Reports (Star) published semimonthly by the U.S. Government Printing Office, (GPO), Washington D.C. 20402 for the National Aeronautics and Space Administration. Subscriptions and single issues are available from Supt. of Docs., GPO.

INTRODUCTION

The National Technical Information Service (NTIS) of the U.S. Department of Commerce is the central source for the public sale and announcement of Government-sponsored research, development and engineering reports and analyses prepared by Federal agencies, their contractors or grantees. NTIS supplies the public with approximately four million documents and microforms annually.

The technical reports announced by NTIS often contain listings of computer programs and/or documentation covering a wide variety of applications.

The object of this directory is to announce to the scientist, systems analyst, and programmer, the availability of these computer programs, and to disseminate this software as fully as possible to fulfill NTIS' role in information transfer.

These computer program listings or the documentation can be purchased for the regular price of the technical report in either hard copy or microfiche, thereby providing the user with a viable piece of software at an exceptionally low price.

If there are any questions, comments, or suggestions please contact David Grooms, Product Manager (703) 557-4672.

The computer software offered by NTIS was created by a variety of Federal agencies to meet their diverse but quite specific objectives. It is provided without installation, support, or maintenance services and sometimes requires customer modifications to run effectively in customer environments.

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Abstract Entry

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Corporate author

Keywords — used for indexing and searching

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Title of document

Abstract of document

PB-239 100/1CP PC **A12/MF A01**
Bechtel, Inc., San Francisco, Calif.
Path to Self-Sufficiency Directions and Constraints. Appendices
Final rept. on Phase 1.
Aug 74, 267p* Rept no. BECHTEL-10900-74-43-I-App
Grant NSF-C867

Descriptors: *Energy supplies, *Computer programs, Crude oil, Natural gas, Coal, Oil shale, Uranium, Thorium, Bituminous sands, Hydroelectric power generation, Geothermal prospecting, Solar energy conversion, Wastes, Systems analysis, Systems engineering, Capitalized costs, Fossil fuel deposits, Transportation, Planning, Forecasting, Algorithms, Flow charting, Mathematical models, FORTRAN.

A computer program that calculates resource requirements and summarizes results for any fuel mix is presented. The program tabulates an annual schedule of required facilities to be brought on-line and attendant annual schedules of capital (2 classes), manpower (4 types), and materials (9 categories) requirements. The model is exercised for two likely fuel mixes and the implications in terms of anticipated capital, manpower, and materials constraints are discussed.

Subject Index Entry

Subject Term.—These are arranged in alphabetical sequence in the Index

Title

Order number. Documents in the abstract section are sequenced alphanumerically by this number.

ENERGY SUPPLIES
Energy System Network Simulator (ESNS). Ii. A User's Guide
BNL-20979 9B

Path to Self-Sufficiency Directions and Constraints
PB-239 099/5CP

Path to Self-Sufficiency Directions and Constraints. Appendices
PB-239 100/1CP 21D

An Economic Analysis of Declining Petroleum Supplies in Texas: Income, Employment, Tax and Production Effects as Measured by Input-Output and Supply-Demand Simulation Models
PB-243 320/9CP 08I

Corporate Author Index Entry

Corporate author

Order/accession number

Title

BECHTEL, INC., SAN FRANCISCO, CALIF.
BECHTEL-10900-74-43-I
Path to Self-Sufficiency Directions and Constraints
PB-239 099/5CP 21D
BECHTEL-10900-74-43-I-App
Path to Self-Sufficiency Directions and Constraints. Appendices
PB-239 100/1CP 21D

Electrical & Electronics Engineering

AD-A001 105/6CP PC **A04**/MF **A01**
Syracuse Univ N Y Dept of Electrical and Computer Engineering
Reactively Loaded Directive Antennas
Technical rept.
Roger F. Harrington, and Joseph R. Mautz. Sep 74, 60p Rept nos. ATR-74-6, TR-1
Contract N00014-67-A-0378-0006

Descriptors: *Antenna arrays, *Directional antennas, Gain, Electrical loads, Electrical impedance, Computer programs, Antenna radiation patterns.

The radiation characteristics of an N-port antenna system can be controlled by impedance loading the ports and feeding only one or a few of them. The use of reactive loads to produce high gain antenna systems is studied first. The theory employs the concept of modal resonance to resonate the real current that produces maximum gain. When the resonated current is the principal contributor to the radiation pattern, then the pattern is almost independent of the position of the feed. This usually requires large coupling between the antenna elements, and can result in supergain antennas. The theory of resonance is extended to include complex port currents and impedance loads. Numerical methods are developed and applied to arrays of linear dipoles arbitrarily distributed on a plane. Computations are made using both the method of moments and the sinusoidal current approximation. The two methods giv similar results. Computer programs are included to allow application of the theory to arrays of the user's choice.

AD-A001 306/0CP PC **A03**/MF **A01**
Naval Research Lab Washington D C
Analysis of Electrical Characteristics of Edge-Coupled Microstrip Lines with a Dielectric Overlay
Interim rept.
Barry E. Spielman. 25 Oct 74, 41p Rept no. NRL-7810

Descriptors: *Strip transmission lines, Couplers, Electric filters, Directional, Phase shift circuits, Computer programs, FORTRAN.
Identifiers: Computer aided design, MICDOC Computer program, FORTRAN 4 programming language.

An analysis was performed of the electrical characteristics of edge-coupled microstrip lines with a dielectric overlay. This analysis is applicable to the design of broadband directional couplers, filters, and Schiffman phase shifters for microwave integrated circuit applications. The analysis incorporated an even- and odd-mode treatment that invokes a quasi-TEM propagation model. This treatment enabled the analysis to be formulated in terms of integro-differential equations involving equivalent sources at conductor and dielectric boundaries. The formulation was reduced to a form suitable for numerical solution by employing a method-of-moment solution with pulse expansions of equivalent sources and point matching of the boundary conditions. The analysis was implemented by a digital computer program that provides information on midband coupling, modal impedances, coupled line characteristic impedance, modal phase velocities, and coupled line phase velocities.

AD-A002 144/4CP PC **A11**/MF **A01**
Vermont Univ Burlington Dept of Electrical Engineering
Time Domain Aperture Antenna Study. Volume II
Final rept. 21 Dec 72-21 May 74
Hugh C. Maddocks. Oct 74, 228p RADC-TR-74-254-Vol-2
Contract F30602-73-C-0104
See also Volume 1, AD/A-002 143.

Descriptors: *Antenna apertures, Time domain, Horn antennas, Transients, Far field, Antenna feeds, Parabolic antennas, Radiation, Computer programs, FORTRAN.

This research employs a direct time domain model applicable to aperture antennas of any shape excited by fields of any form in space and time to study theoretically the electromagnetic far fields of a paraboloid reflector when fed by a transverse electromagnetic (TEM) horn antenna. First, the TEM horn antenna is considered as an aperture antenna with an arbitrary excitation V(t) applied to its apex. The time domain model is then applied to determine the electric far fields of the TEM horn, and the theoretical results are compared with published experimental data on a relative basis. Reasonable agreement is obtained. Approximate closed form solutions for the electric far fields of the TEM horn in the azimuth plane are also fo... Secondly, the TEM horn is studied in terms of current sheets using the vector potential formulation in order to confirm the approximate closed form solutions found in the azimuth plane using the aperture model.

AD-A002 335/8CP PC **A04**/MF **A01**
Royal Aircraft Establishment Farnborough (England)
Notes on the Design of Microstrip and Stripline Bandpass Filters
Technical rept.
B. Lake, and W. V. Reeder. Aug 74, 73p RAE-TR-74068, DRIC-BR-42762

Descriptors: *Band pass filters, *Strip transmission lines, Computer programs, Computer applications, Great Britain.
Identifiers: Design, Computer aided design.

The paper describes procedures used to design microstrip and stripline bandpass filters. Design computer programs are included together with worked examples. Comparisons between measured and theoretical responses for a number of practical filters are given.

AD-A002 732/6CP PC **A03**/MF **A01**
Naval Research Lab Washington D C
Computer Analysis of Conformal Phase Arrays
J. K. Hsiao, and J. B. L. Rao. 15 Nov 74, 41p Rept no. NRL-7826

Descriptors: *Phased arrays, *Computer applications, Conformal structures, Far field, Computer programs, FORTRAN.

A systematic method of analyzing conformal arrays on a general surface is described. A computer program is included in this report along with the necessary subroutines. By using proper input data cards and the subroutines, the program can be used for the arrays on a general conformal surface or well-defined surface like that of a circular cylinder, circular torus, cone, or a plane. The computer output includes a printout and a plot of the radiation patterns. Crosspolarization, if any, will be plotted on the same curve.

AD-A003 538/6CP PC **A05**/MF **A01**
Naval Postgraduate School Monterey Calif
Hybrid Mode Analysis of Microstrip on Dielectric and Ferrite Substrate
Master's thesis
Ahmet Munir Tufekcioglu. Sep 74, 95p

Descriptors: *Strip transmission lines, Substrates, Dielectrics, Perturbations, Numerical analysis, Computer programs, Power spectra, Theses, FORTRAN.
Identifiers: Method of moments.

A hybrid mode analysis of microstrip on a dielectric substrate is presented. A numerical solution for wavelength and characteristic impedance of single and coupled, balanced strips is obtained. Line parameters are shown to be very frequency dependent but in agreement with the quasi-static results of other investigators in the low frequency limit. The extension of this technique to perturbation analysis of microstrip on ferrite is also described. A numerical solution for the propagation constant is obtained.

AD-A004 131/9CP PC **A03**/MF **A01**
Syracuse Univ N Y Dept of Electrical and Computer Engineering
Analysis of Radiation by Linear Arrays of Parallel Horizontal Wire Antennas over Imperfect Ground
Tapan K. Sarkar, and Bradley J. Strait. 1 Sep 74, 31p Scientific-3, AFCRL-TR-74-0538
Contract F19628-73-C-0047

Descriptors: *Antenna arrays, Computer programs, Linear arrays, Antenna radiation patterns, Parallel orientation, FORTRAN.
Identifiers: FORTRAN 4 programming language.

A user oriented computer program is presented and described for analyzing radiation from linear arrays of parallel horizontal thin-wire antennas over the surface of an imperfectly conducting earth. The program is equipped to treat unequally spaced arrays of wires that can be of different lengths and radii, but it is assumed the wires are all centerfed. The wires are assumed to be unloaded and that the conductivity of the earth is finite. The effects of the imperfectly conducting earth are accounted for approximately by using the method of reflection coefficients. Computed output consists of current distributions, input impedances, and far-field patterns specified by the user.

AD-A004 227/5CP PC **A07**/MF **A01**
Naval Postgraduate School Monterey Calif
'ASAP' Antennas-Scatterers Analysis Program, A General Purpose User-Oriented Computer Program for Analysis of Thin-Wire Structures in the Presence of Finite Ground
Master's thesis
Jerry Wayne McCormack. Dec 74, 133p Rept no. NPS-52AB74122

Descriptors: *Antennas, *Computerized simulation, *Computer programs, Wire, Scattering, Antenna radiation patterns, Electrical impedance, Currents, Theses.
Identifiers: IBM 360 computers.

Previous computer programs to solve the electro-magnetic equations for thin-wire radiating structures have been coded in one of two forms; the very limited specialized form or the comprehensive all encompassing form. Thus, the beginning user, engineer or student, must possess expertise in computer programming as well as in electro-magnetic theory. This thesis develops a computer program which can be used by the student to gain insight into wire radiating structures and, at the same time, be used by the engineer to obtain the expertise necessary to use the more comprehensive programs.

AD-A004 235/8CP PC **A03**/MF **A01**
Naval Postgraduate School Monterey Calif
Electromagnetic Compatibility Study of Conducting Wires
Master's thesis
Levent Uluc. Dec 74, 26p Rept no. NPS-52AB74121

Descriptors: *Electric wire, *Electromagnetic compatibility, Radiofrequency power, Coupling(Interaction), Microwaves, Statistical analysis, Theses, Computer programs.

Assigning probabilities to RF power picked up on aerospace cables at microwave frequencies by using analytical methods was the objective of this thesis. The coupling from radiated fields to typical unshielded wires was calculated in the frequency range 1 GHz to 10 GHz by using a thin wire antenna computer program. The data obtained from the calculations were used to get the cumulative distribution function of absorbed power and also to observe its variation with changing frequency and loading of the wires. The results of this analysis compared favorably with those of a previous experimental approach. This demonstrates that analytical methods can be used for calculating and predicting the coupling from radiated fields to unshielded wires.

AD-A004 265/5CP PC **A06**/MF **A01**
Naval Postgraduate School Monterey Calif
Computer Analysis and Design of Electrical Circuits Using the IBM 360/67 and the XDS 9300 Computer and the AGT/10 Display Unit
Master's thesis
Banthit Nutasara. Dec 74, 109p

Descriptors: *Electrical networks, *Computer applications, Computer programs, Computer graphics, Transfer functions, Differential equations, Numerical integration, Theses.
Identifiers: *Network analysis theory, *Network synthesis, Computer aided design.

Several small-scale, special-purpose computer programs that were written to provide the output of two-port networks as filters in the time domain and also the frequency domain over a wide range of parameter variations are contained herein. The computer program outputs are plotted on the screen display unit. The effects of the responses when parameters are changed can be distinguished for the purpose of synthesis, and design. Some synthesis, analysis and design techniques are also discussed.

AD-A005 467/6CP PC **A05**/MF **A01**
Naval Postgraduate School Monterey Calif
Experimental Study of Correlator Filters Not Utilizing a Delay
Master's thesis
Tito Manlio Rincon. Dec 74, 78p

Descriptors: *Electric filters, *Signal processing, *Correlators, Low pass filters, Circuits, Fourier transformation, Time series analysis, Theses, Computer programs.
Identifiers: Signal detection, Autocorrelation, Laguerre functions, DSL computer program.

This work is an application of the methods in obtaining the correlation functions. In particular, the method of correlation without a 'pure' time-delay is presented together with the concept of 'orthogonal filters', which are Laguerre function type filters. Of these filters, the nonsymmetric Laguerre type is analyzed and used to realize a practical correlator designed for low frequency signals. The correlator was computer-simulated by the DSL subroutine and the results of the autocorrelation of a 155 Hz sine wave were compared to the results obtained for the autocorrelation of a similar wave in the actual correlator. A detail description of the design of the correlator and of the DSL program used are also presented.

AD-A006 370/1CP PC **A05**/MF **A01**
General Electric Co Syracuse N Y Heavy Military Equipment Dept
Computer-Aided Amplifier Design In BASIC
Technical information series rept.
L. Rider. Jul 74, 84p Rept no. R74EMH15

Descriptors: *Transistor amplifiers, *Computer aided design, Computer programs, Transducers, Electrical networks, Gain, Impedance.
Identifiers: TRANSAMP computer program, PARAM computer program, TRANSG computer program, TRANZ computer program, TRANSFIX computer program, TGAIN computer program, Basic programming language.

The report covers six computer programs which may be used as design aids in the synthesis of active or passive linear two-port networks. These programs may be used in designs for any device which can be described by a set of two-port S-parameters. The program PARAM permits conversion of other two-port parameter sets to S-parameters. The TRANSAMP program provides stability information and constant gain contours. TRANSG computes the transducer gain of a two-port network from reflection coefficients. TRANZ computes the input or output reflection coefficients and impedances. TRANSFIX computes gain circles for specified termination impedances. TGAIN computes the transducer gain of a circuit having fixed-topology transmission line matching networks. Two sample designs are given to illustrate the use of the programs. A complete listing of all the programs is included.

AD-A006 640/7CP PC **A04**/MF **A01**
Michigan Univ Ann Arbor Cooley Electronics Lab
High-Frequency Transister Modeling for Circuit Design
Technical rept.
A. B. Macnee, and R. J. Talsky. May 71, 65p
CEL-TR-205, 014820-19-T, ECOM-0138-19-T
Contract DAAB07-68-C-0138

Descriptors: *Bipolar transistors, Mathematical models, Circuits, Computer aided design, Computer programs, Optimization.
Identifiers: Network analysis theory, Network synthesis.

It has been found that hybrid-pi or high-frequency T are inadequate high-frequency models for certain transistor types even though the models are supplemented by reasonable extrinsic elements. The hybrid-pi can be modified to model these transistors by replacing the (r sub pi)(C sub pi) circuit by an RC ladder. Using a computer optimization program an optimal, N-lump model is generated. For the 2N918 transistor a two-lump model extends the frequency range of the hybrid-pi model to (f sub T)/2. Typical circuit examples show most of the improvement in model performance can be obtained with a two-lump model.

AD-A006 929/4CP PC **A05**/MF **A01**
Ohio State Univ Columbus Electroscience Lab
The Development of a Multiturn Loop Antenna for the AN/PRC-77
Technical rept.
R. J. Davis. Dec 74, 92p Rept no. ESL-3824-1
Contract N00123-74-C-0645

Descriptors: *Loop antennas, *Transmitter receivers, Manportable equipment, Omnidirectional antennas, Antenna radiation patterns, Computer programs, Theses.
Identifiers: AN/PRC-77, AN/PRC-25.

An electrically small antenna element, the multiturn loop, is proposed as a replacement for the three-foot monopole standard on the AN/PRC-77 and AN/PRC-25. The principal objective was to develop a multiturn loop with an omnidirectional pattern and approximately the gain of the standard monopole. Based on past experience with multiturn loop antennas, loop configurations were selected which would minimize the increase in packset size for top, bottom and back-side mounting locations. Patterns were measured for these configurations and compared with patterns of the standard monopole antenna. Parameters were varied (loop size, turn spacing and position on the packset) to optimize the radiation efficiency of the multiturn loop.

AD-A007 157/1CP PC **A20**/MF **A01**
Tennessee Technological Univ Cookeville Dept of Engineering Science
Rain Impact Damage to Supersonic Radomes
Final rept. 17 Nov 71-30 Jun 74
Ray Kinslow, Dallas G. Smith, Vireshwar Sahai, Leland L Long, and John Peddleson, Jr. Oct 74, 468p TTU-ES-74-3, RL-75-5
Contract DAAH01-72-C-0375

Descriptors: *Radomes, *Rain erosion, Ceramic bodies, Raindrops, Damage, Impact, Spallation, Fracture(Mechanics), Stress waves, Supersonic flight, Computer programs.

The research described has been directed toward a better understanding of raindrop damage to vehicles traveling at very high velocities with emphasis upon the erosion of ceramic-type radomes. An accelerator capable of impacting targets with short water jets at speeds up to Mach 5 is described. The validity of using high-speed liquid jets to simulate raindrop impact is demonstrated. Topics covered include: drop energy-crater volume relations; oblique and multiple impacts; erosion rates; internal fracturing and spallation caused by stress waves; radome coatings; information from rocket sled tests; a theoretical analysis of the cratering process; motion of raindrops in the supersonic shock layer; probability modeling of erosion; and spatial and temporal variations of pressure exerted on the target surface by liquid impacts.

AD-A007 659/6CP PC **A05**/MF **A01**
Air Force Aero Propulsion Lab Wright-Patterson AFB Ohio
Practical Stability of a Reluctance Synchronous Machine
Final rept. Oct 73-Mar 74
William U. Borger. Feb 75, 81p Rept no. AFAPL-TR-74-118

Descriptors: *Electric motors, Alternating current, Mathematical models, Computerized simulation, Lyapunov functions, Computer programs, Stability.
Identifiers: Synchronous machines.

The ideal reluctance synchronous machine with dual rotor windings is modeled mathematically and simulated on a digital computer. In addition, it is demonstrated that practical stability of the machine exists when the Liapunov theorem requirements have been met.

AD-A007 970/7CP PC **A03**/MF **A01**
Harry Diamond Labs Adelphi Md
Computer-Aided Design of Bulk Microwave Acoustic Delay Lines
Technical rept.
Theodore H. Hopp. Dec 74, 36p Rept no. HDL-TR-1676

Descriptors: *Acoustic delay lines, Microwave equipment, Computer aided design, Mathematical models, Computerized simulation, Computer programs, FORTRAN.
Identifiers: Equivalent circuits.

A mathematical model of a microwave acoustic delay line is derived and presented which takes into account the mechanical resonances of a finite acoustic delay medium. A computer simulation of the model shows that when the delay medium is taken to be finite the frequency response of the delay line is different from the response of a delay line with a completely absorbing (infinite) delay medium. This difference in response is obtained experimentally when changing from pulse operation to continuous wave (CW) operation of a delay line. This is the first model known to the author which demonstrates this effect.

AD-A008 509/2CP PC **A04**/MF **A01**
Aerospace Corp El Segundo Calif

An Analysis of the Fresnel Region of a Large Parabolic Communication Antenna with the Scalar Diffraction Theory
Michael T. Tavis. 1 Jul 74, 60p TR-0075(5901-02)-1, SAMSO-TR-75-84
Contract F04701-74-C-0075

Descriptors: *Spacecraft antennas, *Parabolic antennas, Radio fields, Near field, Computer programs, Communication satellites.
Identifiers: Fresnel region.

Spacecraft antennas that are very large in terms of a wavelength present special problems after they are installed on the vehicle in that final tests to verify that no changes in the antenna performance have occurred during storage, handling, and installation can seldom be performed under far-field conditions. This report investigates the feasibility of making final measurements at distances that would be practical in typical assembly buildings. The data channel patterns and tracking patterns of a typical parabolic reflector communications antenna in the radiating near-field region are examined in this report using the Fresnel approximation to the scalar diffraction theory.

AD-A008 526/6CP PC **A14**/MF **A01**
Mcdonnell Aircraft Co St Louis Mo
Intrasystem Electromagnetic Compatibility Analysis Program. Volume I. User's Manual Engineering Section
Final rept. 19 May 72-19 Nov 73
J. L. Bogdanor, R. A. Pearlman, and M. D. Siegel. Dec 74, 320p RADC-TR-74-342-Vol-1
Contract F30602-72-C-0277
See also Volume 2, AD-A008 527.

Descriptors: *Electromagnetic compatibility, *Computer programming, Life cycles, Air Force equipment, Electromagnetic interference, Radiofrequency interference, Mathematical models, Computer program documentation, Manuals, FORTRAN.
Identifiers: IEMCAP computer program.

The user's manual describes the operation and usage of the Intrasystem Electromagnetic Compatibility Analysis Program (IEMCAP). IEMCAP is a USA Standard FORTRAN program for computer-aided implementation of electromagnetic compatibility (EMC) at all stages of an Air Force system's life cycle, applicable to aircraft, space/missile, and ground-based systems. Extensive knowledge of computers is not required to use the program and all inputs are in easy to use, free-field format. The volume, the Engineering Section, contains descriptions of the program, its organization, analytic basis, operating principles, and logic flow. The system model employed in IEMCAP for the various analysis tasks is presented. The systems approach is derived from basic communications equations in analytic form and then quantized to sampled spectra for digital computers. The volume also contains a discussion of the program operation.

AD-A008 527/4CP PC **A10**/MF **A01**
Mcdonnell Aircraft Co St Louis Mo
Intrasystem Electromagnetic Compatibility Analysis Program. Volume II. User's Manual Usage Section
Final rept. 19 May 72-19 Nov 73
J. L. Bogdanor, R. A. Pearlman, and M. D. Siegel. Dec 74, 201p RADC-TR-74-342-Vol-2
Contract F30602-72-C-0277
See also Volume 1, AD-A008 526, and Volume 3, AD-A008 528.

Descriptors: *Electromagnetic compatibility, *Computer programming, Systems engineering, Life cycles, Air Force equipment, Electromagnetic interference, Radiofrequency interference, Computer program documentation, Manuals.
Identifiers: IEMCAP computer program.

The volume, the Usage Section, contains detailed instructions for usage of IEMCAP. A complete description of the input data requirements, formats, and rules for applying them are given. Instructions are also given for data setup and program execution for the various analysis tasks. Sample outputs are presented and described to aid in interpretation of analysis results. An example run is also presented in which a typical system is analyzed. This shows how engineering data is converted into the IEMCAP input format and gives samples from the resulting computer output. Three appendices are provided. The first describes test methods for use with the computer-generated EMC specification limits along with an example. The second appendix describes a separate merge utility program. This program performs supplemental data file management which consolidates two files. The third appendix describes the usage of another separate program which provides supplemental intermodulation frequency analysis.

AD-A008 528/2CP PC **A16**/MF **A01**
Mcdonnell Aircraft Co St Louis Mo
Intrasystem Electromagnetic Compatibility Analysis Program. Volume III. Computer Program Documentation
Final rept. 19 May 72-19 Nov 73
J. L. Bogdanor, C. E. Clark, R. A. Pearlman, R. E. Plummer, and C. D. Skouby. Dec 74, 353p
RADC-TR-74-342-Vol-3
Contract F30602-72-C-0277
See also Volume 2, AD-A008 527.

Descriptors: *Electromagnetic compatibility, *Computer programming, Systems engineering, Life cycles, Air Force equipment, Electromagnetic interference, Radiofrequency interference, Computer program documentation, FORTRAN, Manuals.
Identifiers: IEMCAP Computer program.

The report documents the programming details of IEMCAP. It contains detailed descriptions of all subroutines, variables, and constants used in the program. IEMCAP is a USA Standard FORTRAN program for computer-aided implementation of electromagnetic compatibility (EMC) at all stages of an Air Force system's life cycle, applicable to aircraft systems, spacecraft and missile systems, and ground-based systems. Extensive knowledge of computers is not required to use the program, and all inputs are in easy-to-use, free-field format. The program incorporates analytical math models to perform four analysis tasks: generation of EMC specification limits tailored to a specific system, analysis for granting waivers to the specifications, survey of the system for interference, and comparative analysis to aid in trade-off decisions. Math models are included covering a large number of source signal waveforms and RF modulation types, receptor types, and transfer modes between sources and receptors. Models are also included for effects of environmental electromagnetic fields.

AD-A009 175/1CP PC **A03**/MF **A01**
Kentucky Univ Lexington
SCEPTRE Models of a Pulse Forming System
Phase rept.
Ronald J. Kuhler, and Victor J. Watson. Mar 75, 33p RADC-TR-75-69
Contract F30602-72-C-0418

Descriptors: *Networks, *Transient radiation effects, Circuits, Pulses, Electromagnetic compatibility, Computerized simulation, Computer programs.
Identifiers: Sceptre computer program.

Work performed in the generation and testing of the pulse forming network SCEPTRE model is discussed with emphasis upon attempts to determine the pulse forming network element stressing factors under conditions of specific fault occurrences: pulse transformer failure via secondary short or load short; secondary open; and pulse forming network capacitance short. When the generator model is available, the composite system can be simulated to determine the result of transient and fault conditions on the overall network operation.

AD-A009 185/0CP PC **A05**/MF **A01**
Army Materiel Command Texarkana Tex Intern Training Center
A Survey of Computer-Aided Electronic Circuit Analysis Programs
Final rept.
Soo Young Shin. Mar 75, 76p Rept no. USAMC-ITC-02-08-75-220

Descriptors: *Electrical networks, *Computer programming, Computerized simulation, Matrices(Mathematics), Mathematical models.
Identifiers: SCEPTRE computer program, *Network analysis theory, Network synthesis, CORNAP computer program, SYSCAP computer programs, SCAP computer program, ECAP computer program, ECAP 2 computer program, CIRCUS computer program, CIRCUS 2 computer program, ASTAP computer program, BELAC computer program.

This report is the result of a survey on a few computer-aided electronic circuit analysis programs. The characteristic features and analysis capabilities of each program are discussed in detail. The common aspects among the programs are tabulated for easy comparison. The actual computer program executions of two example circuit networks are included. The programs surveyed are ECAP, ECAP-II, CIRCUS, CIRCUS II, SCEPTRE, ASTRAP, BELAC, SYSCAP, CORNAP and SCAP.

AD-A009 594/3CP PC **A11**/MF **A01**
Gte Sylvania Inc Needham Heights Mass
Extended SCEPTRE. Volume I. User's Manual
Final rept. 15 May 72-30 Jun 74
David Becker. Dec 74, 248p AFWL-TR-73-75-Vol-1
Contract F29601-72-C-0093
See also Volume 2, Dec 74, AD-A009 595.

Descriptors: *Circuits, *Transient radiation effects, *Computer programs, Control sequences, Debugging(Computers), FORTRAN, Instruction manuals.
Identifiers: *SCEPTRE computer program, IBM 360 computers, IBM 7090/94 computer, FORTRAN 4 programming language.

Volume 1 of Extended SCEPTRE covers circuit preparation and entry and describes the use of the special program options, including: Stored model; re-output, continue and rerun; the subprogram capability; and the various print and plot options. Examples of the use of the old and new features are given. Separate chapters contain system information for using SCEPTRE on the 7090/94 and S/360 machines. CDC 6600 system information and additional notes to the user are contained in volume 1, appendixes G and H respectively.

AD-A009 595/0CP PC **A06**/MF **A01**
Gte Sylvania Inc Needham Heights Mass
Extended SCEPTRE. Volume II. Mathematical Formulation
Final rept. 15 May 72-30 Jun 74
David Becker. Dec 74, 111p AFWL-TR-73-75-Vol-2
Contract F29601-72-C-0093
See also Volume 1 dated Dec 74, AD-A009 594.

Descriptors: *Circuits, *Transient radiation effects, *Computer programs, Direct current, Alternating current, Voltage, Computations, Matrices(Mathematics), Differential equations, Numerical integration, FORTRAN.

Identifiers: *SCEPTRE computer program, Sensitivity analysis, Newton-Raphson method, IBM 360 computers, IBM 7090/94 computer, Network analysis theory.

Volume 2 of Extended SCEPTRE covers the following subjects pertinent to the DC, AC, and transient solutions: Treatment of matrices including sparse matrices, sources and source derivatives, integration routines including implicit integration, and d-c option mathematics and the adjoint network.

AD-A009 637/0CP PC **A08**/MF **A01**
Syracuse Univ N Y Dept of Electrical and Computer Engineering
Method of Moments Applications. Volume VI. Matrix Methods for Static Microstrip
Phase rept. Jul 73-Sep 74
A. Farrar, and A. T. Adams. Feb 75, 162p RADC-TR-73-217-Vol-6
Contract F30602-72-C-0360
See also Volume 5, AD-783 897.

Descriptors: *Strip transmission lines, Electromagnetic fields, Electromagnetic compatibility, Matrices(Mathematics), Green's function, Fourier analysis, Capacitance, Electrostatics, Computer programs, FORTRAN.
Identifiers: Method of moments, Fourier integrals.

Matrix methods are applied to static microstrip problems and used to deduce the approximate propagation characteristics of the dominant, quasi-TEM mode. Three basically different techniques are employed, in conjunction with the matrix methods. The first uses a free space Green's function, the second uses multiple imaging to obtain a Green's function for single substrate microstrip, and the third uses Fourier integral methods to obtain the Green's function for multilayered and/or covered microstrip. Several classes of problems are treated. The capacitance matrix, propagation constant, and characteristic impedance are obtained for two-dimensional (transmission line) problems. In addition, a general method for treating capacitive discontinuities in microstrip is developed and applied to typical three-dimensional discontinuity problems such as an open circuit, a gap in microstrip, and a sudden change in width of microstrip. Finally, multilayered and covered microstrip propagation is analyzed by a Fourier integral method.

AD-A010 002/4CP PC **A08**/MF **A01**
Clarkson Coll of Technology Potsdam N Y
CTRUMP: Its Development and Use in Solution of Problems of Conduction Heat Flow in Solid State Devices
Phase rept.
Robert L. Basile, and Henry Domingos. Mar 75, 154p RADC-TR-75-74
Contract F30602-72-C-0463

Descriptors: *Semiconductor devices, *Conduction(Heat transfer), *Computer programming, Solid state physics, Thin films, Gallium arsenides, Carbon resistors, Computations, FORTRAN, Gunn diodes.
Identifiers: IBM 360/44 computers, CTRUMP computer program.

The TRUMP program, developed by Arthur Edwards of the Lawrence Radiation Laboratory, has been adapted for use on the IBM 360/44, under the name CTRUMP. Modifications were made to enable calculations of three-dimensional heat flow in solid state devices, as a result of internal conduction and internal heat generation with constant boundary conditions. CTRUMP was then used to calculate temperature rise in thin film and carbon resistor models, as well as in a model of a gallium arsenide Gunn effect diode. An operating manual for CTRUMP is included as an Appendix.

AD-A010 313/5CP PC **A06**/MF **A01**
Picatinny Arsenal Dover N J
User's Manual for PCBOARD
Final rept.
Ralph E. Lombardi. Jan 75, 108p

Descriptors: *Printed circuits, *Computer aided design, *Interactive graphics, Instruction manuals.
Identifiers: PCBOARD Computer program.

PCBOARD is Super Tool-a digital computer program used to design the layouts of printed circuit boards. Not a substitute for printed circuit layout experience, it rather provides the designer with the use of an interactive graphics terminal functioning as an electronic drafting board. Layouts can be generated on the face of the graphics screen thru the optimum placement of components and construction of the conductor paths interconnecting their common leads. A computer driven plotter produces inked drawing copies of the completed screen layout or when equipped with an optical exposure head this same plotter can produce an actual size artwork master of the conductor pattern directly on photographic film for use in the manufacture of the board.

AD-A011 343/1CP PC **A02**/MF **A01**
Braddock Dunn and Mcdonald Inc El Paso Tex
Technical Tasks for the NET-2 Network Analysis Program
Final rept. 1 Jan-31 Dec 74
Allan F. Malmberg. Dec 74, 21p HDL-071-1
Contract DAAG39-74-C-0071
Sponsored in part by Defense Nuclear Agency, Washington, D.C.

Descriptors: *Electrical networks, *Computerized simulation, *Bipolar transistors, Computer programs, Mathematical models.
Identifiers: NET 2 computer program, Equivalent circuits.

Various technical tasks have been performed in support of the NET-2 Network Analysis Program, Release 8 and Release 9. These tasks include final checkout of Release 9, data structure improvements, work on eliminating computational delay, maintenance of the program, and addition of the Gummel-Poon bipolar transistor model.

AD-A011 348/0CP PC **A11**/MF **A01**
University of South Florida Tampa Dept of Electrical Engineering
SUPER-SCEPTRE. User's Manual. A Program for the Analysis of Electrical, Mechanical, Digital, and Control Systems. Revision I
Final rept.
James C. Bowers, John E. O'Reilly, and Gary A. Shaw. May 75, 233p
Contract DAAA21-73-C-0433, DAAA21-73-C-0655
Report on AMC CAD-E Series. See also AD-782 251 and AD-787 522.

Descriptors: *Electrical networks, *Mechanical components, *Computer applications, Logic circuits, Mechanical engineering, Gates(Circuits), Computer programming, Instruction manuals, FORTRAN.
Identifiers: *SUPERSCEPTRE computer program, SCEPTRE computer program, FORTRAN 4 programming language, Network analysis theory, Computer aided design, Feedback control.

SUPERSCEPTRE is a preprocessor developed for use in conjunction with the SCEPTRE circuit analysis program. SUPERSCEPTRE enables the user to simulate one-dimensional,n-degree of freedom mechanical systems, transfer functions, and digital logic devices in addition to electrical networks. SUPERSCEPTRE retains the useful features of SCEPTRE and includes a mechanical description language analogous to the SCEPTRE circuit description language. The language is easy to learn and no previous computer programming experience is needed to use SUPERSCEPTRE effectively. The derivation of equations is not required since SUPERSCEPTRE automatically formulates the describing equations of a system from the component values and the system topology.

AD-A011 603/8CP PC **A09**/MF **A01**
Air Force Cambridge Research Labs Hanscom AFB Mass
Impact of SAW Filters on RF Pulse Frequency Measurement by Double Detection
Physical sciences research papers
K. R. Laker, and A. J. Slobodnik, Jr. 6 Jan 75, 194p Rept nos. AFCRL-PSRP-621, AFCRL-TR-75-0011

Descriptors: *Band pass filters, Acoustic waves, Surface waves, Radiofrequency pulses, Measurement, Frequency bands, Detection, Mathematical models, Computer programs.
Identifiers: Acoustic surface waves.

When it is desired to measure the frequency of RF pulses to within a resolution comparable to the pulse spectral width, special techniques must be adopted. Double detection is such a method. The report presents a simplified mathematical model of the double detection frequency measurement technique. Both frequency and time domain (through the use of an FFT routine) responses of the two individual filters are considered along with the difference of the squares of the time domain responses. Good agreement between theory and experiment is shown. The model includes gating and thresholding and the effects of these parameters are investigated. A complete computer program description, listing, and test case are given. This model can be used to optimize the parameters of a double-detection system. Finally, the model has been used to evaluate the double detection performance of a variety of filter responses including Butterworth, flat exponential filter, brick wall, Kaiser truncated sinx/x, Hamming, and Gaussian.

AD-A012 963/5CP PC **A05**/MF **A01**
Illinois Univ At Urbana-Champaign Coordinated Science Lab
Analysis of Dielectric Waveguides for Millimeter Wave and Optical Integrated Circuits
Master's thesis
William Victor McLevige. Feb 75, 80p Rept nos. R-673, UILU-ENG-75-2207
Contract DAAB07-72-C-0259

Descriptors: *Dielectric waveguides, *Millimeter waves, *Integrated circuits, Wave propagation, Boundary value problems, Partial differential equations, Maxwells equations, Numerical integration, Computer programs, FORTRAN, theses.
Identifiers: Integrated optics, FORTRAN 2 programming language.

Some new dielectric waveguide structures suitable for millimeter wave and optical integrated circuits are presented. A method of analyzing wave propagation in these guides is developed through assuming simple field distribution and approximating the various regions of the guides in terms of effective dielectric constants. The mathematical formulation utilized results in a closed form solution from which the dispersion characteristics of the waveguides are readily obtained. Experimental results are described and the agreement between theory and experiment is shown to be quite good.

AD-A013 104/5CP PC **A04**/MF **A01**
Massachusetts Inst of Tech Lexington Lincoln Lab

Optimization of a Communication Satellite Multiple-Beam Antenna
Technical note
Andre R. Dion. 27 May 75, 62p TN-1975-39, ESD-TR-75-180
Contract F19628-73-C-0002

Descriptors: *Multiple beam antennas, *Satellite antennas, *Lens antennas, Communication satellites, Synchronous satellites, Waveguides, Lenses, Antenna radiation patterns, Pencil beams, Area coverage, Wide angles, Gain, Computer programs, X band, Satellite communications, Optimization.
Identifiers: *Waveguide lens antennas, Earth coverage.

The dimensions of a multiple-beam antenna designed to optimize some desirable characteristics of a synchronous communication satellite are derived. The multiple-beam antenna is an X-band waveguide lens with a cluster of feeds in its focal plane. Two antenna systems are considered: (1) an antenna system radiating pencil beams for area coverage, and (2) an antenna system radiating an earth-coverage beam with nulls in prescribed directions. The characteristics of the optimum configurations are studied over a band of frequency and for practical values of feed excitation errors. (Author)

AD-A013 107/8CP PC **A04**/MF **A01**
Mitre Corp Bedford Mass
Computer Simulation of MUX Bus Voltage Waveforms under Steady State Conditions
Technical rept.
R. A. Costa. Jun 75, 71p MTR-2948, ESD-TR-75-67
Contract F19628-75-C-0001

Descriptors: *Avionics, *Bus conductors, *Computerized simulation, *Multiplexing, Reliability(Electronics), Costs, Voltage, Waveforms, Airborne, Electric cables, Shielding, Fortran, Computer programs, Equations, Steady state, Transformers, Resistors, Remote terminals.
Identifiers: Computer software, Twisted pair, Fortran 4 programming language, Fault isolation.

Digital techniques involving multiplex busing are being advocated in many quarters as a means of satisfying the need for greater reliability, decreased modification cost, and simplified maintenance of airborne avionics systems. This paper documents efforts to develop a computer simulation of a shielded, twisted pair cable multiplex bus with multiple subscribers using steady state equations. The simulation predicts voltage waveforms, driving point impedances, and power distributions for systems compatible with MIL-STD-1553 (USAF). Excellent agreement has been found between laboratory observations and the computer simulation, validating this approach. (Author)

AD-A013 419/7CP PC **A05**/MF **A01**
Rockwell International Corp Anaheim Calif Electronics Research Div
Programmable Acoustic Signal Processing Devices
Final rept. 1 Oct 73-27 Feb 75
P. J. Hagon, L. R. Adkins, R. H. Harada, K. M. Lakin, and D. Penunuri. May 75, 88p C73-369/501, ECOM-73-0106-F
Contract DAAB07-73-C-0106

Descriptors: *Signal processing, *Acoustic delay lines, Acoustic waves, Surface waves, Computer programming, Correlators, Transmitter receivers, Coding, Ultrahigh frequency, Integrated circuits, Silicon, Sapphire, Matched filters, Spread spectrum, Decoding, Computer programs, Fabrication.
Identifiers: Silicon on sapphire.

The main objectives of this program were: To develop advanced programmable signal processing devices which employ surface acoustic wave tapped delay lines and integrated control circuits. This included the design, fabrication, and evaluation of electronically programmable tapped delay line (PTDL) waveform generators and matched filters. To design a transceiver which utilizes the PTDL's developed in Task 1 above as matched filters and demonstrate signal transmission and electronically programmed decoding of spread spectrum phase coded wave-forms at 435 MHz with 20 MHz chip rates. To deliver six 435 MHz PTDL's to ECOM together with two demonstration exerciser boxes and the transceiver.

AD-A013 473/4CP PC **A13**/MF **A01**
Naval Postgraduate School Monterey Calif
Hybrid Mode Analysis of Coplanar Transmission Lines
Master's thesis
Klaus-Dieter Kuchler. Jun 75, 285p

Descriptors: *Slot lines, *Strip transmission lines, Ferrites, Resonators, Substrates, Fourier transformation, Computer programs, Matrices(Mathematics), Numerical analysis, Green's function, Transmission lines, Theses.
Identifiers: Method of moments.

A frequency dependent hybrid mode analysis of general coplanar transmission lines is presented. A Fourier transform technique is applied and the resulting expressions are evaluated numerically using the method of moments. Shielded slot line resonators as well as dispersion characteristic and characteristic impedance of open and closed boundary slot lines, coupled slot lines and coplanar strip lines are obtained. An extension of this technique is used in a perturbational analysis of slot lines on a ferrite substrate. The theoretical performances of various slot line directional couplers are predicted. Numerical results are compared with experiments in various cases, where excellent agreement has been obtained.

AD-A013 950/1CP PC **A02**/MF **A01**
Massachusetts Inst of Tech Lexington Lincoln Lab
Minimum Directivity of Multiple-Beam Antennas
Journal article
Andre R. Dion. 24 Jun 74, 3p JA-4412, ESD-TR-75-197
Contract F19628-73-C-0002
Availability: Pub. in IEEE Transactions on Antennas and Propagation, vAP-23 n2 p283-284 Mar 75.

Descriptors: *Antennas, *Space communications, *Antenna feeds, Directional, Focusing, Gain, Computer programs, Reprints.
Identifiers: Multiple beam antennas, Spacing.

The minimum directivity of a multiple-beam antenna is an important design parameter of the related communications system. This parameter is a function of the spacing between the feeds of a focusing device. In this communication it is shown that the minimum directivity can be optimized by the proper choice of feed spacing. (Author)

AD-A014 418/8CP PC **A04**/MF **A01**
Naval Avionics Facility Indianapolis Ind
MECA 74 (Multivalued Electronic Circuit Analysis - Version 1974) - A Faster Computer Program for Analyzing Resistive Nonlinear Circuits
Technical rept.
Paul A. Medlock. Sep 74, 70p Rept no. NAFI-TR-2027

Descriptors: *Electrical networks, *Computer programming, Flip flop circuits, Linear systems, Nonlinear systems, Resistors, Voltage, Instruction manuals.
Identifiers: *MECA 74 computer program, *Network analysis theory.

This report is a user's manual for MECA 74, a user oriented nonlinear network analysis program which uses less computer time on large networks than its predecessor MECA 68. MECA 74 is capable of finding operating points, driving point characteristics, and transfer characteristics of resistive nonlinear networks containing controlled sources, and two terminal nonlinear resistors characterized by piecewise-linear voltage-current curves.

AD-A014 643/1CP PC **A07**/MF **A01**
Alford (Andrew) Consulting Engineers Winchester Mass
A Guide for the Selection of Antenna Characteristics for Single Frequency and Two Frequency Localizers In the Presence of Reflecting Structures
Final rept. Oct 69-Apr 75
Andrew Alford, Edward French , and Raymond Schwartz. Apr 75, 146p FAA-RD-75-64
Contract DOT-FA70WA-2253

Descriptors: *Antenna arrays, *Instrument landings, *Glide path systems, Directional, Traveling waves, Directional antennas, Airports, Electromagnetic wave reflections, Hangars, Computer programs, Handbooks.
Identifiers: Localizer arrays, DOT/4IZ/ID.

Four new localizer antenna arrays, utilizing traveling wave elements, have been developed for the FAA. These elements are directional and are free of the mutual coupling problems of former arrays. Additionally the elements in the arrays are fed through couplers which have a 50 ohm input and output impedance. All arrays are broad band and operate without any line cutting. An initial part of this effort was to study a large number of the congested airports and determine the theoretical patterns necessary to provide CAT I or CAT II performance. Additionally the arrays were to be modular, that is the smallest array could be expanded into the next bigger higher performance array and so forth to the very largest array. The smallest two arrays are single frequency arrays and the larger two are two-frequency capture-effect arrays. During the theoretical study phase, a computer program was developed to assist in analyzing the signal performance in the presence of reflecting surfaces. From this study, this handbook was developed to assist the engineer to make predictions with a minimum of mathematics as to what array to install to give the perforamnce desired or what array is needed to upgrade a present localizer array. (Author)

AD-A014 835/3CP PC **E02**/MF **A01**
General Electric Corporate Research and Development, Schenectady, N.Y.
Operator's Manual for Computer Programs for Prediction of Lightning Induced Voltages in Aircraft Electrical Circuits
Final rept. 1 Feb-30 Nov 74
K. L. Maxwell, F. A. Fisher, J. A. Plumer, and P. R. Rogers. Apr 75, 42 SRD-75-006, AFFDL-TR-75-36-Vol-2
Contract F33615-74-C-3068

Descriptors: *Circuits, *Surges, Lightning, Aircraft equipment, Electric power, Coupling(Interaction), Magnetic fields, Instruction manuals, Computer programming, Predictions.

The manual describes the use of computer programs defined in the technical report 'Computer Programs for Prediction of Lightning Induced Voltages in Aircraft Electrical Circuits.' It supplements the technical report with information on the use of the computer programs.

AD-A014 848/6CP PC **A04**/MF **A01**
Syracuse Univ N Y Dept of Electrical and Computer Engineering
Analysis of Radiation by Wire Antennas over Imperfect Ground
Tapan K. Sarkar, and Bradley J. Strait. 1 May 75, 74p Scientific-6, AFCRL-TR-75-0337
Contract F19628-73-C-0047

Descriptors: *Antenna arrays, *Radio fields, Mathematical analysis, Computer programs, Orientation(Direction), Wire, Ground effect.

Three user-oriented computer programs are presented and described for analyzing radiation from arrays of parallel vertical wires, parallel horizontal wires, and also arbitrary wire configurations over the surface of an imperfectly conducting earth. The first two programs are equipped to treat unequally spaced arrays of wires that can be of different lengths and radii and of arbitrary excitation and loading. The effects of the imperfectly conducting earth are accounted for in an essentailly exact manner by using the Sommerfeld formulation. The third program treats arbitrary wire antennas and incorporates the ground effects approximately by using the reflection-coefficient method. Computed output consists of current distribution, input impedances, and field patterns specified by the user.

AD-A015 090/4CP PC **A06**/MF **A01**
Johns Hopkins Univ Laurel Md Applied Physics Lab
Wideband Solid-State Phased-Array Antenna Development at UHF
Technical memo.
G. J. Laughlin. Jul 75, 101p Rept no. APL/JHU/TG-1278
Contract N00017-72-C-4401

Descriptors: *Phased arrays, Ultrahigh frequency, Solid state electronics, Broadband, Transistor amplifiers, Power amplifiers, Integrated systems, Impedance matching, Computer programs.

Development of an experimental 16-element solid-state linear phased-array antenna that has an operating band from 0.6 to 0.95 GHz is described. Radiating elements in the antenna are novel strip radiators made using printed circuit techniques. The array aperture has been impedance matched to a VSWR03.0:1 over the octave band from 0.5 to 1.0 GHz with beam scanning to plus or minus 60 degrees in the H plane. Element patterns measured on a 10- by 10-element array aperture indicate that the aperture is also matched with beam scanning to plus or minus 60 degrees in the E plane. Each of the radiators in the 16-element linear array was integrated with a microwave transistor amplifier with a nominal gain of 10 dB and efficiency of 50% at 3 watts output. Bandwidths of the amplifiers limit the 16-element solid-state array to an operating band from 0.6 to 0.95 GHz. Beam scanning in the H plane is accomplished by inserting lengths of coaxial delay lines between the integrated array and a 16:1 power divider network. Techniques and methods used in this development are applicable at higher radar frequencies.

AD-A015 174/6CP PC **A08**/MF **A01**
General Electric Corporate Research and Development Schenectady N Y
Computer Programs for Prediction of Lightning Induced Voltages in Aircraft Electrical Circuits
Final rept. 1 Feb-30 Nov 74
K. J. Maxwell, F. A. Fisher, J. A. Plumer, and P. R. Rogers. Apr 75, 161p SRD-75-005, AFFDL-TR-75-36-Vol-1
Contract F33615-74-C-3068
See also Volume 2, AD-A014 835.

Descriptors: *Transient radiation effects, *Aircraft equipment, *Lightning, *Computer programs, Circuits, Electrical equipment, Surges, Magnetic fields, Predictions.
Identifiers: DIFFUSION computer program, APERTURE computer program.

The report describes a computerized program to define the induced circuit voltage within an aircraft electrical system due to a lightning strike on the aircraft. One routine of the program (DIFFUSION) calculates the effect of magnetic fields caused by current on the aircraft skin. The other routine (APERTURE) calculates the magnetic field that enters the aircraft because of an opening. The induced voltages are then calculated for any given electrical circuit. The program has defined geometrical configurations for a fuselage, rectangular wing, and empennage sections. A subroutine calculates the current distribution on the skin of the section being analyzed. The program input current and output voltage are in the time domain.

AD-A015 242/1CP PC **A08**/MF **A01**
Michigan Univ Ann Arbor Radiation Lab
Sidelobe Suppression Mode Performance of ATCRBS with Various Antennas
Interim rept. Jul 73-Jun 74
Jovan Zatkalik, Dipak L. Sengupta, and Chen-To Tai. Feb 75, 161p TSC-FAA-75-3
Contract DOT-TSC-717

Descriptors: *Air traffic control systems, *Sidelobes, Antennas, Suppression, Radar beacons, Directional antennas, Antenna arrays, Antenna radiation patterns, Computerized simulation, Computer programs.
Identifiers: DOT/4IZ/ID, ATCRBS(Air Traffic Control Radar Beacon Systems), Air traffic control radar beacon systems.

The SLS mode performance of terminal and enroute ATCRBS using existing and various improved antennas in the presence of perfectly dielectric flat ground are investigated theoretically. Necessary analytical expressions for various quantities characterizing the system performance have been derived. A computer program has been developed for the computation and tabulation of these quantities as functions of the elevation angle of the observation point for different combinations of heights of the directional and omnidirectional antennas. For each antenna combination results are given for the following seven quantities: the P1 and P2 pulse intensities, the pulse ratio P1/P2, the mainbeam killing and sidelobe punch-through zones in space, the effective azimuth beamwidth, the number of replies and the coverage diagram. Short discussions of results are given wherever appropriate.

AD-A015 243/9CP PC **A08**/MF **A01**
Michigan Univ Ann Arbor Radiation Lab
Improved Sidelob Suppression Mode Performance of ATCRBS with Various Antennas
Interim rept. Jul 73-Jun 74
Dipak L. Sengupta, Jovan Zatkalik, and Chen-To Tai. Feb 75, 168p TSC-FAA-75-4
Contract DOT-TSC-717

Descriptors: *Air traffic control systems, *Sidelobes, Antennas, Suppression, Radar beacons, Antenna arrays, Antenna radiation patterns, Computer programs, Computerized simulation.
Identifiers: DOT/4IZ/ID, ATCRBS(Air Traffic Control Radar Beacon Systems), Air traffic control radar beacon systems.

The ISLS mode performance of terminal and enroute ATCRBS using existing and various improved antennas in the presence of perfectly dielectric flat ground are investigated theoretically. Necessary analytical expressions for various quantities characterizing the system performance have been derived. A computer program has been developed for the computation and tabulation of these quantities as functions of the elevation angle of the observation point for different combinations of heights of the directional and omnidirectional antennas. For each antenna combination results are given for the following seven quantities: the P1 and P2 pulse intensities, the pulse ratio P1/P2, the mainbeam killing and sidelobe punch-through zones in space, the effective azimuth beamwidth, the number of replies and the coverage diagram. Short discussions of results are given wherever appropriate.

AD-A015 675/2CP PC **A03**/MF **A01**
Syracuse Univ N Y Dept of Electrical and Computer Engineering
Design of Reactively Controlled Antenna Arrays
Technical rept.
Roger F. Harrington, Robert F. Wallenberg, and Alan R. Harvey. Sep 75, 42p Rept nos. TR-4, TR-75-10
Contract N00014-67-A-0378-0006

Descriptors: *Antenna arrays, Beam steering, Antenna radiation patterns, Circular antennas, Computer programs, Reactance, Transformers, Transmission lines, Directional antennas, Antenna feeds, Dipole antennas.
Identifiers: Univariate search, Design.

This report considers the use of variable reactance loads to control the beam direction of reactively loaded antenna arrays. The arrays considered have a single feed point, no transmission lines to the elements, and one reactive load per element. Only partial control of the array characteristics is possible using this scheme. The initial design of the array is obtained by resonating the desired port currents, and this is then improved by an optimum seeking univariate search method. This procedure gives good results for arrays of moderate numbers of relatively closely spaced elements. Several numerical examples are given for arrays of half-wavelength long dipole antennas. A computer program for the univariate search method, with operating instructions, is included. (Author)

AD-A015 808/9CP PC **A03**/MF **A01**
Illinois Univ At Urbana-Champaign Coordinated Science Lab
Computer Aided Analysis of Integrated Injection Logic
Technical rept.
Jeffrey Alan Niehaus. Sep 75, 46p Rept nos. R-689, UILU-ENG-75-2224
Contract DAAB07-72-C-0259

Descriptors: *Integrated circuits, *Logic circuits, Digital systems, Computerized simulation, Theses, Gates(Circuits), Computer applications.
Identifiers: *Integrated injection logic circuits, Computer aided analysis, Large scale integrated circuits, Logic design, SPICE computer program.

Integrated injection logic is a low power, high density bipolar logic family. The switching speed is inversely proportional to the current levels used, which can vary anywhere from the nA to microamp range. Since integrated injection logic is a current switching logic, it can operate over a wide range of supply voltages. Besides possessing a low speed power product, it has the highest packing density of any standard logic family. The paper compares results of derived equations with circuit simulations run under the Berkeley SPICE program on the DEC-10 Computer. Logic design with these multiple-output, single-input devices is also analyzed and simulated on the computer.

AD-A016 576/1CP PC **A04**/MF **A01**
Naval Postgraduate School Monterey Calif

A Method to Predict the Thermal Performance of Printed Circuit Board Mounted Solid State Devices
Final rept.
Matthew D. Kelleher. 31 Jul 75, 57p Rept no. NPS-59-Kk75071

Descriptors: *Solid state electronics, Thermal analysis, Printed circuits, Circuit boards, Reliability(Electronics), Predictions, Cooling, Heat transfer, Computer programs, FORTRAN.
Identifiers: Solid state devices, FORTRAN 4 programming language.

The objective was to formulate a design procedure to be used in the prediction of the thermal performance of printed circuit board mounted solid state devices (specifically 14 and 16 pin DIP's and TO-3 and TO-66 transistor cases). The project consists of an analytical phase which constitutes the actual formulation of the design procedure in the form of a digital computer program with appropriate documentation and an experimental phase which involves testing of actual P-C boards to verify the analytical model.

AD-A016 776/7CP PC **A05**/MF **A01**
Harry Diamond Labs Adelphi Md
Damage Analysis Modified TRAC Computer Program (DAMTRAC)
George H. Baker, Alan D. McNutt, David M. Rubenstein, and G. Bradford Shea. May 75, 96p Rept no. HDL-TM-75-6
See also report dated Jun 68, AD-836 683.

Descriptors: *Solid state electronics, *Transient radiation effects, Semiconductor devices, Computer programming, Computerized simulation, Circuits.
Identifiers: DAMTRAC computer program.

A computer program tailored for EMP damage analysis of solid-state circuitry has been developed by modifying the existing transient radiation analysis by computer (TRAC) network analysis program. Modification of the TRAC diode and transistor models to include breakdown prameters and the addition of a semiconductor device parameter library have greatly simplified the analyst's task. An added feature is a subroutine that automatically calculates the amplitude and duration of transient power dissipated in circuit components.

AD-A016 826/0CP PC **A15**/MF **A01**
Joint Technical Coordinating Group on Electronics Equipment Reliability
Final Report of the Joint Logistics Commanders Electronic Systems Reliability Workshop
1 Oct 75, 334p
See also Summary report dated 1 Aug 75, AD-A014 568.

Descriptors: *Reliability(Electronics), *Meetings, Microcircuits, Electronic equipment, Management planning and control, Systems analysis, Test methods, Procurement, Avionics.
Identifiers: Computer program reliability.

The Workshop represents a culmination of almost three years of effort by the Joint Technical Coordinating Group on Electronic Equipment Rellability (JTCG-EER), which was devoted to a series of investigations for improving reliability and procurement practices related to microcircuits. After making substantial progress on its device related projects, the JTCG-EER decided to organize the Electronic Systems Reliability Workshop in order to address the system reliability problem and to consider means of developing improved management procedures, documentation, standards, and analytic and testing techniques for producing more reliable systems. The Workshop was organized into seven work groups, namely: Acquisition Reliability Management, Operational Reliability Management, Reliability Testing, Reliability Documentation, Reliability Analysis, Reliability Design Techniques, and Software Reliability.

AD-A017 094/4CP PC **A14**/MF **A01**
Florida Univ Gainesville Dept of Electrical Engineering
Investigation and Study of Computational Techniques for Design and Fabrication of Integrated Electronic Circuits
Final rept. 7 Mar 74-30 Jun 75
David P. Kennedy. Sep 75, 305p
Contract ARPA Order-2700, Grant MDA903-74-G5

Descriptors: *Integrated circuits, *Computer aided design, *Semiconductor devices, Costs, Manufacturing, Mathematical models, Computer programs, Communication equipment, Radar equipment, Epitaxial growth, Metal oxide semiconductors, Silicon, Transistors, Field effect transistors, Ion implantation.

Under ARPA Grant MDA903-74-G5, the University of Florida, Gainesville, Florida, has undertaken a program of study on the topic of Computer Engineering of Integrated Circuits. The purpose of this program was to identify problem areas associated with the design and development of integrated semiconductor circuits; problem areas that result in excessive cost and inadequate availability of the particular type electronic structures required by the DoD. An additional purpose of this study is to recommend a program of research and development directed toward alleviating the identified problem areas.

AD-A017 106/6CP PC **A99**/MF **A01**
Air Force Cambridge Research Labs Hanscom AFB Mass
Surface Acoustic Wave Filters at UHF: Design and Analysis
Physical sciences research papers
Andrew J. Slobodnik, Jr. 3 Jun 75, 672p Rept nos. AFCRL-TR-75-0311, AFCRL-PSRP-634

Descriptors: *Band pass filters, Acoustic waves, Surface waves, Transducers, Ultrahigh frequency, Frequency response, Frequency synthesizers, Periodic functions, Computer programs, Computerized simulation.
Identifiers: *Acoustic surface waves, Interdigital transducers, Design.

The purpose of the report is to provide a unified and reasonably self-contained source of theoretical techniques for ideal Surface acoustic wave (SAW) bandpass filter design and analysis. Topics discussed include an introduction to sampling theory, transducer analysis from sampling weights, cosine squared-on-a-pedestal transducers, phase reversal transducers, Dolph-Chebyshev and Kaiser weighting for sharp-cutoff filters, optimum (equiripple) filter synthesis plus Butterworth and other no-null frequency response filters. In addition, periodic time and frequency responses are discussed. Synthesis of phase weighted bandpass filters are also considered in detail, as are second order and real life effects such as inaccurate apodization, inaccurate finger placement, electrode resistance effects, and phase distortion due to the finite gap between electrodes and dummy electrodes. In all cases, full computer program descriptions, listings and test runs are provided.

AD-A017 475/5CP PC **A03**/MF **A01**
Army Electronics Command Fort Monmouth N J
Avalanche and Depletion Region Widths for Uniformly Doped Gallium Arsenide Impact Avalanche Transit Time Diodes
Research and development technical rept.
Kenneth L. Klohn, and John F. Armata, Jr. Nov 75, 44p Rept no. ECOM-4368

Descriptors: *IMPATT diodes, Gallium arsenides, Doping, Breakdown(Electronic threshold), Direct current, Computer programs, Electrical properties.

High dc to rf conversion efficiency is one of the primary objectives in designing impact avalanche transit time (IMPATT) devices. To aid in the design for best efficiency for any given frequency, it is very desirable to know the size of the avalanche region and depletion layer as a function of the doping concentration in the material. This report summarizes the dc analysis used to determine values of breakdown voltage, depletion layer width, maximum electric field, avalanche width to depletion width ratio, dc to rf conversion efficiency and the range of possible transit time frequencies, all as a function of doping concentration between 1 x 10 to the 15th and 1 x 10 to the 17th atoms per cu cm. A calculator program is presented to perform the above calculations. Comparisons were made among four different sets of constants found in the literature for the ionization rate equation at room temperature and three sets for an operating temperature of 200 degrees Celsius. Calculations were made for a uniformly doped gallium arsenide IMPATT device which is the simplest structure to fabricate.

AD-A017 677/6CP PC **A03**/MF **A01**
Mitre Corp Bedford Mass
The 'Standard' MUX Bus: Some Constraints on Information Flow Arising from MIL-STD-1553 (USAF)
Technical rept.
P. R. Cloud. Nov 75, 44p MTR-3041, ESD-TR-75-96
Contract F19628-75-C-0001

Descriptors: *Bus conductors, *Time division multiplexing, *Message processing, *Communications networks, Avionics, Specifications, Military requirements, Standards, Communications traffic, Control systems, Computer programs, Information transfer, Remote terminals, Word organized storage.
Identifiers: Constraints.

MITRE has designed, constructed, and operated an avionics time division multiplex bus compatible with the requirements of MIL-STD-1553 (USAF). In the course of engineering the software to perform the message control function for this network, some constraints on the message flow were encountered that are not immediately apparent when reading the standard. The purpose of this report is to alert the system designer to some of these potential difficulties. Four main topics are discussed: (1) Bus capacity; (2) A time constraint on message handling; (3) Subaddresses, and Data Word accessibility; and (4) Temporal characteristics of information transferred on the bus.

AD-A017 956/4CP PC **A05**/MF **A01**
Army Electronics Command Fort Monmouth N J
A Quantum Mechanical Description of Charge Injection Devices (CID)
Final rept.
Steven A. Bleier. Jul 75, 85p Rept no. ECOM-4342
Master's thesis.

Descriptors: *Charge coupled devices, Quantum theory, Semiconductor devices, Vidicons, Wave functions, Schrodinger equation, Computations, Computer programs.
Identifiers: *Metal insulator semiconductors, *Charge injection devices.

Of the two charge transfer techniques in use today, the charge injection device (CID) is analyzed by using quantum mechanical methods. First, the basic structure of the CID is reviewed. The CID consists of a linear array of metal-insulator-semiconductor (MIS) elements.

Each element of the device is a photon detector whose function is to transform the incident image into a distribution of minority carriers located in an inversion region under the metal gates. Since the MIS structure is the primary mechanism by which this transformation operation occurs, its characteristics are analyzed. The prime concern of this paper is to investigate characteristics of the depletion region formed when voltage is applied to the MIS structure. By assuming that a constant electric field exists within the semiconductor and a constant potential exists within the insulator, approximate wave functions and energy levels for the minority carriers are found by computational methods for both regions. Finally, the theory of quantum transitions is used to derive an expression for the transition probability when light is absorbed by the MIS structure.

AD-A018 444/0CP PC **A03**/MF **A01**
Bdm Corp Albuquerque N Mex
The EMCAP (Electromagnetic Compatibility Analysis Program) Properties of the Banded Matrix Iterative Solution Technique for Thin Wire Moments Problems
Phase rept. 2 Apr-1 Jul 75
T. R. Ferguson. Nov 75, 35p BDM/A-141-75-TR, RADC-TR-75-272
Contract F30602-74-C-0182

Descriptors: *Electromagnetic compatibility, *Computer programs, *Mathematical prediction, *Electric wire, Equations, Simultaneous equations, Moments, Stability, Errors, Control systems, Computer logic, Iterations, Matrices(Mathematics), Electrical impedance, Thinness, Bandwidth, Exponential functions, Efficiency, Approximation(Mathematics).
Identifiers: Linear equations.

Efficient solution of the linear simultaneous equations arising from thin wire moments problems by a banded matrix iterative technique has been demonstrated for a variety of small problems in previous reports. This report includes studies of stability of the equations, computation of residual errors in the iterative method, statistics on performance of a new convergence measure, prediction of efficiencies during the iteration, possibilities for control logic for the iteration with checkpoint/restart capabilities, and an attempt to accelerate convergence. (Author)

AD-A018 452/3CP PC **A04**/MF **A01**
Illinois Univ At Urbana-Champaign Coordinated Science Lab
Analysis of Slot Line Type Waveguides
Technical rept.
Nikola Samardzija. Nov 75, 52p Rept nos. R-697, UILU ENG-75-2232
Contract DAAB07-72-C-0259
Master's thesis.

Descriptors: *Waveguide slots, *Strip transmission lines, *Dielectric waveguides, Waveguides, Wavelengths, Transmission lines, Electric fields, Coaxial cables, Electromagnetic fields, Propagation, Computer programs, Theses, Integrated circuits, Magnetic fields.

The idea of having electromagnetic fields propagating along the slot in a metal sheet is not a new one. It has been used for radiating antenna elements, in which radiation was of primary interest. Also dielectric-covered resonant slots have been analyzed by Bailey in 1967. The basic difference between previous slot elements and the slot line is that in the latter we are interested in minimizing radiation in order to achieve superior transmission characteristics.

AD-A018 546/2CP PC **A06**/MF **A01**
Thermal Technology Lab Inc Buffalo N Y
Development of Lightweight Transformers for Airborne High Power Supplies. Volume II
Final technical rept. Jun 72-Jan 75
R. Haumesser, D. Lockwood, R. McNall, and James P. Welsh. Jun 75, 112p AFAPL-TR-75-15-Vol-2
Contract F33615-72-C-1944
See also Volume 1, AD-A018 545.

Descriptors: *Transformers, *Computer programs, Power supplies, Subroutines, Airborne, Programming manuals, User needs, Cooling, Printers(Data processing), Debugging(Computers), Plotting, Winding, Cores, Capacitance, Lightweight, Parameters.
Identifiers: TDPLOT computer program, Design.

A procedure, Function TDP, and its associated subroutines and functions, determines a consistent set of values for dependent design parameters for a given set of independent design parameter values. A listing of transformer design parameters and a consistent set of units are presented. These are passed in and out of TDP through a 300 element array PV in labeled common block PVDC. Section 2 discusses general features and limitations of TDP. Considerations that must be taken into account in order to avoid infeasable transformer designs are discussed in Section 3. Program TDPLOT is an aid in optimizing transformer designs. This procedure generates an output in the form of 3-dimensional line printer and/or Cal-Comp plots of the objective function and final transformer design parameter values. A description of the input required by PROGRAM TDPLOT and the output that is generated is discussed in Section 4. Appendix 2 discusses computing system requirements and presents an example run. An FTN compiler source listing of the program is provided in Appendix 3.

AD-A018 697/3CP PC **A03**/MF **A01**
Naval Research Lab Washington D C
Some Comments on Power Combiner/Switch Matrices
C. W. Young, Jr, and M. L. Reuss, Jr. 26 Nov 75, 27p Rept no. NRL-7937

Descriptors: *Signal processing, *Matrices(Circuits), Switching circuits, Errors, Power conditioning, Computer programs.

High-power signals can be switched with low-power switch control using hybrid matrices and parallel amplifiers. This study treats the effects of input phase and amplitude errors on the outputs of combiner/switch matrices. Worst-case isolation and loss are considered as a function of the errors mentioned and of the unbalance of the hybrids forming the matrix. Effects of each parameter are considered individually; a computer program to study the effects of several errors simultaneously is listed in the report.

AD-A018 999/3CP MF **A01**
Naval Air Development Center Warminster Pa
Bent Plate Computer Program Listing
Oct 75, 75p NADC-75251-20b, DOD/DF-75/003b
For computer program on magnetic tape, see AD-A019 001. See also AD-A019 000.
Availability: Available in microfiche only.

Descriptors: *Antenna radiation patterns, *Electromagnetic scattering, *Computer programs, Aircraft antennas, Plates, High frequency, Reflection, Diffraction, Predictions, FORTRAN.
Identifiers: Bent plate computer program, CDC 6600 computers.

The program can be used to show the electromagnetic scattering effects from a flat or bent plate. One antenna or an array of antennas can be mounted near the plate. The program will compute information necessary for antenna pattern plots. If the plots are desired, a magnetic tape drive is necessary to run the program. The generated tapes from these programs can be used on a California Computer Products, Inc's CALCOMP pen plotter, model 763 to produce the desired antenna patterns.

AD-A019 000/9CP MF **A01**
Naval Air Development Center Warminster Pa
Roll Plane Computer Program
Oct 75, 142p NADC-75251-20a, DOD/DF-75/003a
For computer program on magnetic tape, see AD-A019 001. See also AD-A018 999.
Availability: Available in microfiche only.

Descriptors: *Antenna radiation patterns, *Computer programs, Aircraft antennas, Airframes, Predictions, FORTRAN.
Identifiers: Roll plane computer program, CDC 6600 computers.

The Roll Plane program can be used to predict an antenna radiation pattern for a fuselage mounted antenna. The aircraft's fuselage, wings and horizontal stabilizers can be modeled in the program. The program will compute information necessary for antenna pattern plots. If the plots are desired, a magnetic tape drive is necessary to run the program. The generated tapes from the program can be used on a California Computer Products, Inc. CALCOMP pen plotter, Model 763 to produce the desired antenna patterns.

AD-A019 001/7CP CP **T04**
Naval Air Development Center Warminster Pa
Roll Plane and Bent Plate Programs. Release No. 1
Software
Walter D. Burnside, Robert E. Lee, and Robert D. Hayes. Oct 75, 2400 ft NADC-75251-20, DOD/DF-75/003
Availability: Available in 9 track, 800/1600 ASCII character code, odd parity only. Price includes documentation, AD-777 975, AD-777 976, AD-777 977 and AD-777 989.

Descriptors: *Antenna radiation patterns, Aircraft antennas, High frequency, Predictions, Electromagnetic scattering, Reflection, Diffraction, Airframes, Magnetic tape, FORTRAN.
Identifiers: *Software, Roll plane computer program, Bent plate computer program, CDC 6600 computers.

This tape contains two source computer programs. They are named the Roll Plane and Bent Plate Programs. The Roll Plane program can be used to predict an antenna radiation pattern for a fuselage mounted antenna. The aircraft's fuselage, wings and horizontal stabilizers can be modeled in the program. The Bent Plate program can be used to show the electromagnetic scattering effects from a flat or bent plate. One antenna or an array of antennas can be mounted near the plate. Both programs will compute information necessary for antenna pattern plots. If the plots are desired, a magnetic tape drive is necessary to run the program. The generated tapes from these programs can be used on a California Computer Products, Inc's CALCOMP pen plotter, model 763 to produce the desired antenna patterns.....Software description: These programs were written in the FORTRAN programming language for implementation on a CDC 6600 computer using the SCOPE 3.3 operating system.

AD-A019 155/1CP PC **A09**/MF **A01**
Naval Ammunition Depot Crane Ind
Neutron Hardness Assurance for Bipolar Transistors through Determination of Physical Parameters
Final rept.
R. D. Blice, and J. A. Munarin. Nov 75, 199p AFWL-TR-74-327

Descriptors: *Bipolar transistors, Radiation resistance, Nondestructive testing, Neutron irradiation, Predictions, Computer programs, FORTRAN, Transient radiation effects.

A nondestructive method of neutron radiation hardness assurance is developed for bipolar transistors using a detailed one-dimensional model to obtain the powers (sensitivity parameters) relating postirradiation h sub FE and V sub CE(sat) at any operating point to preirradiation physical parameters and preirradiation electrical measurements at specified operating points. The transistor model uses physical dimensions, doping concentrations, diffusion constants, electric fields, and minority carrier lifetimes determined from terminal electrical measurements. The sensitivity parameters are applied to (1) predicting postirradiation h sub FE and V sub CE(sat) from preirradiation electrical measurements and the physical parameters extracted from them and (2) establishing upper or lower bounds on preirradiation physical parameters. In this study, sensitivity parameters are calculated for a medium-power double-diffused planar epitaxial NPN device (2N2222A).

AD-A019 219/5CP PC **A05**/MF **A01**
Army Electronics Command Fort Monmouth N J
Operational Procedures for Optimized Reliability and Component Life Estimator (ORACLE)
Final rept.
Jerry Kastning. Dec 75, 78p Rept no. ECOM-4382

Descriptors: *Computer programs, *Reliability, *Reliability(Electronics), Electronic equipment, Integrated circuits, Semiconductor devices, Capacitors, REsistors, Diodes, Electrical equipment, Failure(Electronics), Cost analysis, Data bases, Trade off analyses, Predictions, Modules(Electronics), Optimization.
Identifiers: Mean time between failure, ORACLE computer program, Software.

Optimized Reliability And Component Life Estimator (ORACLE) is a software program which determines the failure rate of integrated circuits, discrete semiconductors, capacitors, resistors and inductors. In determining individual component failure rates, ORACLE follows the procedures prescribed in MIL-HDBK-217B. Thus ORACLE eliminates the most tedious parts of producing a reliability analysis for military equipment; namely, the looking up of the myriad of individual component parameters and formulas needed to determine component failure rates. The data base is restricted to components with a military part number. Those components currently found in the data base include integrated circuits, transistors, various types of diodes, capacitors, and inductors. Resistors, some styles of capacitors and some styles of inductors do not need to be in the data base as their individual part number contains enough information to allow ORACLE to decode and determine the failure rate without further information from a data base. ORACLE produces: (1) the total failure rate for a module (a set of related parts that together perform a specified function); (2) the MTBF for the module; (3) the price for each component if purchased in small quantities; and (4) the price for each component if purchased in quantities of 1000 or more. The component part input formats provide for the submission of component application dependent information such as the operating temperature, the operating environment, the component screening level, the duty cycle or usage, and other specific information uniquely applicable to each part. The purpose of this procedure is to perform a tradeoff analysis.

AD-A019 438/1CP PC **A04**/MF **A01**
Princeton Univ N J Solid State and Materials Lab
A Computer Program to Calculate Surface State Densities and Lateral Nonuniformities in Metal-Oxide-Semiconductor Devices
Technical rept.
T. A. Pandolfi, and B. S. H. Royce. 22 Dec 75, 59p Rept nos. PSSL-221275, 1256-AMS
Contract N00014-75-C-1022

Descriptors: *Semiconductor devices, *Computer programs, Metal oxide semiconductors, Surface properties, Doping, Depletion, Surface energy, Density.
Identifiers: BASIC programming language.

A Basic language computer program to control data taking and parameter calculation of metal-oxide-semiconductor devices is presented. The program calculates surface potential, surface state density, apparent doping density, and depletion width.

AD-A019 470/4CP PC **A02**/MF **A01**
Bdm Corp El Paso Tex
Maintenance for the NET-2 Network Analysis Program
Final rept. 2 Apr-31 Dec 75
Larry D. Ray. Dec 75, 15p HDL-140-1
Contract DAAG39-75-C-0140

Descriptors: *Circuit analysis, *Computer programs, Radiation effects, Networks, Nuclear radiation, Maintenance, Electronic equipment.

Maintenance activities for the Release 9 version of the NET-2 Network Analysis Program are described. These activities include correction of logical and programming errors, improvement of numerical techniques as required, and provision of engineering assistance and consultation in the application of NET-2 as directed by the Harry Diamond Laboratories. (Author)

AD-A019 851/5CP PC **A08**/MF **A01**
Air Force Inst of Tech Wright-Patterson AFB Ohio School of Engineering
Automated Design of Digital Integrate Circuit Masks
Master's thesis
Russell A. Glastetter. Dec 75, 155p Rept no. GE/EE/75-30

Descriptors: *Integrated circuits, *Masks, *Computer aided design, Chips(Electronics), Metallizing, Algorithms, Computer programs, FORTRAN, Theses.
Identifiers: Large scale integrated circuits, Lee algorithm, CDC-6600 computers.

A computer program is developed to generate an integrated circuit mask for the metalization layer of a standard COS/MOS chip. The program is written in FORTRAN Extended for the CDC 6600 computer. It is designed for digital circuits and bridges the gap from logic diagram level information to actual mask production tapes. The program was designed for use with the RCA Gate Universal Array family of chips. These chips consist of a large array of COS/MOS transistors. Circuits are built up from such digital logic functions as gates, flip-flops, binary dividers and other small scale logic functions. The interconnecting paths between the modules are routed by a form of the Lee algorithm. The output is via standard plotting system subroutines and, with very slight modification, can be used with most plotting systems.

AD-A020 872/8CP PC **A03**/MF **A01**
Georgia Inst of Tech Atlanta School of Electrical Engineering
Silicon Controlled Rectifier Large Signal Model
Final rept. 1 Oct 74-30 Jun 75
R. P. Webb, W. R. Callen, W. E. Sayle, and R. D. Jones. Oct 75, 26p AFAPL-TR-75-89
Contract F33615-74-C-2039

Descriptors: *Silicon controlled rectifiers, Computerized simulation, Mathematical models, Transients.
Identifiers: Supersceptre computer program.

Experimental measurements and a computer model of the transient behavior of standard low and intermediate power SCR's are described. The forward current through the device is monitored as the gate is triggered, with an initially applied forward voltage. The anode current as a function of time has been measured for fixed gate pulse duration, with gate pulse amplitude as a parameter. A computer model, using exponential functions to describe the anode current as a function of time, has been developed and is compared with the experimental results.

AD-A020 994/0CP PC **E03**/MF **A01**
Mitre Corp Bedford Mass
Intensified Silicon Diode-Array Target TV-Camera Tube (EBSICON); Description and Mathematical Model
Technical rept.
K. F. Muller, and G. O. Sauermann. Jan 76, 129
MTR-3073, ESD-TR-75-362
Contract F19628-76-C-0001

Descriptors: *Camera tubes, Electron tube targets, Vidicons, Silicon, Semiconductor diodes, Image intensification, Mathematical models, Computer programs, Gain, Optical images, Storage, Arrays, Space surveillance systems.
Identifiers: Electron beam semiconductor devices, GEODSS system.

In the document the mechanical configuration and the electrical operation of a low light level TV scanning image tube which incorporates high optical gain and image storage is described. The physical phenomena associated with these properties are described. From analytical descriptions of the phenomena, a mathematical model is developed. The computer program implementations of the model provide economical tools for overall system design considerations. These implementations of the model are flexible enough to encompass all sensor tube characteristics and their operating modes conceivable at this time. Where sufficiently accurate tube and operating parameters were available, comparisons of the model performance with experimental data showed very good quantitative agreement.

AD-A021 171/4CP PC **A03**/MF **A01**
Massachusetts Inst of Tech Cambridge Artificial Intelligence Lab
Heuristic Techniques in Computer Aided Circuit Analysis
Gerald Jay Sussman, and Richard Matthew Stallman. Mar 75, 28p Rept no. AI-M-328
Contract N00014-70-A-0362-0005

Descriptors: *Circuit analysis, *Computer aided instruction, *Artificial intelligence, *Heuristic methods, Electrical networks, Bias, Voltage, Transistor amplifiers, Steady state.
Identifiers: EL computer program.

Whereas other circuit analysis systems rely on classical, formal analysis techniques, EL employs heuristic inspection methods to solve rather complex DC bias circuits. These techniques also give EL the ability to explain any result in terms of its own qualitative reasoning processes. EL's reasoning is based on the concept of a local one-step deduction augmented by various teleological principles and by the concept of a macro-element. Several annotated examples of EL in operation and an explanation of how it works were presented. Also how EL can be extended in several directions, including sinusoidal steady state analysis were discussed. EL is significant not only as a novel

approach to circuit analysis but also as an application of Artificial Intelligence techniques to a new and interesting domain.

AD-A021 452/8CP PC **A05**/MF **A01**
R and D Associates Marina Del Rey Calif
Linear and Non-Linear EMP Diffusion Through a Ferromagnetic Conducting Slab
Technical rept.
William J. Karzas, and Charles T. C. Mo. Jul 75, 80p Rept no. RDA-TR-9000-001
Contract N00014-75-C-0104

Descriptors: *Electromagnetic shielding, *Ferromagnetic materials, Electromagnetic pulses, Transverse waves, Penetration, Diffusion, Numerical analysis, Finite difference theory, Computer programs, Nonlinear systems.
Identifiers: DIFUSN computer program.

The report investigates the shielding problem for the incident EMP in the form of a cylindrical TEM wave, such as a wire carrying a surge arrestor current terminated at an iron or steel shielding plane. Because of the large strength of the incident field, the nonlinear ferromagnetic saturation of the plate plays an important role in determining the peak and the shape of the shape of the transmitted field. This problem, based on and together with its one-dimensional plane-wave-incidence version, is solved analytically for a constant mu case. The analytical results are then used to partly predict and to interpret the numerical results for the one-dimension nonlinear case, obtained by using a finite difference code DIFUSN, and to help predict the behaviors for the cylindrical nonlinear case.

AD-A021 720/8CP PC **A06**/MF **A01**
Illinois Univ At Urbana-Champaign Coordinated Science Lab
Computer-Aided Analysis of Mixer Circuits
Technical rept.
William Hsia Kao. Jan 76, 107p Rept nos. R-716, UILU-ENG-76-2204
Contract DAAB07-72-C-0259, Grant NSF-ENG-75-02708

Descriptors: *Circuit analysis, *Mixing circuits, *Mixers(Electronics), *Computerized simulation, Computer applications, Algorithms, Transients, Computer programs, Steady state, Waveforms, Theses, Transistors, Parameters, Costs.

While great advances have been made in numerical algorithms for d.c., a.c., and transient analysis of systems, very little research has been done on the development of simulation programs for the steady state analysis of nonlinear communication circuits. This thesis carries out an assessment of computer aided simulation techniques in the analysis of mixer circuits. Problems that are frequently encountered in mixer circuits, some mixer performance criteria, and some design tips are discussed. A survey of various computational techniques for the steady state analysis of nonlinear circuits is also presented. (Author)

AD-A021 736/4CP PC **A07**/MF **A01**
Gte Sylvania Inc Mountain View Calif
Electret Tape Transducer
Final rept. Mar-Sep 75
G. Kirby Miller. Feb 76, 132p RADC-TR-76-22
Contract F30602-75-C-0075

Descriptors: *Transducers, Electrets, Tapes, Intrusion detection, Acoustic detectors, Ultrasonic radiation, Doppler systems, Computer programs, FORTRAN.

The report covers an initial program to establish the feasibility of a new line transducer based on an active ultrasonic electret tape concept. It describes a theoretical model based on a lumped-element harmonic electromechanical analysis and was programmed for a high speed digital computer to allow the assessment of the effects of fourteen transducer parameters. It also describes the method used for charging the electret layer, the techniques developed for fabricating samples of the transducer, the test procedures required to evaluate the active and passive performance characteristics of the samples, and refinements to the fabrication process necessary to develop long samples.

AD-A021 789/3CP PC **A04**/MF **A01**
Naval Postgraduate School Monterey Calif
Microstrip Loss
Master's thesis
Remzi Arikonmaz. Dec 75, 73p

Descriptors: *Strip transmission lines, Losses, Spectrum analysis, Computer programs, Impedance, Theses.

The thesis presents a frequency dependent analysis of microstrip loss. Spectral domain theory is employed to develop expressions for both dielectric and conductor loss in a form suitable for programming on a digital computer. Computational results are presented and compared with those of other investigators.

AD-A022 375/0CP PC **A04**/MF **A01**
Georgia Inst of Tech Atlanta School of Electrical Engineering
A Computer Model for a High Power SCR
Final rept. 1 Oct 74-30 Jun 75
H. A. Nienhaus, J. C. Bowers, and M. S. Ziemacki. Dec 75, 62p AFAPL-TR-75-106
Contract F33615-74-C-2039
Prepared in cooperation with University of South Florida, Tampa. Dept. of Electrical Engineering.

Descriptors: *Silicon controlled rectifiers, *Computer programs, High power, Electrical properties, Mathematical models, Computerized simulation.

This paper describes a computer model for the Westinghouse T527-1284 series of SCR's. This device, which has an average continuous current rating of 115a and a one cycle surge current rating of 1200a, consists of two SCR's in the amplifying gate configuration. The described model can also be applied to other devices which employ the amplifying gate and shorted emitter. (Author)

AD-A022 702/5CP PC **A06**/MF **A01**
Rockwell International Cedar Rapids Iowa Collins Radio Group
High Stability Temperature Compensated Crystal Oscillator Study
Interim progress rept. no. 3, 28 Feb 74-28 Feb 75
Alan B. Mroch, and Glenn R. Hykes. Feb 76, 114p ECOM-73-0137-3
Contract DAAB07-73-C-0137
See also Rept. No. ECOM-73-0137-2, AD-A003 921.

Descriptors: *Crystal oscillators, Tactical communications, Thermal stability, Frequency stabilizers, Voltage regulators, Sensitivity, Compensation, Digital to analog converters, Radiofrequency filters, Packaged circuits, Temperature, Integrated circuits, Computer programs, Sizes(Dimensions).
Identifiers: Large scale integrated circuits.

The purpose of this program is the further development of a high stability temperature compensated crystal oscillator (HSTCXO) initially developed under contract DAAB07-71-C-0136. This HSTCXO is digitally compensated and is intended for use as a reference frequency source in advanced tactical communications systems. The program is to include detailed investigations into critical areas of size reduction, compensation simplification, and performance improvement. Five advanced exploratory models of the digitally compensated HSTCXO are to be delivered.

AD-A022 966/6CP PC **A04**/MF **A01**
Center for Naval Analyses Arlington Va Operations Evaluation Group
MATCHAR - A Computer Program for Estimating Character Error Rate
Research contribution
Rodger E. Poore. Dec 75, 53p Rept no. CRC-289
Contract N00014-76-C-0001

Descriptors: *Computer programs, *Message processing, *Communications traffic, Errors, Communication and radio systems, Naval equipment, Quality control, Estimates, Circuits, Data reduction, Rates.
Identifiers: MATCHAR computer program, *Character error rate.

A computer program for estimating character error rate by comparing send and receive character streams is described and evaluated. (Author)

AD-A022 979/9CP PC **A10**/MF **A01**
Boeing Aerospace Co Seattle Wash
Users Manual for SUPERSAP2
Final rept.
J. L. Cooke, J. J. Schwarz, D. E. Duncan, and L. H. Skinner. Feb 76, 210p D224-13047-2, AFWL-TR-75-70
Contract F29601-74-C-0008
Prepared in cooperation with BDM Corp., Albuquerque, N. Mex. Rept. no. BDM/A-120-74-TRR1.

Descriptors: *Computer programs, *Electromagnetic susceptibility, *Semiconductors, Semiconductor devices, Integrated circuits, Data storage systems, Failure(Electronics), User needs, Machine coding, Data bases, Programming languages, Programming manuals, Information retrieval, Threshold effects.
Identifiers: *Supersap 2 computer program, CDC series 6000 computers.

This report presents user information for the computer code SUPERSAP2. SUPERSAP2 is a data storage and retrieval program. It is designed to manipulate data from two large data bases in support of EMP susceptibility threshold analysis. The Component Data Base contains data on approximately 86,000 electronic component types. The System Description Data Base is user defined. SUPERSAP2 uses a command language to provide user control of a variety of data manipulations. (Author)

AD-A023 174/6CP PC **A08**/MF **A01**
Air Force Inst of Tech Wright-Patterson AFB Ohio School of Engineering
Automated Multiple Fault Test Generation for Combinational Networks
Master's thesis
Robert A. Hendrix. Mar 76, 156p Rept no. GE/EE/76-2

Descriptors: *Logic circuits, *Reliability(Electronics), Gates(Circuits), Computer programming, Sensitivity, Computer programs, Theses, FORTRAN.
Identifiers: *Fault detection.

This report deals with multiple fault detection in combinational logic networks; the faults considered are those which may be represented by one or more lines stuck at logic value 0 or 1. Some new theorems and rules are presented which aid in the identification of masking faults, and an algorithm is developed which produces multiple fault detection test sets for single-output combinational logic networks. The al-

gorithm uses a path sensitizing technique to generate tests for members of a set of prime faults; any network fault can be represented by a combination of faults from the prime fault set, and a test which detects all combinations of prime faults will detect any single or multiple fault in the network. A modified version of the algorithm is implemented in the FORTRAN computer programming language; the automated version produces test sets which are optimal or near-optimal and usually complete. In the test generation process, certain redundancies are also detected.

AD-A023 198/5CP PC **A06**/MF **A01**
Bdm Corp Albuquerque N Mex
Wire Moments Problems of Intermediate Size
Phase rept. 2 Jul-1 Oct 75
T. R. Ferguson. Mar 76, 111p BDM/A-2-76-TR, RADC-TR-76-48
Contract F30602-74-C-0182

Descriptors: *Wire, *Moments, *Computer programs, *Electromagnetic compatibility, Electromagnetism, Matrices(Mathematics), Iterations, Linear algebraic equations, Method of moments, Electromagnetic radiation, Electromagnetic scattering, Antennas.
Identifiers: Thin wire moments problems, Banded matrix iteration.

This report discusses results obtained from a general purpose computer code for solving thin wire moments problems in which a banded matrix iterative solution technique has been substituted in the place of Gaussian elimination. Results are reported for comparison to previous reports and to solutions in the literature, including a disk, washer, sphere, hemisphere, and toroid. The effect of varied wire radius, sigment lengths, and mesh size are studied. The remaining economic barrier to solving large problems is the cost of computing matrix elements. A brief study of the use of approximate matrix elements is included. Two possibilities are discussed for automating the segment numbering to minimize the bandwidth in the solution algorithm. (Author)

AD-A023 225/6CP PC **A06**/MF **A01**
Georgia Inst of Tech Atlanta Engineering Experiment Station
Shaped Elevation Beam Antenna
Final technical rept.
Robert A. Moore, Neal T. Alexander, and Henry P. Cotten. Feb 76, 121p Rept no. GIT-A-1708-F
Contract N00014-75-C-0574

Descriptors: *Radar antennas, Height finding, Beam forming, Systems analysis, Fabrication, Computer aided design, Antenna radiation patterns, Microwave antennas, Far field, Antenna feeds, Computer programs, FORTRAN.

This report contains information on the design, development, and tests of the Shaped Elevation Beam Antennas. Two identical Shaped Elevation Beam Antennas were designed, fabricated, tested and delivered to NWC. These antennas when installed in an appropriate manner will form the antenna for a height finding radar system.

AD-A023 252/0CP PC **A04**/MF **A01**
Michigan Univ Ann Arbor Electron Physics Lab
Analysis, Design, and Fabrication of High-Efficiency, High Average Power, Pulsed TRAPATT Diode Oscillators
Final rept. 21 Jun 74-31 Aug 75
N. A. Masnari, R. J. Lomax, J. R. East, and M. Khochnevis-Rad. Dec 75, 63p 012147-F, HDL-CR-75-201-1
Contract DAAG39-74-C-0201

Descriptors: *TRAPATT devices, *Avalanche diodes, *Microwave oscillators, Oscillation, Circuits, Interactions, Computer programs.
Identifiers: Risetime.

The objectives of the program are to investigate theoretically and experimentally to verify the start-up transient behavior of the TRAPATT mode in both n- and p-type avalanche diodes. The investigation has involved three stages: (a) The development of a computer program which models with good accuracy the coaxial line currently in use in our laboratory; (b) The interaction of the above program with an already existing device program; and, (c) The investigation of the effect of pulse rise time on the turn-on behavior of the TRAPATT mode. Two basic studies were performed: (a) Theoretical Computer Study. This phase of the program has involved the development of a computer model which takes into consideration both the diode and the circuit properties. A particular current drive is assumed to exist and the interaction between the diode and circuit is evaluated thus resulting in the time-varying voltage wave shape developed across the diode. (b) Experimental Measurement of Transient TRAPATT Triggering Behavior. Detailed experiments have been executed to identify those mechanisms which participate in the turn-on characteristics of a TRAPATT device. The investigations have revealed the presence of numerous oscillations being present during the initiation of the TRAPATT mode. The various signals are identified, and it is demonstrated that the TRAPATT mode may be triggered by any one of the signals which are present.

AD-A023 287/6CP PC **A04**/MF **A01**
Naval Surface Weapons Center White Oak Lab Silver Spring Md
Design of a Varactor Tuned Gunn Oscillator Using Microstrip Circuitry
John M. Vranish. 10 Jan 75, 70p Rept no. NSWC/WOL/TR-75-3

Descriptors: *Microwave oscillators, Gunn diodes, Varactor diodes, Tuning devices, Strip transmission lines, Mathematical models, Computer programs, FORTRAN.
Identifiers: Design.

The paper presents a procedure used in designing and fabricating a working model of a varactor tuned oscillator using microstrip circuitry. The design procedure includes mathematical models and their associated computer programs in Fortran Computer Language. The fabrication of the working model includes experimental techniques; both for measurements of oscillator components and for adjusting (trimming) the oscillator frequency.

AD-A023 480/7CP PC **A05**/MF **A01**
Air Force Avionics Lab Wright-Patterson AFB Ohio
Multiwall Radome ANalysis Program
Final rept. Jun 74-Jun 75
Robert M. Blumgold. Feb 76, 76p Rept no. AFAL-TR-75-183

Descriptors: *Radomes, *Computer aided design, *Computer programs, Transmissivity, Electrical conductivity, Reflectivity, Antenna radiation patterns, Radar antennas, Aircraft antennas, Multimode.
Identifiers: Multiwall radomes, Radome computer program, Waves 2 computer program, Contour station antennas.

This report describes a computer analysis tool for calculating the electrical transmission and reflection properties of a multiwall radome. The radome program may be used with a suitable antenna program to estimate the effects of the radome on the antenna pattern. The analysis tool is comprised of two programs, a radome-geometry program, RADOME, and a flat-panel analysis program, WAVES2. The geometry program calculates the incidence angle for each ray (a ray represents the radiated RF power from each antenna element) at the radome wall. The output data from the geometry program, RADOME, serves as input to the flat-panel program. The flat-panel program then calculates the electrical transmission and reflection parameters of the radome for each ray. These parameters may then be used with a suitable free-space antenna pattern simulation program, and the resultant antenna pattern in the presence of the radome can be computed. (Author)

AD-A023 899/8CP PC **A05**/MF **A01**
Naval Surface Weapons Center White Oak Lab Silver Spring Md
Analysis of Two Low Q Active Filter Circuits
Final analysis rept.
Dennis Stutzel, and Stephen Martin. 19 Dec 75, 94p Rept no. NSWC/WOL/TR-75-51

Descriptors: *Operational amplifiers, *Radiofrequency filters, Acoustic torpedoes, Thermal stability, Homing torpedoes, Active systems, Drift, Computer programs, Sensitivity, Transfer functions, Q factors.
Identifiers: Mark-48 torpedoes.

Circuit equations for a sensitivity analysis of two active filter circuits are derived using a single pole model of the op amp. A BASIC computer program is used to calculate the sensitivities of center frequency, Q, and gain to variations in each component value and op amp parameter. The computer program also multiplies the sensitivities by the temperature coefficients of the circuit components and op amp parameters to indicate the relative amounts of temperature drift in filter characteristics that are caused by each component. A second method for determining drifts in filter parameters with temperature is also described; this approach makes use of a network analysis program to plot the temperature shifted transfer function of each filter based on component drifts in the worst case directions determined by the signs of the sensitivities. Both of these techniques are used to compare the temperature stabilities of four active filters related to the Gamma Detector of the Mk 48 Mod 1 Torpedo. (Author)

AD-A023 926/9CP PC **A16**/MF **A01**
Rome Air Development Center Griffiss AFB N Y
Reliability Growth Study
Final technical rept.
Oct 75, 360p Rept no. RADC-TR-75-253
Includes printout of tables.

Descriptors: *Electronic equipment, *Reliability, *Economic models, *Data bases, Growth(General), Tables(Data), Computer programs, Parametric analysis.

No abstract available.

AD-A024 028/3CP PC **A03**/MF **A01**
Naval Weapons Center China Lake Calif
Numerical Method for Determination of Microstrip Interdigitated Coupler Design Parameters
Summary rept.
Donald D. Paolino. Mar 76, 35p Rept no. NWC-TP-5843

Descriptors: *Waveguide couplers, Strip transmission lines, Couplers, Mathematical models, Computer aided design, Computer programs.

A method of determining design parameters for the microstrip interdigitated (Lange) coupler is presented. Parameters investigated include coupling coefficients, odd and even mode velocities, and characteristic impedance. A general method of analysis is reviewed, convergence of the method is studied, and a computer program implementing this analysis along with supporting test data are presented. Test results indicate a good agreement between measured and predicted coupling and directivity for the interdigitated couplers.

AD-A024 065/5CP PC **A07/MF A01**
Varian Associates Beverly Mass
CFA Design Improvement Program
Semi-annual rept. 1 Jul-31 Dec 75.
Mar 76, 128p
Contract N00123-75-C-1294

Descriptors: *Microwave amplifiers, *Crossed field devices, *Microwave tubes, Emitters, Manufacturing, Computer programs, Computerized simulation.
Identifiers: Sole(Electronics).

This report describes the technical objectives and summarizes the accomplishments during the first six months (July 1, 1975 - December 31, 1975) of a program aimed at improving the design techniques for emitting sole, reentrant stream, crossed-field amplifiers.

AD-A024 432/7CP PC **A12/MF A01**
Michigan Univ Ann Arbor Electron Physics Lab
Properties of S-Band TRAPATT Diode Oscillators
Technical rept.
R. J. Trew. Mar 76, 265p TR-134, RADC-TR-76-62
Contract F30602-74-C-0012
Doctoral thesis.

Descriptors: *TRAPATT devices, *Microwave oscillators, *Avalanche diodes, *Semiconductor diodes, S band, Electrical properties, Mathematical models, Waveforms, Harmonics, Circuits, Optimization, Computer programs.
Identifiers: Microwave circuits.

The purpose of this investigation is to study theoretically and experimentally the operation of TRAPATT mode (an acronym for trapped plasma avalanche triggered transit) oscillators. The solid-state device and microwave circuit as well as the interaction between them are considered in detail. A simplified computer model of a TRAPATT oscillator that considers the operation of the device from the terminal voltage-current waveforms has been developed. This model allows the investigation of arbitrary current waveforms and therefore can be used in the study of harmonic tuning effects and the requirements for high-efficiency operation. The simplified computer model is used to study the operation of the oscillator with many different terminal voltage-current waveforms. Waveforms containing up to ten harmonic frequencies are considered. By individually varying the amplitude and phase angles of each harmonic component the optimum tuning conditions for high-efficiency operation are obtained. It has been determined that the oscillator efficiency is primarily dependent upon the amplitude and phase angle of the fundamental signal and the phase angle of the second-harmonic component. The amplitude of the second harmonic and the amplitudes and phase angles of the third and higher harmonic components have a significant effect on oscillator frequency but only a minor effect on oscillator efficiency. It has also been determined, theoretically at least, that steady-state TRAPATT oscillations are possible with single-frequency operation. (Author)

AD-A024 448/3CP PC **A09/MF A01**
Naval Research Lab Washington D C
Electroacoustic Modeling of Magnetostrictive Shells and Rings. Part 2. EIGSHIP Predicted Performance; Experimental Measurements; and Computer Listing of EIGSHIP
Interim rept.
S. Hanish, B. J. King, R. V. Baier, and P. H. Rogers. 19 Apr 76, 187p Rept no. NRL-7964
See also Part 1, AD-A002 924.

Descriptors: *Electroacoustic transducers, *Acoustic detection, *Antisubmarine warfare, Magnetostrictive elements, Shells(Structural forms), Rings, Mathematical models, Computations, Computer programs, Electrical impedance, Mechanical impedance, Efficiency, Performance, FORTRAN.
Identifiers: *EIGSHIP computer program, CDC-3800 computers.

The mathematical model of the electroacoustic performance of a force-driven free-flooding magnetostrictive cylinder shell used as an underwater sound transducer, originally developed in another report, has been coded into a computer program called EIGSHIP. This program is designed to predict electrical and mechanical impedances of the loaded shell, transmitting responses, electroacoustic efficiency, surface velocities, far-field beam patterns, and other relevant performance parameters. An experimental check on the prediction capabilities of EIGSHIP was undertaken on three specially constructed magnetostrictive shells which were tested under water load conditions in an indoor test facility. A full discussion of the comparison of predicted and measured performance is presented. The coded listing of EIGSHIP and instructions on its input requirements and output format are furnished in detail. Samples of typical computer runs are displayed and commented on.

AD-A024 552/2CP PC **A02/MF A01**
Naval Air Development Center Warminster Pa Aero-Electronic Technology Dept
Antenna Prediction Computer Programs
Interim rept. for period ending Oct 75
Robert D. Hayes. 15 Apr 76, 5p Rept no. NADC-75251-20C

Descriptors: *Antenna radiation patterns, *Computer programs, Fortran, Files(Records), Magnetic tape, Aircraft antennas, electromagnetic scattering, Costs.
Identifiers: Roll plane computer program, Bent plate computer program.

The purpose of this report is to identify a magnetic tape which has stored on it two computer programs. These are the Roll Plane and Bent Plate Programs. (Author)

AD-A024 634/8CP PC **A11/MF A01**
Naval Air Development Center Warminster Pa Aero-Electronic Technology Dept
Computer Programs for Scattering Effects Investigation
Interim rept.
Robert D. Hayes. 14 Apr 76, 240p Rept no. NADC-75250-20

Descriptors: *Aircraft antennas, *Computer programs, *Antenna radiation patterns, *Mathematical prediction, *Electromagnetic scattering, Fuselages, Wings, Horizontal stabilizers, Data processing, Output.
Identifiers: Roll plane computer program, Bent plate computer program, CDC 6600 computers.

To aid potential users of two computer antenna prediction programs, sample problems were developed and executed on a computer. For these programs, input load sheets, problem diagrams, program listing and output data are given. (Author)

AD-A024 768/4CP PC **A04/MF A01**
Darcom Intern Training Center Texarkana Tex
A Survey of Computer-Aided Electronic Circuit Design Programs
Final rept.
J. A. Moore. Apr 76, 69p Rept no. DARCOM-ITC-02-08-76-016

Descriptors: *Integrated circuits, *Computer aided design, Computer programming, Linear systems, Optimization.
Identifiers: *MAGIC computer program, *CIRCAL2 computer program.

Two computer-aided circuit design programs and a design system for linear integrated circuits are examined, and their features and capabilities are discussed. The programs are MAGIC and CIRCAL-2, two programs which are capable of handling a large class of design problems. The design system for integrated circuits aids the user in all phases of integrated circuit design.

AD-A025 029/0CP PC **A08/MF A01**
Kentucky Univ Lexington Dept of Electrical Engineering
Applications of Multiconductor Transmission Line Theory to the Prediction of Cable Coupling. Volume II. Computation of the Capacitance Matrices for Ribbon Cables
Final rept,
Arthur E. Feather, and Clayton R. Paul. Apr 76, 155p RADC-TR-76-101-Vol-2
Contract F30602-72-C-0418
See also Volume 1, AD-A025 028.

Descriptors: *Multiconductor cables, Cable assemblies, Electromagnetic compatibility, Coupling(Interaction), Transmission lines, Crosstalk, Interference, Matrices(Mathematics), Computer programs, Capacitance, Fourier series, FORTRAN.
Identifiers: *Flat cables, GETCAP computer program.

Multi-conductor ribbon cables using closely coupled dielectric-coated conductors are now used extensively to interconnect electronic subsystems. General techniques involving solution of the multiconductor transmission line equations can be used to predict unwanted interference or crosstalk in the cable. Inherent in these techniques is knowledge of the per-unit-length transmission line capacitance and inductance matrices of the ribbon cable. A computer implemented numerical technique for determining these matrices for ribbon cables is described. The per-unit-length charge distributions on the conductor and dielectric surfaces are described by Fourier series with the potential and displacement vector equations at these surfaces enforced as boundary conditions. A matric inversion techniques is used to develop elements of the generalized and transmission line capacitance matrices. Computer program GETCAP was written in a user-oriented format. The user simply describes the physical characteristics and GETCAP computes the per-unit-length capacitance matrices for the ribbon cable described.

AD-A025 132/2CP PC **A06/MF A01**
Litton Systems Inc San Carlos Calif Electron Tube Div
Development of Computer Program TWTVA for Calculation of 3-D Electron Trajectories in Coupled-Cavity TWTs
Final rept. 10 Nov 75-10 Mar 76
J. R. M. Vaughan. 10 Mar 76, 119p Rept no. L-59333-2
Contract N00123-76-C-0424

Descriptors: *Traveling wave tubes, Electron beams, Particle trajectories, Computer programming, FORTRAN.

The report describes the development of a computer program for calculation of three-dimensional electron trajectories in a coupled cavity traveling wave tube. RF, magnetic and space charge fields are included without paraxial approximations. Both PPM and solenoid magnetic fields are admitted. Each field is represented by a potential matrix. The rf vector potential matrix is computed from an integration of Kosmahl and Branch's field formulation. The magnetic vector potential matrix is derived from ideal current loops representing the field sources. The space charge potential matrix is obtained by an extension of Hockney and Buneman's Fourier Analysis Cyclic Reduction

method to cylindrical coordinates. The trajectory steps are then computed from analytic integrals of the general cross-field equations of motion, using a fast subroutine for simultaneous interpolation and differentiation of the potential matrices. A comprehensive example is given of output obtained from the program.

AD-A025 154/6CP PC **A05**/MF **A01**
Epsco Labs Wilton Conn
Development and Analysis of Four Pole Balanced Armature Transducer for US Navy Sound Powered Telephones
Final rept.
Thomas A. Giordano. Apr 76, 100p Rept no. 5082
Contract N00024-75-C-04323

Descriptors: *Telephone equipment, *Armatures, Electroacoustic transducers, Sensitivity, Low frequency, Magnetic alloys, Permeability, Electrical impedance, Computer programs.

A thorough analytical study of the Four Pole Balanced Armature Transducer has been made and its application to a sound powered telephone has been examined. Four prototype transducers have been fabricated and tested. These transducers proved to be more efficient than the current 2 pole devices, with overall transducer-to-transducer response showing a 3 - 7 db increase in overall sensitivity. This increase is attributed not only to the inherent improvement in sensivity of the 4 pole transducer over the 2 pole transducer but also to the lighter mass structure of an interconnecting tube through the diaphragm to improve low frequency response. (Author)

AD-A025 259/3CP PC **A04**/MF **A01**
Ohio State Univ Research Foundation Columbus
Antenna Mathematical Modeling (GTD)
Final technical rept. 1 Nov 74-31 Dec 75
R. G. Kouyoumjian, R. J. Luebbers, and L. Ton-That. Apr 76, 70p RADC-TR-76-107
Contract F30602-75-C-0051

Descriptors: *Antennas, Mathematical models, Diffraction analysis, Computer programs, Numerical analysis, Moments, Antenna radiation patterns, Dipole antennas, Electrical impedance.

The primary objective of this effort has been to employ the geometrical theory of diffraction in combination with the moment method to develop a user-oriented computer code to calculate the radiation pattern of wire antennas in the presence of perturbing structures. The work accomplished can be divided into two parts. A theoretical and experimental investigation of the effect of edges on antenna input impedance and current was conducted. Then based on the results of this study, a user-oriented computer code was developed for wire antennas in the presence of a conducting surface bounded by edges, which is positioned over a reflecting surface of infinite extent. Such a configuration can be used to simulate conditions encountered in the design of antennas to meet Air Force requirements. This report describes the above work and concludes with some recommendations to imporve the present code.

AD-A025 457/3CP PC **A03**/MF **A01**
Syracuse Univ N Y Dept of Electrical and Computer Engineering
A Computer program for Radiation from Arbitrarily Oriented Wire Antennas over Imperfect Ground
Interim technical rept.
Tapan K. Sarkar, and Bradley J. Strait. May 76, 37p Scientific-11, RADC-TR-76-136
Contract F19628-73-C-0047

Descriptors: *Antenna radiation patterns, *Ground(Electrical), *Computer programs, Electric wire, Electric fields, Loading(Electronics), Antenna feeds, Electrical impedance, Planar structures, Electrical conductivity, Wavelengths.
Identifiers: Thin wire antennas, Ground plane, Imperfect grounds.

This report describes and lists a computer program for analyzing radiation from antenna arrays of arbitrarily oriented thin-wire antennas over the plane surface of an imperfectly conducting earth. The solution is that obtained from the E-field integral equation by the method of moments. The program input is the problem geometry, the array excitation and loading, and the characteristics of the earth. The program output is the current distribution on the wires, input independences of the feed points, and the complex E-field at points in space specified by the users. Sample input-output data are included. (Author)

AD-A025 718/8CP PC **A06**/MF **A01**
Ohio State Univ Columbus Electroscience Lab
A Moment Method Technique for Probe-Fed Cavity-Backed Slot Antennas
Technical rept.
A. J. Fenn, and G. A. Thiele. Mar 76, 108p Rept no. ESL-4091-3
Contract N00014-75-C-0313
Master's thesis.

Descriptors: *Slot antennas, *Antenna feeds, Antenna arrays, Antenna apertures, Coupling(Interaction), Moments, Cavities, Integral equations, Low frequency, Computer programs, Theses.

A technique is presented which permits the application of the method of moments to cavity-backed slot antennas. Of specific interest are slot antennas operating over large bandwidths (e.g., 3.3:1) whose aperture distribution cannot be assumed and must be determined by the type of excitation employed, the electrical size of the aperture, and to a lesser extent by mutual coupling effects. (Author)

AD-A026 102/4CP PC **A05**/MF **A01**
Naval Undersea Center San Diego Calif
LOLA User's Manual
Research and development rept. Mar-Jul 75
M. S. Ball, and D. M. Cottel. Feb 76, 83p Rept no. NUC-TP-517

Descriptors: *Assemblers, *Programming manuals, *Computer architecture, Computer aided design, User needs, Computer logic, Computer programs, Equations, Digital systems, Integrated circuits, Input output processing.
Identifiers: *Logic language assembler, LOLA(Logic Language Assembler).

This document describes the Logic Language Assembler, a computer program developed to aid in the design and implementation of digital logic systems. The circuit components and interconnections are specified with Boolean-like logic equations. The program checks this system specification for inconsistencies, allocates logic functions to circuit components, and produces a list describing the component/pin connections for every signal name. (Author)

AD-A026 111/5CP PC **A21**/MF **A01**
Hughes Aircraft Co Culver City Calif Electro Optical Div
Adaptive Programmable Signal Processor Study. Volume 3
Final rept. 20 Jun 75-30 Apr 76
K. E. Myers. Apr 76, 494p HAC-Ref-D4535-Vol-3, HAC-P76-121-Vol-3, SAMSO-TR-76-83-Vol-3
Contract F04701-75-C-0241, ARPA Order-2954

Descriptors: *Signal processing, *Surveillance, Real time, Onboard, Spaceborne, Electrooptics, Dual mode, Radar, Computer programs, Digital systems, Logic devices, Integrated circuits.
Identifiers: *Adaptive signal processors, Video encoders.

This report presents the results of a study to define an Adaptive Programmable Signal Processor (APSP) suitable for on-board satellite processing of data generated by spaceborne electro-optical surveillance sensors and dual mode radars. The tasks performed included: (1) definition of system requirements based upon mission requirements supplied by SAMSO, (2) definition of processor performance requirements, (3) configuration of a processor architecture to meet those requirements, (4) evaluation of present and projected semi-conductor device technology applicable to APSP development, (5) identification and preliminary design of those devices critical to APSP development, and (6) preparation of a plan for designing, fabricating and testing a feasibility demoonstration model of an APSP, including requirement component development. (Author)

AD-A026 188/3CP PC **A03**/MF **A01**
Civil Engineering Lab (Navy) Port Hueneme Calif
Instrumentation of Replacement Base Insulator Assembly - VLF East Tower, Lualualei, Hawaii
Final technical note Jul 74-Jun 75
S. K. Takahashi. Apr 76, 48p Rept no. CEL-TN-1430

Descriptors: *Antenna masts, *Electrical insulation, Very low frequency, Hawaii, Loads(Forces), Finite element analysis, Replacement, Instrumentation, Computer programs.

The cone-type base insulators beneath a 1,500-foot-high guyed VLF antenna was replaced with station post-type base insulators. Strain gages were mounted on both types of insulators during the tower raising and lowering operations to determine the distribution of load on the base insulator assembly. The maximum strain deviation for the cone-type insulators from the average strain was 6%, which indicated that the load was distributed almost equally on the three insulators at the midtier. The strain deviation for the station post-type insulators varied from -36 to 052% when compared with the average strain value. Finite element computer analyses were performed for both the cone and post insulators subjected to a direct axial load. The vertical and circumferential stresses compared very well with the average values of the experimental strain readings.

AD-A026 222/0CP PC **A09**/MF **A01**
Intelcom Rad Tech San Diego Calif
Packaging Effects on Semiconductor Device Radiation Response
Final phase rept. Jul 74-Apr 75
Robert A. Berger, and Joseph L. Azarewicz. 15 May 75, 195p Rept no. INTEL-RT-8025-724
Contract F04701-72-C-0322

Descriptors: *Radiation damage, *Semiconductor devices, *Integrated circuits, Electronic equipment, Environmental tests, Photons, Epitaxial growth, Transistors, Computer programs, Gates(Circuits), Dosimetry, Response.
Identifiers: Nand gates.

This report examines the effect of FXR-stimulated, re-emitted radiation from the packages of three planar-epitaxial transistors and two high-level NAND gate integrated circuits on the photocurrent response of the devices. Experimental measurements were made on the five

devices in both low- and high-engery photon (FXR) environments. The experimental results are compared with a radiation transport analysis (including use of the SANDYL code) of the device package, materials, and proton energy spectrum. This work adds further verification to a procedure for extending simulation test data to a real photon environment. (Author)

AD-A026 266/7CP PC **A08**/MF **A01**
Air Force Inst of Tech Wright-Patterson AFB Ohio
Thin-Film Semiconductor Detectors for 10.6 micrometer Radiation
Doctoral thesis
Jon C. Zimmerman. 1975, 151p Rept no. AFIT-CI-76-45

Descriptors: *Infrared detectors, *Semiconducting films, Bolometers, Schottky barrier devices, Antimony compounds, Sulfides, Germanium, Tellurium, Selenium, Bismuth, Gold, Alumina, Substrates, Measuring instruments, Instrumentation, Fabrication, Thermal analysis, Computer programs, Thermal radiation.
Identifiers: Thermal measuring instruments, *Infrared bolometers.

Thin-film semiconductor detectors were investigated for use as room temperature thermal detectors for infrared radiation at 10.6 micrometers. Some of the materials investigated were antimony trisulfide, germanium, tellurium, and selenium. The most successful devices were fabricated from 400 A bismuth, 6800 A selenium, and 1500 A gold on an alumina substrate. The method of operation was also studied and it was found that devices operating in the avalanche region of the Schottky diode formed between selenium and bismuth provided the best responsivity and frequency response. The responsivity of the device was measured as a function of the geometry and the modulation frequency. A comprehensive thermal analysis of thin-film thermal detectors has been made and a computer program written to calculate the responsivity of arbitrary devices. The analysis is completely general and is applicable to multilayered devices and diode as well as thermal change of resistance type of devices.

AD-A026 567/8CP PC **A11**/MF **A01**
University of South Florida Tampa Dept of Electrical and Electronic Systems
A Survey of Computer-Aided-Design and Analysis Programs
Final rept. Jan 75-Jan 76
James C. Bowers, Charles Lors, John E. O'Reilly, George Wzobrist, and Thomas Rodby. Apr 76, 233p AFAPL-TR-76-33
Contract F30602-75-C-0118

Descriptors: *Computer aided design, *Computer programs, *Computer program documentation, *Circuit analysis, Core storage, Circuits, Transients, Errors, Computers, Time domain.
Identifiers: *Computer software, *Electronic circuit analysis software, Run time, ECAP computer program.

This report contains a survey of sixteen computer aided design programs useful for electronic circuit analysis. Most of the well known, first generation programs (such as ECAP) were not included in this survey. These older programs can no longer compete with the second and third generation nonlinear, sophisticated programs. However, some of the lesser known European linear programs were included, as a matter of information only. It is divided into three major parts. Part 1 contains general data on each program along with a summary of each of the user's manuals. This part of the report is prefixed by four tables which summarize the properties of all the programs. Part 2 of the report contains a critical analysis of each of the programs. The eighteen circuits given in the appendix were the basis upon which flexibility, accuracy, and cost comparisons were made. Part 3 contains a comparison analysis of all the programs and conclusions which may be known from the results of this survey. As a result of some of the advanced publicity concerning this survey, several individuals brought to our attention programs which were not being included. Some of these do look promising, but were unknown and unpublished, hence there was no realistic way to have found out about them in time. (Author)

AD-A027 022/3CP PC **A04**/MF **A01**
Harry Diamond Labs Adelphi Md
ICEDIT -- An Interactive Graphics Editor for Integrated Circuit Masks
Technical memo.
Steven J. Choy. May 76, 60p Rept no. HDL-TM-76-8

Descriptors: *Interactive graphics, *Computer programs, *Integrated circuits, Minicomputers, Data processing terminals, Masks, Computer aided design.
Identifiers: ICEDIT system, FORTRAN 4 programming language, PRIME-300 computers, Editing routines.

The ICEDIT system is an interactive graphic editor used to input, manipulate, and store integrated circuit masks. Its capabilities include graphic input, keyboard input, interactive graphic editing, and data output to teletype, printer, nine-track magnetic tape, or disc file on a PRIME 300 minicomputer in FORTRAN IV. GRAFHELP and GTS are used as the graphics support. The graphics terminal is the Imlac PDS-4 display system. The capabilities, operations, and software design of the system are discussed.

AD-A027 071/0CP PC **A11**/MF **A01**
Technology Service Corp Santa Monica Calif
Adaptive Processing Experiment (APE) Phase II
Final technical rept. Jun-Dec 75
J. Bailey, J. Mallett, B. Whitehead, A. Katz, and T. Boak. May 76, 242p RADC-TR-76-130
Contract F30602-75-C-0264
Availability: Microfiche copies only.

Descriptors: *Adaptive control systems, *Digital filters, Computer programs, Computer program documentation, Radar, Over the horizon detection, Antennas, Beam forming, Receivers, Sidelobes, Channels, Radar mapping, Matched filters, Data processing, Power spectra.
Identifiers: *Adaptive processing, Computer software.

The impact of receiver passband phase and amplitude error on the RMS sidelobes of a digital beamforming system is analyzed. A method is developed whereby a digital transversal filter is used on the output of each receiver prior to beamforming to minimize the error in a LMS sense. The method is applied to an OTH radar system and results given. With a 16-tap filter the receivers error is reduced from -35 dB to -63 dB. Additionally, a method of calibrating an H. F. receive array by the use of a known near-field source is illustrated. Results are shown for the performance of the calibrated array against OTH sources using conventional and adaptive beamforming techniques. Discrimination of better than 40 dB is illustrated for an OTH signal source 2000 miles from the array. (Author)

AD-A027 260/9CP PC **A07**/MF **A01**
Air Force Inst of Tech Wright-Patterson AFB Ohio School of Engineering
Parameter Sensitivity Analysis of a High-Voltage, Vaporization-Cooled, Three-Phase, Core-Type Transformer
Master's thesis
Edgar L. Dove. Jun 76, 141p Rept no. GE/EE/76-8

Descriptors: *Transformers, *Magnetic cores, *Computer aided design, High voltage, High power, Vaporization, Cooling, Airborne, Power supplies, Parametric analysis, Computer programs, Theses.
Identifiers: Three phase transformers.

This parameter sensitivity analysis considers which independent design parameters have the most influence upon the determination of the weight and volume of a high-voltage, vaporization-cooled, three-phase, core-type transformer. The analysis is conducted through the use of a computer program which given a set of independent design parameters calculates a consistent set of values for the transformer's dependent design parameters. Two of the dependent design parameters are weight and volume. Initially, the weight and volume are determined for a reasonable set of independent design parameters. Then each independent design parameter is varied while all other independent parameters are held constant. With the weight and volume of th initial design as the common reference points, the comparison of the graphs of weight and volume as functions of the individually varied independent design parameters is the basis of the analysis. The analysis shows that the independent design parameters which most influence the determination of the weight and volume of the transformer are the power-out of the transformer, voltage-in, voltage-out, frequency of operation, number of inside secondary layers, maximum flux densities, conductor cooling rates, and the parameters which specify the core leg cross sectional areas. (Author)

AD-A027 267/4CP PC **A05**/MF **A01**
Naval Postgraduate School Monterey Calif
Sampled Analog Recursive Comb Filters and Their Application to MTI- Radar
Master's thesis
Lars Terje Saetre. Dec 75, 93p

Descriptors: *Recursive filters, *Signal processing, *Moving target indicators, Charge coupled devices, Cancellation, Radar clutter, Computer programs, Theses, Analog systems.

The design of second order sampled analog filters using Z-transform techniques developed in digital theory was studied. A second order recursive CTD- filter was implemented and investigated. Deviation from theoretical frequency response was found to be partly due to frequency dependent circuitry. MTI- simulation was performed, and the ability of the CTD-filter to cancel clutter and pass doppler frequencies was demonstrated. Unexplained glitches in the filter output were noted.

AD-A027 407/6CP PC **A04**/MF **A01**
Cold Regions Research and Engineering Lab Hanover N H
Heat Sinks: A Study of Variable Types of Heat Sinks (En Undersogelse af Forskelligt Udformede Koleprofiler. Forskellige Faktorers Indflydelse pa Profilets Virkning)
U. Fabricius. Jan 76, 58p Rept no. CRREL-TL-508
Trans. from Danish Research Center for Applied Electronics 70p 1974.

Descriptors: *Heat sinks, *Electronic equipment, *Heat transfer, Thermal resistance, Temperature, Experimental design, Optimization, Convection(Heat transfer), Conduction(Heat transfer), Radiative transfer, Loading(Electronics), Comparison, Theory, Profiles, Computer programs, Translations, Denmark.
Identifiers: Temperature distribution.

Twelve various types of heat sinks are included in this investigation, which is stressing a com-

parison between the profiles rather than a comparison between manufactures. It has been examined as to how much power can be added to the heat sink at intermittent service without influencing the junction temperature of the power component to exceed a tolerated maximum temperature. (Author)

AD-A028 734/2CP PC **A12**/MF **A01**
Stanford Univ Calif Edward L Ginzton Lab
Acousto-Optic Interactions
Final rept. 1 Feb 73-31 Aug 75
P. L. Adams, A. Albanese, C. F. Quate, and H. J. Shaw. Jul 76, 268p Rept no. GL-2523
Contract N00014-75-C-0778
See also report dated Mar 74, AD-778 693.

Descriptors: *Optical waveguides, *Piezoelectric crystals, *Acoustooptics, Optical images, Optical scanning, Optical detection, Fiber optics, Electrooptics, Waveguide couplers, Fourier transformation, Multiplexing, Signal processing, Surface waves, Acoustic waves, Lithium compounds, Niobates, Deflectors, Computer programs.
Identifiers: Lithium niobates, Acoustic surface waves, Integrated optics, Optical modulators.

New devices are described which are based on optical waveguides on lithium niobate crystals, using the material anisotropy, including couplers, electro-optic modulator and light multiplexer, and optical deflector and scanner using collinear acousto-optic interaction between surface acoustic waves and optical surface waves. Complete theory for the propagating modes and coupled modes is presented. A new type of waveguide is presented for use with surface acoustic wave devices for real-time direct scanning and Fourier transform scanning of optical images, which introduces no additional transmission loss over that for unguided propagation. Test pattern results demonstrate the ability of this type of waveguiding to increase the transverse resolution of such scanners, and good correlation between theoretical and experimental results is shown.

AD-A028 781/3CP PC **A04**/MF **A01**
Hughes Aircraft Co Culver City Calif Radar Microwave Lab
Phased Array Antennas Scanned near Endfire
Final rept. Jan 75-Mar 76
P. C. Bargeliotes, A. T. Villeneuve, and W. H. Kummer. Mar 76, 57p Rept nos. HAC-P76-232, HAC-Ref-D3119
Contract N00019-75-C-0160

Descriptors: *Conical antennas, *Antenna arrays, *Slot antennas, *Electronic scanners, *Phased arrays, Cylindrical bodies, Computer programs, Mathematical models, Diffraction, Electric fields, Polarization.
Identifiers: Endfire antennas, Geometrical optics, Cylindrical antennas.

Excellent agreement has been shown between element patterns of circumferential and radial slots on a cone, computed with the normal mode series computer programs, and patterns measured with an experimental model with both types of slots. When the modal series is used for the computation of exact patterns, the number of modes required for convergence of the series increases as the distance of the slot location from the tip of the cone increases. Computational difficulties from accumulated round-off errors also affect the accuracy and limit the applicability of the modal series program to element positions not too far from the cone tip. The approximate asymptotic approach, on the other hand, allows the separation of the diffracted field and the geometrical optics field. More specifically, the asymptotic approach resulted in complete expressions for the E sub theta and E sub phi radiation fields in terms of optical, transition, and diffraction fields. The complete expressions for each of the two field components, in a form suitable for numerical computation, were included in the Final Report on Contract No. N00019-74-C-0127. An examination of these expressions indicates that the diffraction coefficients of both field components are only a function of the angular coordinates and not of the location of the radiating element.

AD-A029 211/0CP PC **A05**/MF **A01**
Naval Research Lab Washington D C
Computer-Aided Analysis of Dissipation Losses in Isolated and Coupled Transmission Lines for Microwave and Millimeter-Wave Integrated-Circuit Applications
Interim rept.
Barry E. Spielman. Jul 76, 98p Rept no. NRL-8009

Descriptors: *Strip transmission lines, *Microwave equipment, *Integrated circuits, *Computer aided design, Dissipation, Losses, Charge density, Computer programs, FORTRAN.
Identifiers: Directional couplers, Method of moments.

The analysis employs a quasi-TEM model for uniform isolated transmission lines and for the even- and odd-mode transmission lines associated with coupled-line structures. The conductor and dielectric losses in these structures are then related to equivalent charge-density distributions, which are evaluated using a method-of-moments solution. The transmission lines treated by this which are evaluated using a method-of-moments solution. The transmission lines treated by this analysis may contain any number of lossy conductors and inhomogeneous dielectrics, consisting of any number of different homogeneous dielectric regions. After explicit expressions are developed for use in evaluating conductor and dielectric loss coefficients for the even and odd modes of coupled transmission lines a development is provided to explicity relate the four-port, terminal, electrical performance of directional couplers to the modal loss coefficients. Losses are evaluated for examples of four isolated transmission lines and one coupled transmission line. For microstrip and coplanar waveguide the computed loss coefficients are in reasonable agreement with experimental data. For inverted microstrip and trapped inverted microstrip, evaluations presented in both tables and graphs provide useful design information for circuit applications. A comparison is made of the total loss characteristics of microstrip, coplanar waveguide, inverted microstrip, and trapped inverted microstrip. The utility of the analysis for coupled-transmission-line losses is illustrated for the example of edge-coupled microstrip with a dielectric overlay by comparing computed loss characteristics with measured values.

AD-A029 546/9CP PC **A10**/MF **A01**
Mississippi Univ University Dept of Electrical Engineering
Analysis of the Air Force Weapons Laboratory's Horizontally Polarized Dipole Electromagnetic Pulse Simulator
Final rept. Mar 75-Aug 76
Chalmers M. Butler, K. R. Umashankar, and Donald R. Wilton. Aug 76, 219p AFOSR-TR-76-1073
Grant AF-AFOSR-2825-75

Descriptors: *Electromagnetic pulse simulators, *Antennas, Mesh, Wire, Polarization, Horizontal orientation, Mathematical prediction, Electromagnetic fields, Transients, Computer programs.
Identifiers: *Electromagnetic theory, Air Force Weapons Laboratory.

This report presents an analysis of the operating characteristics of the Horizontally Polarized Dipole Electromagnetic Pulse Simulator located at Kirtland Air Force Base, New Mexico. The analysis and an attendant computer program resulting from this work enable operators of the HPD Simulator to compute with reasonable accuracy and efficiency the transient electromagnetic field radiated by the simulator into a specified test volume. A theory is developed for the loaded loop radiator, which is constructed from cages of loaded wires, and coupled, integro-differential equations are formulated for the unknown current on the wires of the structure. These equations are solved in the frequency domain and desired radiated fields are computed via Fourier transform techniques. (Author)

AD-A029 887/7CP PC **A05**/MF **A01**
Johns Hopkins Univ Laurel Md Applied Physics Lab
URLIM - a Unified Radome Limitations Computer Program, Volume 1. Theoretical Background
Technical memo.
R. K. Frazer. Jul 56, 97p Rept no. APL/JHU/TG-1293A-Vol-1
Contract N00017-72-C-4401

Descriptors: *Radomes, *Computer programs, Data management, Guided missile trajectories, Aerodynamic heating, Heat transfer, Boresighting, Errors, Thermal stresses, Limitations, Computerized simulation.
Identifiers: URLIM computer program.

URLIM, a unified radome limitations computer program, has been developed to aid the radome design engineer by providing a definition of the maximum flight performance capabilities of radome materials. URLIM numerically determines the response of the radome to aerodynamic heating and loading. It computes the following as functions of trajectory time: thermal stress; radar boresight error rates; missile-radome attachment stresses caused by maneuvers, pressure, and drag forces; and the onset of radome melting. The basic output of the program is a notation of trajectory time at which the radome reaches its design limitations. Many options are available to the user of the URLIM program that provide a wide variety of analysis capability. For this reason, URLIM may also be considered as a general purpose aerodynamic heat transfer program as well as a specific purpose radome limitations program. Volume 1 of this report presents the theoretical background of the analysis techniques used in URLIM; Volume 2 provides a detailed explanation of how to use URLIM. (Author)

AD-A030 080/6CP PC **A05**/MF **A01**
Naval Postgraduate School Monterey Calif
Theoretical Analysis of a Model for a Field Displacement Isolator
Thesis
Ram Sharon. Jun 76, 80p

Descriptors: *Attenuators, Strip transmission lines, Substrates, Ferrites, Fourier transformation, Computer programs, Mathematical analysis, Theses, FORTRAN.
Identifiers: *Isolators.

A frequency dependent analysis of a shielded edge-guided mode isolator is presented. A Fourier transform technique is applied to the boundary expressions of a structure built on a dielectric substrate, and the resulting equations are solved for the wavelength ratio. By using perturbation analysis and the results obtained for the dielectric case, solutions for the normalized propagation constant and attenuation for waves traveling in the -Z and 0Z directions, in a structure built on a ferrite substrate, are obtained.

AD-A030 463/4CP PC **A02**/MF **A01**
Computer Sciences Corp Falls Church Va
Computer Program Description: PWRDEN - A Program for the Evaluation of Power Densities In the Near Field of Antenna Apertures
Technical note
William B. Munson. Sep 76, 25p
Contract DCA100-73-C-0008

Descriptors: *Antenna apertures, *Antenna radiation patterns, *Computer programs, Communication satellite terminals, Near field, FORTRAN.
Identifiers: PWRDEN computer program, FORTRAN 4 programming language, Power density.

This report describes the mathematical analysis and the computer program for the prediction of power densities in the vicinity of antenna apertures. (Author)

AD-A031 096/1CP PC **A05**/MF **A01**
Battelle Columbus Labs Ohio
Investigation of Cage and Bearing Instability In Despun Antenna Bearings Due to Changes In Lubricant Properties
Summary rept. no. 2, 28 Feb 75-31 Jan 76
J. W. Kannel, S. S. Bupara, and C. J. Pentlicki.
Apr 75, 89p AFML-TR-75-38-Pt-2
Contract F33615-74-C-5012
Prepared in cooperation with Comsat Labs., Clarksburg, Md.

Descriptors: *Ball bearings, Instability, Dynamics, Computer programs, Satellite antennas, Attitude control systems, Antenna components, Lubrication, Stability.
Identifiers: BASDAP 2 computer program, Bearing cages, Despun antennas.

A computer program has been developed for the purpose of investigating cage instability in a despun antenna bearing. As a result of the experimental and analytical studies, a stability criterion is presented which relates stability to lubricant and cage properties. In general, it is shown that a cage in a bearing can be unstable (regardless of the guiding surface) provided the cage is not externally constrained and the ball-race tractions are very high.

AD-A031 108/4CP PC **A04**/MF **A01**
Ohio State Univ Research Foundation Columbus
GTD-AMP Computer Program Description. User's Manual
Technical rept. Oct 74-Dec 75
R. J. Luebbers, R. G. Kouyoumjian, and L. Ton-That. Feb 76, 64p RADC-TR-76-23
Contract F30602-75-C-0051

Descriptors: *Computer programs, *Antenna radiation patterns, *Antennas, *Electromagnetic radiation, Programming manuals, Scattering, Machine coding, Models, Diffraction, Reflection, User needs, Input output processing, Numerical analysis.

This report describes the capabilities, limitations, and operation of the OSU, GTD-AMP Computer Code, which has been developed to calculate the electromagnetic radiation from currents on thin wires in the presence of a perfectly-conducting polygonal plate positioned over a reflecting surface of infinite extent. Although the code is based on the Geometrical Theory of Diffraction (GTD) it is designed to be compatible with the Antenna Modeling Program (AMP). The GTD-AMP program described herein is capable of handling many antenna-scattering problems once the currents on the wire radiators are known. Ordinarily these currents are found from the AMP program in the manner described in the text; however, they may be specified or obtained by other means. This combination of the moment method and GTD makes it possible to calculate radiation patterns which could not be calculated by either method individually.

AD-A031 145/6CP PC **A03**/MF **A01**
City Coll New York Dept of Electrical Engineering
Planar Circuits for Microwave Tubes
Final rept. Jul 74-Jun 76
Morris Ettenberg. Jul 76, 42p CCEE-M2, ARO-12106.1-EL
Grant DAHC04-74-G-0214, DAHC04-75-G-0176

Descriptors: *Microwave tubes, *Circuits, Planar structures, Tapes, Computer programs, Network flows, Computations.
Identifiers: Network synthesis, Network analysis theory.

Three variations of the Meander Line have been analyzed using the Fletcher Admittance technique. These are the Stub Loaded, Interline Loaded, and Quadruple Parallel lines. The dispersion characteristics have been calculated by evaluating the determinant of the boundary condition matrix and finding the approximate zero numerically. The interaction impedance has been calculated for the Stub Loaded and Quadruple Parallel lines. Comparisons of calculated and experimental results are presented.

AD-A031 298/3CP PC **A04**/MF **A01**
Mb Associates San Ramon Calif
Antenna Modeling Program Supplementary Computer Program Manual (AMPJ)
Apr 75, 58p Rept no. MB-R-75/37
Contract N00014-71-C-0187
See also AD-767 420, AD-A005 673 and AD-A025 890.

Descriptors: *Antennas, *Mathematical models, *Electric wire, *Computer programs, Junctions, Geometry, Matrices(Mathematics), Machine coding, Computerized simulation.
Identifiers: *Wire antennas.

This manual is a supplement to the Engineering, User's and Systems manuals prepared for the Antenna Modeling Program (AMP), and describes the operation, theory and coding of the changes made to AMP for more accurate treatment of multiple wire junctions and reduction of the time for interaction calculations on large structures. (Author)

AD-A031 428/6CP PC **A08**/MF **A01**
Cornell Univ Ithaca N Y
Wide-Band Microwave Amplifier Realizations in Microstrip Employing a GaAs Schottky-Barrier Field-Effect Transistor
Interim rept. 1974-1976
R. B. Watson, Jr. Aug 76, 161p RADC-TR-76-246
Contract F30602-74-C-0001

Descriptors: *Field effect transistors, *Microwave amplifiers, *Transistor amplifiers, *Schottky barrier devices, Broadband, Strip transmission lines, Solid state electronics, Gallium arsenides, Dispersion relations, Computer programs, Fortran.
Identifiers: Ladder networks, Lumped inductors, Chip capacitors.

This work deals with the realization of two 4-8 GHz flat-gain amplifier designs in microstrip using a single GaAs Schottky-barrier field-effect transistor. Two aspects of microstrip amplifier realization are considered. The first aspect is accurate realization of required lumped and distributed circuit elements. The second involves detailed mathematical modelling of practical circuit elements, permitting computer analysis and optimization of complete amplifier networks. After techniques for analysis and design of microstrip transmission lines are reviewed including loss and dispersion effects, particular areas of difficulty in practical design and fabrication of amplifiers are studied. These areas include microwave short circuit (DC open) realization using radial line sectors, fabrication of lumped inductors from Hewlett-Packard SBFET leads (Package 60), and circuit modelling of microstrip to coaxial transitions. Two versions of a simple amplifier design were built and measured on a Hewlett-Packard microwave network analyzer. A Fortran computer analysis program based on transmission scattering matrices was written to calculate the scattering parameters of ladder network models such as this first amplifier. The program aided in improving design methods such as the realization of lumped inductors.

AD-A031 472/4CP PC **A14**/MF **A01**
Massachusetts Inst of Tech Lexington Lincoln Lab
Phased Array Antennas
Final rept. Apr 73-Jun 75
A. Hessel, S. Barone, B. R. Cheo, Y-L Liu, and J. Shapira. Mar 76, 317p ESD-TR-76-78
Contract F19628-73-C-0002
Prepared in cooperation with Polytechnic Inst. of New York, Farmingdale. Dept. of Electrical Engineering and Electrophysics, rept. no. POLY-EE/EP-76-152.

Descriptors: *Phased arrays, Conformal structures, Spiral antennas, Computations, Computer programs, Admittance, Antenna radiation patterns, Antenna apertures, FORTRAN.

The report contains theoretical analysis and computed results for various types of phased arrays. Arrays on the exterior of a conducting sphere and on the interior of a conducting cylinder are treated in the first two chapters. The spiral antenna is dealt with, as an isolated element and in an infinite array, in the next two chapters. The last chapter contains the analysis of ridge waveguide arrays and a study of their wide band performance.

AD-A031 757/8CP PC **A05**/MF **A01**
Ohio State Univ Columbus Electroscience Lab
Plane Wave Expansion for Arrays of Dipoles or Slots in Presence of Dielectric Slabs
Technical rept.
B. A. Munk, R. D. Fulton, and R. J. Luebbers.
Sep 76, 83p ESL-3622-6, AFAL-TR-76-53
Contract F33615-73-C-1173

Descriptors: *Antenna arrays, Slot antennas, Dipole antennas, Computer programs, Dielectrics, Impedance, Admittance, Surface waves, Plane waves, Radomes.

The report presents the admittance properties of slot arrays in the presence of dielectric layers. The work relates to the design of metallic radomes. The report discusses the admittance properties of slot arrays in the presence of dielectric layers as a stepping stone to the transmission properties. These admittance properties are also applicable to phased arrays. In particular, the admittance is shown here to be almost independent of scan angle up to plus or minus 70 degrees in the E-, H- and 45 degree plane. This was obtained by proper use of dielectric layers mounted adjacent to the slotted surface. The presence of surface waves is also investigated, and ways to avoid them are pointed out. Finally, the effect of a semi-infinite dielectric media upon an array of dipoles is determined.

AD-A031 784/2CP PC **A04**/MF **A01**
Syracuse Univ N Y Dept of Electrical and Computer Engineering
A Reactively Loaded Aperture Antenna Array
Technical rept.
John Luzwick, and Roger F. Harrington. Sep 76, 68 Rept nos. TR-76-10, TR-3
Contract N00014-76-C-0225

Descriptors: *Antenna apertures, *Antenna arrays, Reactance, Gain, Admittance, Computer programs, Matrices(Mathematics), Vector analysis, Measurement, Voltage, Loading(Electronics), Resonance, Optimization, Waveguide slots, Beams(Radiation), Aiming.

Identifiers: *Reactive loads, *Waveguide backed apertures.

This report considers an array of reactively loaded aperture antennas, specifically, an N element array of closely-spaced waveguide-backed rectangular slots. Only the center waveguide is fed and the other waveguides are short circuited to provide the reactive loads. The positions of the short circuits are chosen to obtain maximum antenna gain in some specified direction. By varying the positions of the short circuits a directive beam can be steered through 180 deg. space. Both seven and nine element arrays are considered explicitly. Feasibility for physical realization of the reactive loading is discussed. A computer program with operating instructions is included. (Author)

AD-A031 802/2CP PC **A03**/MF **A01**
Bdm Corp Albuquerque N Mex
SCEPTRE/LOGIC Circuit Analysis Program User's Manual
Final rept.
Allan F. Malmberg, and Larry D. Ray. Jul 76, 45
BDM/A-145-75-TR-R1, AFWL-TR-75-279
Contract F29601-74-C-0106
See also AD-882 384 and AD-751 518.

Descriptors: *Computer programs, *Circuit analysis, *Logic circuits, *Computer aided diagnosis, *Transient radiation effects, *Integrated circuits, Programming manuals, Subroutines, User needs, FORTRAN, Programming languages, Gates(Circuits), Models, Response, Simulation.
Identifiers: *SCEPTRE computer program, Users manuals, NAND gates, NOR gates, OR gates.

SCEPTRE/LOGIC is a modified version of the SCEPTRE circuit analysis program. This manual is intended as a guide for SCREPTRE users who wish to utilize the LOGIC features of the modified code. It is written with the assumption that the reader is familiar with input preparation and application of SCEPTRE.

AD-A032 131/5CP PC **A08**/MF **A01**
Syracuse Univ N Y Dept of Electrical and Computer Engineering
Solid State Array Studies Relevant to OTP Regulations. Part 2. Random Effects in Planar Arrays of Dipoles
Interim rept. Sep 74-Feb 76
Arlan T. Adams, Peter Hsi, and A. Farrar. Aug 76, 165p RADC-TR-76-241-Pt-2
Contract F30602-75-C-0121
See also Part 1, AD-A032 130.

Descriptors: *Microwave amplifiers, *Solid state electronics, *Phased arrays, *Radar antennas, Dipole antennas, Planar structures, Electrical impedance, Excitation, Matrices(Mathematics), Far field, Redundancy, Random variables, Sampling, Harmonics, Computer programs, Antenna radiation patterns, Gain.
Identifiers: Method of moments.

A computer program for the analysis of random effects in planar arrays is described. The method of moments is applied iteratively in conjunction with a random sampling process, to obtain mean far field beam patterns and their expected variation. Block-Toeplitz impedance redundancies and the zeros of the excitation matrix are utilized in a special efficient solution routine. Separate array analysis at fundamental and harmonic frequencies yields the expected ratio of harmonic to fundamental levels. The theory of the computer program is outlined and typical results are presented. Significant gain degradation is predicted at harmonic frequencies. The results are applied to the OTP regulations and it is concluded that certain types of microwave solid state devices tested are viable candidates for array elements in view of these regulations. (Author)

AD-A032 686/8CP PC **A02**/MF **A01**
Syracuse Univ N Y Dept of Electrical and Computer Engineering
Applications of Matrix Methods to Radiation and Scattering Systems
Final rept. 1 Jan 73-30 Jun 76
Roger F. Harrington. Sep 76, 19p RADC-TR-76-306
Contract F19628-73-C-0047

Descriptors: *Antenna radiation patterns, *Electromagnetic radiation, *Electromagnetic scattering, *Matrix theory, Antennas, Synthesis, Apertures, Linear arrays, Waveguides, Computer programs.
Identifiers: *Antenna synthesis, Wire antennas, Method of moments.

The objective of this research project was to investigate applications of matrix methods to radiation and scattering systems. Four major topics were investigated, namely, (a) antenna pattern synthesis, (b) wire antennas over imperfect ground, (c) radiation and scattering from large bodies, and (d) electromagnetic transmission through apertures. All technical reports issued on project work are listed and abstracts of each are given. Published papers and oral papers related to project work are also listed. Based on the results of this project, recommendations for further research work are given. (Author)

AD-A032 715/5CP PC **A09**/MF **A01**
Naval Academy Annapolis Md
Low Frequency Dielectric Properties of Wide Band-Gap Semiconductors
Research rept.
Scott M. Jenkins. 17 Mar 76, 196p Rept no. USNA-TSPR-77
Report on a Trident scholar project.

Descriptors: *Dielectric properties, *Semiconductors, Solid state electronics, Low frequency, Pressure transducers, Computer programs, Temperature, Audio frequency, Zinc selenides, Selenides, Arsenic compounds, Arsenic sulfides, Cadmium selenides, Cadmium sulfides.
Identifiers: Arsenide selenides, *Amorphous semiconductors.

The complex dielectric constant has been measured for single crystal CdS and CdSe, and amorphous As2S3, As2Se3, and ZnSe at five audio frequencies 1000-10000 Hz) over the temperature range 4.2-300K at 1 atmosphere and over the pressure range 1-3000 atmospheres at temperatures from 260-320K. Anomalies are noted in the temperature variation of the real part of the dielectric constant for the As glasses. One anomaly is attributable to a Debye-type impurity while the other remains unexplained. The volume independent temperature derivative and temperature independent volume derivative of the real part of the dielectric constant are calculated for each material. These are used in conjunction with the Clausius-Mossotti equation to evaluate the various contributions to the pressure and temperature derivatives of the dielectric constant. For CdS, the Lyddane-Sachs-Teller relation is found to hold and the Szigeti effective charge is calculated. Finally, the possible use of these materials as a pressure transducer is discussed. (Author)

AD-A033 412/8CP PC **A05**/MF **A01**
Naval Electronics Lab Center San Diego Calif
Simplified VLF/LF Mode Conversion Program with Allowance for Elevated, Abritrarily Oriented Electric Dipole Antennas
Interim research rept. Mar-Sep 76
R. A. Pappert, and L. R. Shockey. 10 Oct 76, 79p Rept no. NELC/IR-771

Descriptors: *Dipole antennas, *Ionospheric propagation, Electric fields, Very low frequency, Low frequency, Orientation(Direction), FORTRAN, Homogeneity, Computer programs, Atmospheric disturbances, Anisotropy, digital computers.
Identifiers: Mode conversions, Waveguide modes.

This report presents an updated version of an earlier simplified mode conversion program for VLF/LF propagation in the earth-ionosphere waveguide. The new program includes the provision for calculating at an arbitrary height within the guide all three electric field components generated by an electric dipole of arbitrary orientation and height within the guide. The program is designed for treating air to air, ground to air or air to ground VLF/LF problems involving a waveguide channel which is horizontally inhomogeneous along the direction of propagation. (Author)

AD-A033 495/3CP PC **A03**/MF **A01**
Johns Hopkins Univ Laurel Md Applied Physics Lab
High-Resolution Clock Control for the TIP Satellite
Technical memo.
R. E. Jenkins, and A. D. Goldfinger. Sep 76, 46p
Rept no. APL/JHU/TG-1301
Contract N00017-72-C-4401

Descriptors: *Clocks, *Crystal oscillators, *Frequency synthesizers, *Timing devices, Navigation satellites, Kalman filtering, Computer programs, FORTRAN, Navigation computers, Frequency standards.
Identifiers: Satellite clocks, Clock control, TIP satellite.

The Transit Improvement Program (TIP) satellite clock is controlled by the IPS (Incrementally Programmable Synthesizer) and flight computer subsystems. Together they provide a synthesis of frequency offset and frequency drift that can be used to compensate for such errors in satellite crystal oscillator. To do this, the ground software must estimate the oscillator offset and drift and then compute the proper control parameters to be injected into the satellite to steer the clock. The system provides a resolution of control of 1 part in 10 to the 13th power in frequency and 1 part in 10 to the 13th power per day in drift. Estimation of oscillator offset and drift from high-resolution pseudo-random noise epoch measurements is accomplished by a discrete Kalman filter, based upon a three-state model with continuous random walks in frequency and frequency drift as the driving noise in the oscillator. A ground software program has been provided to implement the Kalman filter and compute the control parameters required to steer the satellite clock to the reference ground clock. The programs are written in Fortran 4. Complete listings of the software and operating procedures are provided. (Author)

AD-A033 592/7CP PC **A04**/MF **A01**
TRW Systems Group Redondo Beach Calif Nuclear Survivability Dept
Nonelectrical Languages Simulation Module (NELSIM). Volume I
Final rept.
M. Epstein, and J. R. Pistacchi. Sep 76, 65p
AFWL-TR-73-256-Vol-1
Contract F29601-73-C-0024
See also Volume 2, AD-A033 606.

Descriptors: *Programming languages, *Computerized simulation, FORTRAN, Radiation damage, Analogs, Circuit analysis, Transient radiation effects, Subroutines, Simulators.
Identifiers: FORTRAN 4 programming language, *NELSIM computer program.

NELSIM is a FORTRAN IV computer program written for the CDC 6000 series computers.

NELSIM generates electric analogs from mechanical, thermal, electro mechanical and electro optical system input descriptions. The electrical analogs generated are in a format acceptable to the SCEPTRE (System for Circuit Evaluation and Prediction of Transient Radiation Effects) program. The Nelsim output can then be executed on the SCEPTRE program to determine the system transient response. This report documents the theory and formulation utilized in the generation of NELSIM. The structure of the program and its subroutines are discussed. Also included is a sample problem section illustrating the input and output of the program and subsequent transient response obtained. (Author)

AD-A033 606/5CP PC **A05**/MF **A01**
TRW Systems Group Redondo Beach Calif Nuclear Survivability Dept
Nonelectrical Languages Simulation Module (NELSIM). Volume II
Final rept.
M. Epstein, and J. R. Pistacchi. Sep 76, 100p
AFWL-TR-73-256-Vol-2
Contract F29601-73-C-0024
See also Volume 1, AD-A033 592.

Descriptors: *Programming languages, *Computerized simulation, FORTRAN, Computer applications, Differential equations, Radiation damage, Transient radiation effects, Analog systems, Networks, Circuit analysis, Simulators, Computer programs.
Identifiers: *NELSIM computer program, FORTRAN 4 programming language.

NELSIM is a computer program developed to convert non-electrical system descriptions into electrical analogs or differential equations consistent with existing circuit analysis programs. The program provides an interface between system level problems and electrical simulation programs. The module permits engineers not familiar with disciplines generally associated with circuit simulation programs to solve system problems without manually deriving the electrical analogs and differential equations necessary to utilize such programs. (Author)

AD-A033 698/2CP PC **A15**/MF **A01**
Naval Postgraduate School Monterey Calif
Theory of Operation and Applications of Sampled Analog Devices in Recursive Comb Filters
Doctoral thesis
Stacy Vernon Holmes. Jun 76, 333p

Descriptors: *Charge coupled devices, *Recursive filters, Moving target indicators, Analog systems, Computer programs, Theses, Computer aided design, FORTRAN.

The theory of operation of charge coupled devices in the sampled analog mode is investigated. The applications of charge coupled devices in recursive filters is explored, both in first and second order systems. A means for translating nth order filters to first or second order is explained. Tables are developed to assist the engineer in choosing the proper coefficients for second order recursive filter design. Applications of recursive filter systems to moving target indicator processors are explored.

AD-A034 095/0CP PC **A04**/MF **A01**
Illinois Univ At Urbana-Champaign Electromagnetics Lab
Study of Mutual Coupling between Two Slots on a Cylinder
Final rept. 16 Jul-15 Nov 76
S. W. Lee, and R. Mittra. Nov 76, 63p
Contract N00019-76-M-0622

Descriptors: *Slot antennas, *Magnetic dipoles, Displacement, Admittance, Cylindrical bodies, Electromagnetic fields, Coupling(Interaction), Metal plates, Computer programs, Diffraction, Asymptotic series, Mathematical models, Complex variables.
Identifiers: Mutual coupling.

Contents: Calculation of Mutual Admittance between Two Slots on a Cylinder; Asymptotic Solution of Surface Field Due to a Magnetic Dipole on a Cylinder.

AD-A034 975/3CP PC **A05**/MF **A01**
Harry Diamond Labs Adelphi Md
SEMCON: A Semiconductor Damage Data Reduction Computer Code
Technical memo.
J. Michael Clodfelter. Dec 76, 91p Rept no. HDL-TM-76-28

Descriptors: *Semiconductor devices, *Radiation damage, *Computer programs, *Machine coding, *Radiation hardening, Curve fitting, Nuclear explosions, Electromagnetic pulses, Data processing, Subroutines, Data reduction, Plotting, Failure(Electronics), Least squares method.
Identifiers: Semcon computer program.

SEMCON is a semiconductor damage-data-reduction computer code that analyzes various semiconductor devices. The code evaluates semiconductor devices by giving the following information: (1) determination of damage--the failure or nonfailure of a device; (2) calculation of power, energy, and impedance; (3) least-squares fits of specific damage curves to chosen data; (4) selection of the best least-squares fit; and (5) log-log plots of least-squares fits. This report details the development and capabilities of SEMCON, as well as the procedures for using the code. (Author)

AD-A035 052/0CP PC **A02**/MF **A01**
Rome Air Development Center Griffiss AFB N Y
The Complete Electromagnetic Fields in the Focal Region of a Paraboloidal Reflector
Ronald L. Fante, and Richard L. Taylor. Sep 76, 20p Rept no. RADC-TR-76-295

Descriptors: *Parabolic antennas, *Cassegrain antennas, Electromagnetic fields, Computer programs, Reflectors, Fortran, Plane waves, Illumination.

By using the physical optics approximation we have developed a computer progrm to calculate the complete near field distribution of a paraboloid which is illuminated by a plane wave. This program is described and a number of results obtained with this program are presented, including some comparisons with known results for the fields in the focal plane. (Author)

AD-A035 289/8CP PC **A07**/MF **A01**
Air Force Inst of Tech Wright-Patterson AFB Ohio School of Engineering
Switching System Simulator
Master's thesis
Charles R. Williams. Dec 76, 139p Rept no. GE/EE-76-45

Descriptors: *Switching circuits, *Simulators, *Computerized simulation, Algorithms, Computer programs, Programming languages, Models, Instruction manuals, User needs.
Identifiers: CDC 6600 computers, Switching theory.

Switching System Simulator (SSS) is a CDC 6600 computer program which simulates and evaluates networks of interconnected switching elements. SSS determines all the possible ways in which a given switching system can complete a set of input/output connections. SSS is not limited to specific types of switching systems but allows the user to define the functions required. The SSS input source program is taken from a schematic diagram of the switching system is to be simulated. Each input, output and interconnecting path must be labeled with a unique name. Using the SSS input language, the user prepares the source program which defines all the pertinent characteristics of the switching system as well as the required input/output connections. SSS compiled a computer model of the switching system based on the input source program and outputs a list of all the possible switching element positions which satisfy the required input/output connections. A user's manual is included as part of this thesis which describes the capabilities, features and input language conventions of SSS. (Author)

AD-A035 401/9CP PC **A09**/MF **A01**
Mb Associates San Ramon Calif
Antenna Modeling Program Supplementary Computer Program Manual (AMP2)
Jan 75, 184p Rept no. MB-R-75/4
Contract N00014-71-C-0187
See also AD-767 420, AD-A005 673, AD-A025 890 and AD-A031 298.

Descriptors: *Antennas, *Mathematical models, *Programming manuals, Antenna radiation patterns, Computer programs, Machine coding, Wire, Magnetic fields, Integral equations, Hybrid systems, Computer files, Digital computers, Engineering, Theory, Subroutines.
Identifiers: CDC 6700 Computers.

This manual is a supplement to the Engineering, User's and Systems manuals prepared for the Antenna Modeling Program (AMP). This document describes the operation, theory, and coding of the changes made to AMP in order to decrease the running time for large voluminous structures with wire appendages. The options incorporated are surface modeling with surface patches as an alternative to wire grid modeling, and the use of approximate structure matrix elements where appropriate. In addition, an option for the precautionary dumping of temporary file storage is included. The AMP code as modified (AMP2) has been implemented on the Naval Ship Engineering Center CDC 6700 and has been delivered to the Naval Research Laboratory, U.S. Army Strategic Communications Command, and the Rome Air Development Center.

AD-A035 855/6CP PC **A05**/MF **A01**
Georgia Inst of Tech Atlanta
Computational Techniques for the Reduction of Nonlinear Effects Using Passive Compensating Networks
Phase rept. 1 Oct 74-1 Jul 76
Kendall L. Su. Dec 76, 98p RADC-TR-76-369
Contract F30602-75-C-0118

Descriptors: *Transistor amplifiers, *Distortion, Frequency response, Compensators, Intermodulation, Computer programs, Transfer functions, Mathematical models, Computations, Nonlinear analysis.
Identifiers: *Network analysis theory.

The objective of this effort is to develop design procedures to minimize nonlinear effects in mildly nonlinear circuits--Specifically, design procedures that will reduce nonlinear distortions such as intermodulation, desensitization, gain compression, etc. in communication equipment. The approach used relies on reducing in-band nonlinear distortion products by modifying the first order transfer functions outside the band of interest. The technique makes use of the fact that certain high-order nonlinear effects in the passband are functions of first-order network parameters at frequencies outside the band. By appropriate modification of these first-order parameters in-band, nonlinear effects can be reduced.

AD-A035 902/6CP PC **A03/MF A01**
Syracuse Univ N Y Dept of Electrical and Computer Engineering
A Solution for a Wide Aperture Reactively Loaded Antenna Array
Technical rept.
John Luzwick, and Roger F. Harrington. Jan 77, 31p Rept nos. TR-77-1, TR-5
Contract N00014-76-C-0225
See also AD-A031 784.

Descriptors: *Antenna apertures, *Antenna arrays, *Slot antennas, Waveguide slots, Computer programs, Reactance, Beam steering, Integral equations, Numerical integration, Matrices(Mathematics), Admittance.
Identifiers: Reactive loads.

This report considers an array of wide aperture reactively loaded antennas, specifically, an N element array of closely-spaced waveguide-backed rectangular slots radiating into a half-space region. Only the center slot is fed and the other slots are parasitically excited. The parasitic slots are reactively loaded by short-circuit waveguides. By varying the positions of the short circuits, a directive beam can be steered through 180 deg in space. The solution uses the moment method applied to the integral equation for the equivalent magnetic current in the aperture region and a numerical integration technique. Solutions for seven, nine, and fifteen element aperture arrays are given. A computer subroutine which generates the aperture half-space admittance matrix is described and listed. (Author)

AD-A036 161/8CP PC **A06/MF A01**
Air Force Weapons Lab Kirtland AFB N Mex
Plate: A 2-D Transmission Line Current Symmetry Code
Final rept.
John A. Justice. Jan 77, 105p Rept no. AFWL-TR-76-205

Descriptors: *Transmission lines, *Capacitors, Machine coding, Programming manuals, Two dimensional, Foils(Materials), Electric current, Voltage, User needs, Inductance, Resistors, Numerical methods and procedures.
Identifiers: *Capacitor banks, Users manuals, Mutual inductance, *Computer programs, PLATE computer program.

This report is primarily intended as a users manual for the two-dimensional current flow code PLATE. The current symmetry to a thin cylindrical foil that is being imploded by the j bar x B bar force in a short z-pinch device is considered. The code PLATE calculated azimuthal current asymmetries to the experimental load for various capacitor bank and parallel plate transmission line configurations. A discussion of numerical techniques is included. Two sample problems are discussed. A complete listing and sample output are included. (Author)

AD-A036 250/9CP PC **A02/MF A01**
Cold Regions Research and Engineering Lab Hanover N H
A Computer Program to Determine the Resistance of Long Wires and Rods to Non-homogeneous Ground
Steven A. Arcone. Jan 77, 21p Rept no. CRREL-77-2

Descriptors: *Electrical resistivity, *Electrical grounding, *Electric wire, Direct current, Arctic regions, Permafrost, Electrodes, Rods, Terrain, Emplacement, Horizontal orientation, Vertical orientation, Earth models, Computer programs, Computations.

A computer program was developed for finding the d-c resistance to ground of two simple electrodes, a straight horizontal wire and a vertically driven rod. The objective of this study was to develop a rapid means of finding the resistance to ground of simple electrode types in arctic environments where a two-layer earth model, frozen and unfrozen ground, is applicable. The program can consider homogeneous as well as two-layer earth, and the length, diameter and position of the electrodes. The computations were performed first by dividing an electrode into several smaller segments. Next the electrostatic potential of each segment was computed at the center of the electrode for unit-applied current. The segment potentials were then summed to find the total resistance to ground. Some specific computations are presented in comparison with previous theoretical work of other authors. The following conclusions were made: 1) A maximum run time of 165 seconds is needed for all two-layer arctic models where (a) the depth of the upper layer does not exceed 10 m, (b) the vertical rod length is less than 30 m, or (c) the horizontal wire length is less than 100 m; 2) Best accuracy is obtained when rod and wire radii are less than 0.01 m; and 3) Coincidence of the center of the vertical electrode with the two-layer interface must be avoided. (Author)

AD-A036 563/5CP PC **A02/MF A01**
Army Missile Research Development and Engineering Lab Redstone Arsenal Ala Guidance and Control Directorate
Transients on a Lossless, Exponentially-Tapered Transmission Line
Technical rept.
David Mathews. 30 Dec 76, 12p Rept no. RG-77-5

Descriptors: *Transmission lines, *Transients, Computer programs, Propagation, Convolution integrals.

A solution for the problem of a voltage pulse propagating along a lossless, exponentially-tapered transmission line is presented in the form of a convolution integral. If the input pulse can be approximated in terms of simple functions, an analytical solution is possible. If not, numerical evaluation of the resulting integral is still much simpler than solving the differential equations of propagation.

AD-A036 737/5CP PC **A03/MF A01**
Syracuse Univ N Y
Antenna Select Computer Program (ANTSEL)
Phase rept.
Jose Perini, and Harvey Schuman. Jan 77, 49p
RADC-TR-77-32
Contract F30602-75-C-0121

Descriptors: *Electromagnetic compatibility, *Electromagnetic interference, *Ship antennas, Computer applications, Data storage systems, Fortran, Computer programs, Shipboard.
Identifiers: ANTSEL computer program.

The Antenna Select Computer code (ANTSEL) is described here. The code is designed to aid the ship designer in the selection of appropriate antennas at the concept stage of ship design. It is an initial version upon which the feasibility of such codes can be assessed. There are essentially three modes of operation -- Learn, Search, and List. Under Learn Mode, stored antenna data is updated. Under Search Mode, antennas that meet desired specifications are found. Under List Mode, selected antenna data is presented. Listings of two versions of ANTSEL are included here. One version is suited for the Honeywell GCOS timesharing system. The other for the Control Data Corporation timesharing system. (Author)

AD-A036 868/8CP PC **A04/MF A01**
Syracuse Univ N Y
System Modularization to Minimize Life Cycle Costs
Final technical rept. Aug 75-Jul 76
John E. Biegel, and Bisrat Bulcha. Jan 77, 51p
RADC-TR-77-13
Contract F30602-71-C-0312

Descriptors: *Electronic equipment, *Modules(Electronics), *Life cycle costs, Circuit interconnections, Modular construction, Networks, Systems engineering, Heuristic methods, Computer programs, Combinatorial analysis.
Identifiers: Partitioning, Mean time to repair, Graph theory.

When designing equipments, particularly electronic equipments, there is a need to collect components into integral groups called modules. A network can be arbitrarily decomposed into modules, but an optimum modularization would minimize the life cycle cost (LCC) of the system. This research was directed toward that goal. The method developed is a heuristic and no attempt has been made to establish its optimality (although no counter examples are known). The problem is approached as one of decomposing a network subject to constraints. The problem may be stated as: Decompose a system to minimize the life cycle cost subject to physical constraints, a mean-time-to-repair constraint and establish spares to meet an availability constraint. A computer routine has been developed and explained. A flow chart is included. (Author)

AD-A036 960/3CP PC **A03/MF A01**
Rome Air Development Center Griffiss AFB N Y
Effect of CW-396A Radome on the Radiation Pattern of Rectangular Antennas
Technical rept.
Ronald L. Fante, Peter R. Franchi, and Richard L. Taylor. Dec 76, 32p Rept no. RADC-TR-76-397

Descriptors: *Radomes, *Antenna radiation patterns, S band, L band, FORTRAN, Computer programs, Antenna lobes, Rectangular bodies.
Identifiers: Grating lobes.

This report studies the effect of the CW-396A radome on the radiation pattern of a number of different rectangular antennas. It was found that this radome produces grating lobes, which are approximately 30 dB below the main beam level at L-band and approximately 23 dB lower at S-band. A FORTRAN listing of the computer program used is included in this report.

AD-A037 903/2CP PC **A04/MF A01**
Naval Electronics Lab Center San Diego Calif
Electromagnetic System Interaction Algorithms (SEMCA, IPM, TRED, and COSAM are Compared with Respect to Modeling Philosophy, Flexibility, Data Base, Noises and Interferences, Interference Threshold Criteria, Attenuation Modeling and Antenna Coupling, and Printouts)
Technical document
St Li. 3 Jan 77, 60p Rept no. NELC-TD-506

Descriptors: *Electromagnetic environments, *Electromagnetic compatibility, *Electromagnetic interference, Algorithms, Coupling(Interaction), Computer programs, Shipboard, Models, Antennas, Radiofrequency, Data bases, Threshold effects, Attenuation, Errors, Transmitters, Receivers.
Identifiers: TRED(Transmitter and receiver equipment development).

TRED is a system design tool while SEMCA, IPM, and COSAM are mainly used as interference prediction tools. A user-computer interactive program is recommended. It would be based on the TRED design philosophy and would be used during the design stage of shipboard RF communication systems. In addition, a performance evaluation program for shipboard RF communication systems is recommended. The purpose of the evaluation is to

predict final system performance in terms of articulation index and bit error rate. (Author)

AD-A037 960/2CP PC **A06/MF A01**
Raytheon Co Bedford Mass Missile Systems Div
Synthesis of Plane Stratified Dielectric Slab Spatial Filters Using Numerical Optimization Techniques
Final rept. 1 Apr-30 Sep 76
J. H. Pozgay, S. Zamoscianyk, and L. R. Lewis.
Dec 76, 105p BR-9389, RADC-TR-76-408
Contract F19628-76-C-0189

Descriptors: *Spatial filtering, *Dielectric films, X band, Planar structures, Antenna arrays, Laminates, Layers, Optimization, Synthesis, Computer programs.
Identifiers: *Planar arrays, Microwave equipment.

The synthesis of plane stratified dielectric slab spatial filters using numerical optimization techniques is presented. The stratified dielectric slab spatial filter is a unique concept for element pattern control on large planar arrays in that it gives protection for the array in the fashion of a radome. However, because of the relatively limited number of low loss microwave dielectrics, the synthesis of practical spatial filters must proceed in a manner which guarantees that the final configuration consists of materials which are readily available and reproducible. A numerical optimization technique of stratified dielectric filter synthesis has been developed which provides this guarantee while simultaneously attaining the required spatial and frequency bandwidth response. Using the optimization technique, an eleven layer filter design for use with a large mechanically scanned array has been obtained which has greater than 10 dB rejection in an angular stopband of 36 deg and less than 0.3 dB transmission loss in an angular passband of 10 deg around broadside. An up to date tabulation of available low loss microwave dielectrics and complete computer program listings are given in the Appendices. (Author)

AD-A038 135/0CP PC **A08/MF A01**
Gte Sylvania Inc Mountain View Calif Electronic Systems Group-Western Div
Advanced Array Design, Test and Evaluation
Final technical rept. 1 May 74-30 Jun 76
James E. Rice, Jr. Jan 77, 152p RADC-TR-77-25
Contract F30602-74-C-0252, F30602-75-C-0287

Descriptors: *Radar antennas, *Planar structures, *Antenna arrays, Computer programs, High frequency, Frequency modulation, Continuous wave radar, Backscattering, Over the horizon detection.
Identifiers: *Planar arrays, Low sidelobe arrays.

From 1 May 1974 to 30 June 1976, GTE Sylvania, Incorporated, Electronic Systems Group-Western Division, provided engineering field services in support of the RADC experimental HF FM/CW backscatter system at Dexter, New York. These services were primarily concerned with the design and development of a low sidelobe planar array, computer control of system parameters, and prediction of performance from precision measurements. This report discusses and details these efforts. (Author)

AD-A038 142/6CP PC **A04/MF A01**
Syracuse Univ N Y Dept of Electrical and Computer Engineering
Antenna Pattern Distortion Computer Program
Jose Perini, and Kazuhiro Hirasawa. Jan 77, 68p
RADC-TR-77-35
Contract F30602-75-C-0121

Descriptors: *Antenna radiation patterns, *Computer programs, *Electromagnetic compatibility, *Antennas, Electromagnetic fields, Distortion, Coupling(Interaction), Communication equipment, Geometry, Parameters.
Identifiers: Mutual coupling.

The Antenna Pattern Distortion Computer Program is a user oriented code that allows the engineer designing a communication antenna farm to easily enter the antennas involved by simply calling their AF number (AT1181, AT1097, AT197, and a lightning rod LR1000) and specifying their location on an arbitrary reference plane. This reformer plane may be specified as a perfectly conducting infinite ground plane if desired. The program output may be any specified horizontal or vertical pattern. It can also calculate the mutual coupling between any two antennas. If the information provided by the AFCS SCREEN is available, the program can provide plots of the communication range of station when the antenna pattern, antenna power, terrain topography, and receiver sensitivity are specified for any specified aircraft altitude. (Author)

AD-A038 350/5CP PC **A05/MF A01**
Hughes Aircraft Co Culver City Calif Antenna Dept
Conformal Phased Array Breadboard
Final rept.
Peter C. Bargeliotes, A. F. Seaton, Alfred T. Villeneuve, and Wolfgang H. Kummer. Jan 77, 80p Rept nos. 2753/981, HAC-Ref-D6190
Contract N00019-76-C-0495

Descriptors: *Phased arrays, *Slot antennas, *Conformal structures, *Radar antennas, *Conical antennas, Phase shift circuits, Antenna radiation patterns, X band, Admittance, Coupling(Interaction), Guided missile antennas, Computer programs.

Flush mounted slot antenna systems on metallic cones or ogival surfaces can be inertialessly scanned in the required direction. Since scanning over a wide angular region is generally desired, the radiation characteristics, including the effect of mutual coupling on the radiating elements, must be investigated before the more detailed system aspects are considered. To this end, various approximation techniques have been examined for use in pattern calculations and in impedance calculations. These include the approximate asymptotic approach and the equivalence principle technique. The approximation techniques provide simplified computations as compared with the exact technique, and are not applicable to all conditions. A combination of exact and approximation techniques is generally required to design or analyze an array. The approximate asymptotic approach, which allows the separation of the diffracted field and geometrical optics fields, has been examined in detail. It appears that the asymptotic representation of the Legendre function chosen for the analysis leads to divergent expressions as the mode number m is increased, and hence limits the usefulness of the asymptotic approach in the present problem. The divergent nature of the asymptotic expression is verified by computed radiation patterns of several azimuthal modes. A computer program is being developed to apply the equivalence principle technique to a conical surface.

AD-A038 627/6CP PC **A03/MF A01**
Watkins-Johnson Co Palo Alto Calif
Pyrolytic Boron Nitride as a Dielectric Substrate Material for Microwave Intergrated Circuits
Final rept. 1 Jun 76-1 Apr 77
C. M. Krowne. 1 Apr 77, 43p
Contract N00014-76-C-0896

Descriptors: *Integrated circuits, *Substrates, *Strip transmission lines, *Dielectrics, Microwave equipment, Pyrolysis, Boron nitrides, Tensors, Anisotropy, Couplers, Distortion, Computer programs, Electrical impedance.
Identifiers: Pyrolytic boron nitride, Microstrip transmission lines, Phase velocity.

Quasi-TEM electromagnetic theory is developed for microstrip lines on diagonal tensor dielectric substrate materials. Computer programs based on this theory using method of moments are described and were utilized to determine the electrical parameters for single and parallel-coupled microstrip lines on the substrate material pyrolytic boron nitride (PBN). Experimental measurements for single lines on PBN and for quadrature interdigitated coupled lines on PBN are reported.

AD-A038 790/2CP PC **A03/MF A01**
Syracuse Univ N Y
Point Source Radiation Pattern Synthesis by Iterative Techniques
Phase rept.
Jose Perini, and Jason Chou. Feb 77, 40p
RADC-TR-77-33
Contract F30602-75-C-0121

Descriptors: *Antenna radiation patterns, *Steepest descent method, *Antenna arrays, Iterations, Planar structures, Computer programs, Television antennas, Gain, Convergence, Omnidirectional antennas, Backlobes, Weighting functions, Optimization, Electromagnetic compatibility.

The steepest descent method has been applied to the radiation pattern synthesis of a planar array. The error function is defined as the difference between the specified pattern and the radiation pattern over the entire synthesis range. The steepest descent technique is used to find the new array parameters such that the error function is a minimum. Synthesis examples and a computer program implementation of the method are presented in the report. (Author)

AD-A038 969/2CP PC **A12/MF A01**
General Electric Co Pittsfield Mass Ordnance Systems
Digital Microcircuit Characterization and Specification
Final technical rept. Apr 75-Dec 76
Thomas M. Ostrowski. Mar 77, 259 RADC-TR-77-91
Contract F30602-74-C-0159

Descriptors: *Integrated circuits, *Microcircuits, *Microprocessors, Logic circuits, Digital systems, Test methods, Functional analysis, computer programs, Debugging(Computers), Specifications, Flip flop circuits, Shift registers.
Identifiers: Slash sheets.

The objective of this effort was to generate MIL-M-38510 slash sheets for microprocessor integrated circuits. The report includes the general microprocessor test philosophy developed and used, technical analyses of manufacturer generated functional test programs, changes made to manufacturer programs, and the approach taken in slash sheet development. Two slash sheets were developed; /400 for the 6800 and /420 for the 8080A microprocessor (not included in the report). Also included are analyses of functional tests for many low power Schottky flip flops and one CMOS register circuit (CD4035A). (Author)

AD-A039 188/8CP PC **A02/MF A01**
Syracuse Univ N Y
Antenna Pattern Synthesis Computer Program
Technical rept.
Jose Perini, and Kazuhiro Hirasawa. Feb 77, 20p
RADC-TR-77-37
Contract F30602-75-C-0121

Descriptors: *Antenna radiation patterns, *Computer programs, Computer aided design, Synthesis, Electromagnetic compatibility, Electromagnetic fields, Optimization.

Optimization techniques have been applied to the antenna pattern synthesis problem using point sources and ignoring the mutual coupling effects. If these effects are to be taken into account, it becomes very costly to perform the synthesis. In this report an approximate way to solve this problem has been prepared and implemented on a computer program. (Author)

AD-A039 344/7CP PC **A07**/MF **A01**
Rome Air Development Center Griffiss AFB N Y
Implementation of Operational Procedures for Optimized Reliability and Component Life Estimator (ORACLE)
Rept. for Jul 75-Dec 76
George W. Lyne. Mar 77, 129p Rept no. RADC-TR-77-49
Includes Errata sheet dated Apr 77.

Descriptors: *Computer programs, *Failure(Electronics), *Reliability(Electronics), Programming manuals, Flow charting, Electronics, Components, Life expectancy, Estimates, Forecasting, Maintenance, Predictions, Modules(Electronics).
Identifiers: *Oracle computer program, Honeywell 6000 computers, MTBF(Mean time between failure), Mean time between failure.

This report presents instructions for the implementation of the ORACLE computer program, as developed by the US Army, on the RADC/Honeywell GCOS 6000 Computer System. This version of the ORACLE program is a software package which determines: The failure rate of electronic piece-parts based on the procedures set forth in MIL-HDBK-217B. The total piece-part failure rate of an electronic module, equipment and/or system. The MTBF for an electronic module, equipment and/or system based on the piece-part failure rates. (Author)

AD-A039 509/5CP PC **A07**/MF **A01**
Rome Air Development Center Griffiss AFB N Y
A Time Domain Program for Wire Antenna Analysis
Final rept.
John Potenza. Apr 77, 142p Rept no. RADC-TR-77-123

Descriptors: *Antennas, *Computer programs, Time domain, Transients, Subroutines, Mathematical models, Formats, Fortran, Data processing, Input output processing.
Identifiers: *Wire antennas, Impulse response.

This report discusses a user oriented computer routine to analyze antennas directly in the time domain. A number of sample cases were run and compared to previously published experimental results. A discussion of inputting data and output format is included to guide potential users. For the sake of completeness, a review of the time domain equations as well as the Fortran listing of the program are included. This information was published in a final report (1) and was distributed only to RADC and NRL, and is not available through DDC.

AD-A039 843/8CP PC **A03**/MF **A01**
Naval Research Lab Washington D C
Focusing Characteristics of Symmetrically Configured Bootlace Lenses
Memorandum rept.
J. P. Shelton. Apr 77, 31p Rept no. NRL-MR-3483
Contract DOT-FA75WAI-556

Descriptors: *Microwave optics, *Lenses, Microwave antennas, Focusing, Computer programs, Ground controlled approach radar, Ray tracing, Fortran.
Identifiers: *Bootlace lenses, Lens antennas.

The line-source bootlace lens produces optimum focusing characteristics when it is constrained to exhibit front-to-back as well as right-left symmetry. It is shown that the symmetric bootlace lens is a one-parameter family when the radiating array is specified to be lambda/2 spaced with 0 or - 90-degree coverage. Design equations for the lens are derived, and overall focusing performance and design data are plotted. A computer program of the design equations is presented.

AD-A039 965/9CP PC **A02**/MF **A01**
Naval Research Lab Washington D C
TE-Mode Solutions for Dielectric Slab Center Loaded Ridged Waveguide
Interim rept.
Charles W. Young, Jr. 29 Apr 77, 18p Rept no. NRL-8105

Descriptors: *Waveguides, *Transformers, Dielectrics, Broadband, Transmission lines, Propagation, Electromagnetic wave propagation, FORTRAN, Computer programs, Transmission lines, Equivalent circuits, Transverse waves.
Identifiers: Design.

Dielectric slab center loaded ridged waveguide has been analyzed to obtain TE sub 10 propagation characteristics for the losses case. The analysis was performed by solving for the lowest order resonance of the transverse wave component, using an equivalent transmission line circuit which models the height change at the ridge as an effective shunt susceptance. Calculated and measured data are compared; they show good agreement. The analysis should prove useful in designing transformers to match empty ridged waveguide to slab loaded rectangular waveguide components such as toroidal phase shifters. (Author)

AD-A040 026/7CP MF **A01**
BDM Corp Albuquerque N Mex
General Electromagnetic Model for the Analysis of Complex Systems. Volume I. User's Manual
Final technical rept. 2 Apr 74-30 Sep 76
R. J. Balestri, T. R. Ferguson, and E. R. Anderson. Apr 77, 182p RADC-TR-77-137-Vol-1
Contract F30602-74-C-0182
See also Volume 2, AD-A040 027.
Availability: Microfiche copies only.

Descriptors: *Electromagnetic compatibility, *Electromagnetic radiation, *Electromagnetic scattering, Antenna radiation patterns, Matrices(Mathematics), Solutions(General), Approximation(Mathematics), Iterations, User needs, Manuals, Computer programs, FORTRAN, Models.
Identifiers: Method of moments, GEMACS computer program.

Volume I of this report is the user's manual for the GEMACS code developed under this contract. GEMACS utilizes a MOM (Method of Moments) formalism with the EFIE (Electric Field Integral Equation) for the solution of electromagnetic radiation and scattering problems. The code employs both full matrix decomposition and Banded Matrix Iteration solution techniques and is expressly designed for large problems. Volume II of this report describes the engineering approximations, the theory and implementation of the Banded Matrix Iteration scheme, and the results of a wire grid modeling study that established consistent wire grid modeling requirements for large structures. (Author)

AD-A040 123/2CP PC **A04**/MF **A01**
Army Electronics Command Fort Monmouth N J
Transient Waveform Analysis of Switching Converter
Technical rept.
Emil Kittl. Apr 77, 51p Rept no. ECOM-4493

Descriptors: *DC to DC converters, *Transients, Waveforms, Switching, Resonance, Computer programs, Steady state, Computerized simulation, Circuit analysis, Modes, Avalanche diodes, transistors.
Identifiers: Power processing, Transient analysis.

The DC to DC series resonance converter circuit using antiparallel diodes to introduce two additional controlled time intervals for diode conduction has been modeled as an idealized series capacitor resonance circuit with four cyclic switching states. For the two transistor and two diode conduction periods of these states, linear circuit analysis is used. The boundary conditions at the time interface between the four switching states are defined for automatic cyclic sequencing so that a continuous string of wave trains of converter operation results. The computer program is written in basic language.

AD-A040 223/0CP Not available NTIS
Texas Tech Univ Lubbock Dept of Electrical Engineering
Rational Fault Analysis
Interim rept.
Richard Saeks, and Stanley R. Liberty. May 77, 252p
Contract N00014-75-C-0924
Proceedings of Symposium on Rational Fault Analysis, Lubbock, Tex., 19-20 Aug 74.
Availability: Marcel Dekker, Inc., N. Y., N. Y. 10016, HC $27.50 (No copies furnished by DDC).

Descriptors: *Test methods, *Reliability, Faults, Electronics, Diagnosis(General), Statistical analysis, Computer programs, On line systems.
Identifiers: *Fault analysis, *Meetings.

This volume contains the proceedings of the Symposium on Rational Fault Analysis held in Lubbock, Texas in August 1974. Participants in the symposium represented industry, government, and universities. The topics covered include fault analysis in analog and digital electronics, testing of non-electrical devices, implementation problems, and the mathematics of fault analysis. In addition bibliographies on analog and digital fault analysis are included. (Author)

AD-A040 269/3CP PC **A05**/MF **A01**
Breuer and Associates Encino Calif
Functional Level Modeling of Complex Elements in TEST/80
Melvin A. Breuer. 1 Sep 76, 81 Rept no. TEST/80-1-76
Contract N00014-75-C-1053

Descriptors: *Logic elements, *Circuit analysis, Computer programs, Gates(Circuits), Models, Automatic, Algorithms, Computer applications, Flip flop circuits, Shift registers, Counters, Machine translation.
Identifiers: Automatic test generation program, Test/80 computer program, Computer software.

This report documents the result of just one task of the contract. This task was to investigate the feasiblity of handling complex elements functionally, rather than at the logic level, in an ATG system. A test generation system was assumed, based upon the concepts of path sensitization a la the D-algorithm. This feasiblity is shown in the report. More precisely, function models were developed for three devices (a flip-flop, a counter, and a shift register). These models include mechanisms for processing implication, D-drive and line justification. Concepts are discussed for dealing with both edge-

triggered and level devices, as well as a generic language for specifying the functional operation of a device. (Author)

AD-A040 271/9CP PC **A06/MF A01**
Breuer and Associates Encino Calif
An Advanced Automatic Test Generation System for Digital Circuits
Melvin A. Breuer. 29 Mar 77, 111p Rept no. TEST/80-1-77
Contract N00014-75-C-1053

Descriptors: *Logic circuits, *Circuit analysis, Automatic, Digital systems, Preprocessing, Algorithms, Circuit testers, Random access computer storage, Shift registers, Gates(Circuits), Counters.
Identifiers: Automatic test generation program, TEST/80 computer program.

This is the third and final report documenting our research into the design of a new and powerful automatic test generation system for digital logic, called TEST/80. This system is designed around the following six concepts. 1. A powerful circuit preprocessing analysis which leads to greater efficiency during stimulus generation. 2. An effective initialization algorithm. 3. The use of time frames, phases and periods so that asynchronous circuits can be accurately processed during stimulus generation. 4. The use of functional level primitives so that complex circuits including shift registers, counters and RAM's, can now be effectively processed. 5. The use of a stimulus generation algorithm which incorporates the concepts in 1-4. 6. The use of a functional level concurrent fault simulator, used to grade a test and produce a fault dictionary.

AD-A040 398/0CP PC **A04/MF A01**
Harry Diamond Labs Adelphi Md
User's Manual for the NLINE Multiconductor Transmission-Line Computer Code
Technical rept.
Janis Klebers. May 77, 52p Rept no. HDL-TR-1803

Descriptors: *Computer programs, *Transmission lines, *Electromagnetic shielding, Electromagnetic pulses, Coupling circuits, Multiconductor cables, Electric cables, FORTRAN, Time domain, Magnetic fields, Computerized simulation, Computer applications.
Identifiers: NLINE computer program, Plane waves.

This manual describes applications of the multiconductor transmission-line computer program, NLINE. The program computes the voltages and currents induced by an incident plane electro-magnetic wave on the conductors or in the loads of a lossless transmission line made up of 11 conductors or less. The solution is provided both in the frequency and time domains. The program accepts arbitrary angles of incidence, transmission-line length, and resistive terminations. The Thevenin equivalent lumped-parameter method is described for use of NLINE with non-linear loads. Computational agreement with experimental data is demonstrated. A complete FORTRAN program listing is included. (Author)

AD-A041 319/5CP MF **A01**
Rome Air Development Center Griffiss AFB N Y
FAA Lightning Protection Study: Lightning Induced Transients on Buried Shielded Cables: Numerical Analysis and Results
Final rept. May 76-May 77
John D. Nordgard, and Chin-Lin Chen. May 77, 118p FAA/RD-77-83
Contract DOT-FA72WAI-353
Availability: Microfiche copies only.

Descriptors: *Lightning arresters, *Electric cables, Lightning, Transients, Numerical analysis, Coaxial cables, Protection, Electric current, Voltage, Surges, Computer programs.
Identifiers: *Buried cables, Electromagnetic disturbances.

This report is primarily concerned with analysis of induced transient current and voltage pulses on buried shielded transmission lines, due to earth conduction effects of nearby lightning discharges. A numerical method is presented in this report to determine the amount of coupling between a lightning discharge to ground and an earth-return transmission line. The transmission line is assumed to be a long straight horizontal coaxial cable with an inner shield and an outer armor, terminated on both ends with typical communication equipment load impedances. The general case is considered here, in which the outermost conductor is not necessarily in perfect contact with the conducting earth but has a contact impedence with the earth, as in cables with an outer dielectric covering for corrosion or water protection. Indirect strikes to the cable via conductive coupling mechanisms through the earth are considered. Several average lightning channel conditions and several representative buried cable geometries are examined. The results are conveniently displayed via numerous graphs of the time histories and frequency spectra of the resulting transient current and voltage surges. (Author)

AD-A041 321/1CP MF **A01**
Raytheon Co Bedford Mass Missile Systems Div
Design and Analysis of Bifurcated Twin Dielectric Slab Loaded Rectangular Waveguide. Dual Frequency Array Elements
Final rept. Jan 76-Feb 77
J. H. Pozgay, M. Fassett, and L. R. Lewis. 1 Mar 77, 246p BR-9674, RADC-TR-77-160
Contract F19628-75-C-0197
Availability: Microfiche copies only.

Descriptors: *Dielectric waveguides, *Exciters, *Phased arrays, *Antenna arrays, Frequency, Strip transmission lines, Antenna apertures, High frequency, Mathematical analysis, Computer programs, Grids, Antenna lobes, Antenna feeds, Dual mode.

The design and analysis of a unique dual frequency array element and three probe element exciter for aperture sharing at two widely separated frequency bands is presented. The bifurcated twin dielectric slab loaded rectangular waveguide element simultaneously supports a single low frequency band phase center and four independently controllable high frequency phase centers, resulting in the formation of an independent radiating beam in each band. The principle element design objective is to minimize the element count while maximizing the rejection of high frequency grating lobes. It is shown that the slab loaded element results in 21 percent fewer phase and frequency control per unit array area than an alternate diplexed wide band element dual frequency concept for a scanning array operated over 15 percent bands centered at 4 and 8 GHz. The radiation and coupling properties of the array element are developed from a scattering formulation of the feedguide - free space discontinuity for the fully excited infinite array. Comparison of theoretical performance for triangular and rectangular grid configurations shows that considerable improvement in high frequency grating lobe rejection is obtained from the triangular lattice. To characterize the transverse aperture fields, a complete modal description of propagation in the inhomogeneously loaded guide is obtained through a component-by-component comparison of the degenerate eigen-functions of the structure.

AD-A041 864/0CP PC **A10/MF A01**
Boeing Commercial Airplane Co Seattle Wash
Air Traffic Control Experimentation and Evaluation with the NASA ATS-6 Satellite. Volume IV. Data Reduction and Analysis Software
Final rept. Sep 73 to Dec 75
A. D. Thompson, S. C. Wilson, P. F. Rieder, W. L. Chu, and M. J. Mardesich. Sep 76, 214p D6-44049, FAA-RD-75-173-4
Contract DOT-TSC-707-4
See also Volume 6, AD-A041 971.

Descriptors: *Aircraft antennas, *Air traffic control systems, *Scientific satellites, *Communication satellites, Signal to noise ratio, Multipath transmission, Modems, Digital systems, Fast Fourier transforms, Algorithms, Envelope(Space), Scattering, Detectors, Data processing, Computer programs.
Identifiers: ATS-6 satellite.

Software used for the reduction and analysis of the multipath prober, modem evaluation (voice, digital data, and ranging), and antenna evaluation data acquired during the ATS-6 field test program is described. Multipath algorithms include reformatting operations, delay-spectra time histories, delay-Doppler scatter function S(Tau, Omega), noise determination and removal, spread calculations, airborne tape analysis, and other detailed processing including time-domain analysis and various integral and Fourier operations on S(Tau, Omega). Modem and antenna evaluation data processing software includes algorithms for the determination of (1) C/N sub o and multipath interference ratio, S/I, (2) digital data bit-error rates, block error statistics, and inter-error spacing, and (3) ranging error statistics and distribution. Sample outputs are given. Program listings and other information are provided in an auxiliary software data package. The report consists of seven volumes: I - Executive Summary; II - Demonstration of Satellite-Supported Communications and Surveillance for Oceanic Air Traffic Control; III - Summary of U.S. Aeronautical Technology Test Program; IV - Data Reduction and Analysis Software; V - Multipath Channel Characterization Test; VI - Modem Evaluation Test; VII - Aircraft Antenna Evaluation Test. (Author)

AD-A042 149/5CP PC **A02/MF A01**
Bdm Corp El Paso Tex
Power Series V-I Curve Element and Optimization Improvements in the NET-2 Network Analysis Program
Final rept.
Allan F. Malmberg. 8 Aug 75, 10p Rept no. BDM/E-19-75-F-0158
Contract DAAG39-75-C-0158

Descriptors: *Resistors, *Computer programs, Nonlinear systems, Voltage, Electric current, Mathematical models, Optimization, Power series, Subroutines, Digital computers, FORTRAN.
Identifiers: Characteristic curves, NET-2 computer program, *Network analysis theory.

A model for a nonlinear resistor has been developed and implemented in NET-2. The nonlinear resistor has actually been implemented as an algebraic power series in which element voltage is a function of element current. The power series function is defined for non-negative values of current and reflected into the other half plane (non-positive current) as a negative function. Details of the power series element are given. The FORTRAN listing of subroutine PSVI, the power series element routine, is given in Appendix A.

AD-A042 288/1CP MF **A01**
Naval Postgraduate School Monterey Calif
A Computer Aided Design of Digital Filters
Salih Kayhan Elitas. Jun 77, 105p
Availability: Microfiche copies only.

Descriptors: *Digital filters, *Computer aided design, Computer programs, Theses.
Identifiers: Modified transitional Butterworth Chebyshev filters, Butterworth filters, Chebyshev filters.

Expressions for a generalized Modified Transitional Butterworth-Chebyshev (MTBC) filter are derived. The characteristics of this filter as applied to digital filter design are investigated. It is shown that by adjusting location and order of the inserted zeros, the cut-off slope rate of the filter can be traded for maximum attenuation in the stop band. The performance of this MTBC filter is compared to that of Butterworth, Chebyshev, transitional Butterworth-Chebyshev filters together with those suggested by other investigators. It is shown that the stop-band attenuation can be significantly increased without great sacrifice of cut-off slope rate. Step response of this MTBC filter is also obtained and compared with other filters. Various tabulations as well as graphs of this filter are given for design purposes. A computer program is developed for the design of this filter. (Author)

AD-A042 594/2CP PC **A03**/MF **A01**
Army Electronics Command Fort Monmouth N J
NASTRAN Data Generating Programs and Analytical Models for Analysis of Antenna Mast and Tower Structures
Final rept.
James W. Jetter, Jr. Jul 77, 29p Rept no. ECOM-4508

Descriptors: *Antenna masts, *Towers, *Computer aided design, Guy wires, Aerodynamic loading, Computer programs, Static loads, Anchors(Structural), Wind velocity, Wind direction, Directional, Prestressing, Nodes, PUnched cards.

This report is concerned with the development of data generating programs and analytical models to facilitate the structural analysis of antenna mast and tower structures subjected to static and dynamic loadings. The programs generate the data cards necessary to define the structure geometry and material properties of typical masts and towers for the NASA Structural Analysis Program (NASTRAN). The automatic data generating program for masts can be used to model any mast of constant cross section and can handle any number of cable tie points and anchor points; deform cards to duplicate cable pretension are also generated as well as the force cards needed for representing a uniform wind type pressure. The automatic data generator for towers generates a series of tower stages and considers four (4) variations of tower geometry, three (3) possible base conditions and any number of sides greater than two (2). This program was designed for towers with regular generation properties and equal side lengths, but a separate program enables some variations in side length to be considered. In order to provide an economical but efficient NASTRAN model for analyzing antenna towers, three models, with varying degrees of exactness were investigated using several NASTRAN rigid formats for analysis. The capabilities and limitations of these models, with respect to the rigid formats considered, was studied. (Author)

AD-A042 600/7CP PC **A03**/MF **A01**
Army Electronics Command Fort Monmouth N J
Analysis Techniques and Instrumentation for Blast Loaded Parabolic Antennas
Progress rept. 26 May-8 Aug 75
James W. Jeter, Jr. Jul 77, 26p Rept no. ECOM-4509

Descriptors: *Parabolic antennas, *Blast loads, *Computer aided design, Reinforcement(Structures), Computer programs, Flat plate models, Digital computers, Overpressure, Dynamic loads, Failure(Mechanics), Satellite communications, Punched cards, Time domain, FORTRAN.
Identifiers: B-5700 computers.

In this report, a physical model and blast analysis techniques are developed for a solid surface parabolic antenna, using the NASTRAN structural analysis program. The antenna considered is the US Army Satellite Communication Agency Antenna, consisting of a center section and four petal sections, all of which have the structural configuration of stressed skin over reinforcing ribs. The antenna is modelled as a network of flat membrane plates, except at connection points, where appropriate bending stresses are accounted for. An alternate model makes it possible to consider, to some extent, bending stresses in the skin. A simplifying assumption of symmetrical behavior of the reflector reduces analysis costs considerably. When analysis of the center section alone is necessary, removal of a minimal number of computer cards from the complete model results in a model of the center section. Computer programs are described which translate the blast parameters and antenna geometry into concentrated dynamic loads at NASTRAN grid points. The analysis procedure for dynamic loads is outlined. Instrumentation and maximum overpressure loads for a shock tube test are recommended, based on available information. This task was supported financially by the Scientific Services Program of the US Army Research Office. (Author)

AD-A042 758/3CP PC **A03**/MF **A01**
Purdue Univ Lafayette Ind School of Electrical Engineering
Influence of Horizontal Ground Wires on Low Angle Radiation from HF Antennas
Interim technical rept.
C. L. Chen , and W. L. Weeks. 19 May 77, 37p
Scientific-1, RADC-TR-77-171
Contract F19628-76-C-0086

Descriptors: *Antennas, High frequency, Horizontal orientation, Ground(Electrical), Wire, Computer programs, Angles, Radiation, Polarization, Vertical orientation, Method of moments.

Digital computer programs are being developed to evaluate the effects of horizontal ground wire systems on the low angle radiation from vertically polarized HF antennas. An extensive method of moments program (WF-LLL2A) has been modified for this purpose. An alternative approximate method has also been studied and the results compared. Results to date indicate the feasibility of these types of calculations and that a low angle field enhancement of 20 to 25% by design of the ground wire system may be possible at the higher frequencies in the HF band. (Author)

AD-A042 848/2CP PC **A08**/MF **A01**
Colorado State Univ Fort Collins Dept of Electrical Engineering
Digital Filter Design and Implementation Methods
Final technical rept. 4 Apr 73-30 Jun 74
Thomas A. Brubaker. Jul 77, 164p AFAL-TR-75-211
Contract F33615-73-C-1253

Descriptors: *Digital filters, *Avionics, Flight control systems, Multiplexing, Interactions, Covariance, Control systems, Algorithms, Reliability, Recursive filters, Transfer functions, Fortran, Computer programs.
Identifiers: Design.

This report describes methods for the design and implementation of digital filters that have applications in modern aircraft avionics and flight control systems. Design of the digital filters and the interaction between the design and implementation are emphasized. Multiplexing of digital filters is discussed. (Author)

AD-A042 859/9CP PC **A04**/MF **A01**
Army War Coll Carlisle Barracks Pa
Management of Research and Development for Electronic Systems
Individual study project rept.
George L. Wooley. 3 Jun 77, 74p

Descriptors: *Research management, *Electronics, Advanced systems, Technology, Department of Defense, Life cycles, Life expectancy, Information transfer, Matrices(Mathematics), Development tests, Systems approach, Acquisition, Computers, Computer programs, Assessment, Risk analysis.

The intent of this investigative research effort was to perform a critical appraisal of the Department of Defense technological innovation process in the light of recent research in private industry technological innovation. The study focuses specifically on Research and Development and technological innovations for electronic systems. The focus is directed toward electronic systems because of the thesis that electronic technology is progressing rapidly enough to make the life span of technologies less than the optimun DOD system acquisition cycle time. The study concludes that more DOD electronic systems will be fielded with obsolete computer subsystems unless changes are made in the military R and D approaches. The first recommendation is that Department of Defense establish a program of joint service evaluation of competing technologies as part of electronic systems development projects. The study also recommends the establishing of a more meaningful incentive program for government and contractor personnel that is unique to technological innovation.

AD-A043 400/1CP PC **A06**/MF **A01**
Ohio State Univ Columbus Dept of Electrical Engineering
A GTD Analysis of the Circular Reflector Antenna Including Feed and Strut Scatter
Final technical rept. Mar 76-Apr 77
S. H. Lee, R. C. Rudduck, C. A. Klein, and R. G. Kouyoumjian. Aug 77, 105p 4381-1, RADC-TR-77-259
Contract F30602-76-C-0224

Descriptors: *Parabolic antennas, *Antenna lobes, Scattering, Diffraction, Geometry, Numerical analysis, Antenna feeds, Antenna radiation patterns, Circular antennas, Computer programs, Supports.

Recently, the wide angle side lobes of a circular reflector antenna pattern were calculated by the Geometrical Theory of Diffraction and an overall pattern can be obtained from a combination of GTD and aperture integration methods. In this report, the analysis is extended to include the scattering from the feed supports. The feed support scattering is treated using the concept of equivalent current line source. The cylinder scattering model developed in this report gives the effect of strut scattering on the wide angle side lobes of the reflector. The scattering from the feed struts always has its greatest effect near the scattering cones for each strut. These scattering cones usually give rise to a maximum aperture blockage effect in certain off-principal plane patterns. The analysis given here can be used to compute the complete pattern of any arbitrary plane cut for a practical circular reflector antenna system. (Author)

AD-A043 560/2CP PC **A02**/MF **A01**
California Univ Berkeley Dept of Electrical Engineering and Computer Sciences

Research In Integrated, High-Frequency Communication Circuits
Final rept. 1 May 74-30 Apr 77
R. G. Meyer, and D. O. Pederson. Jul 77, 8p
ARO-12131.6-EL
Grant DAHC04-74-G-0151

Descriptors: *Integrated circuits, *Communication equipment, *Low noise amplifiers, *Voltage controlled oscillators, High frequency, Broadband, Monolithic structures(Electronics), Transistor amplifiers, Distortion, Avalanche diodes, Computer aided design, Computer programs.
Identifiers: Noise figure, Zener diodes.

This report summarizes our research results in Integrated, High-Frequency Communication Circuits. A monolithic integrated circuit process giving 1.7 GHz transistors has been realized. This allowed realization of an optimum, wideband, low-distortion, monolithic amplifier with 20 dB gain and 370 MHz bandwidth. The circuit incorporates low-noise Zener diodes and has a worst case noise figure of 9 dB. Research on monolithic VCOs yielded an optimum topology for a temperature-stable high-frequency VCO. A monolithic triangle sine wave converter yielding 0.3% total harmonic distortion over a 70 deg C temperature range has been realized for use with such VCOs. A computer-aided design program SINC-S has been written for the analysis of oscillator circuits. This typically gives a factor of three improvement in computation time compared with conventional techniques. (Author)

AD-A043 804/4CP PC **A03**/MF **A01**
Syracuse Univ N Y Dept of Electrical and Computer Engineering
Pattern Magnitude Synthesis for a Reactively Loaded Circular Antenna Array
Technical rept.
John Luzwick, and Roger F. Harrington. Aug 77, 40p Rept no. TR-77-6
Contract N00014-76-C-0225

Descriptors: *Antenna arrays, *Antenna radiation patterns, Circular, Loading(Electronics), Synthesis, Optimization, Reactance, Dipole antennas, Algorithms, Excitation, Q factors, Computer programs, Matrices(Mathematics).

This report presents a method for synthesizing a given radiation field magnitude pattern for a reactively loaded circular dipolar array. The reactively loaded circular dipole array has the center dipole fed and the outer dipoles parasitically excited with reactive loads across their input terminals. Both seven and thirteen element arrays are considered. A Rosenbrock optimization algorithm is applied directly to the synthesis error function to determine the reactive loads required for minimum error. Any arbitrarily shaped magnitude pattern can be treated. The pattern magnitude synthesis results for the reactively loaded array are compared to that of an optimally excited array. A computer program for the optimization algorithm with operating instructions is included. (Author)

AD-A044 114/7CP MF **A01**
Air Force Occupational Measurement Center Lackland AFB Tex
Instrument Trainer Specialist AFSC 34151
Occupational survey rept. Apr-Jun 77.
22 Aug 77, 52p Rept no. AFPT-90-341-222
Report on Electronics Principles.
Availability: Microfiche copies only.

Descriptors: *Electronic technicians, *Skills, *Job analysis, Training devices, Instrumentation, Electronics, Electronic equipment, Careers, Career ladders, Jobs, Job satisfication, Job training, Surveys, Questionnaires, Computer programs, Air Force personnel, Data acquisition, Enlisted personnel, Maintenance personnel, Inventory.
Identifiers: Occupational surveys, Air Force specialty codes, Instrument trainer specialty.

This report summarizes the results of the administration of the Electronic Principles Inventory to airmen assigned as Instrument Trainer Specialists (AFSC 34151). The data for this report were collected during the period April through June 1977. This report describes: (1) development and administration of the survey instrument; and (2) electronic principles used by DAFSC 5-skill level personnel both CONUS and overseas and assigned to selected major commands. (Author)

AD-A044 121/2CP MF **A01**
Air Force Occupational Measurement Center Lackland AFB Tex
Defensive Systems Trainer Specialist, AFSC 34152
Occupational survey rept.
22 Aug 77, 52p Rept no. AFPT-90-341-222
Availability: Microfiche copies only.

Descriptors: *Electronic technicians, *Skills, *Job analysis, Defense systems, Electronic equipment, Electronics, Inventory, Air Force personnel, Enlisted personnel, Careers, Jobs, Surveys, Questionnaires, Computer programs, Data acquisition, Training devices.
Identifiers: Occupational surveys, Air Force Specialty Codes, Defensive Systems Trainer Specialty.

This report summarizes the results of the administration of the Electronic Principles Inventory to airmen assigned as Defensive Systems Trainer Specialists (AFSC 34152). The data for this report were collected during the period April through June 1977. This report describes: (1) development and administration of the survey instrument; and (2) electronic principles used by DAFSC 5-skill level personnel both CONUS and overseas and assigned to selected major commands. (Author)

AD-A044 122/0CP MF **A01**
Air Force Occupational Measurement Center Lackland AFB Tex
Analog Navigation/Tactics Training Devices Specialist, AFSC 34155
Occupational survey rept. Apr-Jun 77.
22 Aug 77, 52p Rept no. AFPT-90-341-222
Availability: Microfiche copies only.

Descriptors: *Electronic technicians, *Skills, *Job analysis, Training devices, Navigation, Analog simulation, Tactical warfare, Electronic equipment, Electronics, Inventory, Air Force personnel, Enlisted personnel, Careers, Jobs, Surveys, Questionnaires, Computer programs, Data acquisition.
Identifiers: Occupational surveys, Air Force Specialty Codes, Analog Navigation/Tactics Training Devices Specialty.

This report summarizes the results of the administration of the Electronic Principles Inventory to airment assigned as Analog Navigation/Tactics Training Devices Specialists (AFSC 34155). The data for this report were collected during the period April through Jun 1977. This report describes: (1) development and administration of the survey instrument; and (2) electronic principles used by DAFSC 5-skill level personnel both CONUS and overseas and assigned to selected major commands. (Author)

AD-A044 125/3CP PC **A04**/MF **A01**
Air Force Occupational Measurement Center Lackland AFB Tex
Analog Flight Simulator Specialist, AFSC 34153
Occupational survey rept. Apr-Jun 77.
22 Aug 77, 52p Rept no. AFPT-90-341-222

Descriptors: *Electronic technicians, *Skills, *Job analysis, Flight simulators, Analog systems, Electronics, Inventory, Air Force personnel, Enlisted personnel, Careers, Jobs, Surveys, Questionnaires, Computer programs, Data acquisition, Electronic equipment.
Identifiers: Occupational surveys, Air Force Specialty Codes, Analog Flight Simulator Specialty.

This report summarizes the results of the administration of the Electronic Principles Inventory to airmen assigned as Analog Flight Simulator Specialists (AFSC 34153). The data for this report were collected during the period April through June 1977. This report describes: (1) development and administration of the survey instrument; and (2) electronic principles used by DAFSC 5-skill level personnel both CONUS and overseas and assigned to selected major commands. (Author)

AD-A044 189/9CP MF **A01**
Air Force Inst of Tech Wright-Patterson AFB Ohio School of Systems and Logistics
An Analysis of the Exponential Function as the Underlying Distribution for Describing Failures in Inertial Measurement Units
Master's thesis
Lowell R. Crowe, and Levi D. Lowman, Jr. Jun 77, 186p Rept no. AFIT-LSSR-22-77A
Availability: Microfiche copies only.

Descriptors: *Inertial measurement units, Reliability(Electronics), Failure(Electronics), Distribution functions, Attack aircraft, Jet bombers, Transport aircraft, Theses.
Identifiers: A-7D aircraft, A-7E aircraft, AC-130H aircraft, C-5A aircraft, B-52G aircraft, B-52H aircraft, Exponential density functions, SIMFIT computer program.

This study examined the assumption that the underlying failure distribution for inertial measurement units is exponential. Failure data from three inertial measurement units, the KT-73 unit from the A-7D/E and AC-130H, the FLIP unit from the C-5A, and the LN-15 unit from the B-52G/H, were analyzed by use of the SIMFIT computer program. This program is a curve fitting technique employed for fitting a sample of data to twelve theoretical distributions. The research hypothesis was to show that the 'exponential assumption' of failures for the above units was inappropriate by finding a failure distribution which would better model the failure data. The results indicated that the gamma was, in fact, the best model of the distributions tested and several other models, such as the Weibull and lognormal, were generally found to be better than the exponential model. Other areas of reliability discussed include renewal, data aggregation, and infant mortality. (Author)

AD-A044 394/5CP PC **A03**/MF **A01**
Naval Surface Weapons Center White Oak Lab Silver Spring Md
Computer Aided Wire Wrapping of Integrated Circuit Boards
Final rept.
Donald L. Bartusek. May 76, 26p Rept no. NSWC/WOL/TR-76-37

Descriptors: *Computer applications, *Wire winding machines, *Integrated circuits, *Circuit boards, Computer programs, Algorithms, Punched cards, Logic circuits, Wiring diagrams.
Identifiers: Wire wrapping.

This report is written as a user's manual for the computer algorithm that automatically produces a deck of cards to submit to an automatic wire wrapping facility. A simplified user language is used for data input which is written in dip coordinates taken directly from the logic drawings. (Author

AD-A044 758/1CP PC **A03**/MF **A01**
Syracuse Univ NY Dept of Electrical and Computer Science
A Minimum Boundary Condition Error Algorithm for Thin Wire Radiation and Scattering Problems
Phase rept. 1 Jul 75-31 Dec 76
D. J. Buchanan. Aug 77, 50p RADC-TR-77-278
Contract F30602-75-C-0121

Descriptors: *Wire, *Electromagnetic radiation, *Electromagnetic scattering, Algorithms, Boundary value problems, Error analysis, Numerical methods and procedures, Mathematical analysis, Convergence, Point theorem, Computer programs, Electric current, Distribution.
Identifiers: Method of moments.

This report contains results of numerical tests on a method of moments algorithm for the solution of thin wire radiation and scattering problems. The algorithm has convergence behavior similar to a highly overdetermined field point matching scheme. It has been assumed, therefore, that information about the range of applicability of overdetermined wire formulations can be inferred from the results of these tests. Unfortunately, in the tests performed so far, the algorithm has proven to be generally inferior to the other formulations tested. The report is divided into three sections. The algorithm, called MBCRE (for Minimum Boundary Condition Residual Error) is described in Section I. Section II explains the test result tables and also the connection between the MBCRE algorithm and overdetermined point matching schemes. Section III is a listing of the computer program used for the tests. (Author)

AD-A044 818/3CP PC **A05**/MF **A01**
Hughes Aircraft Co Culver City Calif Antenna Dept
Dynamic Impedance Matching In Conformal Arrays
Final rept. Jan 73-Jan 74
Peter C. Bargeliotes, Wolfgang H. Kummer, and Alfred T. Villeneuve. Jan 74, 90p Rept nos. 2265.30/184, HAC-Ref-C7488
Contract N00019-73-C-0127

Descriptors: *Conformal structures, *Antenna arrays, *Impedance matching, Electromagnetic fields, Conical bodies, Slot antennas, Legendre functions, Bessel functions, Antenna radiation patterns, Computer programs, Coordinates.
Identifiers: Conformal arrays.

Several topics relating to conformal arrays have received detailed attention in the last few years. These topics include pattern synthesis, types of appropriate radiating elements, and their impedance and mutual coupling characteristics, and wide angle scanning of linear arrays located on planar and conical surfaces. In the present report, the computation of an exact element pattern is described. The report begins with the general expressions for two potential functions representing the modal fields of arbitrary apertures on a conducting cone. Expressions for the electric field components are then derived from the potential functions for circumferential and radial slots with particular slot excitations. The field expressions are the basis for a computer program which computes radiation patterns from both circumferential and radial slots. The appropriate approximations for the Legendre functions and the spherical Bessel functions used for their computations are summarized in this report. The computer program is a modification and extension of one described by Pridmore-Brown and has been executed on the IBM 370 computer system, now operational at the Hughes Aircraft Company. The program computes the special functions in DOUBLE PRECISION, thus giving the required accuracy of the computations.

AD-A044 851/4CP PC **A17**/MF **A01**
Florida Univ Gainesville Electron Device Research Center
Computer Aided Engineering of Semi-Conductor Integrated Circuits
Final rept. 1 Jan 76-31 Aug 77
David P. Kennedy. 31 Aug 77, 384p ECOM-75-1344-F
Contract DAAB07-75-C-1344, ARPA Order-2985

Descriptors: *Computer aided design, *Integrated circuits, *Solid state electronics, Semiconductor devices, Model theory, Computer programs, Cost effectiveness, Mathematical models, Metal oxide semiconductors, Field effect transistors.

The objectives of this program are to remove the empiricism associated with the design and manufacturing of custom integrated circuits for military applications and to reduce the cost of these circuits by devising improved computer-aided engineering techniques. Efforts of research covered by this report are Part I, Semiconductor Device Modeling conducted by the University of Florida and, Part II, Integrated Circuit Process Modeling conducted by Stanford University. Part I of the report deals with: (a) A One-Dimensional Mathematical Model of MOSFET Operation; (b) The Inversion Layer Carrier Mobility in an MOSFET; (c) An Integral Equation-Relaxation Procedure for the Determination of Equilibrium Potentials in Semiconductor Devices; (d) A Test Pattern Model using Monte Carlo Methods of Analysis; (e) Equivalent Circuit Studies; and (f) A Two-Dimensional Model for MOSFET Operation. Part II deals with: (a) Effects of Implantation Damage on Impurity Profiles in Annealed Si and Calculation of Range Profiles and Recoil Implantation in Multi-Layered Media; (b) Thermal Oxidation (a joint effort by Stanford University Integrated Circuits Laboratory, and Fairchild Camera and Instrument Corp. Research and Development Laboratory); (c) Silicon Epitaxy; and (d) A Mathematical Model of Impurity Diffusion (conducted by Louisiana State University). (Author)

AD-A045 460/3CP PC **A06**/MF **A01**
Air Force Inst of Tech Wright-Patterson AFB Ohio School of Engineering
Parameter Independent Design Utilizing Scattering Parameters
Master's thesis
William F. Duke. Jun 77, 109p Rept no. AFIT-GE/EE/77-5

Descriptors: *Transistor amplifiers, *Microwave networks, Scattering, Parameters, Theses, Computer aided design, Optimization, Computer programs, Finite difference theory.
Identifiers: Parameter independence design.

A parameter independence factor for two-part networks is defined and a method for its calculation using finite differences is shown. An approach to two-part scattering-parameter circuit design using computer optimization techniques is developed and illustrations are presented to demonstrate the utilization of a digital computer for implementing this approach. The versatility of the approach is clarified by demonstrating how both standard network design criteria and parameter independent network design requirements are specified and met. This design technique has direct Air Force application in the areas of microwave network design and Electronic Warfare with particular emphasis on the independence of the network parameters with respect to device parameters. (Author)

AD-A045 653/3CP PC **A07**/MF **A01**
Stanford Univ Calif Digital Systems Lab
SPRINT - An Interactive System for Printed Circuit Board Design User's Guide
Technical rept.
W. M. vanCleemput, T. C. Bennett, J. A. Hupp, and K. R. Stevens. Jun 77, 133p Rept no. DSL-TR-143
Contract N00014-75-C-0601, E4-76-C-03-0515

Descriptors: *Printed circuit boards, *Computer aided design, Computer applications, Compilers, Programming languages, Automation, User needs, Handbooks.
Identifiers: SPRINT computer program, Structural design languages, SPITBOL programming language, SNOBOL programming language.

The SPRINT system for the design of printed circuit boards is a collection of programs that allows designers to interactively design two-sided boards using a Tektronix 4013 graphics terminal. The major parts of the system are: a compiler for SDL, the Structural Design Language, and interactive component placement program, an interactive manual conductor routing program, and automatic batch router, a via elimination program and a set of artwork generation programs. (Author)

AD-A046 232/5CP PC **A05**/MF **A01**
Rome Air Development Center Griffiss AFB N Y
Ultra-Flat UHF Delay Line Modules
Technical rept. 1 Jul 73-24 May 77
A. J. Slobodnik, Jr, and J. H. Silva. Jul 77, 85p
Rept no. RADC-TR-77-257

Descriptors: *Acoustic delay lines, *Modules(Electronics), Surface waves, Frequency response, Ultrahigh frequency, Feedback, Linear systems, Computer programs, Ripples, Time domain, Lithium compounds, Niobates.
Identifiers: *Surface acoustic wave delay lines, SAW devices.

Delay modules consisting of surface acoustic wave (SAW) delay lines, equalizers, and amplifiers have been implemented. Ultra-flat (0 or -0.1 dB passband frequency response over a 215 MHz bandwidth centered at 800 MHz has been demonstrated for 7.5 microsec of time delay. Module gain of up to 10 dB was achieved. Cascading three modules and using a feedback loop to simulate additional cascade elements demonstrated 500 microsec of time delay over 200 MHz bandwidth in a linear system. (Author)

AD-A046 480/0CP MF **A01**
Harry Diamond Labs Adelphi Md
Implementation of the Device Data Bank on the HDL IBM Computer
Technical rept.
Thomas V. Noon. Oct 77, 89p Rept no. HDL-TR-1819
See also Rept. no. HDL-TR-1746, AD-C005 293L, Rept. no. HDL-TM-75-6, AD-A016 776 and Rept. no. HDL-TR-1821.
Availability: Microfiche copies only.

Descriptors: *Semiconductor devices, *Data banks, *Computer applications, Damage, Army research, Computer programs, Libraries, Transistors, Semiconductor diodes, Electromagnetic pulses, Radiation hardening, Transient radiation effects.
Identifiers: DAMTRAC computer program, IBM-370/168 computers, NET2 computer program.

The Device Data Bank, as used by the DAMTRAC and, in the near future, the NET2 circuit-analysis programs on the Harry Diamond Laboratories' IBM 370/168 computer, is presented. The new file structure of the device libraries, access method for use of the device parameters by DAMTRAC and other computer programs, and a management program to manage and maintain the device data bank are presented in detail. The job control lanuage (JCL) for executing the IBM version of DAMTRAC on the HDL computer is also presented. (Author)

AD-A046 662/3CP PC **A09**/MF **A01**
Kentucky Univ Lexington Dept of Electrical Engineering
Applications of Multiconductor Transmission Line Theory to the Prediction of Cable Coupling. Volume VII. Digital Computer Programs for the Analysis of Multiconductor Transmission Lines
Phase rept.
Clayton R. Paul. Jul 77, 180 RADC-TR-76-101-VOL-7
Contract F30602-75-C-0118
See also Volume 1, AD-A025 028.

Descriptors: *Transmission lines, *Multiconductor cables, *Coupling(Interaction), *Computer aided design, Computer programs, Electric cables, Electrical insulation, Electric conductors, Shape, Losses.
Identifiers: Flatpack cables, XTALK computer program, XTALK2 computer program, FLATPAK computer program, FLATPAK2 computer program.

Four digital computer programs, XTALK, XTALK2, FLATPAK, FLATPAK2, for determining the electromagnetic coupling within an (n01) conductor, uniform transmission line are presented. Sinusoidal steady state behavior of the line as well as the TEM or 'quasi-TEM' mode of propagation are assumed. XTALK and XTALK2 consider lines consisting of n wires (cylindrical conductors) and a reference conductor. The surrounding medium is homogeneous and lossless. XTALK assumes that all (n01) conductors are perfect conductors whereas XTALK2 considers the conductors to be lossy. There are three choices for the reference conductor: a wire, a ground plane, an overall cylindrical shield. FLATPAK and FLATPAK2 consider (n01) wire ribbon (flatpack) cables in which all wires are identical and are coated with cylindrical, dielectric insulations of identical thicknesses. All wires lie in a horizontal plane and all adjacent wires are separated by identical distances. FLATPAK considers the wires to be perfect conductors and FLATPAK2 considers the wires to be lossy. The dielectric insulations are considered to be lossless. General termination networks are provided for at the ends of the line and the programs compute the voltages (with respect to the reference conductor) at the terminals of these termination networks for sinusoidal steady state excitation of the line. (Author)

AD-A047 158/1CP PC **A11**/MF **A01**
Comsat Labs Clarksburg Md
Multiple Beam Torus Antenna Study. Volume II
Final rept. Jul 76-Feb 77
William J. English, and Carol Rieger. Mar 77, 238p SBIE-AD-E100-001
Contract DCA100-76-C-0050
Supersedes AD-E100 001. See also Volume 1, AD-A047 157.

Descriptors: *Multiple beam antennas, *Communication satellite terminals, Communication satellites, Antenna apertures, Toroids, Synchronous satellites, Beam steering, Parabolic antennas, Antenna feeds, Wind, Wide angles, Honeycomb cores, Structural mechanics, Sidelobes, Computer programs, Horn antennas, X band.
Identifiers: *Torus antennas, *Satellite communications, Satellite earth terminals, Multifrequency.

Partial contents: Geometrical and Beam Pointing Considerations; Electrical (RF) Performance Characteristics; Mechanical and Structural Characteristics of the Uncorrected Front. Fed MBTA; and Cost Estimates for a Recoverable MBTA.

AD-A047 490/8CP PC **A06**/MF **A01**
Honeywell Inc Minneapolis Minn Aerospace Div
Central Airborne Performance Analyzer
Final rept. Dec 66-Sep 68
John E. Barker, William L. Kruse, and Gilbert J. Mros. Mar 69, 101p Rept no. 20714-FR2
Contract F33657-67-C-0743

Descriptors: *Avionics, *Performance(Engineering), *Central processing units, Monitoring, Inflight, Reliability(Electronics), Failure(Electronics), Malfunctions, Computer Programs, Magnetic recording systems, Teleprinters, Airborne, Side looking radar, Infrared detectors, Aerial cameras, Reconnaissance cameras, Test Equipment, Maintenance management, Systems analysis, Jet fighters, Reconnaissance aircraft.
Identifiers: F-4 aircraft, RF-4C aircraft.

Studies have shown that significant improvements in aircraft effectiveness (availability, mission success, spares, aerospace ground equipment requirements) will result if system monitoring and fault isolation can be done in-flight during actual operation of those avionics systems which have the lowest reliabilities. The Central Airborne Performance Analyzer (CAPA) was used in this program to demonstrate the feasibility of in-flight fault isolation. The CAPA was installed in an RF4C aircraft and interfaced with the electronics systems of the side-looking radar, infrared detecting set, and KS72 camera without altering the circuitry of these systems. Data gathering missions were flown to acquire information about the signals being monitored. The CAPA was then programmed to continuously monitor the aircraft systems, detect any malfunction, isolate the malfunction to a line replaceable unit (LRU), and print the location of the malfunction along with the time of occurrence. In short, the CAPA produces an easily understood maintenance message which is available to the flight line crew immediately upon aircraft landing, without the use of flight line aerospace ground equipment or any ground data processing. Data developed diring the test program proved the technical feasibility and showed that the application of CAPA to RF4C reconnaissance systems would increase the aircraft's effectiveness by 30 percent through increased aircraft availability and a greater number of successful missions. (Author)

AD-A047 548/3CP PC **A03**/MF **A01**
Army Communications-Electronics Engineering Installation Agency Fort Huachuca Ariz Propagation Engineering Div
Electrically-Short Center-Fed Horizontal Dipole Antennas for High-Frequency Communications
Technical rept. 1 Apr-30 Nov 77
Harold F. Tolles. 3 Oct 77, 43p Rept no. CCC-EMEO-PED-77-8

Descriptors: *Dipole antennas, *Antenna feeds, *Whip antennas, Horizontal orientation, Tactical communications, High frequency, Long wavelengths, Radio equipment, Ground(Electrical), Monopole antennas, Inductors, Efficiency, Computer programs, Digital computers.
Identifiers: CDC-6500 computers.

Horizontal dipole antennas less than one-half wavelength long and vertical monopole antennas less than one-quarter wavelength high can be resonated with arm series loading inductors to increase their radiation efficiency. Available programs were used to obtain the optimum location and value of the inductors, and the limitations on the use of these programs are discussed. (Author)

AD-A047 925/3CP PC **A09**/MF **A01**
Jet Propulsion Lab Pasadena Calif
Computer Program for Design and Performance Analysis of Navigation-Aid Power Systems. Program Documentation, Volume I. Software Requirements Document
Final rept.
G. Goltz, L. M. Kaiser, and H. Weiner. Jul 77, 182p JPL-5040-27, CGR/DC-18/76
See also Volume 2, AD-A047 356.

Descriptors: *Computer program documentation, *Power supplies, *Computer aided design, Solar cells, Electric batteries, Feasibility studies, Life expectancy, Cost effectiveness, Flow charting, Algorithms, Test and evaluation.
Identifiers: DSPA computer program.

A computer program has been developed for designing and analyzing the performance of solar array/battery power systems for the U.S. Coast Guard Navigational Aids. This program is called the Design Synthesis/Performance Analysis (DSPA) Computer Program. The basic function of the Design Synthesis portion of the DSPA program is to evaluate functional and economic criteria to provide specifications for viable solar array/battery power systems. The basic function of the Performance Analysis portion of the DSPA program is to simulate the operation of solar array/battery power systems under specific loads and environmental conditions. This document establishes the software requirements for the DSPA computer program, discusses the processing that occurs within the program, and defines the necessary interfaces for operation.

AD-A047 949/3CP PC **A03**/MF **A01**
Westinghouse Defense and Electronic Systems Center Baltimore Md
F-4E Avionics Update
Final rept. 15 Jun-30 Sep 76
A. F. Wenk. Aug 77, 48p AFAL-TR-77-91
Contract F33615-76-C-1340
See also Rept. no. AFAL-TR-76-190, AD-A042 255.

Descriptors: *Jet fighters, *Aircraft fire control systems, *Avionics, Computerized simulation, Digital computers, Head up displays, Computer programs, Display systems, Symbols, Aerial gunnery, Transformers, Distance measuring equipment, Tracer ammunition.
Identifiers: *F-4E aircraft, *F-4 aircraft.

This report covers the final phase of the previous F-4E Austere HUD Program AFAL-TR-76-190, dated December 1976. This report covers live aerial gun firing performance support that Westinghouse provided for the gunsight mechanization previously incorporated in test aircraft No. 304 at AFFTC. The report also covers SEAFAC support work and transformers delivered to SEAFAC. (Author)

AD-A047 999/8CP PC **A07**/MF **A01**
Air Force Avionics Lab Wright-Patterson AFB Ohio
Rooftop Antenna Pointing Program
Final rept. Mar 74-Oct 77
Paul F. Humel. Nov 77, 143p Rept no. AFAL-TR-77-228

Descriptors: *Communication satellites, *Parabolic antennas, *Satellite tracking systems, Computer programs, Installation, Roofs, Aiming, Data processing, Ultrahigh frequency, K band, Ephemerides.
Identifiers: LES-8 satellite, LES-9 satellite, C-135 aircraft.

This document provides a description of the in-house work performed in the Air Force Avionics Laboratory's Communication Systems Evaluation Laboratory (CSEL) to successfully point a ten-foot dish antenna at any earth orbiting satellite for which ephermeris data is available. Both the hardware and software aspects of the program are covered. (Author)

AD-A048 057/4CP PC **A04/MF A01**
Civil Engineering Lab (Navy) Port Hueneme Calif
Computer Technique for Calculations of Potential Distribution in Multidielectric Media
Technical note, Jul 74-Sep 76
Kwang Ta Huang, Brian R. Milner, and Andrew W. McClaine. Sep 77, 73p Rept no. CEL-TN-1502

Descriptors: *Dielectrics, *Electrical insulation, *Electric fields, Potential theory, Distribution, Computer programs, Poisson equation, Equations, Finite difference theory.
Identifiers: Multidielectric media, Laplace equation.

A finite-difference method computer program for calculating the potential distribution for axisymmetric insulator configurations was developed. The program allows the use of unequal grid spacings and multiple dielectric constants. In addition, methods were developed to determine the potentials of conductors whose potentials are unknown, satisfy unknown grid boundary conditions, calculate electric flux line distributions, and plot the field lines by computer. The program has the flexibility to solve similar types of problems that involve the solution of Laplace's or Poisson's equations. Problems that consist of two-dimensional geometries can be treated by using a variation of the axisymmetric program. (Author)

AD-A048 654/8CP PC **A02/MF A01**
Ohio State Univ Columbus Electroscience Lab
Pattern Prediction of Wire Antennas on Satellite Structures
Final rept. 1 Oct 76-1 Jan 78
G. A. Thiele. Jan 78, 10p Rept no. ESL-784575-1
Contract N00173-76-C-0395

Descriptors: *Satellite antennas, Artificial satellites, Method of moments, Computer programs, Geometry, Diffraction.
Identifiers: Wire antennas, Geometrical theory of diffraction.

A technique which combines the Method of Moments and the Geometrical Theory of Diffraction into a single Hybrid Technique is incorporated into a computer program for determining the performance of wire-type antennas on a planar satellite panel which is joined to other planar panels on each of its sides. The computer program, which is still undergoing revisions, is capable of handling up to five antennas on a single satellite metallic panel. (Author)

AD-A049 549/9CP PC **A02/MF A01**
Army Communications-Electronics Engineering Installation Agency Fort Huachuca Ariz Propagation Engineering Div
Antenna Selection for Ionospheric Telecommunication Systems
Final technical memo.
George Lane. Jan 77, 8p Rept no. EMEO-PED-TM-77-1

Descriptors: *Antennas, *Ionospheric propagation, *Telecommunication, *Radio links, Nomographs, High frequency, Angle of arrival, Area coverage, Gain, Coupling(Interaction), Radiofrequency interference, Computer programs, Digital computers, Frequency response, Maintainability, Costs.
Identifiers: CDC-6500 computers.

This memorandum presents the general principles used in the design analysis of ionospheric telecommunication systems. In particular the requirements imposed by the propagating media are discussed. A technique for data presentation of predicted circuit performance is given in addition to several nomographs which are useful to the antenna selection process. (Author)

AD-A049 571/3CP PC **A03/MF A01**
Royal Signals and Radar Establishment Christchurch (England)
Wiregrid Program for Antenna Modelling Including Sinusoidal Interpolation of Current
T. Benjamin. May 77, 47 RSRE-77014, DRIC-BR-58801

Descriptors: *Antennas, *Antenna radiation patterns, *Computerized simulation, *Mathematical models, Far field, Monopole antennas, Dipole antennas, Electrical impedance, Matrices(Mathematics), Interpolation, Sine waves, Electric current, Matching, Computer program verification, Flow charting, Computer programming, Great Britain.

This report describes a method for computer modelling of aerial systems, especially aerials mounted on vehicles. It is based on the wiregrid modelling technique and uses a variation known as sinusoidal interpolation to represent the current in the wires of the model. Results are included for some preliminary test runs of the program, comparing them with standard results and the output of other modelling programs. (Author)

AD-A049 740/4CP PC **A04/MF A01**
Syracuse Univ N Y
Experimental Validation of the Antenna Pattern Distortion Computer Program (VHF Antenna)
Phase rept.
Jose Perini, and Hubert Moses. Dec 77, 58p
RADC-TR-77-374
Contract F30602-75-C-0121
See also Rept. no. RADC-TR-77-35, AD-A038 142.

Descriptors: *Antenna radiation patterns, *Dipole antennas, *Antenna arrays, Computer programs, Electromagnetic compatibility, Very high frequency, Electromagnetic fields, Standing wave ratios, Distortion, Voltage, Coupling(Interaction), Mathematical models, Communication equipment, Ground(Electrical), Electromagnetic radiation, Diameters, Scale models, Antenna masts, Method of moments.
Identifiers: Mutual coupling, Ground plane.

The Antenna Pattern distortionn Computer Program was written at the request of AFCS to evaluate the distortion on the radiation pattern of communication antennas when mounted in close proximity to each other, such as in the communication towers of many AF installations. Although the numerical method used in this computer program (Method of Moments) has been shown to be very accurate in many applications, it was felt desirable to verify it with an experimental validation study. This was done at the RADC anechoic chamber. The first phase of the validation was for the VHF antenna AN1181. In view of the fact that the actual frequency range of this antenna (100-156 MHz) is below that of the RADC anechoic chamber, it was necessary to build a scale model of the antenna. This report presents a description of the measurement procedure, the results and a comparison with the corresponding Antenna Pattern Distortion Computer Program runs.

AD-A050 015/7CP PC **A03/MF A01**
Naval Postgraduate School Monterey Calif
'ASAP' Antennas-Scatterers Analysis Program: A User-Oriented Thin Wire Antenna Computer Code (Revised)
Richard W. Adler. Aug 77, 41p Rept no. NPS-62AB770801

Descriptors: *Antennas, *Computer programs, Wire, Ground(Electrical).
Identifiers: Thin wire antennas.

Previous thin-wire antenna programs have either been very specialized or all-encompassing. A beginning or occasional user does not need expertise in programming to gain insight into wire antenna structures, using this general purpose user-oriented code. The revisions contained herein correct deficiencies of handling the image problem in the original code and improve the accuracy of calculations of structures over finite ground. (Author)

AD-A050 265/8CP PC **A99/MF A01**
Polytechnic Inst of New York Brooklyn Microwave Research Inst
Progress Report No. 42, 15 September 1976 - 14 September 1977, to the Joint Services Technical Advisory Committee
Scientific interim rept.
Arthur A. Oliner. Nov 77, 610p Rept no. POLY-MRI-452.42-77
Contract F44620-74-C-0056

Descriptors: *Microwaves, *Microwave equipment, *Scientific research, Reports, Microwave antennas, Couplers, Gratings(Spectra), Dielectric waveguides, Radiation patterns, Correlators, Quantum electronics, Plasma waves, Interactions, Optical equipment, Oscillators, Parametric devices, Electric power production, Microwave communications, Communications networks, Control systems, Automata, Computer program reliability, Debugging(Computers), Kalman filtering, Image processing.

This report summarizes research accomplished under the aegis of the Microwave Research Institute and covers a broad spectrum ranging from basic theoretical physics, mathematics, and engineering, to experimental investigations involving basic measurements, development of devices, and materials. The report is organized into two major divisions. The first, Electrophysics, includes the topics of: Electromagnetics; Acoustics; Optics; Quantum Electronics; Solid State and Materials; Wave-Matter Interactions; and Electric Power Engineering. The second, Systems, includes the topics of: Communications; Computer and Computer-Communications Networks; Safety, Reliability and Software Engineering; Systems, Control and Networks; and Data Processing.

AD-A050 753/3CP PC **A03/MF A01**
Syracuse Univ N Y
Design of Skewed Isophasors of Electromagnetic Emitters
Phase rept. Mar-Sep 77
Tapan Kumar Sarkar. Dec 77, 49p RADC-TR-77-423
Contract F30602-75-C-0121
Prepared in cooperation with Rochester Inst. of Tech., NY. Dept. of Electrical Engineering.

Descriptors: *Phased arrays, *Antenna arrays, Emitters, Skewness, Optimization, Excitation, Frequency, Time signals, Computer programs, Far field, Subroutines, Algorithms.
Identifiers: Isophasor lines, Displaced phase center antennas.

The magnitude of the slope of skewed isophasor lines from electromagnetic emitters is shown to be directly related to the physical distance between the geometric center of the spatially distributed electromagnetic emitters and the projected phase cebter obtained by extrapolation of the skewed isophasor lines. It is shown that the slope of the iosphasor lines not only depends on the excitations of the electromagnetic emitters but also on the inter-emitter spacing. Finally, an optimization method is utilized to obtain the excitations for a set of spatially distributed electromagnetic emitters for a specified slope of the iosphasor lines, a fixed number of electromagnetic emitters and for a given minimum inter-emitter spacing. (Author)

AD-A050 845/7CP PC **A06**/MF **A01**
Harry Diamond Labs Adelphi Md
Extending and Interfacing the MSEP Semiconductor Damage Data Bank for Analysis and Retrieval by DAMTRAC
Technical rept.
Charles P. Ruzic. Dec 77, 105p Rept no. HDL-TR-1821

Descriptors: *Tactical data systems, *Semiconductor devices, *Computer programs, Nuclear weapons, Electromagnetic pulses, Hardening, Damage assessment, Communication equipment, Systems engineering, Field army, Tactical warfare, Vulnerability, High altitude, Diodes, Data bases.
Identifiers: DAMTRAC computer code.

Presented are four groups of programs to update, maintain, and list the diode and transistor data bases for use with circuit analysis codes. The data bases are specifically designed to work with the DAMTRAC code, but can work with other circuit analysis codes, too. Included in the data bases are the standard TRAC parameters, references to the sources of these parameters, and damage parameters with individual source references. (Author)

AD-A051 018/0CP PC **A02**/MF **A01**
Michigan Univ Ann Arbor Electron Physics Lab
Impatt Device Simulation and Properties
Paul Bauhahn, and George I. Haddad. 14 Jul 76, 10p AFOSR-TR-78-0325
Grant AFOSR-76-2939
Availability: Pub. in IEEE Transactions on Electron Devices, vED-24 n6 p634-642.

Descriptors: *Impatt diodes, Performance(Engineering), Computer programs, Doping, Silicon compounds, Gallium arsenides, Indium phosphides, Computations, Reprints.
Identifiers: Computerized simulation.

The purpose of this paper is to shed further light on the operating characteristics and limitations of IMPATT diodes, particularly those with Read or modified Read structures. This has been achieved by developing efficient and economical computer programs which incorporate all of the important material parameters and doping profiles in an exact manner. These computer programs are then employed to study the properties of high-efficiency Si and GaAs structures. Some very interesting properties of these devices and the effects of material parameters and doping profiles on their performance are presented and discussed. This leads to a better understanding of these devices and their limitations. Preliminary calculations have also been carried out on an InP IMPATT diode and the results are presented. (Author)

AD-A051 067/7CP PC **A09**/MF **A01**
Illinois Univ At Urbana-Champaign Electromagnetics Lab
Mutal Admittance between Slots on a Cylinder or Cone
Final rept. 16 Nov 76-15 Nov 77
S. W. Lee, and R. Mittra. Dec 77, 184p Rept nos. UIEM-77-24, UILU-ENG-77-2267
Contract N00019-77-C-0127

Descriptors: *Admittance, *Electric conductors, Slots, Cylindrical bodies, Diffraction analysis, Slot antennas, Antenna radiation patterns, Conical bodies, Green's function, Arrays, Conformal structures, Computer programs.

The present contract studied the mutual admittance between two thin slots on a conducting cylinder or a cone by ray techniques. Our main contribution in the development of an approximate asymptotic Green's function for the surface function, expressed in terms of Fock functions, is simple to evaluate, and gives excellent numberical results when compared with known exact solutions and/or experimental data. This report contains a brief administrative summary plus three attachments which give the technical details.

AD-A052 433/0CP PC **A02**/MF **A01**
Harry Diamond Labs Adelphi Md
Semiconductor Device Damage Assessment for the INCA Program--A Probabilistic Approach
Technical rept.
Robert L. Williams. Mar 78, 16p Rept no. HDL-TR-1833
Contract MIPR-77-623

Descriptors: *Damage assessment, *Semiconductor devices, Electromagnetic pulses, Vulnerability, Thermal analysis, Response, Standard deviation, Probability density functions, Equilibrium(General), Convolution integrals, Computer programs.
Identifiers: Transients, Surges.

Two methods are described for estimating the probability that a given semiconductor device will be damaged by an electrical transient. Both methods are based on existing device damage data which were obtained by step-stressing devices to failure, using rectangular pulses. Both methods require calculation of the time-dependent power waveform in the device, due to application of the transient. One method employs only the largest peak of this power waveform, while the other includes the entire waveform in a convolution integral. Modifications to the DAMTRAC circuit-analysis program are presented. (Author)

AD-A052 613/7CP PC **A06**/MF **A01**
Arizona Univ Tucson Dept of Electrical Engineering
Simulation of Digital Circuits
Master's thesis
Dennis Milton Moen. 1976, 115p

Descriptors: *Logic circuits, *Computer aided design, Digital systems, Problem solving, Simulation, Machine coding, Gray scale, Counters, Nand gates, Flip flop circuits, Computer programs, Flow charting, Theses.
Identifiers: *Computerized simulation.

Simulation is a problem solving procedure for defining and analyzing a model of a system. Computer-aided design of digital logic has provided the design engineer with an aid to reduce the tedious and time consuming task of design verification. This paper describes a simulation technique for the simulation of digital logic circuits. This paper presents a level mode logic simulator that has improved economy in execution time and ease of model generation. The passage of time is simulated in a precise fashion and element models are executed only when activity occurs in the circuit. A behavior model description is accomplished on an element level rather than a gate level. The use of three-valued logic and the use of precise timing delays for both rising and falling signal levels present a very accurate and informative circuit output timing diagram. This is demonstrated by simulation of an even-odd detection circuit and an up-down gray code counter. (Author)

AD-A053 315/8CP PC **A06**/MF **A01**
Moore School of Electrical Engineering Philadelphia Pa Dept of Computer and Information Sciences
NOPAL Processor: Intra-Test Sequencing
Final rept. 30 Jun 75-31 Aug 77
Ronald Wayne Berman. Jan 78, 106 ECOM-75-0650-F
Contract DAAA25-75-C-0650

Descriptors: *Test equipment, *Test methods, Automatic, Computer programs, Algorithms, Sequences, Programming languages, Flow charting, Matrices(Mathematics).
Identifiers: *Automatic test equipment, *NOPAL processors.

This report describes the algorithms, methods, and programs that represent the intra test sequencing phase of the NOPAL processor. The overall objective of the NOPAL system is to generate a program for computer controlled automatic test equipment for testing an electronic unit under test. The input to the system is a nonprocedural description of the desired test expressed in the NOPAL language. The present report describes how such a specification can be analyzed and how a flowchart can be generated for performing the test. A subsequent phase of NOPAL generates a program based on the flowchart. The report can be read independently of the NOPAL processor. Readers interested only in the automatic sequencing of operations in a program can omit Chapters 1 and 2, which describe the NOPAL language and processor. Readers interested in greater detail on the NOPAL processor can obtain further information in the references listed in the bibliography. (Author)

AD-A053 357/0CP PC **A03**/MF **A01**
Naval Research Lab Washington D C
Reflective Butler Matrices
Interim rept.
J. Paul Shelton, and James K. Hsiao. 14 Mar 78, 30p Rept no. NRL-8188

Descriptors: *Antenna arrays, *Antenna feeds, Coupling circuits, Hybrid circuits, Matrices(Circuits), Networks, Input, Symmetry, Output, Computer programs, Circuit analysis.
Identifiers: *Butler array antennas.

A conventional Butler matrix can be modified to achieve a network which is symmetric about an axis midway between the input and output lines. Such a Butler matrix network can be cut in that plane of symmetry so that the input and output ports are identical. In this manner, the half-matrix corresponds to a reflection-type system in which the feed positions are in the aperture region. This report describes the modifications which symmetrize the Butler matrix and the method for cutting the network on the symmetry plane so as to achieve a reflective matrix. A computer program which generates and plots this network is presented. (Author)

AD-A053 560/9CP PC **A09**/MF **A01**
Kentucky Univ Lexington Dept of Electrical Engineering
Applications of Multiconductor Transmission Line Theory to the Prediction of Cable Coupling. Volume VI. A Digital Computer Program for Determining Terminal Currents Induced in a Multiconductor Transmission Line by an Incident Electromagnetic Field
Phase rept.
Clayton R. Paul. Feb 78, 197p RADC-TR-76-101-6-VOL-6
Contract F30602-75-C-0118

Descriptors: *Transmission lines, *Multiconductor cables, *Electromagnetic compatibility, *Coupling(Interaction), Crosstalk, Electromagnetic fields.
Identifiers: Wire to wire coupling.

The report describes a digital computer program which is designed to compute the terminal currents induced in a multiconductor transmission line by an incident electromagnetic field. Sinusoidal steady state behavior of the line is assumed. The transmission line is uniform and consists of n wires and a reference conductor immersed in a homogeneous, lossless, linear, isotropic medium. The n wires and the reference conductor are assumed to be lossless. The reference conductor may be a wire, an infinite ground plane or an overall, cylindrical shield. The incident electromagnetic

field may be a uniform plane wave or a general nonuniform field. The primary restriction on the program validity is that the cross sectional dimensions of the line, e.g., wire separation, must be much less than a wavelength. (Author)

AD-A053 600/3CP PC **A05**/MF **A01**
Office of Telecommunications Boulder Colo
Operational and Cost Considerations in the Use of Optical Waveguides in a Local Information Transfer System
Final rept.
R. L. Gallawa, and W. J. Hartman. Nov 77, 81p
Rept no. OT-77-133

Descriptors: *Optical communications, *Optical waveguides, *Information transfer, Information exchange, Coaxial cables, Fiber optics transmission lines, Glass fibers, Economic analysis, Cost models, Optical filters, Communication terminals, Computer programs, Mathematical models.
Identifiers: Information transfer systems.

Attention is given to the potential use of optical waveguides in an information exchange system consisting of many terminals distributed uniformly over a circle of radius R. Cost comparison is given between coaxial cable and glass fiber systems, based on a model described in Section 2. The results show that the wide bandwidth capability of fibers leads to definite cost advantages as data rates increase. The model concentrates on the star and the loop distribution systems. The report also discusses various ways of coupling energy into and out of the fibers.

AD-A053 684/7CP PC **A07**/MF **A01**
Pattern Analysis and Recognition Corp Rome N Y
Interactive Digital Receiver Simulator (IDRS) System User's Manual and Software Documentation
Robert E. bozek, Joseph C. Breda, Om P. Gupta, Roland H. Holman, and Raymond J. Staron. Mar 78, 148p PAR-76-30, RADC-TR-78-44
Contract F30602-76-C-0126

Descriptors: *Signal processing, *Receivers, *Computer programs, *Simulators, Digital systems, Spectrum analysis, Histograms.
Identifiers: IDRS computer program.

This report describes the design and implementation of the Interactive Digital Receiver Simulator (IDRS). The IDRS is a computer program that is capable of processing predetected signals that have been converted to digital format and recorded. It allows a user to computer interactively produce (1) desired hardcopy patterns of signals for a detailed analysis of modulation characteristics and (2) processed signal segments for processing by pattern analysis/recognition programs for feature extraction. In essence, the IDRS program provides the user with the capability of interactively creating a digital receiver to his specifications. (Author)

AD-A054 415/5CP PC **A05**/MF **A01**
Westinghouse Defense and Electronic Systems Center Baltimore Md
Analysis of the Performance of Image Glide Slope Antenna in the Presence of Truncated Ground
Interim rept.
G. J. Moussally, R. A. Moore, J. T. Godfrey, and H. F. Hartley. Mar 78, 77p FAA-RD-78-43
Contract DOT-FA74WA-3353

Descriptors: *Antennas, *Instrument landings, *Glide path systems, Images, Glide slope, Electrical grounding, Computer programs, Terrain.
Identifiers: Ground planes.

An analysis has been performed to permit the calculation of fields of dipoles at any orientation over lateral or transverse conducting half-planes and over multiple contiguous strips of arbitrary tilt angle. Computer programs were developed to calculate DDM over terrain types from half-planes and strips. Glide path DDM calculations over typical terrain types for the three image type glide slope systems have been computed. (Author)

AD-A054 694/5CP PC **A08**/MF **A01**
Arinc Research Corp Santa Ana Calif Western Div
Programmer's Manual for SNAP II Computer Program
T. D. Price, and Carolyn Kimme. Aug 68, 175p
Rept no. 474-01-2-916

Descriptors: *Circuit analysis, *Computer programs, Equivalent circuits, Subroutines, Frequency, Programming manuals.
Identifiers: SNAP 2 computer program.

SNAP II performs 5 main functions in solving a circuit. This manual provides a detailed technical description of the SNAP II computer program. The manual is designed such that a qualified programmer cannot only gain a full working knowledge of the programming logic, but also alter or add to it by following specific guidelines. Included in the manual are: a description of the main program, subprograms, interrelations between programs, and each of the variables (code words) used in the programs; a cross-reference indicating the program in which each variable is used; and flow charts depicting each logical sequence in the overall program. See also the user's manual, AD-A054 696.

AD-A054 696/0CP PC **A05**/MF **A01**
Arinc Research Corp Santa Ana Calif Western Div
User's Manual for SNAP II Computer Program
T. D. Price, and C. M. Kimme. Aug 68, 76p Rept no. 474-01-1-909

Descriptors: *Circuit analysis, *Computer programs, Equivalent circuits, Subroutines, Frequency, User needs, Instruction manuals.
Identifiers: SNAP 2 computer program, Users manual.

SNAP II is a computer program incorporating a wide variety of computational subroutines that can be easily used by a nonprogrammer for dc and ac analyses of linear and nonlinear circuits of up to 50 nodes and 200 circuit elements, with any computer of at least 32,000-word storage capacity. The program is designed, primarily for solving circuit problems in the frequency domain. It is characterized by: ease of computer programming, widely applicable forms of output, applicability to various types of computers, and the user's ability to exercise all program options with no programming experience. Detailed steps for preparing an equivalent circuit and instructions for preparing each of the cards describing the circuit are presented in the following sections. Also included are examples that exercise all of the analysis options, suggested analysis techniques, instructions for assembling the complete deck, and programming hints. See also the programmer's manual, AD-A054 694.

AD-B000 051/3CP PC **A05**/MF **A01**
Hughes Research Labs Malibu Calif
Beam Technology for the Fabrication of Microwave Integrated Circuits
Final technical rept., 2 Jan 73-31 Mar 74
Robert Seliger. 31 Mar 74, 84p
Contract N00019-73-C-0261
Distribution limitation now removed.

Descriptors: *Integrated circuits, Fabrication, *Semiconductors, Ion implantation, *Ion beams, focusing, *Field effect transistors, Microwave equipment, Monolithic structures(Electronics), Wafers, Deflection, Electronic scanners, Computer programs, Digital computers, Transconductance, Gain, Gallium arsenides, Doping, Ions, Helium, Masking, Lenses.
Identifiers: Registration(Ion beams), Einzel lenses, Ion lenses.

This report discusses the progress made during the fourth phase of a multiyear program, January 1973 through March 1974, to demonstrate the feasibility of maskless doping by a focused programmable ion beam. A detailed discussion is given of further development of the experimental tiny ion beam system to include the ability to register ion beam patterns with existing structure on a structure on a surstrate. A registration accuracy of about one beam diameter, or 5 micrometers is reported. The size of the ion beam's scan field was measured and found to be about 0.5 mm x 0.5mm. Various possible applications of the tiny beam to microfabrication are studied. The microwave field effect transistor is chosen as an important example of how a focused ion beam can create a laterally varying doping profile (in the plane of a wafer). It is shown by analysis that by tailoring the channel doping along the width of the channel, the gain range of an FET can be extended from one to four orders of magnitude. The results are presented of the first GaAs FET that was tailored by a focused ion beam under computer control. The electrical characteristics of this tailored device are in good qualitative agreement with those predicted by the analysis.

AD-B000 106/5CP PC **A05**/MF **A01**
General Electric Co., Syracuse, N.Y. Heavy Military Equipment Dept.
Analysis of Phased-Array Radar Transmitter AC/DC Power Supply Systems
Technical information series
C. J. Eichenauer. Aug 74, 93p Rept no. R74EMH18

Descriptors: *Radar transmitters, *Power supplies, *Phased arrays, Power supplies, Alternating current, Direct current, Circuits, Systems analysis, Computer programs, Analog computers, Digital computers, Matrix theory.
Identifiers: *Computer aided design.

Detailed quantitative analyses of phased-array power systems are often required as a result of the radar system's variable pulse templet operating conditions. A matrix format, with system capability factors forming columns and system operating modes forming rows, is presented as a useful type of display for the quantitative results of a power-supply system analysis. Four alternate forms of system analysis are then examined - use of steady-state techniques, use of analog computer techniques, development and use of special-purpose digital computer programs, and use of one of the general-purpose user-oriented circuit analysis programs. Examples of each approach are presented. Advantages and disadvantages of each method of analysis are discussed. It is recommended that general-purpose user-oriented analysis programs be used for the majority of nonrepetitive phased-array transmitter investigations.

AD-B000 216/2CP PC **A04**/MF **A01**
Naval Electronics Lab Center San Diego Calif
Thin-Wire Modeling Techniques Applied to Antenna Analysis
Technical document
J. W. Rockway, and J. C. Logan. 11 Oct 74, 57p
Rept no. NELC-TD-359
Distribution limitation now removed.

Descriptors: *Antennas, Mathematical models, Wire, Electromagnetic radiation, Loop antennas, Computer programs, Coding, High frequency, Hydrofoils, Near field, Whip antennas, Frequency response, Helixes.
Identifiers: AN/PRC-104, DE 1041 Vessel, Miniloop Antennas, Multiturn.

This document is a summary of work performed in applying thin-wire modeling techniques in support of antenna analysis at NELC during FY74. Detailed discussion is limited to aspects which show how numerical modeling has contributed to an engineering solution. References cited throughout the document provide a source for more complete coverage of a given subject. The first part is intended as an introduction for the uninitiated reader but may prove informative also to those using the same computer codes. The second part describes how thin-wire modeling has been applied to several engineering problems. Thin-wire modeling is demonstrated to be a useful engineering tool in problems involving determination of current distribution, impedance, near- and far-field electric and magnetic components, and efficiency. Listings of the specialized subroutines added by NELC to the AMP program are appended. (Author)

AD-B004 228/3CP PC **A05**/MF **A01**
Hughes Aircraft CO Fullerton Calif Ground Systems Group
Millimeter-Wave System EMC Study
Quarterly progress rept. no. 3, 6 Aug-6 Nov 74
Glenn G. Sundberg, and Robert F. Marsolais.
Apr 75, 84p FR-75-10-238, ECOM-74-0171-3
Contract DAAB07-74-C-0171
Distribution limitation now removed.

Descriptors: *Electromagnetic compatibility, Millimeter waves, *Radiofrequency interference, Millimeter waves, *Communication equipment, *Radar equipment, Spectrum signatures, Radar antennas, Computer programs, Computer aided design, Electromagnetic shielding, HOrn antennas, Sidelobes, Ka band, Waveguides, Modulation.

This report presents the results obtained from experiments and analysis performed during the third quarter effort of the Millimeter Wave Electromagnetic Compatibility Study. The period covered is from 6 August to 6 November 1974. The major effort in the third quarter consists of performance of experiments which are related to the millimeter wave study, computer analysis of electromagnetic compatibility requirements for typical Army deployments, analysis of modulation effects, analysis of out-of-band antenna characteristics and initiation of the recommended EMC test program for millimeter wave system. Experiments ten through fourteen were performed during this quarter. These experiments involved electromagnetic compatibility evaluation of millimeter wave communication and radar systems. Shielding and reflectivity tests were performed to determine the effects of building and equipment enclosures materials on propagation and scattering of millimeter wave emissions.

AD-B004 752/2CP PC **A05**/MF **A01**
Hughes Aircraft CO Culver City Calif Antenna Dept
Pattern Synthesis of Conformal Arrays
Final rept. Jan 74-Jan 75
Peter C. Bargeliotes, Alfred T. Vilieneuve, and Wolfgang H. Kummer. Jan 75, 87p Rept nos. 2265-30/470, HAC-Ref-D0741
Contract N00019-74-C-0127
Distribution limitation now removed.

Descriptors: *Antenna arrays, Antenna radiation patterns, Conical antennas, Conformal structures, Computer programs, Slot antennas, Scattering, Contours, Diffraction, Synthesis, Digital computers, Electric fields, Series(Mathematics), Integrals, Equations, Bessel functions.
Identifiers: *Conformal arrays, CDC 6600 Computers.

Exact element patterns computed from expressions of two potential functions representing the model fields of arbitrary apertures on a conducting cone were compared with measured patterns. Circumferential and radial slots 6.22 lambda from the tip of a 10 deg half angle cone were used in the pattern measurements. Measured and computed patterns are in very good agreement. During this same period, an asymptotic approximation of the contour integrals representing the fields of the circumferential slot was carried out, resulting in approximate expressions for both field components. These expressions describe the component fields in terms of optical, transition and diffraction fields. The diffracted field is a product of a frequency-independent angular function and a simple function containing the position of the radiating element. Such representation of the fields is better suited for numerical computation than the modal series. Recommendations for further investigative work on the topic of conformal arrays are also included. (Author)

AD-B008 068/9CP PC **A12**/MF **A01**
Air Force Flight Test Center Edwards AFB Calif
Flight Measurement of Aircraft Antenna Radiation Patterns
Final rept.
Ronald W. Mahlum. Oct 75, 257p Rept no. AFFTC-TD-75-3
Distribution limitation now removed.

Descriptors: *Aircraft antennas, Multipath transmission, *Antenna radiation patterns, Measurement, *Jet bombers, Ranges(Facilities), Digital computers, Near field, Extrapolation, Computer programs, Flight paths, Data processing, Skidding, Gain, Turning flight, Mathematical prediction, Far field.
Identifiers: Software, CDC 6500 computers, Antenna gain, B-526 aircraft, B-52 aircraft.

This report describes the technique developed at the Air Force Flight Test Center (AFFTC) for dynamic measurements of aircraft antenna radiation patterns in the presence of multipath radiation. A background on antenna pattern measurement techniques, flight pattern techniques, theory of multipath radiation, and documentation of computer software developed for postflight reduction of data are presented. The technique developed uses recorded signal strength and aircraft position data collected during skidding turns to produce computer generated plots (CDC 6500). The data is corrected for multipath radiation by computer predicted multipath gain at each data point. The resulting data is plotted offline with a CALCOMP plotter. (Author)

AD-483 022/CP PC **E01** MF **A01**
Honeywell, Inc., Minneapolis, Minn. Aeronautical Div.
Fault Diagnosis by White Noise Techniques
Final rept. 15 Feb 65-28 Feb 66
Victor S. Levadi, Lawrence D. Turner, and Larry W. Christenson. May 66, 273p 20226-FR1, AFAPL-TR-66-43
Contract AF 33(615)-2433
Distribution Limitation now Removed.

Descriptors: *Electronic equipment, Maintenance, *Failure(Electronics), Test methods, Nonlinear systems, Pattern recognition, Circuits, Statistical data, Power series, Decision theory, Digital computers, Reliability(Electronics), Programming(Computers), Algorithms, Integrators, Integrals, Integral equations, Mathematical programming, Computer programs.
Identifiers: Statistical decision theory, *Fault diagnosis.

Topics investigated include: Representation of nonlinear systems (the Wiener-Volterra functional power series and other forms), methods of defining faults, the effect of these definitions on the diagnosability of the system, determination of sufficient measurement data to characterize the system under test, and diagnostic procedures. Statistical decision theory is shown to provide an effective approach to fault diagnosis. Most efficient use is made of whatever measurements or a priori information is available about the system under test. Learning machine techniques have been used to determine the diagnostic decision rule by examining known faults. In one example, a single time sample of the output waveform is sufficient to detect faulty systems with 99% accuracy. A hardware implementation is capable of diagnosing any one of four fault classes in less than 2 seconds, including measurement and printout time. Only four time samples of the output are measured. The technique is also applicable whenever the properties of the data which characterize the various fault classes are unknown, e.g., testing via secondary effects, fault prediction. (Author)

AD-705 248/CP HC E01 MF **A01**
Syracuse Univ N Y Dept of Electrical Engineering
The Computation of the Frequencies and Fields of a Cavity Resonator Containing a Magnetoplasma Dielectric.
Gordon Kent, and Neil Sider. Mar 70, 45p TR-70-3, AFOSR-70-0852TR
Grant AF-AFOSR-1266-67

Descriptors: *Cavity resonators, *Plasma medium, Resonant frequency, Simultaneous equations, Bessel functions, Electromagnetic fields, Computer programs, Dielectrics.

The computational procedures for obtaining the resonant frequencies, spatial parameters, and fields of a cavity resonator containing a cold, uniform, collisionless magnetoplasma dielectric are presented. The calculation of frequencies and spatial parameters involves the simultaneous solution of three equations. Two equations are rational in the three variables, and the third is transcendental in two of the variables. The transcendental functions have infinitely many real zeros and poles. An analysis is given to determine ranges of values of the spatial parameters and regions in the space of plasma parameters and frequency where solutions may exist. The method of solution starts with a trial value of frequency, the calculation of corresponding values of spatial parameters from two of the equations, and observation of the sign of the third function. A solution is determined by a change of sign of the third function. The transcendental functions are quotients of Bessel functions, and they are economically computed from continued fractions. The spatial paremeters enter into the field expressions as part of the arguments of Bessel functions. These functions, which have complex arguments, are computed from integral formulas. (Author)

AD-705 565/CP HC E01 MF **A01**
Electromagnetic Research Corp College Park Md
Radiation from Slot Antennas on Cones in the Presence of a Layered Piasma Sheath.
Final rept.
M. Katzin, and W. B. Johns, Jr. Jan 70, 83p HDL-0036-1
Contract DAAG39-67-C-0036

Descriptors: *Reentry vehicles, Blackout(Electromagnetic), *Slot antennas, Plasma sheath, Antenna radiation patterns, Iterative methods, Integral equations, Admittance, Computer programs.

The radiation from slot antennas on a cone in the presence of an inhomogeneous sheath is treated. The sheath is considered as being made up of one or two conical layers, each of which is homogeneous. The boundary conditions lead to a system of integral equations, which number 4M 0 4 for a sheath composed of M(01 or 2) conical layers. These are reduced to singular integral equations of Cauchy type, which are solved in iterative fashion. For sufficiently fine stratification of the sheath, the first iteration should suffice. In general, fields of both magnetic and electric types are generated in the presence of a sheath, even though only a field of magnetic type may be generated in free space. For a ring slot, however, in which the excitation is azimuthally symmetrical, only a field of magnetic type is generated even in the presence of a sheath. It is shown that the solution for this case forms the basis of the solution for the general case. The far field is found by a multidimensional saddle point evaluation. This is illustrated in detail for the free-space case, and then the far field patterns in the presence of a sheath are determined. This can be carried out successfully for all components, and to arbitrary orders of iteration. (Author)

AD-706 007/CP HC E01 MF **A01**
Naval Postgraduate School Monterey Calif
Computer-Aided Filter Design.
Master's thesis
Alec Patton Taylor, Jr. Dec 69, 43p

Descriptors: *Electric filters, Design, Computer programs, Pulse compression, Transfer functions, Theses.
Identifiers: Sierra filters, Computer aided design, *Pulse slimming filters.

Several small-scale, special-purpose computer programs that were written to provide design data for a pulse-slimming filter over a wide range of parameter variations are contained herein. A large-scale computer program is also used to provide additional data. Some synthesis techniques are discussed, and some of the computer program outputs are directly applied in illustrating synthesis techniques for a specific pulse-slimming transfer functions. (Author)

AD-706 008/CP HC E01 MF **A01**
Naval Postgraduate School Monterey Calif
Computer-Aided Netowrk Design by Optimization in the Frequency Domain.
Master's thesis
James Lau. Dec 69, 88

Descriptors: *Electric filters, Design, Band-pass filters, Computer programs, Iterative methods, Search theory, Theses.
Identifiers: *Computer aided design, *Network synthesis, CALAHAN computer program.

The filter design problem is considered as an optimization problem. An iterative search technique is employed to adjust the variable network element values to approximate some desired network response, with a minimum of error. Explicit constraints are employed to ensure physical realizability. The design process uses a combination of a modified version of Calahan's network analysis program with a direct search method of minimization developed by Hooke and Jeeves. The result is a procedure which uses the circuit designer's experience and knowledge to set up the problem but relieves him of the tedious labor now performed by the high-speed digital computer. (Author)

AD-706 063/CP HC E01 MF **A01**
Naval Postgraduate School Monterey Calif
Parameter Estimation for the Mathematical Modeling of Semiconductors Using the Ebers-Moll Equations.
Master's thesis
William Arthur Crumly. Dec 69, 62p

Descriptors: *Electrical networks, Design, *Diodes(Semiconductor), Mathematical models, *Transistors, Mathematical models, Curve fitting, Least squares method, Computer programs, Theses.
Identifiers: Ebers-Moll transistor model, Parameter estimation, Computer aided design, Network analysis.

An accurate method of parameter estimation for the mathematical modeling of semiconductors using the Ebers-Moll equations is presented. Its usefulness is apparent in estimating parameters to be used in computer circuit-analysis programs that have been developed. The Ebers-Moll models were modified to better represent the actual characteristics. The least-square-error methods presented for estimating the parameters are easy to program to the digital computer and result in parameters that are quite accurate in describing the actual characteristics. This procedure yields solutions for parameters that are quite helpful to the engineer in solving electrical circuits involving p-n diodes and junction transistors. (Author)

AD-708 051/CP HC E01 MF **A01**
Houston Univ Tex Dept of Electrical Engineering
Uhcap Users Manual.
Technical rept.
G. F. Paskusz, A.D. Alley, and R. F. Miller. May 70, 69p Rept no. THEMIS-RE-1-70
Contract N00014-68-A-0151

Descriptors: *Circuits, *Programming(Computers), Alternating current, Direct current, Transients, Wiring diagrams.
Identifiers: UHCAP computer program, Computer aided analysis.

The UHCAP Program is designed for circuit and system analysis. The purpose of the manual is to help potential users by defining programming capabilities and cataloging programming rules. (Author)

AD-708 720/CP HC E01 MF **A01**
Massachusetts Inst of Tech Lexington Lincoln Lab
Dynamic Soultions for Single and Coupled Microstrip Lines.
Technical rept.
Edgar J. Denlinger. 19 Nov 69, 77p TR-470, ESD-TR-69-388
Contract AF 19(628)-5167

Descriptors: *Integrated circuits, Microwave frequency, *Transmission lines, Electrical impedance, Electromagnetic fields, Phase shifters, Coupling circuits, Computer programs, Substrates, Dielectrics, Ferrites, Integral transforms, Fourier analysis, Theses.
Identifiers: Microstrip circuits, Fourier transformation.

The investigation presents theoretical and experimental results of single and coupled microstrip propagation on both a pure dielectric and a ferrite substrate. The theory enables one to obtain the frequency dependence of phase velocity and characteristic impedance and also to obtain the electromagnetic field quantitites around the microstrip line. It utilizes a Fourier transform method in which the hybrid mode solutions for a 'fictitious' surface current at the substrate-air interface are summed in such a way as to represent the fields caused by a current distribution that is finite only over the region occupied by the conducting strip and is assumed equal to that for the static case. The theory for the magnetized ferrite microstrip takes into account both the diagonal and off-diagonal components of the substrate's permeability tensor. Excellent agreement is obtained between experimental and theoretical results for single microstrip lines on both ceramic and demagnetized ferrite substrates. The coupled microstrip theory is applied to two commonly used microwave integrated circuit devices, the directional coupler and the meander-line phase shifter. (Author)

AD-708 872/CP HC E01 MF **A01**
Army Electronics Command Fort Monmouth N J
Noise Quality Measurements for Microwave Noise Generators.
Research and development technical rept.
Calvin D. Bates. May 70, 47p Rept no. ECOM-3275

Descriptors: *Noise generators, Microwaves, *Microwave oscillators, Noise(Radio), Power spectra, Probability density functions, Statistical functions, Computer programs.

Measurement techniques for characterizing the noise output of microwave noise generators are described. The aim of these measurements is to formulate a quantitative basis for the comparison, selection and utilization of microwave noise generators. Three measurements, namely: the power density spectrum, the autocorrelation function, and the probability density function (PDF) are discussed. Experimental results for a crossed-field noise generator are shown. A computer program which was formulated to determine the statistics of the measured PDF and permit comparison of test results with a 'normal' distribution is also discussed. Experimental results and analysis of two different noise spectra are also included to illustrate the utility of the noise measurement techniques. (Author)

AD-709 057/CP HC E01 MF **A01**
Naval Postgraduate School Monterey Calif
Application of Display in Flight Vehicle Mission Performance Evaluation.
Master's thesis
Willi Konrad Alois Krauss. Oct 69, 82p

Descriptors: *Aeronautics, *Display systems, Performance(Engineering), Graphics, Data processing systems, Aircraft equipment, Computer programs, Input-output devices, Theses.
Identifiers: Computer graphics.

With the increase in speed of moving vehicles there is a growing need for rapid, easy to interprete display of information concerning its dynamic state. With growing equipment stability a remedy can grow out of research and application of computer aided information presentation, especially the production of proper displays. While all information can be made to correspond to familiar schemes as close as desired new approaches to the general problem must be sought to find an improved information presentation. This study is concerned with the application of computer generated graphics for one or more display consoles for aid in the operation of the vehicle. In the first chapter a major aspect of the general program is chosen for a demonstration: a 'flight vehicle to destination' situation is subjected to an experimental investigation. A general purpose computer with a graphics terminal that has become available just recently has been chosen for the study. Thereby implicitly a measure of the capability to perform a real time on line job is obtained. (Author)

AD-709 064/CP HC E01 MF **A01**
Naval Postgraduate School Monterey Calif
Computer-Aided Design of Linear Networks in the Frequency Domain.
Final rept.
Donald E. Kirk. 11 Jun 70, 49p Rept no. NPS-52KI0061A

Descriptors: *Electrical networks, Design, Nonlinear programming, Optimization, Algorithms, Computer programs, Linear systems.
Identifiers: Fletcher-Powell optimization program, Computer aided design.

The design of linear networks to satisfy frequency domain performance specifications is formulated as a problem in nonlinear programming. Three optimization algorithms, pattern search, gradient projection, and the Fletcher-Powell method, are applied in conjunction with the network analysis program CALAHAN to the solution of the nonlinear programming problem. Examples which illustrate the range of application of the design programs are presented. (Author)

AD-709 910/CP HC E01 MF **A01**
Naval Postgraduate School Monterey Calif
Determining Partition Elements with Feedback Constraints.
Master's thesis
Thomas Joseph Breckon. Jun 70, 76p

Descriptors: *Digital computers, Design, *Logic circuits, Design, *Gates(Circuits), Design, Digital systems, Computer programs, Graphics, Feedback, Algorithms, Theses.
Identifiers: Network synthesis, Bipartite graphs, Graph theory.

The partition problem is that step in the layout problem in which it must be decided which of the elementary digital circuits are to be coalesced into a single, electronic package. A solution of the partition problem must satisfy constraints on the maximum number of elementary circuits that can be put into a single package, and on the number of external connections that can be attached to the package. A solution due to Lawler et al, which minimizes delay caused by clustering electronic elements, is extended to cyclic networks. A new algorithm to extract from a graph the maximal strongly-connected subgraphs (lobes) is developed, and a new approach to clustering the digital elements of a lobe is presented. The digital circuit is represented by a bipartite graph, and solutions are expressed in terms of graph theory. (Author)

AD-709 928/CP HC E01 MF **A01**
Naval Postgraduate School Monterey Calif
Investigations of the Miyata Synthesis Technique.
Master's thesis
Richard Eric Carlson. Jun 70, 49p

Descriptors: *Electrical networks, Electrical impedance, Complex variables, Computer programs, Theses.
Identifiers: Miyata synthesis, Network analysis theory, Network synthesis.

These investigations generalize Miyata's synthesis of passive driving-point impedance functions by developing a step-by-step computational technique for augmenting a general driving-point impedance to insure that the real part of the augmented impedance is positive term by term. This goal has been accomplished and programmed under the provision that the real part of the original impedance is minimum reactive, i.e., has no zeros on the j(omega)-axis. The latter requirement is not restrictive since zeros on the j(omega)-axis. (Author)

AD-709 929/CP HC E01 MF **A01**
Naval Postgraduate School Monterey Calif
Mathematical Modeling and Sensitivity Analysis of Radiation Effects on Semiconductor Junctions.
Master's thesis
Leon Eugene Drouin, Jr. Jun 70, 61p

Descriptors: *Semiconductor devices, Radiation damage, Diodes(Semiconductor), Sensitivity, Capacitance, Mathematical models, Numerical analysis, Recovery, Computer programs, Theses.
Identifiers: *Radiation hardening, *Semiconductor junctions.

The thesis is concerned with the numerical solution of a semiconductor junction recovery from a radiation pulse. The junction is represented by an Ebers-Moll model to account for diffusion current and space-charge capacitance. The radiation pulse is considered as giving rise to a photo-current to which it is related by a linear differential equation. Exact solutions are presented and the recovery time is presented and discussed as a function of several parameters. A simple piecewise linear analysis for a diode circuit is also presented to provide insight into the nature of the transient response and the recovery time. (Author)

AD-710 200/CP HC E01 MF **A01**
Massachusetts Inst of Tech Lexington Lincoln Lab
Frequency Domain Analysis of a Class of Nonlinear Networks.
Technical note
Jerzy Gorski-Popiel. 26 Nov 69, 50p TN-1969-62, ESD-TR-69-350
Contract AF 19(628)-5167

Descriptors: *Electrical networks, Mathematical analysis, *Mixers(Electronics), Performance(Engineering), Computer programs, Nonlinear systems.
Identifiers: Frequency domain analysis, Frequency response, MODCAP computer program.

A method is given for analyzing in the frequency domain the performance of linear networks containing nonlinear resistors. The method is applied to the evaluation of the frequency performance of a reactively terminated mixer. (Author)

AD-710 239/CP HC E01 MF **A01**
Army Electronics Command Fort Monmouth N J
Computer-Aided Analysis of Cascaded Microwave Two-Port Networks.
Technical rept.
Thomas Arell, and Carl Lump. Apr 70, 50p Rept no. ECOM-3257

Descriptors: *Microwave networks, Analysis, Transmission lines, Integrated circuits, Feedback, Electrical impedance, Computer programs, Reflection, Matrix algebra.
Identifiers: *Cascaded microwave networks, Network analysis theory, Computer aided design.

A generalized computer program has been written to analyze microwave cascaded two-port networks. Circuit configurations employing a shunt feedback loop may also be considered. The program utilizes matrix manipulation of 'ABCD' and 'Y' parameters to obtain the combined network matrix in terms of 'ABCD' parameters. The program is capable of solving problems involving circuits containing any number of cascaded elements as well as networks containing two elements (or two cascaded circuits) in parallel. (Author)

AD-710 381/CP HC E01 MF **A01**
Naval Postgraduate School Monterey Calif
A Study of Digital Filters.
Master's thesis
Philip Joseph Walsh. Dec 69, 130p

Descriptors: *Electric filters, Mathematical models, *Information theory, Digital systems, Low-pass filters, Band-pass filters, Difference equations, Integral transforms, Special purpose computers, Computer programs, Real time, Simulation, Theses.
Identifiers: *Digital filters, Laplace transformation, Computerized simulation, Frequency response.

The thesis discusses the subject of digital filters in two parts. First the analytical tools and synthesis techniques which are used for digital signal processors are explained and illustrated with examples. Emphasis is placed on (1) the generation and use of the digital transfer function, (2) design procedures in the frequency domain using methods of continuous-filter design as intermediate steps, and (3) real-time digital-filter implementation schemes. In the second part of the thesis a machine-language computer program is presented for the real-time simulation of digital filters on a hybrid computer. The program is described in detail and experimental results for several filter designs and realization schemes are reported. It is believed that such a computer program, with its inherent ability to accurately simulate a special-purpose computer and to provide external control of word length and clock frequency, could be used to experimentally determine specifications for the LSI implementation of digital filters. (Author)

AD-711 982/CP HC E01 MF **A01**
Motorola Inc Scottsdale Ariz Government Electronics Div
Surface Wedge Electro-Acoustic Transducers.
Final rept. 1 Jun 69-30 Jun 70
Fred S. Hickernell. 30 Jun 70, 60p
Contract N00014-69-C-0297

Descriptors: *Electroacoustic transducers, Wave transmission, *Wave transmission, Silicon, Substrates, Silicon dioxide, Cadmium sulfides, Quartz, Zinc compounds, Oxides, Rayleigh waves, Very high frequency, Propagation.
Identifiers: SWEAT(Surface Wedge ElectroAcoustic Transducer), SWEAT computer program, *Surface waves, Wedge transducers, Love waves.

Theoretical and experimental work was directed toward the development of wedge transducer techniques suitable for the generation of broadband surface acoustic Love waves in the frequency range from 100 MHz to 500 MHz. Theoretical studies characterized wedge transduction and Love wave propagation characteristics. Bonding agents were identified which provided strong coupling of bulk shear waves to acoustic surface waves. Fused quartz and zinc oxide wedge transducers were used to excite surface waves in the VHF region. The propagation properties of Rayleigh waves on free surfaces and Rayleigh and Love waves on layered surfaces were investigated. Love and Rayleigh waves were guided on substrates of silicon using etched SiO2 waveguide structures. (Author)

AD-713 156/CP HC E01 MF **A01**
Syracuse Univ N Y Dept of Electrical Engineering
Computer Programs for Radiation and Scattering by Arbitrary Configurations of Bent Wires.
Hu H. Chao, and Bradley J. Strait. 15 Sep 70, 101p Scientific-7, AFCRL-70-0374
Contract F19628-68-C-0180

Descriptors: *Electromagnetic waves, Scattering, *Antenna configurations, Mathematical analysis, Integral equations, Differential equations, Operators(Mathematics), Matrix algebra, Boundary value problems, Computer programs, Wave functions, Numerical analysis.
Identifiers: Electromagnetic radiation, FORTRAN 4 programming language, FORTRAN.

The problem of electromagnetic radiation and scattering from thin wires with arbitrary shape and with arbitrary excitation and loading is considered. This is treated as a boundary value problem which is formulated as an operator equation. Matrix methods along with the method of moments are used to solve the operator equation approximately. Computer programs suitable for handling radiation problems and plane-wave scattering problems are presented and described. For the former, current distributions, field patterns, and input impedances at the driving points are determined. For the latter, current distributions and bistatic radar cross section patterns are found. Examples are given to illustrate several applications of the programs. Numerical results are compared with experimental data and with results computed by other theoretical methods. (Author)

AD-713 476/CP HC E01 MF **A01**
Cullen Coll of Engineering Houston Tex
Dielectric Field Computations in Semiconductor Oxide Integrated Circuits.
Technical rept.
Don L. Cannon. Jul 70, 82p Rept no. THEMIS-RE-3-70
Contract N00014-68-A-0151
Report on Information Processing Systems.

Descriptors: *Integrated circuits, Potential theory, *Semiconductor devices, Voltage, Partial differential equations, Boundary value problems, Numerical analysis, Integration, Computer programs, Temperature, Thermal stability, Theses.
Identifiers: Themis project, Harmonic functions, Elliptic differential equations.

The report deals with the application of the point relaxation method for the numerical solution of Laplace's or Poisson's equations in multi-dielectric regions in semiconductor integrated circuits. In particular, the type of geometry considered in this report is a rectangular or square region whose boundary potentials may or may not be specified, with a dielectric interface parallel to one of the boundaries. This type of problem is very difficult to solve analytically and yet it is an important problem in planar integrated circuit analysis. The structure is essentially the same as the oxide over silicon or as the junction regions in such a device. Often the electrical field or the static temperature distribution of such regions are required and the research described in this report provides a technique for determining such information. (Author)

AD-714 032/CP PC **E01** MF **A01**
Michigan Univ Ann Arbor
The Discrete Logical Design, Simulation System.
J. R. Guskin, and T. J. Dingwall. Apr 70, 65p Rept no. Memo-26
Contract DA-49-083-OSA-3050, ARPA Order-716
Report on Proj. CONCOMP.

Descriptors: *Programming(Computers), Circuits, *Logic circuits, Design, Networks, Wiring diagrams, Instruction manuals, Computer logic, Simulation, Subroutines, Syntax, Mathematical models, Algorithms, Combinatorial analysis, Reliability(Electronics), Integrated circuits.
Identifiers: Computer aided design, Macroprogramming.

The paper describes the design and implementation of a programming system for simulating a logical network. It is written in a form usable for a user's guide for this system. The system is intended to be used in the instruction of students in the area of logical design.

AD-714 145/CP PC **E01** MF **A01**
Iowa Univ Iowa City Dept of Mathematics
B.I.B.I.: A Symbolic Language for Description and Simulation of Logical Circuits.
Technical rept.
Giuseppe Fantauzzi. Aug 70, 35p Rept no. THEMIS-UI-TR-31
Contract N00014-68-A-0500
Report on the Theory and Applications of Automaton Theory.

Descriptors: *Programming languages, Design, *Logic circuits, Design, Algebras, Sequential analysis, Combinatorial analysis, Digital computers, Simulation, Algorithms, Programming(Computers), Mathematical models, Topology, Binary arithmetic.
Identifiers: Computer aided design, BIBI programming language, Symbolic programming, Computerized simulation.

A formal language is studied aimed at the formal description of any kind of boolean circuit either sequential or combinatorial. Such descriptions are intended to be used both for documentation purposes and for simulation on digital computers. For this reason the language has been designed to allow descriptions both suitable for computer simulation and easily understandable for the people interested in the design of logical circuits. (Author)

AD-714 845/CP PC **E01** MF **A01**
Massachusetts Inst of Tech Cambridge Electronic Systems Lab
Computer Aided Electronic Circuit Design.
Final rept.
Michael L. Dertouzos. Nov 70, 70 Rept no. ESL-FR-436
Contract Nonr-4102(01), Grant NAS12-2208
Sponsored in part by Grant NGL-22-009-019, and NsG-496.

Descriptors: *Circuits, Design, *Programming(Computers), *Electrical networks, Resistors, Capacitors, Wiring diagrams, Optimization.
Identifiers: Computer aided design, CIRCAL 2 computer program, Network analysis theory, Network synthesis, On line computers.

The report describes the status of CIRCAL-2, a general purpose on-line circuit-design program. It is a final report on research sponsored by the National Aeronautics and Space Administration for a period of about five years in the area of on-line circuit design. (Author)

AD-715 121/CP PC **A17** MF **A01**
General Dynamics/Electronics San Diego Calif
Study of Electronic Handling of Mail. Completion Report for Work Task 5. Transmission Methods.
Jul 70, 388p* Rept no. R-69-046-05
Contract RER-30-70
See also AD-715 120 and AD-715 122.

Descriptors: *United States Government, *Communication systems, *Data transmission systems, Electronic equipment, Digital computers, Broadband, Cost effectiveness, Mathematical models, Communication satellites(Active), Analog computers, Systems engineering, Multiplex, Coaxial cables, Errors, Control systems.
Identifiers: *Mail, *Electronic mail handling.

The purpose of the report is to provide the basic information required to do preliminary systems engineering in transmission methods, and to make valid cost estimates of proposed system approaches. Emphasis is placed on the compilation and description of basic communication techniques that are potentially useful for the electronic transmission of mail, in both analog and digital form; presentation of information on terminal and transmission subsystems that will give an overview of potentially useful technologies; demonstration of practical transmission system design approaches, for use in preliminary appraisals of different transmission media and methods; and provision of rational basis for estimating the recurring and nonrecurring costs of transmission systems, so that trade-off studies can be made to assist in the choice of methods to be used. (Author)

AD-717 307/CP PC **E01** MF **A01**
Harry Diamond Labs Washington D C
Dome Filter Design and Analysis Program.
Richard T. Antony. Oct 70, 28p Rept no. HDL-TM-70-26

Descriptors: *Radiofrequency filters, Phase shift, Design, Computer programs.
Identifiers: *Dome filters, Computer aided design.

One failing of the conventional Dome filter design is the need to arbitrarily specify a particular parameter, denoted S. The report presents curves relating S to the maximum phase error and the usable bandwith of the filter. A design modification is presented that increases the filter bandwidth for a given phase error without an increase in the circuit complexity. Finally, employing this modification, a discussion and listing are given of a computer routine that designs the circuit elements and plots the theoretical performance curves of a Dome filter pair for a given phase error requirement. (Author)

AD-717 491/CP PC **E01** MF **A01**
Naval Postgraduate School Monterey Calif
Application of Cohn'S Sensitivity Theorem to Time Domain Responses.
Master's thesis
Alan Lee Dahlvig. Sep 70, 43p

Descriptors: *Electrical networks, Sensitivity, Electrical impedance, Resistance(Electrical), Partial differential equations, Transfer functions, Topology, Integration, Theorems, Computer programs, Theses.
Identifiers: Network analysis theory, Network synthesis, Time domain responses.

A sensitivity theorem by R. M. Cohn states that for linear resistive circuits the ratio of a fractional change in the d.c. input resistance to a fractional change in an internal resistance is equal to the square of the ratio of the current through that internal resistance to the d.c. input current. The theorem is extended to show the sensitivity of input impedance to changes in internal impedances for an arbitrary network at all frequencies. Equations are developed which show the relation between sensitivities and instantaneous power in the frequency domain. An extension to the time domain makes digital computer solutions possible. (Author)

AD-718 407/CP PC **E01** MF **A01**
Texas Univ Austin Electronics Research Center
Radiation of Electromagnetic Waves from a Flanged Waveguide
Technical rept.
George A. Bennett, and Oren B. Kesler. 15 Oct 70, 111p TR-100, AFOSR-70-2874TR
Grant AF-AFOSR-1792-69

Descriptors: *Waveguides, *Electromagnetic waves, Boundary value problems, Propagation, Numerical analysis, Computer programs.
Identifiers: Electromagnetic radiation, Galerkins method.

The boundary value problem considered in the investigation was that of radiation of electromagnetic waves from a two-dimensional parallel plate infinitely flanged waveguide. It was determined through extensive analysis that Galerkin's method is applicable to this problem and that its implementation by partial systems yields excellent results. Specific attention has

been given to a study of the accuracy of the method and the results of this study are reported. The method has been utilized to compute results that are not available elsewhere - the first 120 non-zero reflection coefficients for various frequencies in the resonance region. Also for several frequencies in this region, graphs of the reflection coefficient modulus versus mode number, illustrating their asymptotic behavior, are presented. The complete computer program is included for the readers discernment and general reference. Suggestions are made for extensions of this work. (Author)

AD-718 434/CP PC **E01** MF **A01**
Maryland Univ College Park Dept of Electrical Engineering
A Scattering Matrix Program for High Frequency Circuit Analysis
R. W. Newcomb, and L. Basser. Nov 70, 5p
AFOSR-TR-71-0210
Grant AF-AFOSR-1910-70
Prepared in cooperation with Fairchild Microwave and Optoelectronics Div., Mountain View, Calif. Sponsored in part by Contract F44620-67-C-0001 and Grants NSF-GK-1956, NSF-GK-24036.

Descriptors: *Circuits, Mathematical analysis, *Programming(Computers), Time sharing, S-matrix, Design, Frequency.
Identifiers: Network synthesis, *Network analysis theory, SPEEDY computer program, Computer aided design, Frequency response.

A time-shared program, SPEEDY, is discussed. The program is for small signal analysis of high frequency active circuits. It is based directly upon 2-port interconnections through the scattering matrix, thus eliminating continuous conversions of parameters of previous routines. Program advantages are speed of calculation, due to the generality of S parameters and the limitation to 2-ports; the convenience of accepting measured S parameter data, and the consequent avoidance of transistor equivalent circuits. The program includes two unique subroutines: one that handles all four possible combinations of parallel and series 2-port interconnections, and one that converts 2-port common emitter transistor parameters to common base or common collector configurations. (Author)

AD-718 803/CP PC **E01** MF **A01**
Naval Ordnance Lab White Oak Md
Correlation of Quantized Guassian Processes
Daniel L. Rumsey. 7 Sep 70, 120p Rept no. NOLTR-70-185

Descriptors: *Information theory, Correlation techniques, *Correlators, Mathematical analysis, Signal-to-noise ratio, Statistical processes, Analog systems, Computer programs, Theses.
Identifiers: Gaussian processes, Random processes.

The well-known Polarity Coincidence Correlator was originally developed to simplify the electronics involved in making an Analog Correlator while roughly approximating its output. The Polarity Coincidence Correlator clips the two input signals about their means and compares the resulting signals for polarity to determine the degree of correlation. No amplitude information is used in this system. The idea of clipping each input signal into two regions, as in the Polarity Coincidence Case, is extended to quantizing each input signal into a greater number of regions. The resulting signals are then compared by region, weighted and summed for the degree of correlation. An expression for the output signal-to-noise ratio for this new type of correlator is developed and compared with the output signal-to-noise ratio of the Analog Correlator (ANC) and the Polarity Coincidence Correlator (PCC). It is shown that a good deal of improvement is achieved over the ANC and PCC under certain operating conditions. The theory behind these new types of correlators is developed for three and four region clipping to show the feasibility of these correlators as possibly better alternatives to the Polarity Coincidence Correlator. (Author)

AD-719 879/CP PC **E01** MF **A01**
Technical Univ of Denmark Lyngby Lab of Electromagnetic Theory
Backfire Antennas
Final scientific rept. 1 Jul 67-31 Aug 70
Erik Drago Nielsen. 20 Sep 70, 50p R81, AFCRL-70-0662
Contract F61052-67-C-0056

Descriptors: *Antenna configurations, Numerical analysis, Yagi antennas, Antenna radiation patterns, Reflectors, Computer programs, Denmark.
Identifiers: *Backfire antennas.

The research was restricted to surface wave structures consisting of dipole elements, especially the Yagi antenna structure. Two different ways of approach were investigated. In the first method, usual array theory was employed, the mutual impedances between the dipole elements were calculated according to the EMF method, and the radiation due to the presence of a large surface wave reflector of finite extent was determined from the surface current distribution on the plate. The second method is based on Harrington's Method of Moments, which is a theory for setting up a matrix solution to the problem by subdividing the whole antenna into small segments, over which a constant current may be assumed. Numerical results for Yagi backfire antennas and short-backfire antennas were compared with experimental results obtained in the Radio Anechoic Chamber, Technical University of Denmark. (Author)

AD-721 581/CP PC **E01** MF **A01**
Naval Postgraduate School Monterey Calif
Fault Identification Matrix in Linear Networks
Master's thesis
Kwang Ho Yim. Sep 70, 104p

Descriptors: *Electrical networks, Failure(Electronics), Matrix algebra, Transfer functions, Differential equations, Computer programs, Reliability(Electronics), Theses.
Identifiers: *Network analysis theory, *Network synthesis, FORTRAN 4 programming language, FORTRAN, Electrical faults.

A method utilizing vector representation is investigated for determining a faulty element in passive and active networks by simple external measurements. A large system may be considered as an interconnection of a number of sub-networks. By utilizing the relationships between the magnitudes of a transfer function at various frequencies and the deviations of a circuit element, the fault simulation curves can be drawn. The fault identification regions are defined from the fault simulation curves. A fault identification matrix is constructed corresponding to the defined fault identification regions. The fault identification matrix, when premultiplied by a vector whose components are measured from a network, yields another vector whose components identify a network element which is faulty. A test procedure for the fault identification method is presented and verified. (Author)

AD-721 582/CP PC **E01** MF **A01**
Naval Postgraduate School Monterey Calif
Fault Isolation Using Frequency Response Techniques
Master's thesis
Charles Gilbert Martinache. Sep 70, 79p

Descriptors: *Circuits, Test methods, Failure(Electronics), Detection, Frequency, Response, Computer programs, Theses.
Identifiers: *Electrical fault location.

An investigation of using the response of a circuit at selected test frequencies to isolate faulty circuit components is made. A procedure using a sensitivity approach for intelligent selection of test frequencies is developed. The developed procedure is tested and the results are compared with results using conventional procedures. The effect of random, within tolerance variations of nonfaulty components on the results is studied for both conventional and developed procedures. (Author)

AD-721 678/CP PC **E01** MF **A01**
Naval Underwater Systems Center New London Conn New London Lab
Analysis and Computer Program for Temperature Distribution in a Hollow Cylindrical Ceramic Transducer Element
Research rept.
Russell W. Dunham. 15 Dec 70, 32p Rept no. NUSC/NL-4011

Descriptors: *Electroacoustic transducers, Thermal stresses, *Programming(Computers), Thermal analysis, Cylindrical bodies, Ceramic materials, Distribution functions, Partial differential equations, Boundary value problems, Green's function, Thermal expansion, Sonar.
Identifiers: S1656 computer program, FORTRAN.

The problem of temperature distribution in a hollow cylindrical ceramic element in a sonar transducer under operating conditions is analyzed using the appropriate Green's function. The boundary conditions are taken to be (1) prescribed temperatures over the axial ends and (2) Newton's law of cooling satisfied over the inside and outside radial surfaces. Equilibrium conditions are presented for determining a compatible temperature for the trapped interior gas if the temperatures of the axial ends and the exterior gas are known. Computer Program S1656 provides a convenient means of calculating the temperature distribution in such ceramic cylinders. (Author)

AD-721 803/CP REPRINT
Army Electronics Command Fort Monmouth N J Electronic Components Lab
DEMON--An Optical Seeking Computer Program for the Design of Microwave Circuits
Vladimir G. Gelnovatch, and Ivan L. Chase. 10 Apr 70, 7p
Availability: Pub. in IEEE Jnl. of Solid-State Circuits, vSC-5 n6 p303-309 Dec 70.

Descriptors: *Programming(Computers), Optimization, *Microwave networks, Design, Integrated circuits, Search theory, Topology, Iterations, Microwave amplifiers, Transistors.
Identifiers: DEMON computer program, FORTRAN 4 programming language, FORTRAN, Computer aided design, Network synthesis, Network analysis theory.

An optimal seeking computer program for the design of generalized TEM microwave circuits has been written. The optimization process utilizes a simple but effective rationale called direct pattern search to reduce the error between a desired circuit objective and the current value of a chosen response. Lossy transmission live equations are utilized in the program for exactness. As an example of the utility of this program, a 2-4-GHz maximally flat magnitude microwave transistor amplifier is designed and fabricated. (Author)

AD-722 095/CP PC **E01** MF **A01**
Dartmouth Coll Hanover N H Dept of Mathematics

Case Study in Interactive Computer Graphics. Computer-Aided Design of Logical Circuits. Volume II/Appendices
Jean Gotman. Feb 71, 211p AFOSR-TR-71-0928
Contract F44620-68-C-0015
See also Volume 1, AD-721 478.

Descriptors: *Logic circuits, Design, Computer logic, Control sequences, Computer programs, Subroutines, Graphics.
Identifiers: Computer graphics, *Computer aided design, Interactive computer graphics.

A software package is written for a computer-aided design of logical circuits. Using a graphic terminal and a light-pen, the user will build a logical circuit choosing the components from a set offered to him, and connecting them to each other. During this highly interactive process, all the user's mistakes may be corrected. The software system organizes the data from the picture in a data structure specifically designed to allow easy manipulation of the picture on one hand, and for a subsequent simulation of the circuit on the other hand. The first part (creation of the circuit) makes use of a PDP-9 computer with 8k of core, a GRAPHIC-2 terminal and a 250 K disk. The second part (simulation) is done by the LOGICS program on a GE-635 Time-Sharing to which the PDP-9 is connected by a high-speed line. The user has a choice between 10 to 12 different components. Practically, the circuit may have approximately 30 to 40 components. (Author)

AD-722 556/CP REPRINT
California Univ Berkeley Electronics Research Lab
BIAS-3-A Program for the Nonlinear DC Analysis of Bipolar Transistor Circuits
William J. McCalla, and William G. Howard, Jr. 8 Jul 70, 8p AFOSR-TR-71-1051
Contract DAHC04-67-C-0031, Grant AF-AFOSR-1488-68
Revision of report dated 6 May 70.
Availability: Pub. in IEEE Jnl. of Solid-State Circuits, vSC-6 n1 p14-19 Feb 71.

Descriptors: *Electrical networks, Mathematical models, *Integrated circuits, Field effect transistors, Programming(Computers), Voltage, Iterative methods, Matrix algebra.
Identifiers: BIAS 3 computer program, Network analysis theory, FORTRAN 4 programming language, FORTRAN.

A computer program for both analog and digital circuits that formulates and solves nonlinear equations for dc node voltages and transistor operating points is described. Temperature variations and dependence can be effectively simulated. (Author)

AD-723 064/CP PC **E01** MF **A01**
Virginia Univ Charlottesville Research Labs for the Engineering Sciences
Towards a Completely Automatic Layout Designer
Final rept.
Craig A. Decker, and Linda N. Decker. Sep 70, 57p Rept no. EE-3390-101-70U
Contract DAAG39-70-M-0688
Report on Computer-Aided Topographical Design.

Descriptors: *Integrated circuits, Design, *Programming(Computers), Instruction manuals, Syntax, Computer programs, Semantics, Control sequences, Systems engineering.
Identifiers: *Computer aided design, Computer graphics, ALGOL, Layout, Thick films.

A topographical layout design program has been written in ALGOL to rearrange an initial configuration of components in order to minimize connection distances, minimize connection crossovers, and space components evenly over available area. The syntax and semantics of all design procedures are given, as well as examples of the automatic designer's performance. (Author)

AD-723 216/CP PC **E01** MF **A01**
Stanford Univ Calif Stanford Electronics Labs
A Study of Subharmonic Response in Nonlinear System Models
Technical rept.
Niles Ransom Moseley. Apr 71, 118p Rept nos. SU-SEL-71-018, TR-6657-3
Contract N00014-67-A-0112-0044

Descriptors: *Nonlinear differential equations, Integration, *Electrical networks, Fourier analysis, Approximation(Mathematics), Dynamic programming, Harmonic analysis, Periodic variations, Programming(Computers), Polynomials, Stability, Theorems.
Identifiers: *Network analysis theory, Spectrum analysis, Periodic functions, ADAPT N computer program, LOCAL STAB computer program, LOCAL MIN computer program, STABILITY computer program.

The report investigates the system model G(u, u dot, . . ., u sup n, t) 0 F(t), where F(t) is a periodic excitation. Using an approximate solution of the form u(t) 0 Summation, R00 to UH (U sub c)(R) cos R (omega sub o) t 0 (U sub s) (R) sin R (omega sub o) t), analytical theorems and computer results are obtained that yield information into the nature of the existence and non-existence of subharmonic components in the response. By assuming G(u, u dot, . . . , u sup n, t) to be a polynomial, theorems are developed that determine the conditions for the possible existence and non-existence of subharmonic response. (Author)

AD-723 524/CP PC **E01** MF **A01**
Schjeldahl (G T) Co Northfield Minn
Feasibility Studies of Mosaic Near-Infrared Image Conversion Panels
Technical rept. 1 Feb 70-31 Jan 71
Donald E. Anderson, and Richard L. Swisher. 15 May 71, 113p Rept no. SER-0088
Contract N00014-70-C-0231

Descriptors: *Mosaics(Light-sensitive), Infrared images, *Viewing scscreens, Infrared equipment, Photoelectric materials, Semiconducting films, Electroluminescence, Manufacturing methods, Test methods, Computer programs.
Identifiers: Computerized simulation, Thin films, Thick films, *Electroluminescent panels, Near infrared radiation, FORTRAN 4 programming language, FORTRAN, IMINT computer program, IR computer program, Infrared converters.

Two digital computer simulation techniques are presented for use in evaluating the performance of mosaic patterned, photoconductive sensor/electroluminescent output, image conversion panels. One simulation technique is used for rapid calculation of output light for continuous input radiation levels varying over six orders of magnitude with the simulated panel operated at up to five different applied drive frequencies at each of five drive voltages. The second simulation technique evaluates the output brightness of the panel when operated at one frequency and voltage, but exposed to input radiation of chosen peak intensity and a square wave time profile. These computer simulations were used to evaluate combinations of available electroluminescent (EL) materials and near-infrared sensitive thin film photoconductors. Combinations such as PbS photoconductor with thin film ZnS:Mn EL lamps, CdSe photoconductor with thin film ZnS:Mn EL lamps, and CdSe photoconductor with thick film ZnS:Cu, Cl EL lamps were investigated.

AD-723 637/CP PC **E01** MF **A01**
Air Force Weapons Lab Kirtland AFB N Mex
Systems Analysis Using the Sceptre Program
Technical rept. 1 Dec 68-1 Jun 69
Julien S. Nichols, and David R. Alexander. Apr 71, 32p Rept no. AFWL-TR-70-50
Presented at the IEEE Conference on Nuclear and Space Radiation Effects (1969).

Descriptors: *Electrical networks, Radiation damage, *Programming(Computers), Data processing systems, *Flight control systems, Mathematical models, Transients, Linear systems, Transfer functions, Differential equations, Integral transforms, Systems engineering.
Identifiers: SCEPTRE computer program, Computerized simulation, Feedback control.

The techniques that were developed that permit SCEPTRE to handle linear transfer functions are used to demonstrate how to analyze a multifeedback loop control system which contains a combination of linear, radiation insensitive blocks and nonlinear, radiation sensitive blocks. The output of the system and the electrical signals at critical points within the system are determined for conditions of normal operation, operation in an ionizing radiation environment in which only one unit of the loop is assumed to be radiation sensitive, and operation in a neutron environment in which the same unit is assumed to be sensitive. (Author)

AD-723 762/CP REPRINT
California Univ Berkeley Dept of Electrical Engineering
Elements of Computer-Aided Circuit Analysis
William J. McCalla, and Donald O. Pederson. 11 Aug 70, 16p AFOSR-TR-71-1429
Contract DAHC04-67-C-0031, Grant AF-AFOSR-1488-68
Availability: Pub. in IEEE Transactions on Circuit Theory, vCT18 n1 p14-26 Jan 71.

Descriptors: *Electrical networks, Mathematical models, Programming(Computers), Transfer functions, Numerical analysis, Integration, Nonlinear systems, Simulation, Transients, Reviews.
Identifiers: *Computer aided design, Computer aided analysis, Numerical integration, Frequency response.

A survey is made of the principal techniques, procedures, and routines that are used in present programs for computer-aided circuits analysis. Programs (simulators) are reviewed and selected features compared for the four major classes of circuit analysis: linear dc and ac, nonlinear dc, nonlinear transient, and linear pole zero. (Author)

AD-724 290/CP PC **E01** MF **A01**
Pacific Missile Range Point Mugu Calif
A High-Frequency Amplifier Synthesis Program. LINVIL Computer FORTRAN IV Program Performs Necessary Computations Plus Graphic Output
Technical publication
J. A. Means. 4 Jun 71, 57p Rept no. PMR-TP-71-3

Descriptors: *Radiofrequency amplifiers, Design, *Programming(Computers), *Instruction manuals, Integrated circuits, Gain, Impedance matching, Algorithms, Computer programs.
Identifiers: FORTRAN 4 programming language, FORTRAN, LINVIL computer program, Computer graphics, *Computer aided design.

A FORTRAN IV program called LINVIL has been developed at the Pacific Missile Range, Point Mugu, California, for the purpose of designing high-frequency amplifiers. The input data supplied by the engineer include the four complex parameters of the Y-, Z-, G-, H-, F-, Script F-, or S-type, center frequency, bandwidth, sensitivity, and the source and load resistances. The

computer printout furnishes the maximum available gain, the maximum gain compatible with the sensitivity requirement, the network stability factor (Linvill's C factor), the complex value of load admittance, the complex value of source admittance, the parallel RLC element values required as a load to realize the bandwidth, and the element values (L and C) required to match, at the operating frequency, the complex load and source admittances to the desired load and source resistances. This report includes a brief review of the Linvill technique, examples of various designs with various input data, guides for the user, and a complete FORTRAN IV listing. (Author)

AD-726 359/CP PC **E01** MF **A01**
Harry Diamond Labs Washington D C
A Computer-Aided Data Reduction Technique for Radiation-Induced Conductivity Experiments
Harold E. Boesch, Jr. May 71, 32p Rept no. HDL-TR-1545

Descriptors: *Dielectrics, Electrical conductance, *Radiation damage, Dielectrics, Capacitors, Ionization, Electric insulation, Test methods, Computer programs.
Identifiers: Data reduction, FORTRAN 4 programming language, FORTRAN, LOWDEG computer program, Computer graphics.

A data analysis approach is described for extracting time-dependent radiation-induced conductivity of a dielectric material from the recorded response of a test circuit. The technique makes possible accurate determination of sample conductivity in time regimes where measurements are perturbed by time constants of the measuring circuit. Several representative test circuits and their conductivity solutions are discussed. The circuit solutions are used in a computer program for the reduction of experimental conductivity data. (Author)

AD-726 991/CP PC **E01** MF **A01**
Air Force Inst of Tech Wright-Patterson AFB Ohio School of Engineering
Mossbauer Study of the Magnetocrystalline Anisotropy of NdCo5
Master's thesis
Carl D. Towery. Jun 71, 115p
Contract GEP/PH/71-18

Descriptors: *Magnetic alloys, Mossbauer effect, Cobalt alloys, Neodymium alloys, Intermetallic compounds, Computer programs, Magnets, Anisotropy, Theses.
Identifiers: *Permanent magnets, Magnetocrystalline anisotropy, Iron 57.

The project was initiated to determine if Mossbauer spectrometry can be used to monitor manufacturing processes of permanent magnets made of rare earth-3d transition element compounds. Mossbauer spectra were obtained with absorbers made of powdered NdCo5 alloyed with Fe57. These spectra were obtained at four different temperatures in a range over which a 90 degree rotation of the magnetic axis of NdCo5 is known to occur. The spectra were complex and changed significantly as temperature changed. The number of absorption peaks in each of the spectra indicates that Fe57 may enter three nonequivalent crystal lattice sites in NdCo5. (Author)

AD-728 979/CP PC **E01** MF **A01**
Saclant ASW Research Centre La Spezia (Italy)
A Description of Some Recursive Digital Filters
Technical memo.
Jens M. Hovem, and Martin Thompson. 15 Jun 71, 28p Rept no. SACLANTCEN-TM-167
NATO furnished.

Descriptors: *Electric filters, Mathematical models, Difference equations, Low-pass filters, Band-pass filters, Transfer functions, Integral transforms, Bessel functions, Spectrum analyzers, Computer programs.
Identifiers: *Digital filters, Recursive filters, Signal processing.

A set of digital recursive filters has been programmed on a digital computer. The filters are low-pass and band-pass realization of Butterworth and Bessel characteristics. The method of synthesis, which is described, is by means of the matched z-transform of correcponding analogue filters. Some examples of time and frequency responses of the filters are presented. (Author)

AD-729 578/CP REPRINT
Massachusetts Inst of Tech Lexington Lincoln Lab
MSTRIP (Parameters of Microstrip)
Journal article
Thomas G. Bryant, and Jerald A. Weiss. 30 Oct 70, 3 JA-3827, ESD-TR-71-237
Contract AF 19(628)-5167
Availability: Pub. in IEEE Transactions on Microwave Theory and Techniques, vMIT-19 n4 p418-419 Apr 71.

Descriptors: *Strip transmission lines, Electrical properties, Electrical impedance, Dielectric properties, Programming(Computers).
Identifiers: FORTRAN, FORTRAN 4 programming language, MSTRIP computer program.

The program computes the characteristic impedance, phase velocity, and effective dielectric constant for a single strip or for both the even and odd modes of a coupled pair of strips. The calculation embodies the quasi-static approximation which is accurate provided H1 is no greater than a few percent of the wavelength in an unbounded medium of relative permittivity K. (Author)

AD-730 117/CP PC **E01** MF **A01**
Illinois Univ Urbana Coordinated Science Lab
On the Design of Diagnosable Combinational Networks
Michael Reid Paige. Jul 71, 143p Rept nos. R-519, UILU-ENG-71-2222
Contract DAAB07-67-C-0199, Grant NSF-GK-15459

Descriptors: *Logic circuits, Design, *Computers, Maintenance, Gates(Circuits), Integrated circuits, Programming languages, Decision making, Reliability(Electronics), Mathematical models, Algorithms, Graphics, Compilers, Shift registers.
Identifiers: Fault detection, Fault diagnosis.

A vector notation for the generation of fault detection tests from the functional description of a logic network is introduced. It is shown that it is possible to treat the fault behavior and diagnosis of the basic gate types (AND, OR, NAND, NOR) in a uniform manner and to extend this approach to two-level designs. The formulation of a design criterion to simplify the fault detection problem in multi-level logic networks is studied. The simplification sought is two-fold: The network should be a priori completely diagnosable, that is, all single and multiple faults can be detected; All the information pertaining to the diagnosis of the network can be obtained from the functional description of the element. It is shown that the criterion of network irredundancy satisfies the above requirements, while being a reasonable design tool. The use of a higher-level system design language for the specification of digital networks is examined. Some general properties which are desirable in such a system to enhance the diagnosability of the resulting design are discussed. A method for translating a design description into diagnosable hardware is presented. (Author)

AD-730 321/CP PC **E01** MF **A01**
Harry Diamond Labs Washington D C
Transient Radiation Analysis by Computer Program (TRAC)-360 Version
Herbert J. III Matthews. Jul 71, 214p Rept no. HDL-TR-1522

Descriptors: *Radiation damage, *Computer programs, Programming(Computers).
Identifiers: TRAC computer programs.

TRAC was translated to operate on a IBM 360 computer. The report supplements existing documentation and supports the use of the program on IBM-360 computers. An error detected in the computation of photocurrents was corrected. Plans for future modifications to TRAC are presented. Complete program listings, linkage editor map and a sample problem are included as appendices. (Author)

AD-730 615/CP PC **E01** MF **A01**
Michigan State Univ East Lansing Div of Engineering Research
The Short-Backfire Antenna: A Numerical-Physical Optics Study of Its Characteristics
Tsing-Zone Hsieh, Dennis P. Nyquist, and Kun-Mu Chen. Jul 71, 115p Scientific-2, AFCRL-71-0394
Contract F19628-70-C-0072

Descriptors: *Antennas, Numerical analysis, Antenna radiation patterns, Computer programs, Electrical impedance, Radio fields.
Identifiers: *Backfire antennas.

A numerical-physical optics method is applied to study the circuit (impedance) and radiation characteristics of the short-backfire antenna. This radiator, developed through extensive experimentation by AFCRL, consists of a dipole exciter located between a large rimmed reflector and a small secondary reflector. It has wide bandwidth and high directivity comparable to sophisticated reflector antennas. In the numerical-physical optics method, the following steps are followed: (1) a set of coupled integral equations for the currents excited in the dipole and on the surface of the secondary reflector are formulated and solved numerically, assuming for this step that the large reflector is infinite; (2) the surface currents of the large reflector are approximated by a truncated form of those calculated for the infinite conducting sheet; (3) the radiation field maintained by the currents of the steps (1) and (2) is calculated; and (4) a diffracted field correction is made to account for the finite dimensions of the large reflector and its rim. This method has the advantage, relative to earlier studies, that it can successfully predict the antenna's circuit characteristics. Excellent results are obtained for both square and circular geometries. Comparison is made with experimental measurements made by AFCRL. (Author)

AD-730 616/CP PC **E01** MF **A01**
Michigan State Univ East Lansing Div of Engineering Research
Investigation of Impedance Loaded Slot Antennas
Tsing-Zone Hsieh, Dennis P. Nyquist, and Kun-Mu Chen. Jul 71, 141p Scientific-3, AFCRL-71-0397
Contract F19628-70-C-0072

Descriptors: *Slot antennas, Electrical impedance, Integral equations, Numerical analysis, Computer programs.

A simple, flush-mounted antenna consists of a slot cut in a ground plane and excited by a potential maintained between its edges at a point along its axis. The circuit and radiation

properties of electrically small slot antennas doubly loaded by lumped impedances connected between their edges are investigated. In the theoretical investigations, integral equations for the electric field distributions excited in the impedance loaded slots by a delta-function current source are formulated and solved numerically. In terms of these slot fields, the input impedances and the radiation fields of the loaded slot antennas are calculated. These analytical results are confirmed qualitatively by those of complementary experimental studies. It is demonstrated that the electrically small slot can be forced into a near antiresonant condition by the selection of an optimum purely reactive loading. A large input resistance is subsequently obtained. This optimum reactance is found to be usually capacitive while the antenna input impedance is inductive. Low loss capacitive loading and tuning impedances can thus be utilized to implement a high efficiency, small antenna. A second optimum reactance loading leads to radiation field patterns which can be highly directive in the case of the rectangular slot or greatly modified for the annular slot radiator. (Author)

AD-731 145/CP PC **E01** MF **A01**
Aerospace Medical Research Lab Wright-Patterson AFB Ohio
Development and Preparation of Cost-Optimized Troubleshooting Decision Trees
Gerald P. Chubb, and Robert G. Mills. Nov 69, 13p Rept no. AMRL-TR-69-111

Descriptors: *Programming(Computers), Decision making, *Failure(Electronics), Detection, *Maintenance, Automation, Reliability(Electronics), Sequential analysis, Malfunctions, Regression analysis, Mathematical prediction, Optimization, Costs.
Identifiers: Digital simulation.

The logic tree diagrams have been prepared for several systems, such as the F-106 fire control systems. They have been well received by technicians but are more expensive to prepare than conventional technical orders. Moreover, these manually prepared diagrams were generated on the basis of expert engineering judgment. This paper discusses a computerized technique for optimizing the decision logic for a troubleshooting tree. Input requirements are outlined, and problems associated with these input parameters are reviewed. Approaches to surmounting these difficulties are suggested. If these suggested approaches demonstrably remove recognized input problems, methods can be recommended for documenting design analyses in a manner which greatly facilitates the production of either advanced performance aids or the specification of test sequences to be automated. (Author)

AD-731 178/CP PC **E01** MF **A01**
Syracuse Univ N Y Dept of Electrical and Computer Engineering
A Program for Computing Near Fields of Thin Wire Antennas
Dah-Cheng Kuo, and Bradley J. Strait. 15 Sep 71, 44p Scientific-14, AFCRL-71-0463
Contract F19628-68-C-0180

Descriptors: *Computer programs, Electromagnetic compatibility, *Antennas, Electromagnetic fields, Antenna configurations, Electric currents, Electric fields, Inequalities.
Identifiers: FORTRAN 4 programming language, FORTRAN, *Thin wire antennas.

A user-oriented computer program is presented and described for analyzing the near fields of thin wire antennas. The program is based on the method of moments and is an extension of a program presented earlier for computing far-field and current distributions. In general the wires of a given configuration can be arbitrarily bent and can be excited or loaded at arbitrary points along their lengths. It is also possible to include wire junctions enabling treatment of special configuretions such as wire crossed and supporting wires for long antennas. The subsectional approach used provides accurate results as close as one subsection length from the nearest wire surface. (Author)

AD-731 292/CP PC **E01** MF **A01**
New Mexico Univ Albuquerque Office of Research Services
Radiation from Dielectric Loaded Waveguide Fed Aperture Antennas
Technical rept. May 68-Jul 69
Martin D. Bradshaw. Sep 71, 170p AFWL-TR-71-110
Contract F29601-68-C-0089

Descriptors: *Antenna radiation patterns, Atmosphere entry, *Slot antennas, Plasma sheath, Blackout(Electromagnetic), Dielectrics, Admittance, Numerical analysis, Computer programs, Antenna apertures, Integral transforms, Matrix algebra.
Identifiers: FORTRAN 4 programming language, FORTRAN, Fourier transformation, Far field.

Theoretical and experimental studies of the radiation pattern and input admittance of dielectric loaded waveguide fed aperture antennas are presented. The model consists of a waveguide fed, dielectric loaded aperture whose outer surface is flush with an infinite, perfectly conducting ground plane. The aperture and ground plane are covered by a dielectric layer. The window and the covering layer may be inhomogeneous in the direction of propagation. The analysis makes use of a mode-matching process that permits the effects of higher order modes to be taken into account in the dielectric loaded aperture section and in the covering layer. The window and layer are represented by an arbitrary number of inhomogeneous, lossy, dielectric slabs, each with slightly different permittivities. Collaction (point-matching) techniques are used to match boundary conditions at each interface within the dielectric loaded aperture section and two-dimensional Fourier transforms are used to match boundary conditions at each interface in the covering layer. Matrix techniques are used to handle an arbitrary number of layers in either region. A large number of experimental measurements of input admittance and far-field radiation pattern measurements are presented for three different aperture configurations, with and without a covering dielectric layer. A computer program is described that can handle the computations. The program is written in FORTRAN IV for a Control Data Corporation 6600 machine. Computed values of input admittance and far-field radiation patterns are presented. (Author)

AD-731 406/CP PC **E01** MF **A01**
Syracuse Univ Research Corp N Y
HF Antenna Program
Final rept. 15 May 70-31 May 71
Richard G. Russell. Jun 71, 198p Rept no. SURC-TR-71-169
Contract N00014-70-C-0348

Descriptors: *Antennas, Design, *Combat surveillance, Antennas, *Amphibious operations, Antennas, Deployment, Test methods, High frequency, Antenna radiation patterns, Electromagnetic warfare, Marine Corps, Computer programs.

An HF receiving antenna system for use with USMC Surveillance Systems was designed and fabricated. Antenna pattern measurements were taken on the SURC antenna test range. The formulated electrical design is included. Recommendations, including service testing, were made. (Author)

AD-733 187/CP Reprint
California Univ Berkeley Electronics Research Lab
SLIC-A Simulator for Linear Integrated Circuits
Thomas E. Idleman, Francis S. Jenkins, William J. McCalla, and Donald O. Pederson. 2 Apr 71, 19p AROD-6611:15-E
Contract DAHC04-67-C-0031, Grant AF-AFOSR-1488-68
Sponsored in part by Grant DA-ARO-D-31-124-71-G50.
Availability: Pub. in IEEE Jnl. of Solid-State Circuits, vSC6 n4 p188-203 Aug 71.

Descriptors: *Integrated circuits, Mathematical models, Computer programs, Linear systems, Transistors, Temperature, Gain, Transfer functions.
Identifiers: SLIC computer program, Computerized simulation, Frequency response.

A computer program for the simulation of linear integrated circuits (SLIC) is described. The program formulates and solves nonlinear equations for dc node voltages and transistor operating points; generates linearized small-signal circuit models; and solves for the poles, zeros, frequency response, and anoise response of specified transfer functions. Temperature variations and operating point dependence can be effectively simulated. (Author)

AD-733 202/CP PC **E01** MF **A01**
Naval Postgraduate School Monterey Calif
An Analysis of Phase-Locked Loops
Master's thesis
Marvin Joseph Weniger. Sep 71, 271p

Descriptors: *Phase-locked systems, Mathematical analysis, Comparators, Oscillators, Phase control devices, Performance(Engineering), Computer programs, Synchronization(Electronics), Information theory, Simulation, Stability, Theses.
Identifiers: Digital simulation, Analog simulation, Feedback control.

An investigation was conducted of a third order type two phase-locked loop with a sawtooth phase comparator using both analog and digital simulation techniques and employing an exact system simulation. The results are presented in terms of normalized system parameters and give the system performance as a function of the initial phase between the input and the VCO waveforms, the variation of the input from the VCO frequency, and the system gain and filter characteristics. Some of the data presented includes the time required for the system to meet different types of lock criterion together with the range of frequencies over which the system will lock and the range over which it will lock without cycle skipping. Investigations were conducted of the system performance for eight different types of phase comparators, of which two of the basic forms had been used previously and the rest were new with this work. It was found that two of the new forms, the R-S nonlinear and the additive with ramp nonlinearity exhibited significantly superior performance in that they possessed increased lock ranges, reduced lock times, and greater values of seize frequency than did the basic systems from which they were derived. It was found that three of the phase comparators yielded an unlimited lock range, even though the lock time became quite long for very large frequency variations. (Author)

AD-733 389/CP PC **E01** MF **A01**
Army Command and General Staff Coll Fort Leavenworth Kans
A Proposed Mathematical Model for Predicting Military Electronic Equipment Component Failure Rates and Isolating Underlying Failure Causes
Master's thesis
Raymond E. Starsman. 1970, 157p

Descriptors: *Failure(Electronics), Mathematical models, *Electronic equipment, Reliability(Electronics), Degradation, Probability density functions, Distribution functions, Klystrons, Magnetrons, Life expectancy, Computer programs, Theses.
Identifiers: *Failure analysis, Failure rate.

A mathematical expression for combining the entire failure rate curve is derived based on the assumption that the failure population is composed of three subpopulations, early, chance, and wearout. A graphical method is provided for separating the subpopulations and determining the parameters of the model. The expression is then applied to observed failure data in three detailed examples and in each case the model is shown to represent the observed data at the .05 significance level using the Kolmogorov-Smirnov Test. Two BASIC language computer programs are provided to simplify the use of the proposed model. (Author)

AD-733 906/CP PC **E01** MF **A01**
Army Electronics Command Fort Monmouth N J
Bulk Semiconductor Quasi-Optical Concept for Guided Waves for Advanced Millimeter Wave Devices
Research and development technical rept.
Metro M. Chrepta, and Harold Jacobs. Sep 71, 39p Rept no. ECOM- 3482

Descriptors: *Semiconductor devices, Waveguides, *Waveguides, K band, Silicon, Microwaves, Dielectrics, Phase shifters, Partial differential equations, Computer programs.

Recent suggestions have been made for the design of bulk semiconductor millimeter wave devices, and in particular, a new type of phase shifter. In order for these designs to perform in a satisfactory manner it was found necessary to demonstrate that that electromagnetic propagation would occur largely in the interior of a semiconductor dielectric waveguide with relatively low loss. In this report an analysis is made of electromagnetic waves guided in an infinite slab of material with the properties of high resistivity silicon. Calculations and preliminary experiments are demonstrated at frequencies near 16.0 GHz. It is concluded that propagation in the semiconductor medium offers the possibility of low loss circuitry and satisfies the requisites for device design. (Author)

AD-735 682/CP PC **E01** MF **A01**
Army Electronics Command Fort Monmouth N J
Ground-Loss Reduction at High Frequencies through the Use of Antenna Arrays
Research and development technical rept.
C. M. De Santis, and F. Schwering. Dec 71, 58p Rept no. ECOM-3518

Descriptors: *Antenna arrays, Attenuation, High frequency, Dipole antennas, Numerical analysis, Gain, Computer programs.

High frequency antenna arrays are shown to reduce the effect of conduction losses normally associated with an antenna operating on or in proximity to the surface of the earth. It is demonstrated that the normal directivity gain as a function of array element spacing is modified by the presence of the finite conducting earth, and that at the lower frequencies in the HF range the gain of the array increases rapidly as the element spacing is increased from zero (single dipole) to about 1/10 of a wavelength. At this spacing, the gain approaches a limit which for low conductivities is close to a theoretical upper bound equal to the number of elements in the array. (Author)

AD-735 946/CP PC **E01** MF **A01**
New Mexico Univ Albuquerque Bureau of Engineering Research
CAFA: A Computer-Aided Curve-Fit and Analysis Program
Technical rept.
Bruce W. Noel. Sep 71, 42p Rept no. EE-187(71)ONR-005
Contract N00014-68-A-0158

Descriptors: *Programming(Computers), Curve fitting, *Diodes(Semiconductor), Electrical properties, Computer programs, Differential equations, Integration, Numerical analysis, Mathematical models.
Identifiers: CAFA computer program, Spline functions.

The Theoretical basis for the CAFA program is discussed. An approximate technique evolving from the theory is applied to the analysis of the current-voltage characteristic of a hypothetical diode, with good results. A printout of the resultant program and data is included. (Author)

AD-735 947/CP PC **E01** MF **A01**
New Mexico Univ Albuquerque Bureau of Engineering Research
The Fabrication and Experimental Analysis of Metal-Insulator-Semiconductor Devices for Radiation Vulnerability Studies
Technical rept.
T. A. Williamson, and W. W. Grannemann. Dec 71, 271p Rept no. EE-193(71)ONR-005
Contract N00014-68-A-0158

Descriptors: *Field effect transistors, *Radiation damage, *Capacitors, Semiconductor devices, Nuclear radiation, Computer programs, Manufacturing methods, Vulnerability, Test methods, Numerical analysis.
Identifiers: Metal insulator semiconductor capacitors.

The report discusses the following: The insulated gate field effect transistor (IGFET); Nuclear radiation effects on the IGFET; The fabrication of metal-insulator-silicon (MIS) capacitors; Analysis of the MIS capacitor; Testing of experimental devices, and Analysis of the experimental data.

AD-736 379/CP PC **E01** MF **A01**
Boeing Co Seattle Wash
CIRCUS-2. A Digital Computer Program for Transient Analysis of Electronic Circuits. Volume I. User's Guide
Final rept.
Benjamin Dembart, and Loren D. Milliman. Jul 71, 103 HDL-0070-1
Contract DAAG39-67-C-0070

Descriptors: *Computer programs, Instruction manuals, *Electrical networks, Mathematical models, *Circuits, Transients, Semiconductor devices, Simulation.
Identifiers: *Circus 2 computer program, Network synthesis, *Network analysis theory, Equivalent circuits.

CIRCUS-2 is a digital computer program that computes the time domain response of an electronic circuit to an arbitrary forcing function. The dc steady-state of the network can be calculated by the program and used as initial conditions for the transient solution, or a set of initial conditions may be input. CIRCUS-2 has models for basic elements and accepts user-defined models for other circuit components. The relationships allowed between elements in a model are quite general so that most types of components can be readily simulated. In the volume, a complete description of input required by the code is given along with a discussion of the options that may be used in modeling and in circuit analysis. Several examples are provided. (Author)

AD-736 984/CP PC **E01** MF **A01**
Harvard Univ Cambridge Mass Div of Engineering and Applied Physics
The Proximity Effect in Systems of Parallel Conductors and Electrically Small Multiturn Loop Antennas
Technical rept.
Glenn Smith. Dec 71, 116p Rept no. TR-624
Contract N00014-67-A-0298-0005

Descriptors: *Loop antennas, Mathematical analysis, Radio transmission, Attenuation, Efficiency, Computer programs.
Identifiers: *Electrically small antennas, FORTRAN 4 programming language, FORTRAN.

In the report losses in systems of parallel sound conductors are studied. Both the normal skin effect loss and the additional loss due to the close proximity of adjacent conductors are considered. The results obtained for the parallel conductors are used to evaluate the radiation efficiency of electrically small multiturn loop antennas. (Author)

AD-737 010/CP Reprint
Maryland Univ College Park Dept of Electrical Engineering
Two Scattering Matrix Programs for Active Circuit Analysis
Phichani Bodharamik, Les Besser, and Robert W. Newcomb. 1 Jun 71, 13p AFOSR-TR-72-0362
Grant AF-AFOSR-1910-70, NSF-GK-24036
Revision of report dated 3 Feb 71. Prepared in cooperation with Stanford Univ., Calif., Contract F44620-67-C-0001, Grant NSF-GK-1956.
Availability: Pub. in IEEE Transactions on Circuit Theory, vCT18 n6 p610-619 Nov 71.

Descriptors: *Electrical networks, S-matrix, *Programming(Computers), Numerical analysis, Circuits, Data processing systems, Time sharing.
Identifiers: *Network analysis theory, Computer aided analysis, GENERAL computer program, SPEEDY computer program.

Two scattering matrix programs are described for the area of computer-aided analysis of active circuits. Both programs rest upon an iterative use of cascade loading, a connection previously proven to incorporate any arbitrary connection. One program, GENERAL, covers the multiport case and through an incorporation of the generality of the scattering matrix handles any physical network. GENERAL proceeds by finding the scattering matrix of interconnections through the use of the indefinite admittance and by iteratively cascade loading such interconnections with components. The other (time-shared) program, SPEEDY, is a fast 2-port version. SPEEDY's time advantage comes about by programming the specific results for the most typical design connections (to which the program is limited). (Author)

AD-737 089/CP PC **E01** MF **A01**
Admiralty Surface Weapons Establishment Portsmouth (England)
DC Circuit Analysis by Computer
Technical rept.
N. A. Walter, and P. B. A. Border. Oct 71, 20p
ASWE-TR-71-32, DRIC-BR-27902

Descriptors: *Electrical networks, Mathematical models, *Reliability(Electronics), Mathematical prediction, Programming(Computers), Amplifiers, Transistors, Great Britain.
Identifiers: Equivalent circuits, Computer aided analysis.

The Technical Report describes the importance of correct loading of electronic components in circuits to ensure the reliability of circuit operation initially and over a long period of time. The full mathematical analysis of a circuit to establish these conditions allowing for the various changes in parameter can be a time con-

suming and difficult process. However by using the computer and correctly chosen programs it is possible to perform a complete d.c. analysis very simply, including junction temperature of any transistors. In order to demonstrate this, a number of examples are taken using several different programs readily available to the user. (Author)

AD-737 670/CP PC **E01**/MF **A01**
Harry Diamond Labs Washington D C
MASK MAKER I
Technical rept.
Michael E. Conner. Jan 72, 27p Rept no. HDL-TR-1582

Descriptors: *Masking, *Computer programs, *Integrated circuits, Masking, *Printed circuits, Masking, Automation, Silicon, Instruction manuals.
Identifiers: Mask Maker 1 computer program, Photoresist techniques, FORTRAN.

A new computer program, Mask Maker I, facilitates the drawing, or cutting, of geometric figures composed of right angles. The cut drawings are used as photomask masters in the production of integrated circuits, thick-film circuits, and printed-circuit boards. The program accepts as input, figure-command cards and dimension cards and yields a magnetic tape which, when fitted onto a modified Calcomp plotter, will cause the plotter to cut the figures specified at the input. (Author)

AD-738 538/CP PC **E01**/MF **A01**
American Micro-Systems Inc Santa Clara Calif
Micropower Integrated Circuits Study Program Extension to Scope of Work
Final rept.
Jay L. Farley, Bruce O. Jordan, Daryl E. Mullins, and Perris Pringle. Oct 71, 102p
Contract DAAA21-69-C-559

Descriptors: *Integrated circuits, Reliability(Electronics), *Field effect transistors, Mathematical models, Timing devices, Test methods, Semiconductor devices, Test equipment.
Identifiers: SCEPTRE computer program.

The Extension to Scope of Work provides further study of items not investigated completely by the original basic contract. These are the items dealing with computerized models of the field effect transistor. The primary computer model is the SCEPTRE program. (Author)

AD-739 162/CP PC **E01**/MF **A01**
Air Force Cambridge Research Labs L G Hanscom Field Mass
Complete Theory of Acoustic Bulk Wave Propagation in Anisotropic Piezoelectric Media
Physical sciences research papers
A. J. Slobodnik, Jr, and J. V. O'Brien. 24 Nov 71, 89p Rept nos. AFCRL-71-0601, AFCRL-PSRP-468

Descriptors: *Piezoelectric crystals, Acoustic properties, *Delay lines, Microwave frequency, Propagation, Attenuation, Mechanical properties, Electrical properties, Computer programs, Mathematical models.
Identifiers: FORTRAN, BULK computer program, Acoustic surface waves, Microwave acoustics, Signal processing, Acoustic delay lines, Surface waves.

A complete analysis of acoustic bulk wave propagation in arbitrary, anisotropic, piezoelectric media is presented. All mechanical and electrical quantities of interest are calculated. Propagation loss can be computed using the viscosity tensor approach. The entire analysis is implemented by a computer program which is described in detail. A complete listing and sample input-output data are provided. Thus all necessary information for the quantitative design of high-frequency, low-insertion-loss, long-time-delay, microwave-acoustic-bulk-wave delay lines and other signal processing devices is provided. (Author)

AD-739 203/CP PC **E01**/MF **A01**
Syracuse Univ N Y Dept of Electrical and Computer Engineering
improved Programs for Analysis of Radiation and Scattering by Configurations of Arbitrarily Bent Thin Wires
Dah-Cheng Kuo, and Bradley J. Strait. 15 Jan 72, 52p Scientific-15, AFCRL-72-0051
Contract F19628-68-C-0180

Descriptors: *Antennas, Wire, Computer programs, Numerical analysis, Electrical impedance, Antenna radiation patterns, Electromagnetic fields, Scattering, Electric currents, Radar echo areas.
Identifiers: Near field, Far field.

Improved user-oriented computer programs are presented and described for analyzing the electromagnetic behavior of arbitrarily bent thin-wire antennas and scatterers. A given problem can involve several wires of different shapes and radii and the wires can be excited or loaded at arbitrary points along their lengths. Matrix methods are used with the method of moments to compute various quantities of engineering interest. For radiation problems these include current distributions, input impedances, and specified far-field patterns and near-field distributions. For scattering problems the current is again calculated along with specified scattered field and bistatic radar cross-section patterns. Particular emphasis is given to required data input, and illustrative examples are included. (Author)

AD-739 477/CP PC **E01**/MF **A01**
Texas A and M Univ College Station Dept of Industrial Engineering
Reliability Analysis of a Parallel-Standby System
Research rept.
James H. Brier. 1971, 137p
Master's thesis.

Descriptors: *Redundant components, *Reliability(Electronics), *Switching circuits, Reliability(Electronics), Costs, Failure(Electronics), Mathematical prediction, Inequalities, Computer programs, Tables, Theses.
Identifiers: Mean time between failures.

The paper maximizes the mean time between failures subject to a cost constraint for a system consisting of N-1 subsystems in standby, each subsystem containing M identical components with constant failure rates in parallel. The mathematical feasibility of determining the reliability for particular values of N and M is investigated. Finally the paper demonstrates that the values of N and M which maximize the MTBF of the system do not necessarily maximize the reliability of that system for all time. (Author)

AD-739 996/CP PC **E01**/MF **A01**
Honeywell Inc Hopkins Minn Government and Aeronautical Products Div
Research and Development of a DC-DC Converter
Semiannual rept. 1 Jun-31 Dec 71
J. T. Lingle, and L. V. Westbrook. Mar 72, 67p ECOM-0223-1
Contract DAAB07-71-C-0223

Descriptors: *DC to DC converters, Design, Computer programs, Power supplies, Voltage regulators, Transistors, Reliability(Electronics), Cost effectiveness.
Identifiers: Tradeoffs, Computer aided design.

The purpose of the program was to develop a reliable, efficient, cost effective, high-density source capable of remote operation under a wide range of temperature variations for at least 3000 hours. To accomplish these objectives, it was necessary to analyze the battery-converter-regulator system configuration tradeoffs and to determine the optimum approach for efficiently matching the characteristics of new organic electrolyte lithium batteries and zinc air batteries to the characteristics of communications and surveillance equipment. This document describes the block diagram circuit analysis and computer-aided tradeoff studies and discusses initial breadboard circuit operation. (Author)

AD-740 226/CP PC **E01**/MF **A01**
Auburn Univ Ala Dept of Physics
Second Breakdown and Damage In Semiconductor Junction Devices
Final rept.
Paul P. Budenstein, Duane H. Pontius, and Wallace B. Smith. Apr 72, 174p*
Contract DAAH01-71-C-0708

Descriptors: *Transistors, Failure(Electronics), *Diodes(Semiconductor), Failure(Electronics), Electrical properties, Thermal radiation, Radiation damage, Silicon, Semiconducting films, Optical properties, Test methods, Test equipment, Computer programs.
Identifiers: *Second breakdown, Computerized simulation.

The nature of second breakdown in junction devices and the relationship between second breakdown and damage are investigated both experimentally and theoretically. The experiments were performed on silicon-on-sapphire diodes using the stroboscopic method of Sunshine. Diodes of different geometry and different base doping were included so the effects of these parameters on second breakdown could be determined. The stroboscopic technique allows the temperature configuration over the diode to be determined with a spatial resolution of several microns and a temporal resolution of about 20 ns. Second breakdown can be shown to involve three stages: nucleation of a filament, growth of a relatively broad filament across the high-resistivity region, and growth of a second filament interior to the first wherein material is in a molten state. Theoretical treatments are given to the nucleation, melt transition, and filamentation aspects of the problem. (Author)

AD-741 118/CP PC **E01**/MF **A01**
Naval Postgraduate School Monterey Calif
Multifault Isolation In Linear Networks by the Method of Joint Signature
Master's thesis
Gary Lamour Long. Dec 71, 53p

Descriptors: *Electrical networks, Failure(Electronics), Low-pass filters, Mathematical models, Computer programs, Differential equations, Algebra, Approximation(Mathematics), Theses.
Identifiers: Network analysis theory, *Fault isolation.

A study was made to isolate one and two component faults in simple linear networks by the method of joint signature of order two whereby two measurements of a failed network are coded to all possible combinations of two component values which will produce that fault with all other elements at nominal value. Two additional measurements were obtained, a new joint signature of order two generated, and the faulty component set was selected as the fault pair with the same values at both joint signatures. The method involves numerous solutions of sets of nonlinear equations. By assuming many values of a failed network function the equations were presolved on a one time only basis

for a network. One and two component faults were simulated in two simple low pass filter networks. the highest success rate in isolating faults was approximately 80%. (Author)

AD-741 243/CP PC **E01**/MF **A01**
Illinois Univ Urbana Coordinated Science Lab
Study of Dipolar Polarization in Silicon Nitride Films Using an Adapted Thermally Stimulated Current Technique
Doctoral thesis
Robert Michael Starnes. Apr 72, 123p Rept nos. R-554, UILU-ENG-72-2215
Contract DAAB07-67-C-0199

Descriptors: *Sputtering, Semiconducting films, *Nitrides, Polarization, Silicon compounds, Ionic current, Manufacturing methods, Instrumentation, Electrical properties, Computer programs, Theses.
Identifiers: *Silicon nitrides, Radiofrequency sputtering, Amorphous materials, Amorphous semiconductors.

The thesis is a study of ionic polarization in RF sputtered Si3N4 films by the technique of Thermally Stimulated Current (TSC). The model for this polarization phenomenon is a bound ion which may reside in either of two equilibrium potential minima. When an ion moves from one site to the other it behaves as an electric dipole. The TSC procedure consists of (1) biasing the film to establish a non-equilibrium distribution of ions, (2) thermal quenching to freeze the ions in their non-equilibrium state, and (3) reheating the film while measuring the current resulting from the equilibrium of ions in their states. The thesis describes the construction of an RF sputtering system to deposit refractory insulating films as well as a vacuum dewar and automatic temperature programmer for taking TSC data. (Author)

AD-741 919/CP PC **E01**/MF **A01**
Massachusetts Univ Amherst Dept of Electrical Engineering
Implementation of N-Path Filters Using Two-Level Modulation
Technical rept.
Lynn D. Dann. 10 May 72, 96p TR-1, AFOSR-TR-72-1113
Grant AF-AFOSR-2111-71
Master's thesis.

Descriptors: *Electric filters, Modulation, Mathematical models, Band-pass filters, Fourier analysis, Series, Transfer functions, White noise, Information theory, Multiplex, Computer programs, Theses.
Identifiers: Fourier transformation, Digital filters, Time invariant systems, Signal processing, Random noise, Control theory.

Recently, renewed interest has been given to the use of N-path filters as an alternative method of realizing analog filters. The N-path filter is a configuration composed of N-parallel paths containing identical path filters flanked by input and output modulators. The design of an N-path filter requires that its periodic modulating functions provide a desired set of Fourier coefficients while the rest of the Fourier coefficients may be arbitrary. To illustrate this numerical method, three applications of the N-path filter that are of practical interest are considered: A single passband filter; A least mean-squared error filter; A filter matched to a periodic input signal. (Author)

AD-742 430/CP PC **E01**/MF **A01**
Air Force Inst of Tech Wright-Patterson AFB Ohio School of Engineering
Application of CV Characteristics to Controlling MIS Processing
Master's thesis
Robert A. Fritschie. Mar 72, 79p Rept no. GE/EE/72-12

Descriptors: *Semiconductor devices, Quality control, *Semiconductors, Electrical properties, Capacitors, Transistors, Silicon compounds, Non-destructive testing, Impurities, Computer programs, Electrical conductance, Theses, Silicon dioxide, Alumina, Nitrides.
Identifiers: Process control, IDLCV computer program, FORTRAN, Metal insulator semiconductors, Silicon nitrides.

The purpose of this report is to determine the usefulness of the capacitance-voltage (CV) method as a process control tool. To accomplish this task a study of the physics of MIS structures and the theory of the CV method are given. Then it is shown how the method can be used to obtain various physical properties of the semiconductor, insulator, and semiconductor-insulator interface. A computer program which facilitates the determination of various properties from the CV characteristic is included. The substrate material used is n-type silicon and the kinds of insulators investigated in this study are: Si3N4:SiO2, Al2O3:SiO2, and SiO2. (Author)

AD-742 433/CP PC **E01**/MF **A01**
Air Force Inst of Tech Wright-Patterson AFB Ohio School of Engineering
A Phased Array Antenna with Hemispheric Scan for Satellite Tracking
Master's thesis
Thomas Burke Markham. Mar 72, 94p Rept no. GE/EE/72-15

Descriptors: *Phased arrays, *Satellite tracking systems, Computer programs, Antenna radiation patterns, Mathematical models, Feasibility studies, Theses.
Identifiers: Computerized simulation.

The possibility of replacing large highly directive parabolic antennas for satellite tracking with a phased array is investigated. It is shown that a non-planar array with a circular horizontal cross section and an elliptical vertical cross section has a far field radiation pattern suitable for satellite tracking. The problem is formulated for solution by a high speed digital computer and an analysis of the performance of the optimal array design is presented. (Author)

AD-743 249/CP PC **E01**/MF **A01**
California Univ Berkeley Electronics Research Lab
Horizontal Dipole Arrays Over Lossy Ground
Technical rept.
W. C. Kuo, and K. K. Mei. Dec 71, 108p Rept no. ERL-71-4
Contract DAAK02-71-C-0206

Descriptors: *Antenna arrays, Radio fields, Dipole antennas, Propagation, Numerical analysis, Radio transmission, Computer programs, Integral equations.

The Approximate Boundary Condition is introduced and applied to find the Hertz potential for a horizontal dipole over a lossy ground. The integrals so obtained can be computed much more economically than the Sommerfeld's integral. The results of this approximation are compared with those of Sommerfeld's formulas. It is found that the accuracy is very good in most of the cases even where both the dipole and observation positions are very close to the air-earth interface. The Hertz potential thus obtained is then applied to find the current distribution for a horizontal antenna over a lossy ground. The resulting integral equation is then reduced to Hallen's type, and the current distribution is obtained by a numerical technique. The current distribution for a parallel array antenna fed by the transmission line is also obtained by coupling the transmission line equations to Hallen's equation. (Author)

AD-743 399/CP PC **E01**/MF **A01**
Air Force Inst of Tech Wright-Patterson AFB Ohio School of Systems and Logistics
A Decision Model for the Selection of Standardization Alternatives
Masters thesis
Willima J. Donahue, and Peter C. McKinney. 28 Jan 72, 76p Rept no. SLSR-5-72A

Descriptors: *Reliability(Electronics), *Decision theory, *Electronic equipment, Standardization, Value engineering, Mathematical models, Theses, Computer programs, Simulation.
Identifiers: Computerized simulation, FORTRAN 4 programming language, FORTRAN.

The Directorate of Engineering Standardization, Defense Electronics Supply Center, had no basis for comparing results obtained from conducting a standardization project involving established reliability (ER) parts with one involving non-ER parts. The study was concerned with determining how a mathematical model could be developed to assist in the selection of the most beneficial method of standardization. A simulation technique coupled with the concepts of decision theory was offered as an appropriate modeling technique. The study concluded that such a technique filled a void in the standardization process by providing a systematic methodology for examining standardication alternatives. (Author)

AD-743 834/CP PC **E01**/MF **A01**
Florida Univ Gainesville Dept of Electrical Engineering
A Center of Competence in Solid State Materials and Devices
Fredrik A. Lindholm, Arthur J. Brodersen, Eugene R. Chenette, Larry L. Hench, and Sheng S. Li. 10 Oct 71, 178p Scientific-8, AFCRL-72-0075
Contract F19628-68-C-0058, ARPA Order-1060
See also AD-729 908.

Descriptors: *Semiconductors, Electrical properties, *Semiconductor devices, Electrical properties, *Integrated circuits, Design, Silicon, Gallium arsenides, Photosensitivity, Radiation damage, Neutron reactions, Hall effect, Potassium compounds, Phosphates, Vanadium compounds, Oxides, Noise(Radio), Computer programs.
Identifiers: Amorphous semiconductors, Photomagnetoelectric effect, Potassium phosphates, Vanadium oxides.

Contents:
- Photodetection using photomagnetoelectric and dember effects in gold-doped silicon;
- Investigation of the recombination and trapping processes of photo-injected carriers in semi-insulating Cr-doped GaAs using PME and PC methods;
- Low temperature photomagnetoelectric and photoconductive effects in n-type InAs;
- The effect of a buried layer on the collector breakdown voltages of bipolar junction transistors;
- Device characterization for computer analysis of large semiconductor circuits;
- Structural effects on fast neutron radiation sensitivity of semiconducting glasses;
- Effects of microstructure on the radiation stability of amorphous semiconductors;
- Electronic materials interfacial characterization program.

AD-744 045/CP PC **E01**/MF **A01**
Harvard Univ Cambridge Mass Div of Engineering and Applied Physics
Current Distribution on an Infinite Tubular Antenna in a Cold Collisional Magnetoplasma
Technical rept.
B. Bhat. May 72, 74p Rept no. TR-634
Contract N00014-67-A-0298-0005, Grant NGR-22-007-056
Sponsored in part by Grant NSF-GK-24105.

Descriptors: *Antennas, Plasma medium, Pipes, Electric currents, Resonance, Boundary value problems, Numerical analysis, Computer programs.

An infinite tubular antenna immersed in an unbounded cold collisional magnetoplasma is treated as a boundary value problem. The d. c. magnetic field is assumed parallel to the antenna. The antenna is driven by a delta function generator at z 0 0. It is shown that in the presence of collisions, the antenna is thin compared with all the characteristic wavelengths in the medium. An expression is derived for the total axial component of the current on the antenna and numerical solutions are obtained over a wide range of plasma parameters including the refractive index resonance regions of the magnetoionic medium. The effect of collisions on the current distribution along the antenna operating in each of the resonant and non-resonant regions is also studied. (Author)

AD-744 056/CP PC **A14**/MF **A01**
Aerospace Research Labs Wright-Patterson AFB Ohio
Spectral Matching Factors for Photocathodes, Phosphor Screens, and Photographic Emulsions in Image Intensifier-Recorders Using Night-Sky Illumination, and Related Problems
Final rept.
Radames K. H. Gebel, Hermann J. Spiegel, Hermann R. Mestwerdt, and Roy R. Hayslett.
Apr 72, 321p Rept no. ARL-72-0046

Descriptors: *Photocathodes, Photosensitivity, *Viewing screens, Photosensitivity, *Infrared film, Photosensitivity, *Infrared detectors, Photosensitivity, Phosphorescent materials, Photographic emulsions, Image intensifiers(Electronics), Infrared images, Night sky, Background, Computer programs, Resolution.

The purpose of this paper is to assess the performance of basic components of opto-electronic image recording systems using night-sky illumination. The analysis is concerned with the matching efficiency between night-sky illumination and photocathodes, between photocathodes and phosphor screens and between phosphor screens and photographic films. To preserve resolution, a cascaded opto-electronic system must employ stages with maximum gain so that a minimum number of stages is contained in the system since especially each phosphor screen contributes to the deterioration of resolution. (Author)

AD-744 797/CP PC **E01**/MF **A01**
Army Electronics Command Fort Monmouth N J
Computer Aided Design of Braid Parameters for Coaxial Cable
Technical rept.
Jack Spergel. Nov 71, 52p Rept no. ECOM-3517

Descriptors: *Coaxial cables, Design, *Electromagnetic shielding, Coaxial cables, Computer programs, Attenuation, Textiles.
Identifiers: Computer aided design, Braids, FORTRAN 4 programming language, FORTRAN.

A computer program was designed to calculate braid parameters for coaxial cable such as percent coverage, fill factor, angle, attenuation factor (Kb). Data is provided over a range of carriers, picks, ends, strand diameter, and diameter over the dielectric. (Author)

AD-745 757/CP PC **E01**/MF **A01**
Schjeldahl (G T) Co Northfield Minn
Feasibility Studies of Multispectral Mosaic Image Conversion Panels
Final rept. 1 Feb 71-31 Jan 72
Donald E. Anderson, and Richard L. Swisher. 30 Mar 72, 127p
Contract N00014-71-C-0188

Descriptors: *Viewing screens, Electroluminescence, *Image converters, Feasibility studies, Mosaics(Light-sensitive), Infrared images, Ultraviolet radiation, X rays, Light, Photoelectric materials, Computer programs, Electrical properties, Optical properties.
Identifiers: *Electroluminescent panels, Computerized simulation, IR computer program, FORTRAN 4 programming language, FORTRAN, IMINT computer program, GFIT computer program, ELFIT computer program, ELDG computer program, PLDATA computer program, MASSA computer program, FM computer program, AM computer program, MASSA 2 computer program, CASCAD computer program, Thin films, Thick films.

A development program is described in which the feasibility of mosaic EL/PC image conversion panels sensitive to UV, near IR, X-rays, and visible light was studied. Thin Film photoconductors are electroded in a regular array with unit cells 0.020 inches on centers. These arrays are connected to opaque electrode arrays forming the back pads of an electroluminescent (EL) lamp array through the use of microglass spacer sheets. Both thick film EL and thin film (TFEL) lamp arrays were prepared and studied. The combinations of materials used were prepared in test sample form, electrically and optically parameterized, and then computer simulations were performed to determine the range of parameters needed for a successful assembly. The computer models simulate the transient or steady state optical stimulation of EL/PC cells with simple sinusoidal power applied or more complicated wave-forms. All computer programs used are documented. (Author)

AD-745 758/CP PC **E01**/MF **A01**
Schjeldahl (G T) Co Northfield Minn
Feasibility Studies of Gray Scale Image Storage with Electroluminescent/Photoconductor Image Conversion Panels
Final rept. 2 Mar 71-1 Mar 72
Donald E. Anderson, and Richard L. Swisher. 30 Mar 72, 119p
Contract N00014-71-C-0276

Descriptors: *Viewing screens, Electroluminescence, *Image converters, Feasibility studies, Mosaics(Light-sensitive), Photoelectric materials, Computer programs, Electrical properties, Optical properties.
Identifiers: *Electroluminescent panels, FORTRAN 4 programming language, FORTRAN, Computerized simulation, IR computer program, IMINT computer program, GFIT computer program, ELFIT computer program, PLDATA computer program, ELDG computer program, MASSA computer program, FM computer program, AM computer program, MASSA 2 computer program, CASCAD computer program, Thin films, Thick films.

A study program is described in which the feasibility of achieving levels of gray scale image storage in EL/PC image storage panels is studied. Both thick film EL and thin film EL lamp arrays were prepared and studied. Effort was concentrated on two techniques: slow decaying thin film photoconductors and multifrequency electrical driving of fast response EL/PC panels. The combination of materials used were prepared in test sample form, electrically and optically parameterized, and then computer simulations were performed to determine the range of parameters needed for a successful assembly. The computer models simulated the transient or steady state optical stimulation of EL/PC cells with simple sinusoidal power applied or more complicated waveforms. (Author)

AD-745 979/CP PC **E01**/MF **A01**
Harvard Univ Cambridge Mass Cruft Lab
Modified Dipoles. II. Numerical Solutions
Peter S. Kao. Nov 71, 99p Scientific-13-Vol-2, AFCRL-72-0287
Contract F19628-68-C-0030
See also AD-745 285.

Descriptors: *Dipole antennas, Admittance, *Conical antennas, Numerical analysis, Cylindrical bodies, Computer programs, Antenna radiation patterns, Electric currents.
Identifiers: FORTRAN 4 programming language, FORTRAN.

An infinite set of algebric equations was solved numerically for small cone angles. Comparisons were made between the modified conical antenna and its limiting biconical antenna which provides both an extrapolatory numerical check for the modified conical antenna with shrinking central sphere and an understanding of the underlying physical phenomena. Theoretical and experimental results are in very good agreement. (Author)

AD-746 108/CP PC **E01**/MF **A01**
Naval Research Lab Washington D C
Computer Plots of Attenuation in Standard Rectangular Waveguides
Final rept.
Lamont V. Blake. Jun 72, 43p Rept no. NRL-MR-2458

Descriptors: *Waveguides, Microwave equipment, *Microwaves, Attenuation, Computer programs, Microwave frequency, Copper, Aluminum alloys, Brass, Copper alloys, Silver, Magnesium.
Identifiers: FORTRAN, Aluminum alloy 1100.

A Fortran computer plotting program has been developed to plot the attenuation of air-filled rectangular waveguide for the TE(10) mode, in the frequency range from about cutoff to three times cutoff. Plots are presented for military standard waveguides in the range 300 MHz to 50 GHz. The basic equations on which the program is based and a listing of the program are given. (Author)

AD-747 691/CP MF **A01**
Ocean Technology Inc Burbank Calif
Development of Graphic Area Displays for ASW Attack Management Simulator. Volume II
Technical rept. 1 Oct 71-30 Jun 72
R. M. McGinty, and D. Whitaker. 15 Aug 72, 161p Rept no. C1003-Vol-2
Contract N00014-72-C-0042
See also Volume 1, AD-747 708.
Available in Microfiche Only.

Descriptors: *Antisubmarine fire control systems, *Display systems, *Antisubmarine warfare, Naval vessels(Combatant), Target position indicators, Target designators, Kill probabilities, Cathode ray tube screens, Training devices, Computer programs.
Identifiers: Computerized simulation, Scenarios.

A Navy tactical display associated with surface ship anti-submarine attack control is investigated. The levels of information integration are represented by an operational display system, a developmental display system and an advanced display concept. The experimental technique chosen employs a laboratory simulation of the display systems operated in a simulated tactical and sensor environment by subject operators. The first phase of the research has included: definition of display formats and controls for a multi-mode laboratory display console; development of software for the display console computer; design of a pilot experiment for verifying techniques; definition of man/display effectiveness measures; determination of laboratory procedures; development of an operator training manual; an evalua-

tion of simulation software and experimental procedures. (Author)

AD-748 465/CP PC **E01**/MF **A01**
Air Force Weapons Lab Kirtland AFB N Mex
A Time Resolved X-Ray Spectral Measurement System
Technical rept. 1 Oct 70-1 Dec 71
David J. Johnson. May 72, 52p Rept no. AFWL-TR-72-40

Descriptors: *Plasma medium, *X-ray spectroscopy, *X rays, *Photoelectric cells(Semiconductor), *X-ray filters, Photoelectric cells(Semiconductor), Computer programs, Fluorescence, Acceptability, Detectors, Semiconductors.
Identifiers: ROSSPIN computer program, *Plasma diagnostics, XRADAT computer program.

Computer codes were developed to determine X-ray filter/solid state detector response curves and to reduce filter-detector oscilloscope trace data obtained from pulsed plasma devices.' The first of these codes also generates theoretical X-ray spectra and calculates anticipated detector outputs to aid in unfolding spectra. Eleven Ross filter pairs are also presented which, when used with silicon PIN detectors, give time resolved X-ray spectral information in the energy range from 5 to 67 keV. (Author)

AD-748 626/CP PC **E01**/MF **A01**
Naval Postgraduate School Monterey Calif
GRAPHANT: A FORTRAN Program for the Solution and Graphic Display of Gain and Patterns for Wire and Linear Antennas In the Presence of Lossy Ground
Technical rept.
R. W. Adler, and C. B. Robbins. Jun 72, 127p Rept no. NPS-52AB72061A

Descriptors: *Antenna radiation patterns, *Antenna arrays, *Programming(Computers), Graphics, Ship antennas, Equations of motion, Gain, Computer programs.
Identifiers: GRAPHANT computer program, FORTRAN, Interactive computer graphics.

An interactive computer graphics antenna gain pattern computation and display program for real-world antenna systems is presented. The use of the program as a teaching tool at the Naval Postgraduate School is discussed. Methods for applying the program for the synthesis and design of complex antenna systems are indicated. Research applications include techniques for rapid inspection of gain equations of newly developed antennas. A ship motion model is developed for studying the effects of electrical geometry variations caused gy ship motion in heavy seas on maritime antenna systems and a dynamic presentation of pattern variations is made. (Author)

AD-749 235/CP PC **E01**/MF **A01**
Army Electronics Command Fort Monmouth N J
Power Supply Voltage Monitor for Built-In Test Equipment (BITE) Applications
Research and development technical rept.
Harry A. Wheeler. Aug 72, 20p Rept no. ECOM-4004

Descriptors: *Integrated circuits, Design, *Test equipment(Electronics), Failure(Electronics), Reliability(Electronics), Direct current, Power supplies, Temperature, Test methods, Computer programs.
Identifiers: Voltage monitors, Computer aided analysis, BITE(Built In Test Equipment), *Built-in test equipment.

The report describes the design of a power supply voltage monitor capable of monitoring multiple dc voltages simultaneously, indicating out-of-tolerance voltages on one single lamp. Design data and temperature testing results are included for a given design, as well as a computer program for obtaining data for the design of any additional system to be monitored. (Author)

AD-749 685/CP PC **A17**/MF **A01**
Pacific Missile Range Point Mugu Calif
An Investigation of Synthetic Inductors
Technical pub.
J. A. Means. 14 Aug 72, 399p Rept no. PMR-TP-72-6
Doctoral thesis.

Descriptors: *Coils, Mathematical models, *Inductance, Simulation, Phase shifters, Computer programs, Stability, Circuits, Theses.
Identifiers: Gyrators, Computerized simulation, ROOTLO computer program, Equivalent circuits, IBM 7094 computers, FORTRAN 4 programming language, FORTRAN.

The purpose of this research is to investigate various methods of inductor simulation to characterize and establish the performance constraints of each method. The majority of the methods are shown to produce a driving point impedance function having a single zero and a single pole. Therefore, a generalized equivalent circuit for most of the realizations studied is equivalent to an R-L-R circuit. A program called ROOTLO is developed as an aid in classical stability analysis. Degenerate circuit elements are presented as a conceptual aid in the design process. Several approaches to inductor simulation are investigated. These methods are the capacitively loaded VCT gyrator, the capacitively loaded CVT gyrator, other controlled sources, and the intrinsic parameter approach which does not require an external capacitor. Actual circuits including element values and operating characteristics are included for each realization considered. A brief description of the power inductor is included, and a class B VCT gyrator is given. (Author)

AD-750 590/CP PC **E01**/MF **A01**
Army Missile Command Redstone Arsenal Ala Systems Engineering and Integration Office
A Laplace Transform Amplitude Function Generator Utilizing a Thin Film Semiconductor
Technical rept.
James E. Brown, Jr. 31 Jul 72, 80p Rept no. RC-TR-72-2

Descriptors: *Test equipment, Semiconductor devices, *Semiconducting films, Signal generators, *Integral transforms, Signal generators, Analog-digital computers, Electric fields, Complex variables, Analytic functions, Computer programs.
Identifiers: *Laplace transformation, Thin films, Function generators, Analogs, Analog simulation, Wafers.

The characteristics of many systems can be predetermined by application of an analog. The report was developed to produce a better tool in the area of the electric field analog. It develops as a straightforward proof of the analog existence with the main body being experimental. The experimental area develops in normal form with early familiarization methods through various phases to the final result. The semiconductor can be used with more consistency, and better results, than any present guaranteed device on the market. (Author)

AD-751 019/CP PC **E01**/MF **A01**
Naval Research Lab Washington D C
A FORTRAN Subroutine for Plotting a Smith Chart
Interim rept.
John R. Brinson. Oct 72, 22p Rept no. NRL-MR-2517

Descriptors: *Transmission lines, Electrical impedance, *Computer programs, Instruction manuals, Subroutines, Plotters, Waveguides, Microwave frequency.
Identifiers: FORTRAN, *Smith chart, SMCCHART computer program.

Computer determined waveguide or transmission line parameters can now be shown on a Smith Chart plotted by the subroutine described in the report, saving tedious and time-consuming manual plotting. Also included is a subroutine, ADMTPLT, which selects the data to be plotted on the Smith Chart. All control for the plotting of the charts and the data to be plotted is implemented in the main program. The effect of varying one parameter in the computation of data may be investigated by plotting more than one set of data on each chart. Appendix A shows the development of the algorithms for plotting the Smith Chart, and Appendix B shows the FORTRAN subroutine in a demonstration program. A sample plot is shown. (Author)

AD-751 518/CP PC **E01**/MF **A01**
IBM Federal Systems Div Owego N Y Electronics Systems Center
SCEPTRE Support II. Volume I. Revised User's Manual (Supplement)
Final rept. 15 Apr 70-1 Jul 72
Stephen R. Sedore, and Allen I. Wright. Sep 72, 60p AFWL-TR-69-77-Vol-1-Suppl
Contract F29601-70-C-0038
Supplement to AD-882 384.

Descriptors: *Integrated circuits, *Radiation damage, *Programming(Computers), Instruction manuals, Nuclear radiation, Transients, Mathematical models, Corrections.
Identifiers: SCEPTRE computer program, *Transient radiation effects(Electronics), FORTRAN 4 programming language, FORTRAN, Equivalent cirvuits, IBM 7094 computers, IBM 360 computers.

The report is intended to serve as a supplement to the SCEPTRE User's Manual, AFWL-TR-69-77, Volume I, and also as a final report for Contract F29601-70-C-0038. The content of section 2 should be considered as additions to the existing manual, while section 3 contains information to replace cited portions of the manual. The remainder is the final report that describes in detail the improvements to the program that were added during the contract period. (Author)

AD-751 519/CP PC **E01**/MF **A01**
IBM Federal Systems Div Owego N Y Electronics Systems Center
Mathematical Formulation of SCEPTRE
Technical rept. 15 Apr 70-1 Jul 72
Stephen R. Sedore, and John R. Sents. Sep 72, 70p AFWL-TR-72-77
Contract F29601-70-C-0038

Descriptors: *Electrical networks, Radiation damage, *Programming(Computers), Radiation damage, Integrated circuits, Nuclear radiation, Transients, Mathematical models, Matrix algebra, Integration.
Identifiers: SCEPTRE computer program, Transient radiation effects(Electronics), FORTRAN 4 programming language, FORTRAN, IBM 7090/94 computers, Truncation errors, Newton-Raphson method.

SCEPTRE is a general DC and trainsient analysis FORTRAN 4 program with a capability for handling radiation effects circuit analysis problems. The report contains the theory and formulation that provides a basis for SCEPTRE and a description including flow diagrams of the program operation. (Author)

AD-751 658/CP PC **E01**/MF **A01**
Naval Postgraduate School Monterey Calif

A Computer Model for Rapid Solutions and Visual CRT Display of Radiation Patterns for Arbitrarily Orientable Yagi-Uda Arrays Operating over Lossy Ground or In Ship-Ocean Environments
Master's thesis
Edward Elvis Kennedy. Jun 72, 129p

Descriptors: *Antenna arrays, Mathematical models, Yagi antennas, Electrical impedance, Antenna radiation patterns, Gain, Optimization, Computer programs, Theses.
Identifiers: Computerized simulation, Computer graphics, FORTRAN, SDS-9300 computers.

An arbitrarily orientable Yagi-Uda array antenna was modeled, and a computer simulation run to obtain the input impedance, gain pattern and front-to-back ratio of various arrays. The model made provisions for the antenna to be operated over either a lossy ground plane or aboard a ship in seas of specified state. Quick solution turn-around, with CRT display, enabled relatively rapid optimization of numerous arrays. Theory, resultant optimal designs and performances, photographs, and program listing are included. (Author)

AD-752 474/CP PC **E01**/MF **A01**
Harvard Univ Cambridge Mass Div of Engineering and Applied Physics
Three-Term Exponential Product Solution for the Current on Dipole Antennas In Homogeneous Isotropic Media
Technical rept.
S. R. Mishra. Jun 72, 49p Rept no. TR-636
Contract N00014-67-A-0298-0005

Descriptors: *Dipole antennas, Electric currents, Admittance, Integral equations, Integration, Computer programs, Exponential functions.
Identifiers: Periodic functions, Current distribution, Charge distribution, FORTRAN 4 programming language, FORTRAN.

Hallen's integral equation for the current on a perfectly conducting dipole immersed in an infinite, homogeneous, isotropic, dissipative medium is treated using a simplified form of the trigonometric solution. The form of the solution is an approximation to the rigorous King-Sandler-Wu (K. S. W.) solution and is more suitable from the engineering standpoint. Calculations made for electrical lengths beta H up to 3 pi/2 and for alpha/beta up to 1 are reported and are seen to agree well with the experimental results of Scott and the theoretical results predicted by the K. S. W. theory. It is expected that the theory will also be applicable to larger values of alpha/beta. (Author)

AD-752 561/CP PC **E01**/MF **A01**
New Mexico Univ Albuquerque Bureau of Engineering Research
A Radiation Effects Research Program
Annual rept. 1 Sep 71-31 Aug 72
W. W. Grannemann, R. C. Allen, Jr, L. T. Boatwright, W. J. Byatt, and G. M. Wing. Sep 72, 144p Rept no. EE-199(72)ONR-005
Contract N00014-68-A-0158

Descriptors: *Semiconductors, Radiation damage, *Semiconductor devices, Radiation damage, Band theory of solids, Atomic energy levels, Silicon, Transport properties, Phonons, Wave functions, Transistors, Gallium arsenides, Phosphides, Dielectrics, Capacitors, Indium antimonides, Tellurium, Manufacturing methods, Electron bombardment, Ion bombardment, Titanium compounds, Dioxides, Semiconducting films, Computer programs.
Identifiers: Gallium phosphides, Light emitting diodes, Ion implantation, Thin films, FORTRAN, FORTRAN 4 programming language, Invariant imbedding, Augmented plane wave method, Muffin tin potentials.

Contents:
Invariant imbedding applied to the solution of transport problems with internal sources - The ill-behaved reflection function case;
Energy levels and density of states in three-dimensional crystals;
Band structure of silicon by the APW method;
Wave functions in semiconductors;
Thermal oxidation of gallium arsenide phosphide;
Radiation effects on GaAsP MIS capacitors;
Open-tube Zn-diffused GaAs(1-x)P(x) light-emitting diodes;
A study of GaAs(1/2)P(1/2) MIS capacitors fabricated by using electron-beam-evaporated aluminum oxide;
Electron and neutron radiation effects on electron-beam evaporated high-mobility thin films of indium antimonide;
Fabrication of p-type tellurium thin-film transistors using photoengraving and anodized Al2O3 techniques;
Pulsed electron beam bombardment of semiconductor materials;
Metal-insulator-semiconductor structures created by ion implantation;
Metal-TiO2-silicon structures;
Hybrid radiation-hardened line-driver amplifier;
Radiation testing accessories designed for use during electron-beam tree experiments.

AD-752 600/CP PC **E01**/MF **A01**
Braddock Dunn and Mcdonald Inc El Paso Tex
NET-2 Network Analysis Program
Users's manual
Allan F. Malmberg. Sep 72, 149p
Contract DAAG39-70-C-0050

Descriptors: *Electrical networks, Mathematical models, *Programming(Computers), Instruction manuals, Diodes(Semiconductor), Gates(Circuits), Field effect transistors, Statistical analysis, Distribution functions, Radiation effects, Neutron flux, Monte Carlo method, Curve fitting.
Identifiers: NET 2 computer program, CDC 6600 computers, IBM 360 computers, FORTRAN, FORTRAN 4 programming language, *Network analysis theory, Equivalent circuits.

The report constitutes the User's Manual for the Release 8 version of the NET-2 Network Analysis Program. It supersedes the Preliminary User's Manual which was published in May, 1970. The present report includes some additional circuit elements for special purpose modeling.

AD-752 933/CP Not available NTIS
Michigan Univ Ann Arbor Dept of Electrical Engineering
Computer-Aided Network Design: Revised Edition
Donald A. Calahan. 1972, 362p AFOSR-TR-72-2383
Contract AF-AFOSR-2027-71
See also preliminary edition dated Jan 68, AD-672 378. International Standard Book No. 07-009601-5.
Availability: Hard copy available from McGraw-Hill Book Co., New York, N. Y. $13.95.

Descriptors: *Electrical networks, Design, Transients, Sensitivity, Circuits, Partial differential equations, Matrix algebra, Numerical analysis, Mathematical models, Transistors, Diodes(Semiconductor), Integral transforms, Graphics, Computer programs, Textbooks.
Identifiers: *Network analysis theory, *Network synthesis, *Computer aided design, Sensitivity analysis, Graph theory.

Contents:
Network design by computer;
Analysis of linear networks;
Nonlinear DC circuit analysis;
Transient analysis of dynamic networks;
Sensitivity calculations;
Automatic design;
Tolerance analysis;
Introduction to advanced techniques of equation formulation;
Advanced numerical techniques in transient analysis;
Sparse matrix procedures and related topics;
Network optimization methods;
Time-domain sensitivity calculation.

AD-753 413/CP PC **A12**/MF **E02**
General Electric Co Syracuse N Y
Simplified Modeling of Integrated Circuits for Radiation Performance Prediction
Technical rept. Feb 71-Feb 72
J. R. Greenbaum. Nov 72, 274p* AFWL-TR-72-42
Contract F29601-71-C-0049

Descriptors: *Integrated circuits, *Radiation damage, *Logic circuits, Radiation damage, Computer programs, Numerical analysis, Mathematical models, Shift registers, Gates(Circuits), Relaxation oscillators, Gamma rays, Neutron reactions.
Identifiers: Computerized simulation, SCEPTRE computer program, Operational amplifiers, Flip flops.

The report describes a simple method for developing computer models for digital and analog integrated circuits. The models are capable of allowing computer prediction of both normal performance and performance when the devices are exposed to gamma and neutron radiation environments. Device models have been developed for two NAND gates, two flip-flops, one four-bit Shift Register, a Monostable Multivibrator, an AND-OR-INVERTER, and two operational amplifiers. All models are demonstrated to agree with observed laboratory performance for conditions of pulsed gamma radiation of 3 x 10 to the 10th power rads (Si)/Second. Neutron fluence levels of 1.2 x 10 to the 14th power neutrons per square centimeter, as well as non-radiation conditions. The 'black box' technique is employed for model development. The model descriptions were developed for use with the SCEPTRE circuit analysis program. (Author)

AD-753 666/CP PC **E01**/MF **A01**
Air Force Inst of Tech Wright-Patterson AFB Ohio School of Engineering
Nuclear Thermal Vulnerability of Honeycomb Radome Materials
Master's thesis
Michael V. Bell. Dec 72, 85p Rept no. GNE/PH/73-1

Descriptors: *Radomes, Vulnerability, *Sandwich panels, Thermal stability, Honeycomb cores, Nuclear explosion damage, Thermal radiation, Coatings, Carbon black, Synthetic rubber, Isocyanate plastics, Theses, Computer programs, Aircraft equipment.
Identifiers: RATEMP computer program.

The thermal vulnerability levels of honeycomb sandwich radome panels were determined by using quartz iodide lamps to irradiate the panels in a wind tunnel. The lamps and wind tunnel simulated a thermal pulse on a flying aircraft. The radome panels were tested with lampblack, neoprene, and polyurethane coatings. The pulses delivered the thermal energy of up to 29.9 cal/sq cm sec peak flux and 94.3 cal/sq cm total fluence. (Author)

AD-753 908/CP PC **E01**/MF **A01**
Air Force Academy Colo
Steady State Shape of Orbiting Trailing Wire System
Research rept.

Terry D. Hinnerichs, and Steven A. Crist. Oct 72, 36p Rept no. USAFA-RR-72-7

Descriptors: *Cables(Mechanical), Aerodynamic characteristics, *Antennas, Towed bodies, Towing planes, Turning flight, Flight paths, Towed bodies, Lift, Drag, Equilibrium, Mathematical models, Computer programs.
Identifiers: Computer aided analysis, FORTRAN, FORTRAN 4 programming language, T-29 aircraft.

The computer program described in this report simulates the spiral curve of a wire being towed behind an orbiting aircraft after steady state conditions have developed. Taking the case of a wire and drogue device towed by an aircraft in a constant orbit at a constant altitude, the authors divided the wire into n segments. Then each segment was treated as being in static equilibrium. Starting at the drogue end where all forces are known, general equations were derived which could be applied to each cable segment proceeding up to the aircraft. These equations were then programmed in Fortran 4 language. The results of this program's simulation of a USAF T-29 towing a wire are shown. (Author)

AD-753 914/CP PC **E01**/MF **A01**
E-Systems Inc Falls Church Va Melpar Div
Dielectric Lens Model
Final technical rept.
Philip L. Bachman. Nov 72, 131p 1057.00100, RADC-TR-72-299
Contract F30602-71-C-0129

Descriptors: *Lens antennas, Dielectrics, Antenna feeds, Electromagnetic lenses, Superhigh frequency, Extremely high frequency, Horn antennas, Lasers, Simulation, Antenna arrays, Computer programs, Antenna radiation patterns, Military satellites, Space communication systems.
Identifiers: Dielectric lenses, *Microwave antennas, Computer aided design, Computerized simulation, FORTRAN.

A study was conducted to determine the design and measure the performance of phase-corrected horn antennas employing the dielectric lenses. The objective is to provide data for a dielectric lens antenna system to be evaluated in a satellite communications link. The frequency range of interest is from 15 to 60 GHz with maximum interest from 20 to 30 GHz. Computer programs were used to design lenses having two refracting surfaces and uniform amplitude distributions across the apertures for linked styrene for the lens material. Their performance was measured both individually and in array combinations, and the performance of larger arrays was predicted. (Author)

AD-754 099/CP PC **E06**/MF **E03**
Naval Underwater Systems Center Newport R I
An Analysis of Some Factors that Affect Hydrophone Sensitivity
Technical rept.
John W. Frye, and Michael A. Tucchio. 2 Nov 72, 77p* NUSC-TR-4317, CPG-73-0041

Descriptors: *Hydrophones, Sensitivity, *Piezoelectric transducers, Structural properties, Piezoelectric effect, Elasticity, Loading(Mechanics), Stresses, Fourier analysis, Matrix algebra, Computer programs.
Identifiers: Finite element analysis, MARTSAM 2 computer program, UNIVAC 1108 computers, Hydrophone arrays, FORTRAN, AN/BQR-7.

The report presents a finite-element shell analysis of a hydrophone using the MARTSAM II program in a UNIVAC 1108 computer. In addition to the piezoelectric and elastic properties of the materials, the effects of end-cap geometry and physical properties were considered. Loading was applied as a train of plane waves acting directly on the surface, and no interaction with the surrounding water was considered. Both the theoretical development and formulation of the MARTSAM II program are presented. The analysis indicates that the performance of present-day hydrophones could be readily improved by modifying the geometry and material of end caps to minimize discontinuity stresses and fringing effects at the end-cap/cylinder junction. (Author)

AD-754 263/CP PC **E01**/MF **A01**
Stewart Research Enterprises Los Altos Calif
Circuit and Radiation Effects Analysis by Iterated Propagation of Bivariable Response Functions
Technical rept. Feb 71-Apr 72
Robert G. Stewart, and Peter S. Castro. Nov 72, 260p AFWL-TR-72-76
Contract F29601-71-C-0039

Descriptors: *Integrated circuits, *Radiation damage, *Computer programs, Instruction manuals, Mathematical models, Transfer functions, Neutron reactions, Logic circuits, Graphics, Gates(Circuits), Gamma rays.
Identifiers: SAP computer program, Computerized simulation, Computer graphics, SCEPTRE computer program, UNIVAC 1108 computers, CDC 6600 computers.

Radiation effects analysis of complex electronic circuits by computers presently is limited by core storage and long execution times. A new method, entitled Iterated Propagation of Bivariable Response Functions, treats components in the block sense using experimentally obtained time domain response or transfer functions. These functions are described in a three dimensional space of the input stimuli, output response, and time, by means of fitting the experimental data with cubic polynomials matched in the spline sense at interstices of the fitting grid. The basic data was obtained using conventional oscilloscopic techniques at the Kirtland AFB, flash X-ray facility and the Sandia pulse reactor. A UNIVAC 1108 computer program called SAP, adapted to work with SCEPTRE, uses a modified convolution process to calculate the electrical and the gamma and neutron radiation responses from the surface descriptions. (Author)

AD-754 348/CP PC **E01**/MF **A01**
Naval Postgraduate School Monterey Calif
The Effect of Roll and Pitch on Antenna Radiation Patterns
Master's thesis
Stanley Robert Szemborski. Sep 72, 191p*

Descriptors: *Ship antennas, Motion, *Antenna radiation patterns, Computer programs, Mathematical models, Simulation, Numerical analysis, Theses.
Identifiers: Computerized simulation, Computer graphics.

The strength of an incoming signal to a shipboard communications station is measured. The variations in this signal are analyzed for various conditions of roll, pitch, and signal direction. Graphs and computer outputs are used to present the magnitude and randomness of these signal variations. A smooth surface approximation is used to simulate the problem, and this simulation is compared to observed data. (Author)

AD-754 637/CP PC **E01**/MF **A01**
Ohio State Univ Columbus Electroscience Lab
An Investigation of the Effects of a Lossy Earth on Antenna Patterns at VHF
Technical rept.
Edward H. Newman. Dec 72, 76p HDL-3281-1
Contract DAAG39-72-C-0041

Descriptors: *Loop antennas, Antenna radiation patterns, Very high frequency, Alignment, Attenuation, Computer programs.
Identifiers: Electrically small antennas, Lossy materials, Far field.

The objective of the report is to theoretically investigate the potential of several low profile antennas for use at or near ground level locations, as compared with a quarter wavelength monopole. Of specific interest is the radiated field intensity at low elevation angles produced by VHF multiturn loop antennas having various orientations with respect to a flat lossy earth. (Author)

AD-754 782/CP PC **E01**/MF **A01**
Naval Weapons Lab Dahlgren Va
Stereo Antenna Patterns from Principal Plane Patterns
Technical rept.
Joseph H. Halberstein. Nov 72, 29p Rept no. NWL-TR-2812

Descriptors: *Antenna radiation patterns, Integral equations, Integration, Computer programs, Antenna apertures, Gain.
Identifiers: Trigonometric functions.

In most antenna applications, it is sufficient to consider antenna patterns in two dimensions only, mostly the two-dimensional patterns in the principal planes. When antennas are considered from the electromagnetic compatibility (EMC) and electronic countermeasures (ECM) point of view, the STEREO-three-dimensional patterns become of interest. The question then arises whether it is possible to obtain the gain in an arbitrary direction from the gain patterns as measured in the two principal planes. The report answers this question in the affirmative for rectangular apertures and in the angular region around the antenna where its pattern is adequately represented by an aperture integral. (Author)

AD-754 964/CP PC **E01**/MF **A01**
Stanford Research Inst Menlo Park Calif
Transmission Line Models for Use with Computer-Aided Circuit Analysis Codes
Technical rept. 27 Oct 71-27 Oct 72
M. Lattimer Wright, and Leonard S. Gasiorek. Dec 72, 155p AFWL-TR-72-178
Contract F29601-72-C-0019
Sponsored in part by Defense Nuclear Agency, Washington, D. C.

Descriptors: *Transmission lines, Radiation damage, *Programming(Computers), Radiation damage, Mathematical models, Circuits, Semiconductor devices, Computer programs, Graphics, Neutron reactions, Ionization.
Identifiers: SCEPTRE computer program, Computer aided analysis, Network analysis theory, Network flows, FORTRAN, CDC 6600.

A model was developed for the class of n-conductor transmission lines for use with the SCEPTRE computer program. The model will reproduce the normal electrical performance of the line and is amenable to modifications that will reproduce the effects of an environment of ionizing, EMP, and neutron radiation. The model is based on the fact that wave propagation on a multiconductor cable can be characterized by orthogonal, independent modes. Each of these modes can then be modeled as a single, independent transmission line. These lines, representing the modes, are connected to terminal-to-mode and mode-to-terminal converters at each end of the line. Thus, the overall model represents the terminal-to-terminal electrical behavior of an actual n-conductor cable. The model was verified by comparing the computer-calculated and experimentally measured responses of a three-conductor, two-transmission-line structure. The report includes a CDC 6600 FORTRAN computer program to reduce

the measurement data required to derive the model parameters. (Author)

AD-755 166/CP PC **E01**/MF **A01**
University of South Florida Tampa
SCEPTRE Translator Feasibility Study
Final technical rept.
James C. Bowers, John E. O'Reilly, Jr, Gary A Shaw, and Richard D. Tabbutt. 23 Jan 73, 80p
Contract DAAA21-72-C-0760

Descriptors: *Programming(Computers), *Compilers, *Electrical networks, Mathematical analysis, *Springs, Equations of motion, Transformations, Differential equations, Transfer functions, Mathematical models, Data processing systems, Kinematics, Statics, Dynamics, Graphics, Thermal radiation, Transients, Interfaces, Feasibility studies.
Identifiers: SCEPTRE computer program, Translator routines, FORTRAN 4 programming language, FORTRAN, Network analysis theory, Transient radiation effects(Electronics), IBM 7094 computers, IBM 360 computers, CDC 6600 computers, UNIVAC 1108 computers.

The basic objectives of the research are to investigate the feasibility of and determine the best input format for a SCEPTRE translator capable of providing a point-to-point input of one-dimensional mechanical systems to the SCEPTRE compiler. The objectives have been realized by studying the SCEPTRE program. The compiler accepts point-to-point (or node-to-node) input of electrical elements of resistance, capacitance, inductance, voltage sources, and current sources. The ability of SCEPTRE to formulate differential equations from a topological description of an electrical circuit and to solve these equations with such programming ease on the user's part, prompted the search for electrical analogs with point-to-point mechanical systems for direct input through a SCEPTRE translator. The search was directed toward one-dimensional systems since electrical circuits processed by SCEPTRE are actually only one-dimensional current flow networks (i.e. current can flow in only one dimension, thus current is a scalar quantity.) With this approach in mind, the mathematical formulation of an acceptable mechanical to electrical (here-in denoted mechano-electrical) analog is established. (Author)

AD-756 470/CP PC **E01**/MF **A01**
Ohio State Univ Columbus Electroscience Lab
Analysis and Design of Special Antenna Configurations
Contract rept.
G. A. Richards, J. H. Richmond, and N. H. Geary. Nov 72, 130p BRL-CR-81
Contract DAAD05-69-C-0031

Descriptors: *Antenna configurations, Numerical analysis, Loop antennas, Design, Computer programs, Electrical impedance, Gain, Radio fields.
Identifiers: FORTRAN 4 programming language, FORTRAN.

A new reaction solution was formulated for three-dimensional wire antennas located in free space or over a ground plane, using a piecewise-sinusoidal expansion for the unknown current distribution on the antenna. A set of linear equations was developed for solution by a digital computer. Impedance, radiation efficiency, field patterns, gain, and directivity can be calculated. Computer programs based on this new formulation were used to determine the impedance versus frequency for various loop antennas. Verification of the calculations with experimental results showed that the technique is highly accurate not only for the impedance but also for the current distribution. Calculated and measured results for several three-dimensional dipoles and a square halo antenna are also given. (Author)

AD-756 503/CP PC **E01**/MF **A01**
Center for Naval Analyses Arlington Va
A Computationally Simplified Pair-Exchange Algorithm for the Quadratic Assignment Problem
Charles H. Heider. Nov 72, 31p Rept no. CNA-Professional Paper-101

Descriptors: *Circuit interconnections, Optimization, *Programming(Computers), Algorithms, Matrix algebra, Transformations, Permutations, Computer programs.
Identifiers: *Quadratic assignment problem, Computer aided design, FORTRAN 4 programming language, FORTRAN, CDC 3800 computers.

Recently, considerable interest has been generated in efficient quadratic assignment problem algorithms as a result of computer-aided design automation system projects. Currently available QAP algorithms can be characterized as being computationally complex and requiring medium to large scale computers for implementation. Computer-aided design applications, however, are frequently centered around small process control computers with limited available memory so that the more sophisticated QAP procedures cannot be used. The paper presents a computationally simplified pair-exchange algorithm which has proven to be comparable with the currently available QAP algorithm and which is implementable on a small computer. A CDC 3800 FORTRAN 4 subroutine listing is included. (Author)

AD-756 520/CP PC **E01**/MF **A01**
Naval Postgraduate School Monterey Calif
IMPATT Diode Amplifier
Master's thesis
Charles Thomas Key. Dec 72, 36p

Descriptors: *Microwave amplifiers, *Avalanche diodes, Silicon, Tests, Theses, Computer programs.
Identifiers: *IMPATT diodes.

A high performance IMPATT diode test circuit was developed which is very effective in reducing spurious oscillations of the diode under test by controlling the impedance presented to the diode by the circuit. In this circuit, a 10 GHz silicon diode was tested as an amplifier with power gains in excess of 20 db. (Author)

AD-756 537/CP PC **E01**/MF **A01**
Naval Postgraduate School Monterey Calif
A Computer Technique for Near-Field Analysis of an Ultrasonic Transducer
Master's thesis
Carlton Albert Griggs. Mar 73, 60p

Descriptors: *Piezoelectric transducers, Acoustic properties, *Ultrasonic radiation, Diffraction, Computer programs, Test methods, Fourier analysis, Integral transforms, Transfer functions, Test equipment, Theses.
Identifiers: Computer aided analysis.

A computer technique for obtaining near-field cross-section views of an ultrasonic field is presented. The technique is applied to ultrasonic transducer radiation patterns with sample contour drawings of several cross-sections. A spatial frequency spectrum formulation of diffraction theory is chosen for the computations which are performed with the aid of a fast Fourier transform routine. By experimentation an actual ultrasonic field was generated using a quartz transducer and the field was measured in a cross-sectional plane. A computer generated drawing of the measured data is compared to the drawing of a computer generated prediction of the field at the same plane. (Author)

AD-756 575/CP PC **E01**/MF **A01**
Naval Postgraduate School Monterey Calif
A Symbolic Sensitivity Computation Algorithm
Master's thesis
John Hale Daniel. Dec 72, 57p

Descriptors: *Electrical networks, Sensitivity, *Computer programs, Instruction manuals, Polynomials, Graphics, Partial differential equations, Mathematical models, Algorithms, Theses.
Identifiers: Sensitivity analysis, *Network analysis theory, FORTRAN, NASAP computer program, IBM 360/67 computers.

A study and pursuant development is described of a digital computer program for the computation of transfer function sensitivities in a symbolic form suitable for storage and subsequent repetitive numerical evaluation over a range of frequencies or parameter values. The algorithm is implemented in conjunction with the FORTRAN IBM 360/67 Network Analysis for Systems Applications Program (NASAP) developed by R. S. Schwartz at Northeastern University. Several example problems, as well as suggestions for possible improvement of the algorithm and its extrapolation into the areas of optimization and automatic design, are included. (Author)

AD-756 862/CP PC **E01**/MF **A01**
Army Electronics Command Fort Monmouth N J
Noise Quality Investigation of Various Microwave Devices
Research and development technical rept.
Calvin D. Bates. Jan 73, 34p Rept no. ECOM-4070

Descriptors: *Noise generators, Microwave equipment, Crossed field devices, Power spectra, Probability density functions, Computer programs.

Measurements are described for investigating various microwave devices. A computer program was modified to assess the experimental probability density function (PDF) between various sigma values. Experimental results on four different devices are included and demonstrate the utility of the measurement scheme and the computer results. Gaussian, broadband noise electron beam sources were demonstrated and a solid-state noise source investigated with respect to PDF quality. (Author)

AD-756 875/CP PC **E01**/MF **A01**
Army Missile Command Redstone Arsenal Ala Advanced Sensors Directorate
Computer-Aided Optimization of Microwave Circuits
Technical rept.
William Gary Briscoe. Jan 73, 166p* Rept no. RE-73-3

Descriptors: *Circuits, Design, Microwave equipment, Computer programs, Band-pass filters, Mixers(Electronics), Optimization.
Identifiers: *Computer aided design, Computerized simulation, Network synthesis, FORTRAN, MUPROF computer program.

A new optimization method called the MUltiple PROjected Fibonacci (MUPROF) search is developed and applied to the design of microwave circuits. The MUPROF search is an elimination type direct search method. It is an extension of the projected Fibonacci search devised by Krolak and Cooper and requires about one-tenth the computation time required by the projected Fibonacci search. A wide variety of microwave circuits can be designed by using the MUPROF search to find the optimum values for up to six design variables of a microwave circuit. The complete design optimization program for microwave circuits is formed by combining the optimization program with a general microwave circuit analysis subroutine. (Author Modified Abstract)

AD-757 442/CP Reprint
Army Electronics Technology and Devices Lab Fort Monmouth N J
Let a Computer Design Your i-f Amplifier
Randolph A. Reitmeyer, Jr. 1972, 5p
Availability: Pub. in Electronic Design, 16 Mar 72.

Descriptors: *Radiofrequency amplifiers, Design, Computer programs, Integrated circuits, Field effect transistors.
Identifiers: RFAMP computer program, Computer aided design, FORTRAN, Network synthesis, A.

The report describes a modified FORTRAN program called RFAMP to simplify and speed the design of i-f amplifiers that use transistors and integrated circuits.

AD-757 485/CP PC **E01**/MF **A01**
Raytheon Co Waltham Mass Research Div
Analysis of Interdigital Transducers for Acoustic Surface Wave Devices
Final rept. 15 Dec 71-14 Dec 72
Roger H. Tancrell, and Frank Sandy. 14 Mar 73, 30p S-1524, AFCRL-TR-73-0030
Contract F19628-72-C-0137

Descriptors: *Piezoelectric transducers, Acoustic properties, Programming(Computers), Impedance matching, Curve fitting, Time-lag theory, Fourier analysis, Integral transforms, Electrical properties, Performance(Engineering), Least squares method.
Identifiers: Surface waves, *Acoustic surface waves, Interdigital transducers, FORTRAN 4 programming language, FORTRAN, CDC 6600 computers, COMBS computer program, MATCH computer program, TRANS computer program, LMSFT computer program, ACOUST computer program, Fast Fourier transform, Equivalent circuits, AF.

A computer program has been written for the theoretical analysis of interdigital transducers for acoustic surface wave devices. The theory is based on an equivalent circuit model for the acousto-electric interactions. Results are presented in both the frequency and time domains. The program can analyze any general transducer geometry. The program is written in Fortran IV for the CDC 6600 computer. (Author)

AD-758 519/CP PC **E01**/MF **A01**
Naval Postgraduate School Monterey Calif
Thin Film Pb(0.9)Sn(0.1)Se Photoconductive Infrared Detectors, Metallurgical and Electrical Measurements
Master's thesis
William Godfrey McBride, Jr. Dec 72, 88p

Descriptors: *Infrared detectors, Electrical properties, *Semiconducting films, Photoconductivity, Lead compounds, Tin compounds, Selenides, Vapor plating, Annealing, Thickness, Crystal structure, Band theory of solids, Carriers(Semiconductors), Hall effect, Computer programs, Theses.
Identifiers: Lead selenides, Tin selenides, N.

Pb(0.9)Sn(0.1)Se thin films were deposited onto cleaved (111) CaF2 and BaF2 substrates by either an open one-boat evaporation method or a Knudson type graphite boat method. Photoconductivity was observed after isothermal annealing in Pb/Sn rich vapor to reduce their carrier concentrations to the mid-10 to the 16th power to mid-10 to the 17th power range. At 100K, 500K blackbody responsivities up to 60V/W have been developed, compared with the best blackbody responsivities around 100-125 V/W reported for commercial photo-voltaic detectors of Pb(1-x)Sn(x)Te operated at 77K. (Author Modified Abstract)

AD-758 883/CP PC **A03**/MF **A01**
Northrop Research and Technology Center Hawthorne Calif
Evaluation of Semiconductor Device Analysis Using the Net-2 Computer Program
Final rept. Feb-Oct 72
J. P. Raymond, and M. G. Krebs. Oct 72, 46p*
NRTC-72-6R, HDL-065-1
Contract DAAG39-72-C-0065

Descriptors: *Semiconductor devices, *Radiation damage, *Integrated circuits, Radiation damage, Mathematical models, Electrical properties, Microminiaturization(Electronics), Diodes(Semiconductor), Transistors, Gates(Circuits), Numerical analysis, Computer programs.
Identifiers: NET-2 computer program, CDC 6600 computers, Transient radiation effects(Electronics), Metal oxide semiconductors, A.

An evaluation of the capability of the NET-2 Circuit/System Analysis Computer Program to perform analysis of radiation effects on complex semiconductor devices and microcircuits is presented. The mathematical models considered include both the terminal built-in models and Linvill lumped models of bipolar and MOS devices. Computations of electrical performance and transient radiation-induced response are performed and compared to available exact results. The derivation of complex models for the elements of a junction-isolated bipolar microcircuit (including the multiple emitter transistor) is demonstrated as well as the analysis of a complete junction-isolated TTL Gate microcircuit. NET-2 capabilities in terms of computer run times, numbers of circuit elements allowed, and accuracy of solution are discussed. Device analysis examples include a p-n junction diode and an intrinsic lumped model p-n-p transistor. (Author)

AD-759 031/CP PC **E01**/MF **A01**
Pennsylvania State Univ University Park Ordnance Research Lab
Adaptive High Q Notch Filter
Technical memo.
Lynn A. Poole. 15 Aug 72, 103p Rept no. TM-72-231
Contract N00017-70-C-1407
Master's thesis.

Descriptors: *Band-pass filters, Design, Reverberation, Doppler effect, Transfer functions, Real time, Circuits, Computer programs, Theses, Transients.
Identifiers: *Notch filters, Signal processing, Adaptive filters, Equivalent circuits, N.

The report develops the information, techniques, and circuitry for the realization of an adaptive notch filter. The principal application, considered in the filter design, was for the operation of the adaptive notch in conjunction with a real time signal processor. The design equation expresses the circuit components for the independent control of the filter response in terms of the desired filter characteristics of notch width, notch depth, and center frequency. The experimental evaluation includes the adaptive characteristics, the transient behavior associated with the adaptation of the filter as well as the usual characteristics of system bandwidth, self noise, dynamic range and performance variation with temperature. The achieved performance establishes high expectations for the incorporation of an adaptive notch in a real time signal processor. (Author)

AD-759 701/CP PC **E01**/MF **A01**
Stanford Univ Calif Stanford Electronics Labs
Computer-Generated Loci on Smith Charts to Aid Amplifier Design
Technical rept.
Nelson N. Chan. Mar 73, 59p Rept nos. SU-SEL-73-008, TR-4825-7
Contract N00014-67-A-0112-0038

Descriptors: *Power amplifiers, Design, Electrical impedance, Gain, Plotters, Mathematical models, Computer programs.
Identifiers: Computer aided design, Smith charts, N.

The design of amplifier systems is greatly facilitated by the use of computers. An amplifying element is often represented by a linear two-port model, which is characterized by a set of s-parameters at a particular frequency or at a set of discrete frequencies. With the s-parameters, it is possible to plot loci of constant power gain and loci of constant imput impedance on a load-reflection-coefficient plane (Smith Chart). With these plots, the designer can conveniently select the appropriate load to obtain the desired power gain and input impedance of the amplifier system at the frequency of interest. The HP9810 calculator and its associated plotter have been programmed to generate the above mentioned loci directly on a Smith Chart. The input data consists of only the s-parameters of the two port. These plots are simple and informative and can be obtained in a matter of minutes. (Author)

AD-760 009/CP PC **E01**/MF **A01**
New Mexico Univ Albuquerque Bureau of Engineering Research
Investigations of Metal-Buried Silicide-Silicon Structures and Metal-Titanium Oxide-Silicon Structures
Technical rept.
R. J. Kopp, and W. W. Grannemann. May 73, 178p Rept no. EE-203(73)ONR-005
Contract N00014-68-A-0158

Descriptors: *Capacitors, Manufacturing methods, *Field effect transistors, Radiation damage, *Semiconductor devices, Capacitors, Silicon dioxide, Silicon, Titanium compounds, Oxides, Ion bombardment, Electrical properties, Nuclear radiation, Computer programs.
Identifiers: Metal insulator semiconductor capacitors, Titanium oxides, Ion implantation, FORTRAN, N.

Various MIS (metal-insulator-semiconductor) capacitors were fabricated on single-crystal silicon substrates. Widely differing insulator-material films and processing techniques were used in the construction of these capacitors. These MIS structures were used as test vehicles in several investigations of selected practical and theoretical problems of present engineering interest. Electrical and physical characterizations of these systems are presented along with some modeling of insulator-film bulk properties and properties of the insulator-semiconductor interface regions. Also presented are the chemical, physical, and photolithographic processing methods used in the construction of these MIS structures. (Author Modified Abstract)

AD-760 544/CP PC **E01**/MF **A01**
Clarkson Coll of Technology Potsdam N Y Dept of Electrical and Computer Engineering
An Experimental Study of Noise in MNOSFET Devices
Phase completion rept.
Robert F. Cotellessa, and Peter C. Hart. Jan 73, 135p RADC-TR-72-346
Contract F30602-72-C-0463

Descriptors: *Semiconductor devices, Noise(Radio), *Field effect transistors, Noise(Radio), Theory, Voltage, Test methods, Test equipment, Computer programs, Instruction manuals.
Identifiers: Metal nitride oxide semiconductors, Metal insulator semiconductors, AF.

The theory of the operation of metal-nitride-oxide-semiconductor field effect transistors (MNOSFET's) is briefly presented, as is the theory of noise in metal-insulator-semiconduc-

tor field effect transistors (MISFET's). The noise theory, as developed for a MISFET device, shows the noise to be dependent upon both the gate-to-source voltage and the threshold voltage. Since a MNSOFET device is a variable thresholding device, it is probable that the noise of such a device would be dependent upon the state of the device. Indeed, this has been shown to be the case. An experimental investigation of the noise of the MNOSFET device is accomplished using a digital spectral analysis measurement system. The measurement system is based upon a digital correlation analysis followed by a computation of a fast Fourier transformation in order to obtain the noise power spectrum. (Author)

AD-761 471/CP PC **E01**/MF **A01**
Naval Postgraduate School Monterey Calif
Computer Solution of Hallen's Equation on Multi-Element Arrays Employing the Two Term Approximate Current Distribution
Master's thesis
Charles William Schillinger. Mar 73, 59p

Descriptors: *Antenna arrays, Numerical analysis, *Programming(Computers), *Integral equations, Computer programs, Antenna radiation patterns, Gain, Admittance, Electrical impedance, Theses.
Identifiers: Moments method, N.

The objective of the analytical study was to develop a rapid theoretical analysis on approximate half wavelength elements of an antenna configured in a co-planar, symmetrical array. A computer program was written employing the method of moments approach to the solution of Hallen's integral equation with an approximate two term entire domain expansion assumed for the current distributions. With the solution of the current distributions on each element, additional calculations were made for the input impedance and admittance values, field distributions, power gain, and a graphical output of the radiation pattern. (Author)

AD-761 473/CP PC **E01**/MF **A01**
Naval Postgraduate School Monterey Calif
Feasibility Study of Pb(1-x)Sn(x)Te Charge Coupled Devices for Infrared Imaging Applications
Master's thesis
Alan Jeffrey Doshier. Mar 73, 85p

Descriptors: *Semiconductor devices, *Infrared detectors, Lead compounds, Tin compounds, Tellurides, Electrical properties, Manufacturing methods, Feasibility studies, Theses, Computer programs.
Identifiers: Charge coupled devices, Lead tellurides, Tin tellurides, Metal insulator semiconductors, N.

The purpose of this research was to examine the feasibility of narrow-gap semiconductor charged coupled devices for infrared imaging applications. The semiconductors considered are PbTe for a three to five micron imager and Pb(0.76)Sn(0.24)Te for an eight to 12 micron imager, both operated at a temperature of 85K. Theoretical calculations of signal current and storage time are made based on the metal-insulator-semiconductor theory developed for silicon MIS devices. Experimental studies of Pb(1-x)Sn(x)Te MIS were made which demonstrated that accumulation, depletion, and inversion layers can be controlled by gate voltage, following the general behavior of silicon MIS devices. A PbTe charged coupled device (CCD) infrated imager seems feasible. Feasibility of Pb(0.76)Sn(0.24)Te CCD's will require significant improvements in material and fabrication technology to increase storage time and reduce dark current. (Modified author abstract)

AD-761 510/CP PC **E01**/MF **A01**
Naval Postgraduate School Monterey Calif
Study of PbTe, PbSnTe, PbSe, PbSnSe, and Ge Metal Insulator Semiconductor (MIS) Structures
Master's thesis
Lawrence Michael Kost. Mar 73, 173p

Descriptors: *Semiconductor devices, Electrical properties, *Infrared detectors, Feasibility studies, Lead compounds, Tin compounds, Tellurides, Selenides, Germanium, Manufacturing methods, Semiconducting films, Field effect transistors, Radiation damage, Electron bombardment, Space environmental conditions, Computer programs, Theses.
Identifiers: Metal insulator semiconductors, Lead tellurides, Lead selenides, Tin tellurides, Tin selenides, Charge coupled devices, N.

A thorough understanding and a well developed fabrication procedure of MIS structures are the prerequisite for charged coupled device applications. The object of this thesis is to study the narrow gap semiconductor MIS and investigate its feasibility for IR-charge coupled images applications. Two MIS studies were made. First, MIS of five lead-tin semiconductors were fabricated using E-gun evaporated 100-450A thick Al2O3 or SiO2 layers as insulators. Second, MIS of 0.05ohm-cm p-type and 40ohm-cm n-type Ge were also studied. In addition, effects of electron bombardment simulating the space environment around Jupiter on a n-channel depletion MOSFET were studied. (Modified author abstract)

AD-761 801/CP PC **E01**/MF **A01**
Air Force Inst of Tech Wright-Patterson AFB Ohio School of Engineering
Capacitance and Equivalent Area of a Hollow Single Gap Prolate/Oblate Spheroidal Electromagnetic Pulse Sensor
Master's thesis
Larry W. Wood. Jun 73, 91p Rept no. GE/PH/73S-1

Descriptors: *Dipole antennas, Numerical analysis, *Sensors, Electromagnetic pulses, *Nuclear explosions, Electromagnetic pulses, Capacitance, Spheres, Computer programs, Theses, Partial differential equations, Potential theory, Integration.
Identifiers: FORTRAN, Laplace equation, Harmonic functions, AF.

Electromagnetic sensors of various geometric configurations are used to measure the nuclear electromagnetic pulse. Certain design parameters exist for these sensors and are so related that if any two are known, the others are also known. For dipole sensors, the two most readily calculable parameters are capacitance and equivalent area. The capacitance and equivalent area are calculated for both prolate and oblate hollow single-gap dipole sensors for various ranges of eccentricity and gap-size. The method used is a finite difference scheme in matrix form which solves Laplace's equation in spheroidal coordinates with mixed boundary conditions. The computations are performed on a CDC 6600 digital computer, and a sequence-to-sequence limiting procedure is used to improve the accuracy of the solution. The results are presented in graphical form and the validity of the method is discussed. Recommendations are made for improving the method. (Author)

AD-762 041/CP PC **E01**/MF **A01**
Harvard Univ Cambridge Mass Div of Engineering and Applied Physics
A Theoretical and Experimental Study of the Insulated Loop Antenna in a Dissipative Medium
Technical rept.
Glenn S. Smith. Apr 73, 103p Rept no. TR-637
Contract N00014-67-A-0298-0005

Descriptors: *Loop antennas, Dielectrics, Electromagnetic fields, Admittance, Electrical impedance, Fourier analysis, Series, Spheres, Computer programs, Radio transmission.
Identifiers: Fourier series, FORTRAN 4 programming language, FORTRAN, N.

The performance of a bare antenna as a radiator in a dissipative medium can be significantly altered by placing a dielectric coating around the antenna. For certain antenna types and specific properties of the dissipative medium, the dielectric insulation has been shown to improve the performance of the antenna. In this paper a thin wire circular loop antenna centered in an insulating spherical cavity and immersed in an infinite homogeneous isotropic dissipative medium is analyzed. A Fourier series solution for the antenna current distribution is derived. The coefficients of the series are a combination of the coefficients for the loop in an infinite dielectric medium, which were determined previously by Wu, and a second term, which is an infinite sum. The properties of the sum are examined and expressions for the antenna input admittance, impedance and electromagnetic field in the dissipative medium are obtained. Numerical results are presented for specific antenna sizes and dissipative media. (Modified author abstract)

AD-762 056/CP PC **E01**/MF **A01**
Ohio State Univ Columbus Electroscience Lab
Memorandum on the Radiation Patterns of a Slot Asymmetrically Located on a Square Plate
Technical rept.
C. Donn, and G. A. Thiele. Jun 73, 35p Rept no. ESL-2142-12
Contract N00014-67-A-0232-0018

Descriptors: *Slot antennas, *Antenna radiation patterns, Diffraction, Antenna apertures, Computer programs, Numerical analysis.
Identifiers: N.

A slot antenna mounted symmetrically in the center of a square plate will radiate a symmetrical antenna pattern. When the slot is moved to any other location the pattern will be unsymmetrical. The degree of symmetry degradation for various locations of a slot on a 2' by 2' square plate at approximately 1 GHz and 3 GHz is the subject of this investigation. To make the pattern calculations well-known first-order principles of the geometrical theory of diffraction (GTD) are used. A user oriented computer program is presented in the appendix and its limitations discussed. (Author)

AD-762 482/CP PC **A03**/MF **A01**
Air Force Cambridge Research Labs L G Hanscom Field Mass
Junction Capacitance Techniques to Characterize Radiation Damage in Silicon
Physical sciences research papers
J. W. Diebold, H. M. DeAngelis, L. C. Kimerling, and J. J. Fitzgerald. 12 Mar 73, 38p Rept nos. AFCRL-PSRP-542, AFCRL-TR-73-0157

Descriptors: *Silicon, *Radiation damage, *Diodes(Semiconductor), Electrical properties, Doping, Phosphorus, Capacitance, Voltage, Transients, Defects(Materials), Electron bombardment, Gamma rays, Neutron reactions, Computer programs.
Identifiers: Schottky barrier diodes, CAPVOL computer program, FORTRAN, Semiconductor doping, AF.

Capacitance-voltage and transient capacitance measurements were made on Schottky barrier-on-phosphorus-doped silicon diodes. Energy levels, emission coefficients, and associated introduction rates were determined for defects produced by 1.0-MeV electrons, Co(60)-gamma rays, and 5-MeV neutrons. Total defect introduction rates agree well with carrier removal

data of companion Hall effect samples. In the electron- and gamma-irradiated samples, specific introduction data reveal radiation-induced traps at E(c) - 0.24 eV, E(c) - 0.44 eV, and below midgap. The introduction rate of the traps located below midgap exhibits a strong dependence on donor concentration. In neutron-irradiated, float-zoned silicon a band of shallow trap levels is evident along with levels at E(c) - 0.37 eV, E(c) - 0.40 eV, and below midgap. In neutron-irradiated, crucible-grown silicon, trap levels are observed at E(c) - 0.18 eV, E(c) - 0.23 eV, E(c) - 0.24 eV, E(c) - 0.31 eV, and below midgap. (Author)

AD-762 572/CP PC **E01**/MF **A01**
RCA Advanced Technology Labs Camden N J
Millimeter Wave Phase Shifter
Final rept. 1 Apr-31 Dec 72
Gary G. Weidner, and Burton J. Levin. Jun 73, 66p ECOM-0168-0168-F
Contract DAAB07-72-C-0168, ARPA Order-2099

Descriptors: *Phase shifters, Millimeter waves, Diodes(Semiconductor), Waveguides, Propagation, Computer programs, Phased arrays.
Identifiers: PIN diodes, A.

The report describes exploratory work done on a new phase-shifting technique. The primary objective of this program was to develop and demonstrate a laboratory-model 140-GHz phase shifter. The desired variation in phase shift is produced by electronic modulation of the width of a rectangular waveguide which results in a change in the phase shift per unit length along the waveguide. The change in effective width of the waveguide is accomplished by means of a PIN diode that is literally distributed along a sidewall of the waveguide. Among the tasks required study were (1) propagation analysis for the diode-loaded waveguide to determine the relevant parameters, (2) fabricating and evaluating the distributed PIN diodes, and (3) forming a phase shifter using these diodes. Computed and measured data are presented for waveguides loaded with silicon slabs of various conductivities and for distributed PIN diodes. The work demonstrated the potential feasibility of the distributed PIN phase shifter. (Author)

AD-762 910/CP PC **A04**/MF **A01**
Air Force Cambridge Research Labs L G Hanscom Field Mass
The Performance of 31 and 127 Bit Elastic Surface Wave Encoders and Decoders
Physical sciences research papers
Peter A. Devito, Paul H. Carr, and Thomas L. Szabo. 19 Dec 72, 59p Rept nos. AFCRL-TR-73-0736, AFCRL-PSRP-521

Descriptors: *Secret communication systems, Coding, *Transducers, Design, Communication equipment, Correlators, Delay lines, Decoding, Ultrasonic radiation, Performance(Engineering), Computer programs.
Identifiers: Surface waves, Acoustic surface waves, *Coders, *Decoders, Signal processing, Secure communication, Interdigital transducers, AF.

The use of elastic surface waves to generate and correlate a 31- and 127-bit maximal length bi-phase modulated code for secure anti-jam communications is given. Included is an experiment and theoretical study of the effect of temperature differences and doppler shifts on the performance of surface wave encoders and decoders. Data is given for the selection of the optimum sequence and materials for a given application. (Modified author abstract)

AD-763 903/CP PC **A06**/MF **A01**
Army Missile Command Redstone Arsenal Ala Ground Equipment and Materials Directorate
Thermal Response of Power Transistors
Technical rept.
Dallas L. Thurman. 1 Jun 73, 116p* Rept no. RL-73-4

Descriptors: *Transistors, Thermal stability, Silicon, Mathematical models, Computer programs, Leakage(Electrical), Power.
Identifiers: *Power transistors, FORTRAN, A.

The report is a study of the thermal effects on planar epitaxial silicon power transistors. The primary objectives considered are power dissipation and junction temperature of the device. A nonlinear digital program model is developed with temperature being the dynamic factor. Theoretical techniques are developed to describe I sub(CBO), forward, and saturation region of operation, with respect to the temperature variable. Throughout the study, temperature has significant effects upon the operation of the silicon power transistor. (Author)

AD-763 943/CP PC **E01**/MF **A01**
Systems Science and Software La Jolla Calif
The Dynamic Response of a Semiconductor Configuration to Electron Loading
Final rept.
K. G. Hamilton, J. W. Pritchett, and E. J. Halda. Dec 72, 166p SSS-R-72-1410, HDL-003-3
Contract DAAG39-71-C-0003

Descriptors: *Silicon, Radiation damage, *Transistors, Electron bombardment, Transients, Deformation, Monte Carlo method.
Identifiers: Transient response, CRAM computer code, A.

A two-dimensional elastic-plastic hydrodynamics code has been used to calculate the mechanical response of six axisymmetric semiconductor configurations to electron-beam loading. The grid response is displayed and discussed. The time variations of rear-surface velocities and displacements are shown at selected positions, while some rear-surface responses are exhibited as functions of radius at particular times. These calculations were performed for the prediction of, and comparison with, experimental measurements made on specimens tested using an electron accelerator at Harry Diamond Laboratories. (Author)

AD-764 046/CP PC **E01**/MF **A01**
Naval Research Lab Washington D C
Coupler Test Program CPL1 for Use with a HP (Hewlett Packard) Automatic Network Analyzer
H. Paris Coleman. Jun 73, 17p Rept no. NRL-MR-2603

Descriptors: *Microwave networks, Computer programs, Test equipment(Electronics).
Identifiers: CPL1 computer program, *Network analyzers, N.

A computer program for use with Hewlett Packard automatic network analyzer equipment is described. The program is written in ATS BASIC and is designed to measure the performance characteristics of microwave coupler networks over a band of frequencies. (Author)

AD-764 367/CP PC **A11**/MF **A01**
Polytechnic Inst of Brooklyn Farmingdale N Y
Phased Array Antenna Evaluation Studies
Final technical rept. Apr 71-Apr 72
Leopold B. Felsen, Alexander Hessel, George H. Knittel, Ralph Constantini, and Jacob Goldberg. May 73, 238p PIBEP-73-128, RADC-TR-73-187
Contract F30602-71-C-0316

Descriptors: *Phased arrays, *Radar antennas, Antenna components, Waveguides, Impedance matching, Design, Antenna radiation patterns, Numerical analysis, Computer programs.
Identifiers: AF.

The topics studied are: (1) multimode waveguide elements for phased arrays, (2) finiteness effects in an E-plane array of parallel-plate waveguides, (3) a transition radiating element for wide-angle wide-band matching, and (4) ray methods for computation of mutual coupling on conformal arrays. (Modified author abstract)

AD-764 477/CP PC **E06**/MF **A01**
Naval Postgraduate School Monterey Calif
Performance Analysis of Digital Radiometers
Jorge Eduardo Swett. Mar 73, 158p

Descriptors: *Radiometers, Performance(Engineering), Data processing systems, Analog-to-digital converters, Band-pass filters, Digital systems, Theses, Computer programs.
Identifiers: Performance evaluation, Digital filters, N.

The work investigates the effects of digital processing in radiometers. It deals mainly with two digital versions of a total power radiometer. The first consists of RF, Mixer and IF sections followed by an analog to digital converter. All further processing is done in a digital computer. The second version consists of RF, Mixer and IF sections followed by a square law detector, RC filter and analog to digital converter. From this point on the processing is done by a digital computer. A figure of merit is defined based on the performance of an analog total power radiometer. Exact results are obtained for the figure of merit of the first digital version. For the second, an approximate solution is obtained. The effects of saturation and finite step size of the quantizer were taken into consideration for the above results. The performance of digital balanced-Dicke and noise-adding radiometers is investigated using the above results. The effects of digital filtering on the performance of a radiometer is considered. (Author)

AD-764 595/5CP PC **E01**/MF **A01**
Colorado State Univ Fort Collins Dept of Electrical Engineering
Statistical Design of Nonrecursive Digital Filters
Technical rept.
David C. Farden, and Louis L. Scharf. 31 Jul 73, 41p
Contract N00123-73-C-1375, N00014-67-A-0299-0019
Revision of report dated 23 Mar 73.

Descriptors: *Electric filters, Design, Statistical analysis, Low-pass filters, Band-pass filters, Stochastic processes, Power spectra, Computer programs.
Identifiers: *Digital filters, Signal processing, N.

The problem of designing a finite duration impulse response (FIR) digital filter to approximate a desired spectral response is treated in the paper. The philosophy adopted is that for a given FIR filter structure, the filter coefficients can be designed to provide a minimum mean-squared error (MMSE) estimate of a random signal sequence (the design signal) imbedded in a random noise sequence. By treating the signal and noise covariance functions as design parameters, one can design FIR filters with spectral responses that approximate the power spectral density of the design signal. For signal processing applications that require some attention to signal fidelity, as well as noise rejection, the MMSE philosophy seems appropriate (as opposed to a maximum signal-to-noise ratio philosophy, for example). (Modified author abstract)

AD-764 809/0CP PC **A07**/MF **A01**
TRW Systems Group Redondo Beach Calif

Automatic Transfer Characteristics Modeling Program (SYNAP). Volume I
Final technical rept. 3 May 72-3 Mar 73
Brian A. Haas, Eugene J. Mock, and John R. Pistacchi. Jul 73, 139p AFWL-TR-73-51-Vol-1
Contract F29601-72-C-0091
Report on SYNAP (Symbolic Network Analysis Program).

Descriptors: *Programming(Computers), Circuits, *Electrical networks, Transfer functions, *Circuits, Transfer functions, Topology, Graphics, Matrix algebra, Nuclear explosions, Electromagnetic pulses, Transients.
Identifiers: *SYNAP computer program, FORTRAN 4 programming language, FORTRAN, Computer aided analysis, CDC 6000 computers, *Network analysis theory, AF.

SYNAP (Symbolic Network Analysis Program) is a Fortran 4 computer program written for the CDC 6000 series computers. SYNAP generates literal and/or numerical transfer functions and their corresponding response based on a linear circuit topology or signal flowgraph description. The report contains the theory and formulation used in the generation of SYNAP. The structure of the program, its subroutines and various storage schemes are discussed. Also included is a sample problem section illustrating the input and output of the various portions of the program. (Author)

AD-764 890/0CP PC **A04**/MF **A01**
Harvard Univ Cambridge Mass Div of Engineering and Applied Physics
Electrically Small Loop Antenna Loaded by a Homogeneous and Isotropic Ferrite Cylinder - Part I
Technical rept.
D. V. Giri. Jul 73, 51p Rept no. TR-646-Pt-1
Contract N00014-67-A-0298-0005

Descriptors: *Loop antennas, Ferrites, Magnetic cores, Integral transforms, Computer programs, Numerical analysis.
Identifiers: Fourier transformation, FORTRAN 4 programming language, FORTRAN, N.

A theoretical treatment was developed for the problem of an electrically small loop antenna loaded by an infinitely long, homogeneous, isotropoc but lossy ferrite rod. The loop which carries a constant current was idealized to be a delta-function generator. An effective magnetic current (volts) is expressed explicitly in the form of an inverse Fourier integral. The contribution to the total current from the simple pole which can be associated with the surface wave is called the transmission current while the contribution from the branch cut giving rise to the radiated field is, correspondingly, the radiation current. Also, the asymptotic behavior of the current very near the delta-function source was investigated. Two values of electrical radii of the rod are considered and for one of the cases the magnetic current is plotted for a range of values of the permeability of the ferrite rod. (Author)

AD-765 337/1CP PC **A05**/MF **A01**
TRW Systems Group Redondo Beach Calif
Automatic Transfer Characteristics Modeling Program (SYNAP). Volume II. SYNAP User's Manual
Technical rept. 3 May 72-3 Mar 73
Brian A. Haas, Eugene J. Mock, and John R. Pistacchi. Jul 73, 87p AFWL-TR-73-51-Vol-2
Contract F29601-72-C-0091
See also Volume 1, AD-764 809.

Descriptors: *Programming(Computers), Instruction manuals, *Electrical networks, Transfer functions, *Circuits, Transfer functions, Topology, Integral transforms, Graphics, Mathematical models, Electromagnetic pulses, Nuclear explosions, Transients.
Identifiers: *SYNAP computer program, *Network analysis theory, FORTRAN, FORTRAN 4 programming language, CDC 6000 computers, Laplace transformation, AF.

SYNAP is a prmputer program developed to provide a mathematical modeling capability to the Air Force Weapons Laboratory (AFWL) system analysis code and a mathematical interface to the currently available circuit analysis codes. The program derives literal and/or numerical transfer functions as expanded ratios of polynomials of the Laplace transform variable S. It also rpovides AC, transient and sensitivity analysis for the transfer function. SYNAP greatly extends the capability of existing circuit analysis programs to solve larger and more complex circuit and a system analysis problems. The transfer functions derived can replace detailed piece-part topological circuits, thus enabling analyses to be performed on systems containing a larger number of circuits. (Author)

AD-765 517/8CP PC **A04**/MF **A01**
Varian Associates Palo Alto Calif
Transmitter Tube for Troposcatter Application
Final rept. Jun 70-Jul 71
A. Goldfinger. Jun 73, 73p ECOM-0228-F-70
Contract DAAB07-70-C-0228

Descriptors: *Klystrons, Microwave amplifiers, *Radio transmitters, Klystrons, Microwave communication systems, Tuning devices, Focusing, Magnets, Heat exchangers, S band, Computer programs.
Identifiers: Troposcatter communication systems, Tropospheric scatter communication, A.

The program was directed toward further development and testing of a klystron amplifier. The goal was the fabrication and delivery of a practical field transmitter with an overall efficiency of 50%; the transmitter in this case is defined as the klystron tube, focusing mechanism, and cooling system. Efficiency is defined as the rf power output divided by the sum of the power inputs to the klystron amplifier, the focusing mechanism, and the cooling system. (Modified author abstract)

AD-765 668/9CP PC **A03**/MF **A01**
Naval Postgraduate School Monterey Calif
Slot Line Ferrite Isolator
Master's thesis
Imon Lester Pilcher. Jun 73, 45p

Descriptors: *Attenuators, Ferrites, Waveguide slots, Microwave equipment, Perturbation theory, Computer programs, Theses.
Identifiers: *Slot line isolators, Isolators, N.

A slot line isolator configuration is investigated experimentally. The configuration is analyzed using perturbation theory. Theoretical results obtained from a computer program based on the analysis are compared with the experimental measurements. (Author)

AD-765 697/8CP PC **E04**/MF **A01**
Naval Postgraduate School Monterey Calif
Study of PbSnTe Single Heterojunction Diodes
Master's thesis
Gordon Lee Smith. Jun 73, 89p

Descriptors: *Diodes(Semiconductor), Electrical properties, *Photodiodes, Electrical properties, Lead compounds, Tin compounds, Tellurides, Band theory of solids, Manufacturing methods, Crystal growth, Carriers(Semiconductors), Hall effect, Computer programs, Theses.
Identifiers: *Lead tellurides, *Tin tellurides, Heterojunctions, Photovoltaic effect, N.

The electrical and photovoltaic properties of single heterojunction (SH) Pb(1-x)Sn(x)Te diodes have been studied. SH diodes were fabricated by sequential depositions of p-type Pb(0.86)Sn(0.14)Te using stiochiometric source material and n-type Pb(0.80)Sn(0.20)Te using metal rich source material. At T 0 77K, their energy gaps are 0.136 ev and 0.103 ev, respectively. SH diodes of good rectification with RoA products ranging from 3.5 to 18.6 have been obtained. Operated at 100K, 500K black body photovoltaic responses up to 0.2 volt/watt has been obtained. The current-voltage characteristics have been studied theoretically based on both the Anderson Diffusion Model and the Thermionic Emission Model. Using Anderson's model, and assuming delta E(c) 0 0, constant electron affinity across the junction, fair agreements have been found between measurements and theoretical calculations. (Author)

AD-766 245/5CP PC **A05**/MF **A01**
Air Force Cambridge Research Labs L G Hanscom Field Mass
Defect Levels In Neutron-Irradiated GaAs Schottky Diodes and Laser Diode Degradation
Physical sciences research papers
Jacques E. Ludman. 31 May 73, 81p Rept nos. AFCRL-TR-73-0344, AFCRL-PSRP-550

Descriptors: *Diodes(Semiconductor), *Radiation damage, *Photodiodes, *Neutron reactions, Gallium arsenides, Lasers, Defects(Materials), Atomic energy levels, Mathematical models, Computer programs.
Identifiers: *Light emitting diodes, *Schottky diodes, Gallium arsenide lasers, Semiconductor lasers, Injection lasers, AF.

GaAs Schottky and laser diodes are irradiated with high energy neutrons and the resultant trap and defect structure analyzed. The Schottky diodes are irradiated with a clean high-energy neutron beam from a Van de Graaff accelerator, and the laser irradiation is done in a nuclear reactor. The defect structure is shown to consist of energetically discrete trap levels, but the levels are found not to operate independently. A new defect model is proposed based on coupled defect levels and is shown to be in good agreement with the observations. On the basis of this model, values for the discrete trap levels are determined. Experimentally, Schottky diodes are cooled to temperatures in the region 78K, to 178K, the back bias is turned off and on again, and the capacitance versus time (capacitance decay) is monitored. These measurements are used to derive the activation energies of the trap levels. Trap levels are found at 175, 220, 325, 380 and 460 mV below the conduction band. Several general numerical techniques are developed for the purpose of fitting experimental data to both the independent-level and coupled-level decay models. (Author)

AD-766 252/1CP PC **A05**/MF **A01**
Syracuse Univ N Y Dept of Electrical and Computer Engineering
Special Programs for Analysis of Radiation by Wire Antennas
Bradley J. Strait, Tapan Sarkar, and Dah-Cheng Kuo. 1 Jun 73, 76p Scientific-1, AFCRL-TR-0399-73
Contract F19628-73-C-0047

Descriptors: *Antenna radiation patterns, Numerical analysis, Antennas, Antenna arrays, Computer programs, Design, Optimization, Ground(Electrical).
Identifiers: AF.

Two user-oriented computer programs are presented and described. The first is suitable for handling efficiently typical analysis and design problems involving linear arrays of parallel thin-wire antennas. The second is

designed to enable efficient analysis of radiation from vertical wire antennas over systems of radial ground wires. Examples are given to illustrate various applications of both programs. Special attention is devoted to use of the first program together with a standard optimization procedure to design linear arrays of wire elements with unequal spacings and/or unequal wire lengths. (Author)

AD-766 427/9CP PC **A09**/MF **A01**
Air Force Cambridge Research Labs L G Hanscom Field Mass
Acoustic Surface Wave Diffraction and Beam Steering
Physical sciences research papers
Thomas L. Szabo, and Andrew J. Slobodnik, Jr.
3 May 73, 182p Rept nos. AFCRL-TR-73-0302, AFCRL-PSRP-548

Descriptors: *Microwave equipment, Design, Piezoelectric crystals, Lithium compounds, Niobates, Diffraction, Band-pass filters, Acoustic filters, Transducers, Delay lines, Performance(Engineering), Computer programs, Least squares method.
Identifiers: *Acoustic surface waves, Surface waves, *Lithium niobates, *Microwave acoustics, Interdigital transducers, Beam steering, Acoustic delay lines, MAIN computer program, SLQ computer program, LAGG computer program, CDC 6600 computers, AF.

The report contains a detailed description of diffraction in acoustic surface wave devices. This source of loss is highly important in the design and realization of bandpass filters, long time delay lines and other devices for electronic sensors and communications systems. A complete review of acoustic surface wave diffraction on anisotropic substrates is presented. Full experimental verification of theory is provided. Complete computer program listings and descriptions are provided. The limits of applicability of the parabolic velocity surface theory are quantitatively delineated. Universal diffraction loss design curves are given for all parabolic materials. A limitation in the use of the exact angular spectrum of waves theory occurs for materials having a power flow angle slope approximately - 1 unless the velocity surfaces are very accurately known. Both YZ LiNbO3 and 16-1/2 degree double rotated LiNbO3 fall in this category. Approximate diffraction loss design curves are given for YZ LiNbO3. A complete tabular summary of all important material properties affecting acoustic surface wave device design is included. (Author)

AD-766 677/9CP PC **A08**/MF **A01**
Army Electronics Command Fort Monmouth N J
Computer-Aided Design, Simulation and Optimization for Microwave Integrated Circuits
Technical rept.
Vladimir Gelnovatch. Aug 73, 151p* Rept no. ECOM-4146

Descriptors: *Integrated circuits, Design, *Microwave equipment, Integrated circuits, Transistor amplifiers, Optimization, Numerical analysis, Computer programs, Iterative methods.
Identifiers: *Computer aided design, DEMON computer program, Transferred electron amplifiers, FORTRAN, A.

A realistic design approach, specifically directed at the successful implementation of microwave integrated circuits, involves the use of measured data to represent complex devices and the use of an effective CAD (Computer Aided Design) program to iteratively analyze, simulate, and optimize the performance of a given circuit. By means of a variety of techniques the designer may make effective use of the computer to perform the measurement characterization of an unknown device, reduce the data to a form suitable for further processing and perform a circuit analysis; changing critical element parameters in an intelligent manner until specific requirements are met. The execution of the iterative analysis may be performed automatically by incorporating an efficient self-optimization algorithm in order to achieve some optimal objective. A variety of these techniques have been described in some detail. Several examples of the computer simulation of the anticipated performance of certain types of solid state microwave integrated circuit amplifiers have demonstrated the effectiveness of using actual measured device data and CAD to realize an optimum circuit design. The results obtained on these amplifier modules working under conditions identical to those specified in their simulation have proved to be in excellent agreement. (Author)

AD-766 689/4CP PC **A06**/MF **A01**
Army Missile Command Redstone Arsenal Ala Advanced Sensors Directorate
Recursive Digital Filter Design and Analysis with Applications to Radar Processing
Technical rept.
Robert H. Fletcher, Jr. 30 Apr 73, 109p

Descriptors: *Electric filters, Design, *Moving target indicators, Electric filters, Low-pass filters, Band-pass filters, Integral transforms, Computer programs.
Identifiers: *Digital filters, Recursive filters, FORTRAN, A.

The design and analysis of recursive digital filters by use of the bilinear z-transformation are presented for Butterworth and Chebyshev Type I filters. Although the motivation and primary emphasis of this work lies in the area of radar moving-band-stop filtering as well. The design and analysis of these filters are accomplished with the aid of a set of FORTRAN subroutines which are described and listed here. Examples illustrating the use of these subroutines and some typical results are included. (Author)

AD-767 023/5CP PC **A06**/MF **A01**
Naval Underwater Systems Center New London Conn New London Lab
Thermal Analysis Using the Chrysler Improved Numerical Differencing Analyzer for Third-Generation Computers (CINDA-3G) Program
Research rept.
Robert L. Fromer. 16 Jul 73, 108p* Rept no. NUSC-TR-4461

Descriptors: *Integrated circuits, Thermal analysis, *Programming(Computers), Instruction manuals, Modules(Electronics), Semiconductor devices, Heat transfer, Mathematical models.
Identifiers: CINDA-3G computer program, UNIVAC 1108 computers, FORTRAN 5 programming language, FORTRAN, Computer aided analysis, Network synthesis, AN/BQS-13, Finite difference theory, N.

The application of the CINDA-3G computer program to the solution of thermal problems involving integrated circuit modules is discussed in detail. Included is a brief review of heat transfer principles and thermal modeling techniques. CINDA-3G uses numerical techniques, and proper network modeling of the problem is essential. It is shown that the temperature distributions obtained with the computer program for a sample problem compare favorably with a one-dimensional analytic (hand-calculated) solution. Therefore, the CINDA-3G program appears to be a useful tool in solving complex thermal problems of limited size. (Author) Portions of this document are not fully legible.

AD-767 420/3CP PC **E09**/MF **A01**
Information Systems Menlo Park Calif
Antenna Modeling Program - Systems Manual
10 Apr 73, 291p Rept no. IS-R-72/10
Contract N00014-71-C-0187

Descriptors: *Antenna arrays, Computer programs, *Computer programs, Instruction manuals, Antenna radiation patterns, Gain, Subroutines, Mathematical models, Matrix algebra, Integral equations, Polarization.
Identifiers: FORTRAN, AMP computer program, Thin wire antennas, N.

The manual contains a detailed discussion of the FORTRAN coding of the Antenna Modeling Program (AMP). Its purpose is to aid the programmer in understanding the intricacies of the Fortran coding, and it is designed as a reference manual so that the programmer can examine the function of one subroutine or common block separately. By the same token the FORTRAN list is an integral part of the manual and should be used in conjunction iwth reference to the manual. The Antenna Modeling Program is based on the thin wire electric field integral equation which relates the exciting electric field to the induced currents on some specified thin wire geometry. The integral equation is reduced to an N dimensional system of linear equations by representing the current in terms of N sinusoidal basis functions and enforcing the integral equation at N discrete points.

AD-767 654/7CP PC **E04**/MF **A01**
Naval Postgraduate School Monterey Calif
An Application of the Piecewise-Sinusoidal Reaction Matching Technique to Linear Dipole Antennas
Master's thesis
Michael Lynn Bryant. Jun 73, 105p

Descriptors: *Dipole antennas, Electrical impedance, Electric currents, Matrix algebra, Computer programs, Theses.
Identifiers: Piecewise sinusoidal reaction matching technique, Current distribution, FORTRAN, Method of moments, N.

The paper is an application of the Piecewise-Sinusoidal Reaction Matching Technique (PSRMT) to linear, parallel thin-wire dipoles. The 'method of moments' is briefly outlined and the fundamental electromagnetic principles of reciprocity, surface equivalence and reaction are discussed. Through a logical combination of these concepts, PSRMT is developed and applied to thin-wire dipoles radiating in free space due to a delta function voltage generator at their center. The driving point impedance and the current distribution are calculated and compared to results obtained from other independent theoretical techniques. (Modified author abstract)

AD-767 659/6CP PC **A03**/MF **A01**
Naval Postgraduate School Monterey Calif
An Investigation on the Application of the Method of Partial Images to a Dynamic Problem
Master's thesis
John Francis Timony. Jun 73, 45p

Descriptors: *Dipole antennas, Electrical impedance, Electrostatic fields, Dielectrics, Admittance, Green's functions, Matrix algebra, Computer programs, Theses.
Identifiers: Method of moments, Image processing, Monopole antennas, N.

The method of partial images has been successfully applied to electrostatic problems involving conductors on a dielectric substrate. This same method is investigated for its adaptation to dynamic problems. A Green's Function is derived and applied to the problem of a wire dipole antenna on a dielectric substrate. The input admittance of the antenna is computed by

the method of moments. Experimentally measured values of input admittance are compared with the theoretical values and the error is discussed. (Author)

AD-767 906/1CP PC **E01**/MF **A01**
Syracuse Univ N Y
Antenna Pattern Distortion Computer Program
Technical rept.
Jose' Perini, and Kazuhiro Hirasawa. Aug 73, 43p* RADC-TR-73-230
Contract F30602-72-C-0360

Descriptors: *Antenna radiation patterns, *Computer programs, Distortion, Electromagnetic compatibility, Communication systems, Numerical analysis.
Identifiers: Honeywell 635 computers, FORTRAN 4 programming language, FORTRAN, AF.

Presently, when a new communication facility is designed, there is no simple way that the project engineer can predict the interaction between the many antennas that will be present in the facility. The available rules of thumb are too crude and do not really give any detailed information on the antenna pattern distortion or mutual coupling effects. Recent developments in the area of computer aided design of antennas allowed the development of a computer program that can perform an accurate analysis of the most common antenna installations with far more detail than has been possible. The description and usage of this program is the subject of the report. (Author)

AD-768 214/9CP PC **E01**/MF **A01**
Tennessee Technological Univ Cookeville Dept of Electrical Engineering
An Adaptive Transmitting Array to Maximize Power Flow In a Specific Direction
Final rept. 1 Apr-30 Sep 73
Roy N. Adams, Joseph N. Anderson, and William L. Fuqua. 24 Sep 73, 32p
Contract N00019-73-C-0361

Descriptors: *Phased arrays, Adaptive control systems, Radiofrequency power, Computer programs, Simulation, Mathematical models.
Identifiers: Computerized simulation, N.

The purpose of the research is to demonstrate a method of increasing a transmitting arrays output in a specified direction by adaptive techniques. The report describes an analytical development of an appropriate algorithm, a digital simulation of the system, and the experimental implementation together with test results at 300 MHz. (Modified author abstract)

AD-768 848/4CP PC **A07**/MF **A01**
Howard Univ Washington D C School of Engineering
A Study on Communicaton Antenna Isolation
Final rept.
Bing A. Chiang. Jun 73, 134p FAA-RD-73-94
Contract DOT-FA73WA-3156

Descriptors: *Phased arrays, *Electromagnetic compatibility, Antenna radiation patterns, Radiofrequency interference, Admittance, Electrical impedance, Computer programs, Air traffic control systems, Antenna arrays.
Identifiers: FORTRAN, FAA.

Problems on FAA communication antennas related to isolation are analyzed. The concpet of using progressively phased circular array to achieve high isolation is studied. The method of study is divided into theoretical and experimental. Theoretical study involved using moment method. Symmetrical dipoles were used as elements. Factors analyzed include array radius, antenna size, position accuracy, impedance, radiation pattern, and isolation. The experimental study involved building scale antennas from existing FAA coaxial dipoles and used them as array elements, and simulated matrix feed conditions to study isolation and radiation pattern. An isolation of 55 db was found possible. The concept is shown to provide high isolation in a very limited space. It provides flexibility for beam forming, and azimuth scanning. (Author)

AD-768 872/4CP PC **E01**/MF **A01**
Rhode Island Univ Kingston Dept of Electrical Engineering
A Description of the FORTRAN Program 'Filters'
Technical rept.
James T. Lewis. 27 Sep 73, 26p Rept no. URI-EE-4044/3
Contract N00014-68-A-0215-0006

Descriptors: *Electric filters, Design, *Computer programs, Electric filters, Low-pass filters, High-pass filters, Minimax technique, Iterative methods.
Identifiers: FORTRAN, Digital filters, FILTERS computer program, N.

A FORTRAN program to compute minimax digital filters with or without horizontal restraining lines in the passband or stopband is described. A listing of the program and the output from the solution of two problems is included. (Author)

AD-769 211/4CP PC **A03**/MF **A01**
Naval Underwater Systems Center New London Conn New London Lab
A General Method and FORTRAN Program for the Design of Recursive Digital Filters
Technical rept.
Joseph J. Wolcin. 25 Sep 73, 47p Rept no. NUSC-TR-4629

Descriptors: *Digital filters, *Computer programs, Low pass filters, High pass filters, Band pass filters, Transfer functions, FORTRAN.
Identifiers: Recursive filters, Design, Butterworth filters, Chebychev filters, N.

A general method for the design of digital filters is presented, and a FORTRAN program that follows the steps of the method is described. The computer program can design any low-pass, high-pass, bandpass, or band-reject digital filter by using either Butterworth, Chebyshev, or elliptic approximations to the ideal rectangular type frequency response. The user need only provide the program with a set of structured specifications, and as output the user obtains the transfer function of the minimum order filter that meets his requirements. For convenience, the transfer function is expressed in a form that allows immediate implementation in a cascade type realization. (Author)

AD-769 439/1CP PC **E03**/MF **A01**
Naval Postgraduate School Monterey Calif
The Far Field Analysis of Parallel Plate Luneberg Lenses for Various Feeds
Master's thesis
Robert Boyd Birchfield. Sep 73, 74p

Descriptors: *Luneberg lenses, Far field, Luneberg lens antennas, Antenna aperatures, Integral equations, Microwave antennas, Plates, Parallel orientation, Antenna radiation patterns, Computer programs, Theses.
Identifiers: N.

The thesis developed expressions for the aperature fields and integral equations for the far field radiation characteristics of the Parallel Plate Luneberg Lens Microwave Antenna operating in the TEM or TE sub (10) modes. These expressions were programmed on a digital computer to predict the far field radiation patterns for several feed systems. Experimentation produced far field radiation patterns that were very close to the theoretical patterns for the TE sub 10 mode lens and substantially different for the TEM mode lens. (Author)

AD-769 585/1CP PC **E01**/MF **A01**
Harry Diamond Labs Washington D C
Design and Analysis of 90-Degree Phase Difference Networks
W. Weibach. May 73, 50p Rept no. HDL-TM-73-4

Descriptors: *Phase shift circuits, Electric filters, Computer programs, Networks.
Identifiers: Network analysis theory, A.

The parameters of a 90 degree phase difference (Dome) filter, and their relationship to the filter characteristics, are derived and discussed. The design of two RC implementations and their worst-case analyses are shown. (Author)

AD-770 120/4CP PC **A02**/MF **A01**
Naval Research Lab Washington D C
Phase Shifter Test Programs for Use with an H.P. Automatic Network Analyzer
Memorandum rept.
George T. O'Reilly, and H. Paris Coleman. Nov 73, 15p Rept no. NRL-MR-2675

Descriptors: *Phase shift circuits, Analyzers, *Analyzers, *Computer programs, Microwave equipment, Networks.
Identifiers: NRPS1 computer program, RPS1 computer program, N.

Two computer programs for use with Hewlett Packard automatic network analyzer equipment are described. The programs are written in ATS BASIC and are designed to measure the performance characteristics of microwave phase shifters over a band of frequencies. The first program is for use with a nonreciprocal phase shifter and the second is for use with a reciprocal phase shifter. (Author)

AD-771 952/9CP PC **E01**/MF **A01**
Admiralty Surface Weapons Establishment Portsmouth (England)
A Computer Program for Evaluating the Far-Field Radiation Pattern of an Omni-Directional Antenna Obstructed by a Vertical Metal Cylinder
Technical rept.
T. J. Green. Sep 73, 18p ASWE-TR-73-27, DRIC-BR-37572

Descriptors: *Omnidirectional antennas, *Antenna radiation patterns, Far field, Computer programs, Great Britain, Barriers, FORTRAN.
Identifiers: OMNI computer program, SD.

The degrading effects of cylindrical metal obstructions on the far-field radiation pattern of an omni-directional antenna, vertically or horizontally polarized were investigated by A. J. Hissink. The note is a description of a computer program to evaluate the far-field radiation pattern of such a system. The program which is adapted from Hissink's work, is written in FORTRAN for use on Com-Share Commander II time sharing facility. (Author)

AD-772 714/2CP PC **A04**/MF **A01**
Syracuse Univ N Y Dept of Electrical and Computer Engineering
Computer Programs for Antenna Pattern Synthesis
Joseph R. Mautz, and Roger F. Harrington. Oct 73, 72p Scientific-3, AFCRL-TR-73-0654
Contract F19628-73-C-0047

Descriptors: *Antenna radiation patterns, *Computer programs, Synthesis, Eigenvectors.
Identifiers: FORTRAN, AF.

The report contains computer programs, instructions, and sample input-output data for antenna pattern synthesis as developed in the previous report 'Computational Methods for Antenna Pattern Synthesis'. The programs are valid for point sources arbitrarily distributed in a plane, and for pattern synthesis in this plane. Included are programs for synthesis with (1) pattern magnitude and phase specified, (2) pattern magnitude only specified, (3) these two cases with a constraint on the source norm, and the first two cases with a constraint on the source quality factor. Also included are programs to compute and plot the specified and synthesized patterns. (Author)

AD-772 771/2CP PC **A09**/MF **A01**
Rockwell International Corp Los Angeles Calif Los Angeles Aircraft Div
A Study of the Influences of Solid-State Electrical Distribution on Aircraft Power Generation
User's manual technical rept.
Elmer Fasol, Stewart G. Dawson, Roberto J. Urdaniyia, and Louis A. Ule. Nov 73, 195p NA-73-723-2, AFAPL-TR-73-109-Supp-1
Contract F33615-72-C-1759
See also AD-772 763.

Descriptors: *Electric generators, *Auxiliary power systems, Aircraft equipment, Electrical equipment, Electric power, Distribution, Solid state electronics, Computerized simulation, Digital computers, Digital simulation, Instruction manuals, Computer programs.
Identifiers: AF.

A typical CSD generator computer run is presented as an example with an exactly corresponding flow diagram, a definition of terms, notation, and operating modes. The subroutines are briefly defined, and the load identifiers are defined. The supporting math models were submitted in the October 1973 supplemental monthly report as enclosures. A VSCF converter computer run is presented with an exactly corresponding flow diagram, including subroutines. (Author)

AD-772 815/7CP PC **A06**/MF **A01**
Purdue Univ Lafayette Ind School of Electrical Engineering
Short-Pulse Switches for Airborne High-Power Supplies
Final rept. 31 Jul 72-31 May 73
David B. Miller, and Hannis W. Thompson, Jr.
Nov 73, 102p AFAPL-TR-73-81
Contract F33615-72-C-2097

Descriptors: *Electronic switches, Solid state switches, Semiconductor devices, Indium antimonides, Silicon, Magnetic devices, Computer programs.
Identifiers: Corbino disks, AF.

Prototypes of both magnetically and optically activated high current, high voltage switches are fabricated and tested. Feasibility is demonstrated for both the silicon optically-activated and the indium antimonide, magnetically-activated switches. A near-intrinsic silicon switch shows resistance decrease of almost four orders of magnitude with radiation from Xenon flash lamps. Resistance increase of an InSb cube is demonstrated; this result leads to theoretical predictions of three orders of magnitude resistance increase for a corbino-disk device with modest fields (1-3 wb/sq m). (Author)

AD-772 882/7CP PC **E05**/MF **A01**
Naval Postgraduate School Monterey Calif
Parallel Coplanar Strips on a Dielectric Substrate
Master's thesis
Armando Echeandia Luna. Dec 73, 95p

Descriptors: *Strip transmission lines, Parallel orientation, Dielectrics, Computer programs, Electrical impedance, Partial differential equations, Theses.
Identifiers: N.

A general analysis of coplanar lines on a dielectric substrate is presented. The field equations are written in terms of Hertzian potentials and boundary conditions are applied to generate a system of linear equations. These equations are then Fourier transformed and reduced to a form where a computationally efficient solution can be obtained by the method of moments. Any desired accuracy may be obtained by expanding the transform of the current if the problem is one involving strip conductors of the electric field if there are slots. A one term expansion products very good results. Both wavelength and characteristic impedance of the transmission line structure are obtained. Theoretical and experimental results are presented for coplanar strips. (Author)

AD-773 777/8CP PC **E08**/MF **A01**
Ohio State Univ Columbus Dept of Electrical Engineering
Networks of Two-Input One-Output Flexible Cells - A Study of Logical Properties and Techniques for Learning Realizable Functions
Jon Terry Butler. Mar 73, 213p AFOSR-TR-74-0116
Grant AF-AFOSR-2048-71

Descriptors: *Electrical networks, *Switching circuits, *Circuit interconnections, Input output devices, Mathematical logic, Combinatorial analysis, Synthesis, Graphics, Computer programs, Theses.
Identifiers: Network synthesis, Switching theory, AF.

The report discusses many previously unknown logical properties of networks of two-input one-output cells, such as the number and type of functions realized. In addition, new algorithms are presented which are used to cause the networks to realize a given function.

AD-774 143/2CP PC **A10**/MF **A01**
North Hills Associates Glen Cove N Y
Research Program on Multi Dimensional Matrix Addressing Techniques
Final rept. 1 Aug 72-30 Sep 73
Sol Sherr, Al Loshin, and Arnold Spitalny. 28 Dec 73, 223p
Contract N00014-73-C-0152
Continuation of research reported in AD-751 666, Contract N00014-72-C-0248.

Descriptors: *Display systems, Liquid crystals, Addressing, Detectors, Multiplexing, Computer programs.
Identifiers: Liquid crystal display systems, *Matrix display systems, N.

A research program is reported on in which multi dimensional addressing techniques are investigated, theoretically and empirically. Among the coupling techniques included are electrical, optical and gas discharge. In addition several models are described using liquid crystals as the display media and a combination of electrical and optical addressing in single and multi-layer assemblies. (Modified author abstract)

AD-775 024/3CP PC **E03**/MF **A01**
Naval Postgraduate School Monterey Calif
Correlation Functions Using Laguerre Type Circuits
Master's thesis
Jorge Pedro Auge. Dec 73, 62p

Descriptors: *Circuits, Correlation techniques, Electric filters, Signal processing, Signal to noise ratio, Functions(Mathematics), Computer programs, Theses.
Identifiers: Laguerre functions, *Correlation functions, N.

The work deals with the correlation functions and their methods of obtention. A method without a pure time delay is considered which uses Laguerre functions type filters. The possibilities of using the nonsymmetric Laguerre type filter are analyzed. A very inexpensive set of circuits which are useful to obtain the mentioned filters for low frequency signals are presented, together with their computer analysis and laboratory realizations. (Author)

AD-775 637/2CP PC **A04**/MF **A01**
Illinois Univ Urbana Coordinated Science Lab
Computer-Aided Design of Microwave Circuits
Doctoral thesis
Edgar Sanchez-Sinencio. Aug 73, 71p* Rept nos. R-617, UILU-ENG-73-2219
Contract DAAB07-72-C-0259, Grant NSF-GK-31633

Descriptors: *Circuits, Microwave equipment, Microwave amplifiers, Integrated circuits, Computer programs, Theses.
Identifiers: *Computer aided design, A.

The thesis discusses a computer program for the analysis and design of distributed-lumped circuits, including microwave integrated circuits. It is capable of frequency domain analysis, optimization of transducer power gain, reflection coefficient, and/or noise figure. Also, the program can compute the return difference with respect to any admittance parameter so that the stability of the circuit can be determined by the Nyquist criterion. The program handles complex impedances, resistors, capacitors, inductors, transmission lines, independent current sources and grounded voltage sources, voltage controlled current sources, and multiport elements, such as, transistors and circulators, described by their scattering or admittance parameters. It contains a free-format input. (Modified author abstract)

AD-776 091/1CP PC **A09**/MF **A01**
Signatron Inc Lexington Mass
Electronic Device Modeling
Technical rept. no. 2, 13 May-13 Aug 73
L. Ehrman. Jan 74, 199p RADC-TR-73-407
Contract F30602-73-C-0193
See also report dated Dec 73, AD-774 551.

Descriptors: *Transistors, Field effect transistors, Bipolar transistors, Electromagnetic compatibility, Models, Computerized simulation, Computer programs, Electronics, Nonlinear systems, Electronic equipment, FORTRAN.
Identifiers: FORTRAN 4 programming language, AF.

The software for implementation of the charge-control bipolar transistors model and the means for obtaining the parameters of the charge-control transistor model from experimental measurements are developed. A comparison of predicted and measured nonlinear distortion products based upon several junction field effect transistors is reported. (Author)

AD-776 399/8CP PC **A07**/MF **A01**
IIT Research Inst Chicago Ill
EMP Response of Parabolic Reflector Antennas
Final rept.
P. P. Toulios, and Y. Shiau. Dec 73, 138p Rept no. IITRI-E6276
Contract DAAG39-73-C-0189

Descriptors: *Parabolic antennas, Electromagnetic pulses, Response, Satellite communica-

tions, Mathematical analysis, Computer programs.
Identifiers: A.

A theoretical investigation was conducted to approximately determine the electromagnetic pulse (EMP) response of Satellite Communications Antenna Systems (SATCOM). The ultimate objective is to be able to estimate system susceptibility to an EMP environment.

AD-776 773/4CP PC **A06**/MF **A01**
Massachusetts Inst of Tech Lexington Lincoln Lab
Load Impedance Characteristics of TRAPATT Oscillators
Technical rept.
Jerry D. Welch. 9 Jul 73, 125p TR-496, ESD-TR-73-183
Contract F19628-73-C-0002

Descriptors: *Microwave oscillators, *Avalanche diodes, Electrical impedance, Impedance matching, Computer programs, Theses.
Identifiers: TRAPATT diodes, AF.

A study was made of the impedance required to match the diode in a time-delay-triggered TRAPATT oscillator. The investigation includes both a theoretical analysis and an experimental verification. It provides the most accurate closed-form analysis of TRAPATT oscillator waveforms and efficiencies to date and resolves inconsistencies in the dynamics of the time-delay-triggering processes which have not been adequately explained in previously published analyses. A technique is given for determining the required diode matching impedance and presenting the impedance data in a single set of resistance and reactance curves valid for any fundamental frequency of oscillation. The analysis includes the parasitics of the package and mount and shows that the required matching impedance is strongly influenced by these parasitics; without them the chip itself would be a very broadband device. (Modified author abstract)

AD-776 912/8CP PC **E06**/MF **A01**
Army Electronics Command Fort Monmouth N J
Adjustable Digital Time Converter
Technical rept.
Helmuth M. Kaunzinger, and Otto E. Rittenbach. Feb 74, 130p Rept no. ECOM-4201

Descriptors: *Signal processing, *Moving target indicators, Radar signals, Processing equipment, Compression, Time, Digital systems, Analog to digital converters, Frequency conversion, Target recognition, Target signatures, Computerized simulation, Computer programs, FORTRAN.
Identifiers: COMP computer program, FORTRAN 4 programming language, A.

The presentation covers the analysis, computer solution and simulation, design, construction and performance evaluation of an experimental digital time converter with five compression ratios ranging from 3.16 to 316 in a geometric progression. With an analog to digital converter at the input and a digital to analog converter at the output, this time converter operates with data samples circulating in register rings. The updating of this rotating information occurs at selected slow rates while readout samples are taken at a constant fast rate. The original sequence of input samples is preserved in the compressed output when a correct relationship exists between updating and readout rates, generated in appropriate timing circuits. The compressed signal is presented in segments of approximately .5 second each. The performance evaluation shows that the chosen approach is valid, that an experimental model works as expected, and that subsequent radar systems studies can be made with this time converter. (Modified author abstract)

AD-776 996/1CP PC **E04**/MF **A01**
Georgia Inst of Tech Atlanta
Heat Pipe Cooled Microwave Window
Final rept.
Gene T. Colwell, Harold L. Bassett, and James M. Schuchardt. Feb 74, 75p
Contract DAHC60-73-C-0068

Descriptors: *Microwave equipment, *Heat pipes, *Heptanes, Windows, Cooling, Dielectrics, Alumina, Beryllium oxides, Carbon tetrachloride, Computer programs.
Identifiers: *Microwave windows, A.

The program centered around the examination and selection of suitable dielectric window materials for a heat pipe cooled microwave window and the selection of a working fluid. Two ceramic materials, aluminum oxide and beryllia, were found to be appropriate for window materials in the high average power microwave device. The aluminum oxide material does not possess thermal properties as desirable as the beryllia, but the aluminum oxide is less costly. A number of working fluids were found to have desirable properties, both thermal and microwave, and two of these were very good fluids, Heptane and Carbon Tetrachloride. An experimental heat pipe was constructed and tested as part of this program. The tests indicated that the heat pipe cooled windows could handle up to 2-3 megawatts of RF power at a frequency near 3.0 GHz. (Author)

AD-777 268/4CP PC **E05**/MF **A01**
Air Force Inst of Tech Wright-Patterson AFB Ohio School of Engineering
Energy Spectra for Frequency-Shift-Keyed Signals Transmitted by Synchronously Resonated, Very Low Frequency Antennas
Master's thesis
Tee R. III Hadley. Dec 73, 100p Rept no. GE/EE/73A-10

Descriptors: *Antennas, *Frequency shift keyers, Spectra, Frequency shift, Very low frequency, Resonance, Data transmission systems, Digital systems, Spectrum analysis, Resonators, Broadband, Theses, FORTRAN, Computer programs.
Identifiers: Electronic broadbanding, CDC 6600 computers, AF.

Electronic broadbanding is a technique whereby very low frequency (VLF) antennas can be resonated (retuned) synchronously with a frequency-shift-keyed (FSK) signal for transmission of binary data at rates well over 1000 baud. The thesis investigates the transmitted energy density spectrum for an electronically broadbanded VLF antenna system in which a frequency shift can occur only at the instant of an antenna-current zero-crossing with positive slope. A computer solution shows that the transmitted spectrum is approximately equivalent to the spectrum of an ideal, constant amplitude, FSK signal. A further investigation, again by computer program, shows that if the total frequency shift between the marking and spacing frequencies occurs over a finite period, rather than instantaneously, then the spectrum's sidelobes will be reduced significantly. (Modified author abstract)

AD-777 320/3CP PC **A10**/MF **A01**
Microwave Associates Inc Burlington Mass
Octave-Bandwidth, High-Directivity Microstrip Couplers
Final rept. 17 Mar 72-30 Jun 73
Charles Buntschuh. Jan 74, 218p RADC-TR-73-396
Contract F30602-72-C-0282

Descriptors: *Couplers, Strip transmission lines, Broadband, Computer programs, FORTRAN.
Identifiers: Design, AF.

The purpose of the study was to examine techniques of velocity compensation, broadbanding, and tight coupling, and combine them to produce high-directivity, broad band microstrip couplers from 3 to 20 dB. A further objective was to develop a design procedure, with supporting tables and charts, to facilitate the rapid design of microstrip couplers and to verify the procedure experimentally. (Modified author abstract)

AD-777 722/0CP PC **A04**/MF **A01**
Naval Research Lab Washington D C
FFT Doppler Filter Performance Computations
Memorandum rept.
J. K. Hsiao. Mar 74, 64p Rept no. NRL-MR-2744

Descriptors: *Filters, Doppler systems, Coherent radar, Moving target indicators, Radar clutter, Fourier transformation, Computer programs, FORTRAN, Clutter.
Identifiers: Fast Fourier transform, N.

The fundamental theory of a FFT doppler filter is briefly reviewed. Computer programs to plot the responses and improvement factors of these filters are presented in this report. A wide choice of weighting functions are included in these programs. A number of examples are computed and presented. (Author)

AD-777 887/1CP PC **A04**/MF **A01**
Syracuse Univ N Y Dept of Electrical and Computer Engineering
Programs for Analysis of Radiation by Linear Arrays of Vertical Wire Antennas over Imperfect Ground
Bradley J. Strait, Tapan Sarkar, and Dah-Cheng Kuo. 15 Jan 74, 58p Scientific-4, AFCRL-TR-74-0042
Contract F19628-73-C-0047

Descriptors: *Antenna arrays, Electromagnetic radiation, Computer programs, Linear systems, Far field, Electrical impedance, Antennas, Electric current.
Identifiers: AF.

Two user-oriented computer programs are presented and described for analyzing radiation from linear arrays of vertical thin-wire antennas over the horizontal plane surface of an imperfectly conducting earth. The first program can handle arbitrary excitation of the array wire, although it is assumed they are equally spaced and all of the same length and radius. The second program is equipped to treat unequally spaced arrays of wires that can be of different lengths and radii, but it is assumed the wires are all centerfed. Both assume the wires are unloaded and that the conductivity of the earth is finite. The effects of the imperfectly conducting earth are accounted for approximately by using the method of reflection coefficients. Computed output consists of current distributions, input impedances, and far-field patterns specified by the user. (Author)

AD-778 947/2CP PC **A07**/MF **A01**
Harris-Intertype Corp Melbourne Fla Radiation Systems Div
Recursive Algorithms for Adaptive Array Antennas
Final technical rept. Jun 72-Jun 73
Charles A. Baird, Jr. Mar 74, 150p RADC-TR-74-46
Contract F30602-72-C-0499

Descriptors: *Antenna arrays, Algorithms, Recursive functions, Signal processing, Data transmission systems, Digital systems, High

rate, Antennas, Computers, Control, Phased arrays, Antijamming, Pulse communications, Computer programs, Antenna radiation patterns, Kalman filtering, Adaptive systems.

The techniques define digital control algorithms based on least squares estimation methods to adjust the parameters of a multichannel array filter to perform automatic null steering. The algorithms are designed to converge to the optimal filter parameters (array weights) defined by the solution of a set of linear algebraic equations (a Wiener-Hopf type equation), and their relationship to Kalman filtering methods are discussed. Both convergence analysis and simulations demonstrate rapid convergence behavior; however, accurate computations appear to be required for some cases due to ill-conditioning of these equations. The basic recursive algorithm is derived for use with desired signal approximations, and several techniques for signal acquisition are discussed and simulated. Also, alternative algorithm forms based on using desired signal direction of arrival information are developed and simulated. Finally, the performance of the basic recursive algorithm is compared, through simulations, to the gradient (LMS) and random search methods. (Modified author abstract)

AD-779 680/8CP PC **A03**/MF **A01**
Aerospace Corp San Bernardino Calif Technology Div
Space Charge Limiting from Blackbody Radiation
Interim rept. Mar-May 73
Gerald G. Comisar. 14 May 74, 41p TR-0074(4124)-3, SAMSO-TR-74-118
Contract F04701-73-C-0074

Descriptors: *Diodes(Electron tubes), *Blackbody radiation, Space charge, Photoelectric emission, Computer programs.
Identifiers: BBDIODE computer program, IBM 370/155 computers.

A grounded, parallel-plate vacuum diode illuminated by x rays generates a two-sided distribution of non-Maxwellian photoelectrons. The resulting potential hill problem may be reduced to a first-order nonlinear differential equation subject to two-point boundary conditions. An iterative APL/360 program has been written to allow the user to perform on-line calculations of potentials. Numerical results are presented for several cases of incident blackbody radiation and unequal two-sided emission. (Author)

AD-779 896/0CP PC **A03**/MF **A01**
Royal Aircraft Establishment Farnborough (England)
Small Transformer Design by Computer
Technical rept.
M. D. Palmer. Feb 74, 46p RAE-TR-73155, DRIC-BR-39351

Descriptors: *Transformers, Power supplies, Modules(Electronics), Computer applications, Cores, Ferrites, Computer programs, Great Britain.
Identifiers: *Computer aided design.

The overall efficiency of one module in a modular power supply for an ion motor is mainly determined by the individual efficiencies of the power transistors, the output transformer and the bridge rectifier diodes. A computer program was written to investigate transformer design under conditions compatible with the other circuit elements with the aim of obtaining improvements in efficiency and reduction in mass. Transformers produced to the resulting designs had efficiencies in excess of 98% and masses some 25% less than their predecessors.

AD-780 461/0CP PC **E03**/MF **A01**
Technology Service Corp Santa Monica Calif
Revision to the Frequency Tracking and Estimation Program (Phase-Locked Loop)
Technical rept.
Roger M. Golden, and William B. Kendall. Feb 74, 46p Rept no. TSC-PD-067-21
Contract N00014-71-C-0033

Descriptors: *Phase locked communications, *Phase locked systems, Frequency, Tracking, Signal processing, Satellite communications, Electronics, Computer programs.

A number of modifications have been incorporated into the Frequency Tracking and Estimation Program (Phase-Locked Loop). The modifications improve the tracking properties of the PLL as well as make the program more convenient to use. A summary of the modifications along with a description of all of the parameters needed by the program is given in this report. (Author)

AD-781 330/6CP PC **A07**/MF **A01**
Polytechnic Inst of New York Brooklyn Dept of Electrical Engineering and Electrophysics
Integrated Circuit Reliability Prediction and Complexity Models
Scientific rept.
Henry R. Goldenberg. Jun 73, 128p Rept nos. PINY-EE/EP-74-004, PINY-EER-103
Contract N00014-67-A-0438-0013

Descriptors: *Integrated circuits, *Reliability(Electronics), Models, Reliability, Predictions, Failure(Electronics), Hazards, Weibull density functions, Logic circuits, Computer programs, FORTRAN.

A method for calculating the average hazard rate for a catastrophic failure test using the test duration, the number of failures, and the sample population, is shown. If the number of failures is much less than the sample population, the failure rate can be approximated by the number of failures divided by the product of the sample population and the test duration. A equivalency criterion is developed that allows a transformation between hazard model shapes. The model shapes examined in detail are the constant, the Weibull, and the piecewise linear shapes. It is shown that significant errors in reliability can result from assuming a constant hazard. The principal failure modes of digital integrated circuits are examined, and they are related to the complexity of the circuit by qualitative arguments. The analysis is performed for the TTL 7400 series and the Schottky 74S00 series. It is shown that the hazard function of the integrated circuits is a Weibull function of time with a scale parameter proportional to the number of gates in the devices. (Modified author abstract)

AD-781 832/1CP PC **E05**/MF **A01**
Air Force Inst of Tech Wright-Patterson AFB Ohio School of Engineering
Characteristics of SiO2 Films Grown In an HcL Purged Environment
Master thesis
Richard Randol Hoffmeister. Jun 74, 114p Rept no. GE/EE/74-26

Descriptors: *Integrated Circuits, *Metal oxide semiconductors, *Dielectric films, *Silicon dioxide, *Hydrogen chloride, Manufacturing, Sodium, Impurities, Computer programs, Theses.

The major purpose of the research is to study how the addition of HCl affects the characteristics of oxides typically used in integrated circuit manufacture. HCl was used in two ways: an HCl/O2 mixture was used to clean the oxidation tube prior to oxidation, and an HCl/O2 mixture was used in an in situ process. The oxide parameters having a significant impact on device performance were identified and measured by using both C-V and I-V techniques. An HCl distribution system was constructed and used with a conventional oxidation furnace. Negligible trapping of sodium ions at the Si-SiO2 interface was observed for oxides grown in an HCl cleaned tube and conventional oxides, while strong trapping of the ions was observed when HCl was used in situ. (Modified author abstract)

AD-782 095/4CP PC **A06**/MF **A01**
Texas Tech Univ Lubbock Dept of Electrical Engineering
Optimum Filter Modeling of Integrated Circuits
Final rept. 1 Dec 70-31 May 72
K. S. Chao, S. R. Liberty, R. H. Seacat, and M. A. Chipman. Jun 74, 117p AFWL-TR-72-121
Contract F29601-71-C-0048

Descriptors: *Integrated circuits, *Radiation effects, Signal processing, Nonlinear systems, White noise, Computerized simulation, Computer programs, FORTRAN.
Identifiers: SCEPTRE computer program, Wiener filters, Operational amplifiers.

The report provides a complete and unified description of variations on the Wiener theory for modeling nonlinear systems. In particular, applications to the modeling of integrated circuit operational amplifiers in an ionizing radiation environment are considered. Detailed investigations of four modifications of the Wiener method are discussed here (Lee's method, the indirect method, Bose's method, and the matrix method), as well as extensions of the Wiener theory to include time varying and multiple-input multiple-output systems. It is shown that the matrix method is the best of the methods investigated. A modeling technique based upon this method is presented including a FORTRAN subprogram which can be used in conjunction with the SCEPTRE circuit analysis program for application as indicated above. (Author)

AD-782 251/3CP PC **A09**/MF **A01**
University of South Florida Tampa Dept of Electrical Engineering
SUPER-SCEPTRE. User's Manual. A Program for the Analysis of Electrical, Mechanical, Logic and Control Systems
J. C. Bowers, J. E. O'Reilly, Jr, and G. A. Shaw. 31 Jan 74, 200p
Contract DAAA21-73-C-0433, DAAA21-73-C-0655
Report on AMC CAD-E Series.

Descriptors: *Electrical networks, *Mechanical components, *Computer applications, Circuits, Mechanical engineering, Computer programming, FORTRAN, Transfer functions, Topology, Instruction manuals.
Identifiers: SUPERSCEPTRE computer program, SCEPTRE computer program, FORTRAN 4 programming language, Network analysis theory, Computer aided design.

SUPERSCEPTRE is a preprocessor developed for use in conjunction with the SCEPTRE circuit analysis program. SUPERSCEPTRE enables the user to simulate one-dimensional mechanical systems, transfer functions, and digital logic devices in addition to electrical networks. SUPERSCEPTRE retains the useful features of SCEPTRE and includes a mechanical description language analogous to the SCEPTRE circuit description language. The language is easy to learn and no previous computer programming experience is needed to use SUPERSCEPTRE effectively. The derivation of equations is not required since SUPERSCEPTRE automatically formulates the describing equations of a system from the component values and the system topology.

AD-782 281/0CP PC **A06**/MF **A01**
Gte Sylvania Inc Mountain View Calif Electronic Systems Group-Western Div

High Pressure Transducer
Technical rept.
G. Kirby Miller. 15 Jun 74, 107p Rept no. TR-3
Contract N00014-72-C-0307
See also AD-906 983.

Descriptors: *Transducers, *Hydrophones, Electrical properties, Sensitivity, Environmental tests, Temperature, Performance(Engineering), Tolerances(Mechanics), Coaxial cables, Reliability(Electronics), Electrets, Computer programs, FORTRAN.

The primary purpose of the study is to measure and evaluate the performance of an electret coaxial cable transducer as a hydrophone. This includes any possibel environmental effects on performance such might be caused by depth pressure, temperature, and motion-caused turbulence.

AD-782 351/1CP PC **A07/MF A01**
Naval Research Lab Washington D C
Coefficients for Calculating Radiation Impedances and Far-Field Pressures of Free-Flooded Ring Transducers
Interim rept.
Peter H. Rogers, and Joseph F. Zalesak. 14 Jun 74, 128p Rept no. NRL-7749

Descriptors: *Transducers, Far field, Pressure, Electromagnetic radiation, Acoustic impedance, Computer programs.
Identifiers: *Ring transducers, SHIP computer program.

Tables of coefficients for determining the radiation impedance and far-field pressure of a free-flooded vibrating ring in an arbitrary medium at 45 frequencies for each of 36 ring geometries were produced. The only restriction on the known velocity distribution for using the tables is that the inside, top and bottom, and outside normal surface velocities must be uniform. Simple formulas for determining the normal surface velocity distribution for some special cases and formulas for determining the radiation resistance and far-field pressure in the low-frequency limit were developed. (Author)

AD-782 399/0CP PC **A05/MF A01**
Naval Research Lab Washington D C
Analysis of Discrete Pulse Forming Networks Driving Non-Linear Flash Lamp Loads
Final rept.
Orville C. Barr. Jun 74, 76p Rept no. NRL-MR-2808

Descriptors: *Pulse generators, *Flash lamps, *Xenon lamps, Mathematical models, Electrical networks, Computer programs, FORTRAN.
Identifiers: *Network analysis theory, FORTRAN 4 programming language, CDC 6400 computers, *Pulse forming networks.

An interactive design tool for analyzing discrete lumped parameter pulse forming networks driving time invarient nonlinear flashlamp loads is described. The program is written in FORTRAN IV for the Control Data Kronos timesharing system. The program handles linear (resistive) loads as well as xenon flashlamps. The formulation is structured to allow easy modification. Up to 10 mesh PFN's can be handled. (Author)

AD-782 419/6CP PC **A13/MF A01**
Rochester Univ N Y Dept of Electrical Engineering
Elastic Surface Waves in the Presence of a Fluid Layer
Final rept. 1 Apr 72-30 Sep 73
P. Das. May 74, 290p RADC-TR-74-125
Contract F30602-72-C-0312

Descriptors: *Surface waves, *Acoustooptics, Elastic waves, Correlators, Space charge, Signal processing, Piezoelectric crystals, Semiconductors, Layers, Computer programs, FORTRAN, Ultrasonic radiation, Rayleigh waves, Lithium compounds, Niobates, Cadmium sulfides.
Identifiers: *Acoustic surface waves, Piezoelectric semiconductors, Lithium niobates.

The is a comprehensive report on the theoretical and experimental performance of devices using elastic surface waves in layered structures. The following are the main achievements of this effort: (1) Space charge coupled convolvers and correlators using surface waves and layer waves; experimental demonstration of lowest insertion loss, a few orders of magnitude lower than the previous state-of-the-art devices; and development of a detailed theory. (2) A new technique for optical probing of surface waves and layer waves: experimental determination of the decay parameter of a surface wave in the direction normal to the propagation surface; and the complete elastic fields in the layer wave structure; demonstration of 25% diffraction efficiency for each first order with only 500 mw of electrical power driving the surface wave transducers. Other important contributions in this report are the theoretical analysis of the layer wave propagation including loss or gain, and the observation of streaming phenomena in a liquid layer due to layer waves. (Author)

AD-783 039/1CP PC **A03/MF A01**
Naval Research Lab Washington D C
Microstrip Design Procedure for L-Band Transistor Power Amplifiers
Interim rept.
G. T. O'Reilly, R. E. Neidert, and H. E. Heddings. 27 Jun 74, 47p Rept no. NRL-7745

Descriptors: *Power amplifiers, *Transistor amplifiers, Strip transmission lines, Microwave amplifiers, L band, Impedance matching, Computer programs, FORTRAN.
Identifiers: Computer aided design.

A procedure which uses microstrip matching circuits was formulated for designing L-band transistor power amplifiers. The procedure uses a precision measurement technique for transistor impedances and an optimization routine for realizing the required matching circuits in microstrip. A model for large step discontinuities in microstrip was developed and was included in a computer optimization program. Good agreement was obtained between measured and calculated microstrip circuit impedances. The computer-aided procedure was used to develop L-band, class C, pulse-operated transistor power amplifiers. Significant improvement was obtained in power gain, bandwidth, and collector efficiency over amplifiers designed by more conventional methods. (Author)

AD-783 897/2CP PC **A09/MF A01**
Atlantic Research Corp Alexandria Va Advanced Programs Group
Methods of Moments Applications. Volume V. Thin Wire Antenna Analysis Computer Codes Compared with Measured Data
Final rept. Feb 73-Mar 74
Thomas E. Baldwin, Jr, and Richard Robertson. Jul 74, 179p RADC-TR-73-217-Vol-5
Contract F30602-73-C-0131
See also Volume 4, AD-773 173.

Descriptors: *Dipole antennas, Near field, Matrices(Mathematics), Currents, Admittance, Computer programming, Loop antennas.
Identifiers: Method of moments.

The method of moments is applied to various wire antenna problems for the purpose of investigating the following trade-offs: (1) accuracy of current distributions on the structure, (2) general applicability of several expansion functions to a variety of geometries, (3) computer storage requirements, and (4) computer central processor time (CPU). Three computer programs designed to treat radiation and scattering problems for thin-wire structures by the method of moments were compared extensively with each other and with experimental data. Each of these three programs are available in the literature and represent a variety of different techniques such as pulse, triangle, and sinusoidal expansion functions, respectively, to determine current distributions. (Author)

AD-785 139/7CP PC **A05/MF A01**
Applied Science Associates Inc Denver Colo
Computer Generated Troubleshooting Trees: The Program
Final rept.
William J. Pieper, and Allen L. Pinkus. Jul 74, 96p* AFHRL-TR-74-20(II)
Contract F33615-72-C-1682

Descriptors: *Reliability(Electronics), *Computer programs, Computer programming, FORTRAN.
Identifiers: *Troubleshooting trees, *Fault isolation, Fault detection, Fault tolerant computing, FORTRAN 4 programming language.

This report describes the development, use, and tryout of a computer program to prepare troubleshooting trees by computer. The program inputs information on the system data flow, component reliabilities, and costs of available tests. An iterative process is then used to select the most efficient sequence of tests to isolate all possible faults. This is accomplished by computing an index of information gained per unit cost (IGUC) for each test. The test with the highest IGUC is selected as the first test in the tree. The IGUCs are then recomputed for the remaining tests and the test with the highest IGUC is added as the next step in the tree. The process is continued until a tree is developed which will isolate all faults in the system. (Modified author abstract)

AD-785 512/5CP PC **A03/MF A01**
Army Electronics Command Fort Monmouth N J
Transverse Propagation Constants in Dielectric Waveguides
Research and development technical rept.
Kenneth L. Klohn, John F. Armata, Jr, and Metro M. Chrepta. Aug 74, 27p Rept no. ECOM-4242

Descriptors: *Dielectric waveguides, Propagation, Constants, Millimeter waves, Transverse, Silicon, Computations, Computer programs.
Identifiers: Optical waveguides.

Dielectric waveguides have been proposed as a transmission medium at optical and millimeter wave frequencies. In each case, calculations of the transverse propagation constants were carried out based on simplifying assumptions which allowed a closed form solution to basic transcendental equations. In this report, exact calculations of the transverse propagation constants were made for silicon waveguides having various aspect ratios by solving the transcendental equations on a programmed calculator. No simplifying assumptions were made. The results were used to compute guide wavelengths, and the values were compared to the values obtained experimentally and to those calculated using approximate formulas. The validity of the approximations and the conditions and circumstances in which it is appropriate to use them are discussed. (Author)

AD-786 005/9CP PC **A10/MF A01**
Colorado Univ Boulder Dept of Electrical Engineering
Variable Speed Commutatorless Energy Converters
Final rept. Sep 71-Dec 73 on Phase A
Edward A. Erdelyi, and David A. Remington. Dec 73, 206p

Contract DAAK02-70-C-0244
Report on Investigation of Three-Phase Induction Motors Supplied by Square and Staircase Wave Voltages.

Descriptors: *Induction motors, *Variable speed drives, Drives, Electrical equipment, Numerical analysis, Computer programs, Runge Kutta method.

The theory of three phase squirrel cage induction motors supplied by chopped d.c. supplies is developed. The differential equations are solved by a fourth order Runge-Kutta method explained in the appendix. The waveform of the applied voltage is either square of staircase in shape. The numerical method, specially modified for the application, yields the following results: (a) Current waveshapes in the stator when square wave voltages of 20 Hz to 120 Hz, and stepped wave voltages of 30 to 100 Hz, are applied to the stator terminals. (b) The torque variations at different loads and frequencies. (c) The slip variations at different loads and frequencies. (Modified author abatract)

AD-787 292/2CP PC **A04**/MF **A01**
Army Missile Command Redstone Arsenal Ala Guidance and Control Directorate
The Transient Current Induced on a Conducting Cylinder by an EMP Plane Wave with Applications to Cable Driver Design
Technical rept.
Hugh W. Greene, J. Darryl Holder, and Leonard L. Tsai. 16 Aug 74, 63p Rept no. RG-7508

Descriptors: *Electric cables, *Electromagnetic pulses, *Electromagnetic shielding, Transients, Plane waves, Fourier transformation, Computer programs, FORTRAN, Radiation hardening.
Identifiers: FORTRAN 4 programming language, CDC 6600 computers.

The current excited on an infinite perfectly conducting cylinder by an incident electromagnetic pulse plane wave is analyzed using Fourier transform techniques. Two methods, eigenfunction series solution and moment methods, are used independently to calculate the currents in the frequency domain. Time domain cylinder currents are found by inverse transforming the eigenfunction series results. These are computed at various aspects angles on the cylinder for three different cylinder sizes. The apparent rotational asymmetry and increase in rise time from the theoretical solution should be useful in improving cable driver design. A number of possible extensions of this problem are given together with an approach to correlate simulator and cable driver data. (Author)

AD-787 463/9CP PC **A07**/MF **A01**
Illinois Univ Urbana Coordinated Science Lab
Effects of Redundancy on Fault Detection and Diagnosis In Combinational Logic Circuits
Howard Warren Pribble. Sep 74, 136p Rept nos. R-657, UILU-ENG-74-2223
Contract DAAB07-72-C-0259

Descriptors: *Logic circuits, Faults, Gates(Circuits), Redundant components, Detection, Computations, Computer programs, Theses.
Identifiers: *Fault detection, *Fault tolerant computing.

Most fault detection and diagnosis systems in use today operate under the single-fault assumption, namely that the circuits will be tested often enough so that any single fault can be detected and corrected before another fault occurs. This reasoning fails when the circuit under test contains redundancy because of the undetectable faults which redundancy implies. While an undetectable fault will not affect the logical operation of the circuit, it was demonstrated by Friedman that the presence of an undetectable fault can cause other faults (the second-generation faults) to behave differently than in the normal case or even to become undetectable. The result of this fact is that a fault which cannot be detected and therefore is not corrected, may cause tests for other faults to become invalid. To prevent this, Friedman recommended the removal of 'certain kinds of redundancy.' (Author)

AD-787 486/0CP PC **A03**/MF **A01**
Naval Electronics Lab Center San Diego Calif
Millimeter Wave Gunn Amplifier, Diode Characterization and Network Optimization
Technical document 1 Jan-1 Jul 74
D. Rubin. Aug 74, 45p Rept no. NELC-TD-340

Descriptors: *Microwave amplifiers, Gunn diodes, Millimeter waves, Ka band, Optimization, Computer programs.

A Ka-band amplifier structure with 7.5 GHz bandwidth and 6 dB gain was fabricated. Simple adjustments lead to 15 dB gain with 2.5 GHz bandwidth. Measurements utilize double cosine tapered waveguide matching sections terminated by reduced height waveguide and calibrated sliding shorts. From slotted line measurements of reflection coefficients, two port cavity S parameters may be obtained. Insertion of the diode gives new reflection coefficients from which diode impedance can be separated. The accuracy of the calculated diode and waveguide parameters can be checked by testing calculated reflection gain vs. measured reflectometer gain over the frequency range using various calibrated short positions. Using the diode terminal impedance data, computer optimized matching circuits can be designed for particular gain and bandwidth requirements. (Author)

AD-787 522/2CP PC **A03**/MF **A01**
University of South Florida Tampa Dept of Electrical Engineering
SUPER-SCEPTRE. User's Manual. A Program for the Analysis of Electrical, Mechanical, Logic and Control Systems. Chapters V and VI
J. C. Bowers, J. E. O'Reilly, Jr, and G. A. Shaw. 1 Jul 74, 47p*
Contract DAAA21-73-C-0433, DAAA21-73-C-0655
Report on AMC CAD-E Series. Supplement to report dated 31 Jan 74, AD-782 251.

Descriptors: *Electrical networks, *Mechanical components, *Computer applications, Logic circuits, Mechanical engineering, Gates(Circuits), Special functions(Mathematical), Instruction manuals, FORTRAN.
Identifiers: *SUPERSCEPTRE computer program, SCEPTRE computer program, FORTRAN 4 programming language, Network analysis theory, Computer aided design.

SUPERSCEPTRE is a preprocessor developed for use in conjunction with the SCEPTRE circuit analysis program. SUPERSCEPTRE retains the useful features of SCEPTRE and includes a mechanical description analogous to the SCEPTRE circuit description language. This report is a supplement to the original user's manual.

AD-787 868/9CP PC **A07**/MF **A01**
Sperry Rand Corp Gainesville Fla Sperry Microwave Components Div
Microwave Integrated Circuit Steerable Polarizer
Final rept. 21 Nov 72-21 Mar 74.
Sep 74, 131p NJ-2761-0383, RADC-TR-74-230
Contract F30602-73-C-0082

Descriptors: *Phased arrays, *Steerable antennas, Antenna arrays, Linear arrays, Electronic scanners, Phase shift circuits, Microwave equipment, Integrated circuits, Strip transmission lines, Polarization, Modules(Electronics), Antenna feeds, Microwave oscillators, Gunn diodes, Tuning devices, Varactor diodes, Receivers, Computer programs, FORTRAN.

The report contains the results of a program to develop and build an electronically steerable MIC linear array with a single MIC receiver front end and the necessary array feed structure. The linear array consisted of four modules in a single housing bolted to a second housing containing four cylindrical waveguide antennas. Phase shifters for beam steering and polarization diversity were tight-coupled meander line, nonreciprocal ferrite structures flux driven to obtain effectively 4-bit operation. A varactor tuned MIC Gunn oscillator was investigated for use as the local oscillator. A new design approach consisting essentially of lumped tuning elements was used. A mathematical model for this approach was generated and computerized. A new design approach in phase shifter flux drivers using standard commercial components was derived. (Modified author abstract)

AD-803 999/CP PC **E01** MF **A01**
Litton Industries, San Carlos, Calif. Electron Tube Div.
Study of High-Power Electrostatically Focused Klystrons
Final rept. 1 Jul 64-28 Feb 66
J. F. Hull, G. E. Pokorny, and A. J. Prommer. 1 Aug 66, 151p ECOM-03348-F
Contract DA-36-039-AMC-03348(E), ARPA Order-436
Distribution Limitation now Removed.

Descriptors: *Klystrons, Phased arrays, S band, Focusing, Electrostatics, Electron guns, Computer programs, Electric fields, Radar equipment, Electron beams, Phase(Electronics), Electron lenses, Electric shunts.

The report covers a two-year program of experimental study to establish the feasibility of increasing the power level of electrostatically focused klystrons (ESFK's) to the 1 megawatt peak power range at S-band, and to increase their bandwidth capability with an ultimate objective of 10 percent of center frequency. Since this new type of tube does not require external magnetic focusing structures and all the focusing fields are entirely self-contained within the metal envelope of the tube, it is feasible to operate these tubes in close proximity to each other with center-to-center spacings commensurate with that required for phased array radar systems. The achievement of the 1 MW peak power level at S-band was very successfully demonstrated in a tube which had efficiencies in the 42 - 45 percent range without a depressed collector, a gain of over 30 dB, and a bandwidth of about 3 percent. The feasibility of achieving much broader bandwidths than this was demonstrated on a lower power tube with a broadband output circuit whose hot bandwidth was shown to be 4.55 percent at the 50 kW power level. (Author)

AD-806 839/CP PC **E01** MF **A01**
Litton Industries, San Carlos, Calif. Electron Tube Div.
Development of a Ku-Band Crossed-Field Amplifier (500 Watt Tube)
Final rept. 1 Jul 64-15 Oct 66
John W. Jensen, Gerold E. Pokorny, and E. K. Shaw. Dec 66, 106p ECOM-00276-F
Contract DA-28-043-AMC-00276(E)
Distribution Limitation now Removed.

Descriptors: *Crossed field devices, *Travelingwave tubes, Manufacturing methods, K band, Linear systems, Computer programs, Electrical properties, Delay lines, Waveguide windows, Electron beams, Magnetic fields, Configuration, Electron guns, Microwave amplifiers.

This report first details the electrical design of the tube. It was derived from a design used in another tube at a lower frequency. A large-signal analysis computer program is used to verify the design. The delay line and the electron gun were also derived from the lower frequency tube. The depressed collector used in the tube was also developed by computer analysis. The mechanical design of the tube, based on prior experience in developing similar devices, is given in detail. Several innovations have been incorporated in this design. A permanent magnet design was developed that has the desirable feature of being completely shielded. (Author)

AD-812 886/CP PC **E01**/MF **A01**
Sperry Rand Research Center, Sudbury, Mass.
Transient Behavior of Radiating Elements
Final rept. 2 Feb-1 Nov 66
G. F. Ross, R. H. T. Bates, L. Susman, G. Hanley, and R. Smith. Feb 67, 231p SRRC-CR-66-40, RADC-TR-66-790
Contract AF 30(602)-4050
Distribution Limitation now Removed.

Descriptors: *Phased arrays, *Radar antennas, *Dipole antennas, Phased arrays, *Loop antennas, Phased arrays, *Log periodic antennas, Phased arrays, *Slot antennas, Phased arrays, *Horn antennas, Phased arrays, *Spiral antennas, Phased arrays, *Biconical antennas, Phased arrays, Transients, Theory, Computer programs, Electromagnetic wave reflections, Mathematical models, Response, Mathematical analysis, Antenna apertures, Propagation.
Identifiers: Time domain analysis.

The purpose of the study is to investigate the transient behavior of various radiating elements used in radar phased array systems such as the dipole, the loop, the log-periodic, the slot, the horn, and the spiral antennas. Both the driving point impulse response and the step modulated response in the far field are evaluated experimentally and theoretically. (Author)

AD-819 850/CP PC **A14**/MF **A01**
Stanford Univ., Calif. Microwave Lab.
Microwave Propagation In Periodic Ferrite Structures
Technical rept.
W. F. Egan. Aug 67, 320p ML-1535, RADC-TR-67-377
Contract AF 30(602)-3595
Distribution Limitation now Removed.

Descriptors: *Ferrites, Microwaves, *Band-pass filters, Ferrites, Mathematical analysis, Single crystals, Magnetic fields, Resonators, Delay lines, Phase(Electronics), Attenuation, Equations of motion, Information theory, Computer programs, Approximation(Mathematics), Precession, Magneto-optic effect, Graphics, Garnet, Perturbation theory, Parametric amplifiers, Yttrium compounds.
Identifiers: Mutual coupling, Yttrium iron garnet, Yttrium ferrites.

A new structure for the propagation of microwave signals has been investigated. It consists of a periodic, linear array of single crystal YIG spheres operating in the uniform mode of precession and coupled together by their external magnetic fields. The concept of a YIG sphere as a microwave resonator is thereby extended to a transmission system consisting of coupled resonators. The array is found to have the properties of a band pass filter whose center frequency and bandwidth are controllable by a dc magnetic field in which the array is immersed. (Author)

AD-841 117/CP PC **E01**/MF **A01**
Cornell Univ., Ithaca, N.Y. School of Electrical Engineering.
The Limited Space Charge Accumulation Mode in GaAs
Interim technical rept.
Wilbert Keith Kennedy, Jr. Aug 68, 155p RADC-TR-68-269
Contract F30602-68-C-0042
Distribution Limitation now Removed.

Descriptors: *Diodes(Semiconductor), *Microwave oscillators, Gallium arsenides, Radiofrequency power, Performance(Engineering), X band, Radiofrequency pulses, Band theory of solids, Electrical networks, Waveguides, Computer programs, Theses.
Identifiers: LSA(Limited Space charge Accumulation mode), Limited space charge accumulation modes, Computer simulation, Gunn diodes.

The generation of large pulse microwave power with the limited space charge accumulation (LSA) mode in gallium arsenide is discussed. The theory of the LSA mode is reviewed and a theoretical circuit analysis presented. The experimental results for the LSA operation are presented. Device performance was also investigated and results on spectrum, pulse length and injection phase locking are presented. (Author)

AD-841 397/CP HC E01 MF **A01**
Air Force Weapons Lab., Kirtland AFB, N. Mex.
Systems Analysis Using the Sceptre Computer Program.
Technical rept. 10 Jun-31 Jul 68
John P. Portasik, Carter M. Glass, and Michael L. Goode. Sep 68, 36p Rept no. AFWL-TR-68-98
Distribution Limitation now Removed.

Descriptors: *Circuits, Radiation damage, *Computer programs, Damage assessment, Programming(Computers), Transients, Response, Nuclear radiation, Transfer functions, Flight control systems, Stability, Amplifiers.
Identifiers: SCEPTRE computer program.

Systems analysis is accomplished entirely within the original configuration of the SCEPTRE computer program. No subprograms or other special constructs are required. Models of amplifiers and transfer functions are derived and examples illustrating their use are given. The method provides considerable flexibility in that one or more electronic subsystems can be interconnected arbitrarily with one or more sub-systems represented by transfer functions. (Author)

AD-850 272/CP PC **E01**/MF **A01**
Cornell Univ., Ithaca, N.Y. School of Electrical Engineering.
Solution Growth of Gallium Arsenide
Technical rept.
Stephen Ingalls Long. Mar 69, 122p RADC-TR-69-42
Contract F30602-68-C-0042
Distribution Limitation now Removed.

Descriptors: *Gallium arsenides, Epitaxial growth, *Diodes(Semiconductor), Microwave oscillators, Solutions, Semiconducting films, Carriers(Semiconductors), Electrical properties, Computer programs, Impurities, Theses.
Identifiers: *Gunn diodes.

The theory and experimental procedure for growth of epitaxial layers of GAAS by the solution regrowth method is described. Both GAAS of low carrier concentration with high mobility and intentionally doped GAAS layers, suitable for application to Gunn effect devices, can be grown by this process. Several methods for the evaluation of the thickness, doping profiles and mobility of the GAAS layers are discussed. The limitations of these methods are also presented. Several working Gunn devices were fabricated either with solution grown contacts on commercially made epitaxial active layers or with solution grown active layers. (Author)

AD-859 848/CP HC E01 MF **A01**
Air Force Weapons Lab., Kirtland AFB, N. Mex.
Model Conversion for Circus, Trac, Sceptre, and Net-1.
Technical rept. 1 Nov 68-15 Feb 69
Carter M. Glass, and Gary K. Pritchard. Jul 69, 47p Rept no. AFWL-TR-69-37
Distribution Limitation now Removed.

Descriptors: *Diodes(Semiconductor), Mathematical models, *Transistors, Mathematical models, *Circuits, Design, Transients, Nuclear radiation, Programming(Computers), Design.
Identifiers: Computer aided design, CIRCUS computer program, TRAC computer program, SCEPTRE computer program, NET 1 computer program.

Transistor and diode models used in transient circuit analysis codes are analyzed. The transistor models built into CIRCUS, NET-1, and TRAC, and the Ebers Moll Model commonly used in SCEPTRE, are illustrated. Tables of conversion factors are given to simplify conversion between models, and similar data are given for diode models. Problems that may be encountered in model conversions are explored. (Author)

AD-864 906/CP PC **E01**/MF **A01**
Cornell Univ., Ithaca, N.Y. School of Electrical Engineering.
Suppression In Active Devices-Circuits
Interim technical rept. (Annual), 1 Nov 68-31 Oct 69
J. M. Ballantyne. Dec 69, 115p RADC-TR-69-410
Contract F30602-68-C-0073
Distribution Limitation now Removed.

Descriptors: *Diodes(Semiconductor), Microwave oscillators, *Microwave oscillators, Reliability(Electronics), Electromagnetic compatibility, Noise(Radio), Interferometers, Computer programs.
Identifiers: *Gunn diodes, *Spurious radiation.

The aim of this project is to study the spurious emissions from transit-time Gunn diodes which affect the electromagnetic compatibility of these devices. Harmonic emission far from the fundamental and noise emission in the vicinity of the fundamental have been studied. Efforts on the harmonic program were directed toward the isolation and elimination of extraneous reflections and interferences in the far infrared interferometer. Noise from Gunn effect oscillators has been extensively measured. A major contribution to the noise spectrum is upconverted flicker noise present in the diode current. An analytic treatment of this up-conversion process is given. (Author)

AD-865 352/CP PC **A12**/MF **A01**
Hughes Aircraft Co., Fullerton, Calif. Ground Systems Group.
Theoretical Investigation of Acoustic Surface Waves on Piezoelectric Crystals
Final rept. 1 Dec 68-30 Nov 69
William R. Jones, James J. Campbell, and Sonja L. Veilleux. 4 Dec 69, 257p FR-69-14-1312, AFCRL-70-0020
Contract F19628-69-C-0132
Distribution Limitation now Removed.

Descriptors: *Piezoelectric crystals, Acoustic properties, Computer programs, Electric currents, Surface properties, Films, Sound transmission.
Identifiers: Surface waves, Acoustic surface waves.

The report describes the analyses of several piezoelectric and pure elastic surface wave

propagation problems and computer programs which implement their numerical study. In addition, the formal analysis of an electric current line source located above a piezoelectric crystal half space is presented in some detail. (Author)

AD-867-379/CP PC **E04**/MF **A01**
Rome Air Development Center, Griffiss AFB, N.Y.
Computerized RADC Reliability Notebook (GE/645/TSS/Basic)
Final technical rept.
George W. Lyne. Mar 70, 102p Rept no. RADC-TR-70-14
Distribution Limitation now Removed.

Descriptors: *Reliability(Electronics), Computer Programs, Failure(Electronics), Life Expectancy, Malfunctions, Probability, Stresses, Potentiometers, Capacitors, Electric connectors, Electric relays, Electric switches, Semiconductor devices, Microminiaturization(Electronics), Handbooks.
Identifiers: AF.

Computer programs which enable the reliability engineer to mechanically apply the 'RADC Reliability Notebook,' Volume II, September 1967, in obtaining the failure rate of piece parts are presented. (Author)

AD-873 830/CP PC **A04**/MF **A01**
Naval Postgraduate School, Monterey, Calif.
Nonlinear Computer Models of Field-Effect Transistors
Master's thesis
Arthur David Rathjen. Jun 70, 52p
Distribution Limitation now Removed.

Descriptors: *Field effect transistors, Mathematical models, *Inverter circuits, Siumlation, Amplifiers, Limiters, Mixers(Electronics), Transfer functions, Matrix algebra, Computer programs, Theses.
Identifiers: Computer aided design, Computerized simulation, Trac computer program, Fortran 4 programming language, Fortran, *Network analysis theory.

Whenever active devices are included in an electronic circuit that is to be analyzed by a computer, appropriate models for these devices must be developed. A lumped large-signal dynamic model of the field-effect transistor (FET) is presented and the procedure for pointwise linearization of this model is described. This linearized model is suitable for use with the TRAC (Transient Radiation Analysis by Computer program) network analysis program. Implementation of this model using TRAC coding was demonstrated by programming an example circuit for each of two basic types of field-effect transistor. The performance of the model in simulating a basic pulse invertor circuit was compared with actual device behavior. Suggestions for extension of this work are included. (Author)

AD-875 184/CP PC **E01**/MF **A01**
Cornell Univ., Ithaca, N.Y. School of Electrical Engineering.
Nonlinear Study of Semiconductor Avalanches
Interim Technical rept.
Reidar Lauri Kuvas. Aug 70, 235p RADC-TR-70-142
Contract F30602-68-C-0042
Distribution Limitation now Removed.

Descriptors: *Avalanche diodes, Performance(Engineering), Carriers(Semiconductors), Microwaves, Noise(Radio), Radiofrequency oscillators, Approximation(Mathematics), Response, Parametric amplifiers, Computer programs.
Identifiers: Impatt diodes.

A time-dependent differential equation for the generated conduction current density in a semiconductor avalanche has been derived in the quasistatic approximation. The modification of the intrinsic response time is shown to be of special importance in the design of avalanche photodiodes. Analytical design criteria for such diodes are given. (Author)

AD-876 732/CP PC **E04**/MF **A01**
Naval Ordnance Lab., White Oak, Md.
Computer Design of Stripline Components
Richard O. Giorgis, Alan J. Ramsbotham, and Donald L. Wilson. 4 Jun 70, 90p Rept no. NOLTR-70-105
Distribution Limitation now Removed.

Descriptors: *Strip transmission lines, Microwave equipment, *Microwave equipment, Design, Passive, Coupling circuits, Electric filters, Computer programs, Electrical impedance.
Identifiers: *Computer aided design.

The paper presents a number of computer programs used in the analysis and synthesis of passive microwave stripline components. The programs generate electrical and dimensional parameters for parallel coupled lines, stub tuned lines, couplers, and filters. Also included are programs to calculate characteristic impedance. The programs are written in both BASIC and FORTRAN computer languages and the emphasis of the report is placed on the use of the programs and not on the theoretical aspects of the structures. (Author)

AD-894 473/8CP PC **E04**/MF **A01**
Martin Marietta Aerospace, Orlando, Fla.
EMP Generated Waveforms Subsystems and Circuits
May 72, 79p Rept no. OR-11930
Contract DAAH01-71-C-1366
Distribution Limitation now Removed.

Descriptors: *Transmission lines, Radiation damage, *Electromagnetic pulses, Radiation damage, Guided missiles(Surface-to-surface), Nuclear explosions, Electronic equipment, Mathematical prediction, Mathematical models, Programming(Computers).
Identifiers: CTRAN computer program, Pershing, XMGM-31A missiles, A.

The primary objective was to develop a technique for predicting the characteristics of coupled energy on system cables having a wide range of parameters. It was also desired to present the results of the prediction technique in the form of nomographs or charts to be used by system designers. Energy coupled into complex systems generally contains many frequency components and amplitude variations. In order to facilitate design and test specification requirements, a simplified mathematical model of the major frequency and amplitude components was desirable. (Author)

AD-910 226/0CP PC **A08**/MF **A01**
RCA Advanced Technology Labs., Camden, N.J.
Approaches to Custom LSI
Final rept. 1 Jun 72-1 Mar 73
Albert Feller, J. Greenhouse, T. J. Lombard, A. M. Smith, and J. E. Saultz. Mar 73, 158p AFAL-TR-73-17
Contract F33615-72-C-1929
Distribution Limitation now Removed.

Descriptors: *Integrated circuits, Design, Semiconductor devices, Computer programs, Simulation, Manufacturing, Logic circuits, Gates(Circuits), Transients, Sapphire, Silicon, Costs, Flow charting, Films, Subroutines, Plotters, Interfaces, Loran, Reliability(Electronics).
Identifiers: Avionics, Bipolar transistors, Complementary metal oxide semiconductors, *Computer aided design, Emitter coupled logic, Metal oxide semiconductors, Schottky barrier devices, Semiconductor diodes, Silicon on sapphire, Thick films, Thin films, *Large scale integrated circuits, Medium scale integrated circuits.

A study was conducted to determine why few avionics systems are being designed today using custom LSI arrays and to propose solutions and recommendations that would contribute to increased utilization of custom LSI arrays in avionic system designs. An extensive survey of the technologies and techniques available for custom LSI array design and fabrication was made, followed by a similarly extensive survey of airframe and space houses to determine the reasons for not using custom LSI arrays in new equipment.

AD-913 866/0CP PC **A04**/MF **A01**
Naval Air Development Center, Warminster, Pa. Aero-Electronic Technology Dept.
Efficiency Study of Electrically Short High-Frequency Antennas
Phase rept.
Gerald Palatucci. Aug 73, 67p Rept no. NADC-73054-20
Distribution Limitation now Removed.

Descriptors: *Aircraft antennas, Efficiency, Antenna feeds, Impedance matching, Dipole antennas, Conical bodies, Helical antennas, Attenuation, Tuned circuits, Voltage, Standing wave ratios, Jet fighters, Patrol aircraft, Mathematical models, Computer programs, Digital computers, High frequency, Communication systems, Cylindrical bodies, Disks, Inductance, Fixed capacitors.
Identifiers: F-14 aircraft, Electric coils, Loading(Electrical), S-3 aircraft.

The requirements for high-frequency communication systems are becoming more stringent especially for small aircraft such as the F-14 and S-3. To optimize the transmitter power budget, the relative efficiency of various antenna configurations including the coupling circuits required to match the antenna to the transmitter has been compared in this analytic and experimental study.

AD-914 142/5CP PC **A03**/MF **A01**
Naval Underwater Systems Center, New London, Conn. New London Lab.
Machine for Information Display and Simulation (MIDAS)
Research rept.
Andrew C. Krajec. Sep 73, 29p Rept no. NUSC-TR-4631
Distribution Limitation now Removed.

Descriptors: *Display systems, *Sonar equipment, Man machine systems, Real time, Simulation, Cathode ray tubes, Digital computers, Resolution, Plan position indicators, Semiconductor devices, Mathematical models, Input output devices, Video signals, Interactions.
Identifiers: AN/SQS-26, Computer driven displays, Minicomputers, Video processors, Computer aided design, DDP 516 computers, Computer programs.

The machine for information display and simulation (MIDAS) is a tool for basic display research and a simulator for evaluating console design. A data General Supernova minicomputer directs the operation of two independent high-resolution display controllers. A Honeywell DDP-516 minicomputer executes real-time mathematical models of the AN/SQS-26 sonar system and its environment and targets. Control of the wide dynamic range of display parameters (e.g., refresh rate and video and reflection signals) are accessible to the experimenter for display research. The simulation capabilities of Midas are demonstrated by its display-level simulation of the AN/SQS-26 mod display subsystem in order to evaluate the

subsystem prior to specification. (Modified author abstract)

AD-920 001/5CP PC **A05**/MF **A01**
Varian Associates Palo Alto Calif Light Sensing and Emitting Div
High Speed 1.06 Micron Photomultiplier Tubes
Final rept. 1 Jun 71-29 Jun 73
R. S. Enck, Jr. Jun 74, 94p AFAL-TR-73-401
Contract F33615-71-C-1763 ·
Distribution limitation now removed.

Descriptors: *Infrared detectors, *Crossed field devices, *Photomultiplier tubes, Response, *Laser communications, Frequency multipliers, *Neodymium lasers, Harmonic generators, Near infrared radiation, Green, Gain, Bandwidth, Quantum efficiency, Light pulses, Yttrium aluminum garnet, Photosensitivity, Dynodes, Noise(Electrical and electromagnetic), Digital computers, Computer programs, Transients, Indium phosphides, Arsenides, Gallium arsenides, Bibliographies.
Identifiers: Transient response, S-20 photocathodes, Rise time, Fall time, Indium arsenide phosphides, Group 3 elements, Group 5 elements, Negative electron affinity, Computer aided design.

This report describes the results of work performed under this contract the original purpose of which was to design and develop high speed 1.06 micron sensitive static crossed field photomultipliers. As a result of two program modifications, this contract successfully developed two different static crossed field photomultipliers (SCFPs). The end use of such devices would be their incorporation into gigabit laser communication systems as optical receivers. The first development of this three-phase program was a high output current (250 microamp) four-stage device which features 120 picosecond rise and fall times, a 3-gigahertz bandwidth, 1000 gain, and either S-20 or 1.06 micron InAsP photocathodes achieving 7% quantum efficiency at 5000A and 1.4% quantum efficiency at 1.06 microns. The second development was a 250 microamp output current, six-stage SCFP achieving 100,000 gain at 150 picosecond rise and fall times (2.5 GHz bandwidth) and incorporated GaAs 0.53 micron photocathodes which achieved 18% quantum efficiency. Excess noise for these devices was less than 1 dB. Finally, 0.53 micron GaAs photocathodes were incorporated into 250 microamp output current four-stage devices with the same gain and bandwidth as achieved in the first development. Quantum efficiencies of 22% at 0.53 micron were produced as well as high gain gallium phosphide dynodes and excess noise of less than 0.4 dB.

AD-921 703/5CP PC **A07**/MF **A01**
Michigan Univ Ann Arbor Radiation Lab
VHF-UHF Phased Array Techniques. Part II. Mutual Effects in Finite Arrays of Slots
Technical rept. 1 Sep 72-31 Aug 73
Mohamed A. Hidayet, John A. M. Lyon, and Charles B. Loftis, Jr. Feb 74, 142p 004970-2-T, AFAL-TR-73-399-Pt-2
Contract F33615-71-C-1495
See also Part 1, AD-918 224L.
Distribution limitation now removed.

Descriptors: *Phased arrays, Linear arrays, *Slot antennas, Coupling(Interaction), Computer programs, Boundary value problems, Very high frequency, Ultrahigh frequency, Antenna radiation patterns, Antenna arrays, Phase shift circuits, Electromagnetic fields, Matrices(Mathematics), Antenna feeds, Waveguides, X band.
Identifiers: Blind spots.

The analysis of finite planar arrays of slots is developed. This analysis includes as special cases the linear array of slots with weak coupling and the linear array with strong coupling. This strong coupling case has not been available heretofore in the literature. Likewise the analysis of the finite planar array is presented for the first time in this report. The degenerate or special case of the linear array with the weak coupling of slots is presented with experimental confirmation of results. The experiments of others were used to verify the finite planar array analysis. A complete and error free program has been written in Fortran IV language during this study. This program will enable the sponsor to fully utilize the advanced methods of calculation of array performance without the necessity of making expensive experimental models of planar arrays. This type of early design calculation also makes it possible to avoid 'blind spots' in the projected array performance. The analysis may be adapted to arrays using other than slot elements through the use of the same basic approximation methods as well as with full use of reciprocity and symmetry.

ANL-TKK/RJL-2 PC **E01**/MF **A01**
Argonne National Lab., Ill.
"Forgy"- a Companion Computer Program of "Trim" to Calculate Forces and Energy In Electromagnets
T. K. Khoe, and R. J. Lari. 4 Jan 72, 26p

Descriptors: *Magnets.

For abstract, see NSA 26 19, number 47599.

ANL-7659 HC A14 MF **A01**
Argonne National Lab., Ill.
INVERSION OF DE HAAS-VAN ALPHEN DATA. I. CLOSED SURFACES WITH INVERSION SYMMETRY
R. L. Aurbach, J. B. Ketterson, F. M. Mueller, and L. R. Windmiller. Jul 70, 311p
Contract W-31-109-ENG-38

Descriptors: *Computer programs, *Solid state physics.

For abstract, see NSA 25 07, number 14433.

AWRE-O-30/75 PC **E99**/MF **A01**
UKAEA Weapons Group, Aldermaston. Atomic Weapons Research Establishment.
Plotem 2: A Fortran Program That Computes the Temperature Distribution Across a Thin, Rectangular Microcircuit Which Is Cooled by Conduction to Heat Sinking Edges and by Convection.
P. G. Hambling. Aug 75, 27
U.S. Sales Only.

Descriptors: *Microelectronic circuits, *Temperature distribution, Computer codes, Fortran.
Identifiers: ERDA/420800.

A program in Fortran IV currently used on IBM 370/168 to compute temperature distribution across a thin, rectangular conduction and convection cooled microcircuit is described. Flowcharts (with a commentary) a user's manual and a worked example are given.

BDX-613-1062 PC **A03**/MF **A01**
Bendix Corp., Kansas City, Mo. (Usa).
Solid State Circuit Breaker. Technological Spinoff Report.
E. R. Elmer. Feb 74, 28p
Contract AT(29-1)-613

Descriptors: *Computer codes, *S codes, *Circuit breakers, *Design, Electronic circuits.

For abstract, see NSA 29 12, number 31647.

BNL-50585 PC **A02**/MF **A01**
Brookhaven National Lab., Upton, N.Y.
User's Guide for GRAPEL: Graph for Engineering Language
L. Osterer. Jul 76, 14p
Contract EY-76-C-02-0016

Descriptors: *Computer codes, *Electronic circuits, CDC computers, Computer aided design, Fortran, G codes, Logic circuits.
Identifiers: ERDA/420800, ERDA/990200, *Logic design.

A logic design diagram is constructed from "MODEL" input statements which describe devices, signals, and their connections to one another. The circuit design process accomplished by iterations of "LINDA" and "MODEL" can be accelerated with the pictorial display provided by this program, without any further data preparation. After design completion, GRAPEL results serve as documentation. (ERA citation 03:019521)

CEA-CONF-2650 PC **A04**/MF **A01**
CEA Centre d'Etudes Nucleaires de Grenoble, 38 (France). Lab. d'Electronique et de Technologie de l'Informatique.
Imag 2 Program for the Cad of Electronic Circuits: Bipolar and Mosfet Models at L.E.T.I.
J. Borel, B. Baylac, and E. Mackowiak. 31 Oct 73, 57p Rept no. CONF-7306105-1
U.S. Sales Only.

Descriptors: *Integrated circuits, *Design, *Computer codes, *I codes, *Electronic circuits, Design, Mathematical models, Mosfet, Optimization, Performance.

For abstract, see NSA 31 02, number 05436.

CEA-N-1347 PC **E01** MF **A01**
Commissariat A L'Energie Atomique, Saclay (France). Centre D'Etudes Nucleaires.
Data Acquisition and Processing Program for Thermionic Diodes Parameters, on a Pdp 8-I Computer.
Jacques Colomes, and Thierry Alleau. Oct 70, 33p
U. S. Sales only

Descriptors: *Computer programs, *Thermionic converters.

For abstract, see NSA 24 24, number 51472.

CEA-R-4337 PC **E01**/MF **A01**
Commissariat A L'Energie Atomique, Bruyeres-Le-Chatel (France). Centre D'Etudes.
Simulation of gamma Ray Effects on Bipolar Transistors Using the Cao Programs
P. Cottin, and G. Hantelle. Jul 72, 29p
Lang- In French. U. S. Sales only

Descriptors: *Computer programs, *Gamma radiation, *Transistors.

For abstract, see NSA 27 03, number 05376.

COM-71-50317/CP PC-**GPO**/MF **A01**-NTIS
National Bureau of Standards, Boulder, Colo. Time and Frequency Div.
Efficient Numerical and Analog Modeling of Flicker Noise Processes
Technical note
J. A. Barnes, and Stephen Jarvis, Jr. Jun 71, 25p
Rept no. NBS-TN-604
Paper copy available from GPO $0.35/copy as stock no. 0303-0861, C13.46:604.

Descriptors: *Random noise, Computerized simulation, Digital filters, White noise, Transfer functions, Difference equations, Mathematical models, Computer programs, FORTRAN.
Identifiers: FLICKER computer program, Flicker noise.

It is shown that by cascading a few simple resistor-capacitor filers, a filter can be constructed which generates from a white noise source a noise signal whose spectral density is very nearly flicker, over several decades of frequency f. Using difference equations modeling this filter, recursion relations are obtained which permit very efficient digital computer generation of flicker noise time-series over a similar spectral range. These analog and digital filters may also be viewed as efficient approximations to integrators of order one-half. (Author)

COM-73-50805/3CP PC-GPO/MF **A01**-NTIS
National Bureau of Standards, Boulder, Colo. Electromagnetics Div.
Considerations for the Precise Measurement of Amplifier Noise
Technical note
David F. Wait. Aug 73, 133p Rept no. NBS-TN-640
Paper copy available from GPO $1.25 as C13.46:640.

Descriptors: *Amplifiers, *Electromagnetic noise, Measurement, Thermal noise, Computer programs, Errors.
Identifiers: NBS.

For the best accuracy in measuring noise figure, attention should be given to the choice of the hot and the cold noise standards and to mismatch problems. Tables and graphs are presented to aid in choosing the proper measurement conditions, and an example is given to demonstrate their use. This paper essentially supplements a previous paper (included in an appendix), treating in more detail topics that become important when state-of-the-art measurements are required.

COM-75-10376/2CP PC **A04**/MF **A01**
National Bureau of Standards, Boulder, Colo. Electromagnetics Div.
Characterization of a High Frequency Probe Assembly for Integrated Circuit Measurements
Final rept.
R. L. Jesch, and C. A. Hoer. Apr 75, 60p Rept no. NBS-TN-663
Sponsored in part by Air Force Weapons Lab., Kirtland AFB, N. Mex. Paper copy also available from GPO as C13.46:663.

Descriptors: *Probes, Integrated circuits, Measurement, Transistors, Computer programs, BASIC programming language.

A detailed, applications-oriented description of a measurement technique that characterizes a high-frequency probe assembly for integrated circuit measurements is given along with the procedure that extracts the parasitic effects of the probe assembly from measurements made at the input connectors of the probe assembly. The scattering parameters of an integrated-circuit device or transistor can now be extracted and accurately determined up to 2 GHz at the wafer stage of assembly. This represents a significant advance over conventional techniques that enable only dc parameters to be measured. Measurement results using this technique are given along with the precision of values obtained as well as the nature of the measurement bias introduced by the probe assembly.

COM-75-10711/0CP PC **A03**/MF **A01**
National Bureau of Standards, Washington, D.C. Electronic Technology Div.
Semiconductor Measurement Technology: A Basic Program for Calculating Dopant Density Profiles from Capacitance-Voltage Data
Final rept. Sep 72-Sep 74
Richard L. Mattis, and Martin G. Buehler. Jun 75, 43p Rept no. NBS-Special Pub-400-11
Contract ARPA Order-2397
Sponsored in part by Defense Nuclear Agency, Washington, D.C. Library of Congress Catalog Card no. 75-619089.
Paper copy also available from GPO as C13.10:400-11.

Descriptors: *Semiconductor doping, *Junction diodes, Computer programs, Silicon, Semiconductors, Density(Number/volume), Capacitance, Electrical potential, Semiconductor devices, BASIC programming language, Additives.
Identifiers: CV1 computer program, CV2 computer program.

A computer program is presented which is suitable for calculating dopant density vs. depth profiles from capacitance-voltage data for the case of a Gaussian-diffused p-n junction diode. The program includes corrections for peripheral capacitance of round or rectangular diodes and back depletion of the space charge region into the diffused layer. Inputs to the program consist of the surface dopant density, the junction depth, the background dopant density in the diffused layer, the junction diameter, three scaling parameters, and the capacitance-voltage data pairs. Output from the program is in the form of a plot and an optional listing of dopant density as a function of depth. The equations underlying the program are given and are related to the program whose operation is described in detail. A second program, for generating idealized capacitance-voltage data pairs. Output from the program is in the form of a plot and an optional listing of dopant density as a function of depth. The equations underlying the program are given and are related to the program whose operation is described in detail. A second program, for generating idealized capacitance-voltage data for a Gaussian-diffused diode on material with a constant dopant density is also included.

CONF-760829-6 PC **A02**/MF **A01**
Oak Ridge National Lab., Tenn.
Computer Program to Calculate Composite Conductor Losses in Pulsed Poloidal Coil Systems
W. H. Gray, and J. K. Ballou. 1976, 5p
Contract W-7405-eng-26
Applied superconductivity conference, Stanford, California, United States of America (USA), 17 Aug 1976.

Descriptors: *Superconducting magnets, *Tokamak type reactors, Composite materials, Computer codes, Eddy currents, Energy losses, Heat transfer, Hysteresis, P codes.
Identifiers: ERDA/700202, ERDA/420201.

The code was used to analyze the present design for the poloidal coil system of the ORNL Experimental Power Reactor (EPR). This design requires that superconductor hysteresis losses, superconductor coupling losses, stabilizing material eddy current losses, and structural material eddy current losses be taken into consideration in the calculation of conductor losses. A tabulation of individual losses vs variations in superconductor characteristics and coil current changes is presented to demonstrate the parameters which significantly affect the design. Results indicate that the total energy released into the cryogenic system is less than one-half of that predicted by the previously oversimplified calculation. (ERA citation 02:012073)

CONF-771104-1 PC **A02**/MF **A01**
Sandia Labs., Albuquerque, N.Mex.
SALSIM: A Language for Control of Digital Logic Simulation
G. R. Case, and J. D. Stauffer. Jul 77, 4p
Contract EY-76-C-04-0789
11. annual ASILOMAR conference on circuits, systems, and computers, Pacific Grove, California, USA, 7 Nov 1977.

Descriptors: *Integrated circuits, *Programming languages, Computer aided design.
Identifiers: ERDA/420800, Simulation, SALSIM programming language, Large scale integrated circuits, Simulation languages.

During the development of large-scale-integrated circuits, logic simulation is used to verify the circuit functions and to develop a sequence of input vectors to test the chip after fabrication. In the simulation phase it is necessary to provide a user-oriented simulation language to allow the designer easily to apply the desired states to the input terminals of the network and to monitor its response. The SALSIM language was designed to achieve this goal. The language has three major functions: control of program execution, application of vectors to the input terminals of the network under test, and control of the information generated by the network output. The latter function allows the user to examine the results of the network simulation and to interface the simulaton results with other programs used to generate test sequences or apply the sequences to the actual chip after it is built. Similar to FORTRAN, the language is easy to learn. Typical statements are explained. (ERA citation 03:004754)

CONS/3800-1 PC **A05**/MF **A01**
National Bureau of Standards, Boulder, Colo. Cryogenics Div.
Helium Research In Support of Superconducting Power Transmission. Annual Report, July 1975--September 1976
M. C. Jones, V. D. Arp, W. R. Parrish, D. E. Daney, and P. R. Ludke. Feb 77, 90p
Contract EX-76-A-10-3800

Descriptors: *Helium, *Superconducting cables, *Transducers, Burnout, Computer calculations, Computer codes, Energy conservation, Fluid flow, Heat transfer, Performance, Power transmission, Research programs, Test facilities, Thermal conductivity, Thermodynamic properties.
Identifiers: ERDA/200303, ERDA/420201, Superconducting power transmission, Power lines.

This is the second annual report of research on helium related problems in support of superconducting power transmission development. Results are presented from experimental and computer modeling of the performance of current leads cooled with supercritical helium gas. Performance characteristics studied are burnout conditions and existence of oscillation in the helium gas. Some conclusions on the feasibility of data transmission from high-voltage regions to grounded read-out instrumentation, on thermometry and on helium impurity measurements are reported. Test results of microwave cavity pressure transducers for use at helium temperatures are discussed in detail. Some improvements in computer codes for helium properties and some recent data on the thermal conductivity of helium are described. A recently completed flow facility is described which has been built for research on flow and heat transfer dynamics of supercritical helium in channels of high aspect ratio modeling superconducting power transmission line channels. (ERA citation 02:056360)

COO-2383-0013 PC **A06**/MF **A01**
Illinois Univ., Urbana Dept. of Computer Science.
Quarterly Technical Progress Report, April, May, June 1974.
W. J. Poppelbaum. 118p Rept no. UIUCDCS-QPR-74-2
Contract AT(11-1)-2383

Descriptors: *Computers, *Research programs, *Electronic circuits, Research programs, Automation, Computer codes, Education, Logic circuits, Magnetic fields.

For abstract, see NSA 31 03, number 07993.

DEMO-75/5 PC **A03**/MF **A01**
Democritus Nuclear Research Center, Athens (Greece).
Time Domain Synthesis of Digital Laguerre Filters.
R. E. King, and P. N. Paraskevopoulos. Jun 75, 38p
U.S. Sales Only.

Descriptors: *Electric filters, Design, Cdc computers, Computer codes, Fortran.
Identifiers: ERDA/990200, *Digital filters, Greece.

The essential theory and a time domain synthesis procedure for a class of digital filters which are the discrete analogs of the classical continuous Laguerre filters are presented. The resultant filters are nonrecursive and yet have an infinite impulse response. These filters possess a transversal structure which may be suitably truncated. An algorithm for minimizing truncation errors and a computer-aided design procedure are presented. Two typical examples are given which illustrate the synthesis procedure.

EPRI-EL-284 PC **A12**/MF **A01**
General Electric Co., Schenectady, N.Y.
Fundamental Investigation of Arc Interruption In Gas Flows. Final Report
G. Frind, R. E. Kinsinger, R. D. Miller, H. T. Nagamatsu, and H. O. Noeske. Jan 77, 251p

Descriptors: *Circuit breakers, Aerodynamics, Air, Carbon dioxide, Carbon fluorides, Computer codes, Dielectric properties, Gas flow, Gases, Mathematical models, Nitrogen oxides, Nozzles, Optimization, Performance testing, Power systems, Sulfur fluorides.
Identifiers: ERDA/200300, *Interrupters, *Gas blast circuit breakers, Sulfur fluorides.

Work on the problem of early, or thermal, recovery of gas blast interrupters is reported. The objective of this work is to obtain a quantitative understanding of the physical and aerodynamic processes important for the optimization of such apparatus. In investigations of model testing techniques, recovery speed (RRRV) was found to be completely independent of power frequency over a wide range as long as nozzle blocking and metallic electrode vapor contamination effects are avoided. In investigations of nozzle and electrode geometry, a sharply defined optimal position was found for the upstream electrode with respect to the nozzle throat. Correlations were established between RRRV and features of the flow field at various electrode positions. A diffuse arc section, contributing very little to the recovery speed, was found at the downstream end of nozzles in which large divergence angles and/or low nozzle pressure ratios led to separation of the flow from the wall and associated internal shock waves. Gases and gas mixtures which have thermal recovery speeds nearly as fast as that of SF sub 6 were identified. Such gas mixtures, particularly those with SF sub 6 , permit gaining an advantage over pure SF sub 6 by operation at higher total pressure. A simple theory which indicates the relative recovery speed of gases based on explicit properties of the gas molecular structure was developed. Collectively, the new information holds promise for significant improvements in the thermal interruption speed of gas blast interrupters. (ERA citation 02:024309)

EPRI-EL-537 PC **A10**/MF **A01**
Westinghouse Electric Corp., Pittsburgh, Pa. Design and Development Center.
Controlled Impedance Short Circuit Limiter. Research Report 654
D. A. Paice, J. Zubek, J. Bonk, and R. P. Putkovich. Sep 77, 201

Descriptors: *Current limiters, *Hvac systems, Computer codes, Cost, Design, Economics, Electrical faults, Mathematical models, Performance, Performance testing, Simulation.
Identifiers: ERDA/200301, Limitr circuits.

Continued growth of electrical power systems and the consequent increase in fault currents has produced the need for current limiting devices. The objective of this program was to investigate the technical and economic factors associated with one particular fault current technique, the controlled impedance current limiter. In this method, a series tuned inductor-capacitor circuit, placed in the line, has virtually zero impedance under normal operation; however, during a fault the series tuned configuration is rapidly altered into a high resistive impedance. Five circuit variations of this limiter were examined. Performance of the resonant circuit limiters was analyzed and evaluated by using a digital computer simulation and by tests on a scaled-down model. The computer simulation was based on a power system application having a throughput rating of 300 MVA at a nominal system voltage of 145 kV. The results of this study, however, are applicable for limiters in 69 kV to 345 kV systems. The major parameters of interest were the first cycle peak let-through current, steady state limited fault current, and peak component stresses. With this current limiter, the fault current has relatively little offset and the instantaneous peak let-through current can be held to about 10 times rated current. The fault current after one cycle is typically held to 2 times rated current and is resistive (0 exp 0 phase angle). The major components of the limiter are conventional inductors and capacitors. Typically, a limiter module having a 100 MVA throughput rating occupies a space of 34 x 26 x 20 ft. The costs vary between $1500 to $3900 per MVA. If this cost can be justified, the application, in view of its losses (approximately 0.1%) is especially attractive on a bus tie where its low load factor imposes a minimum of penalty. Furthermore, the strong current limiting performance coupled with resistive follow-through current results in minimum fault current contribution to the system. (ERA citation 03:010073)

EPRI-EL-545 PC **A06**/MF **A01**
Georgia Inst. of Tech., Atlanta. School of Electrical Engineering.
Computer Program for Determination of Earth Potentials Due to Faults or Loss of Concentric Neutral on Urd Cable
E. B. Joy, and H. N. Nunnally. May 77, 118p

Descriptors: *Computer codes, *Electric cables, *Underground power transmission, B codes, Computer calculations, Corrosion, Earth crust, Electric potential, Electrical faults, Numerical solution, Power transmission, Soils.
Identifiers: ERDA/200301.

Extruded solid dielectric cables with bare concentric neutral wires have received wide industry acceptance for underground residential distribution primary construction. The performance of this type of cable has been outstanding since the early 1960's. However, incidences of corrosion of the bare copper concentric neutral wires have caused the utilities to consider methods of mitigating the corrosion process. One viable method to control the corrosion is to apply an appropriate semiconducting or insulating jacket over the neutral wires. However, the effects of the jackets on "touch and step" potentials during short-circuits was not known. A research program was undertaken to develop a general computer program to calculate "touch and step" potentials, using the Franksville, Wisconsin Test Data as a basis for verifying the program. An additional objective was to compute earth surface potentials resulting from operation with an open neutral. The basic approach to the calculation of "touch and step" potentials is to isolate a section of cable of arbitrary length. A distributed parameter model is used to represent this cable section, the surrounding soil and supplemental grounding within the section. An equivalent circuit is employed to represent the remainder of the electrical system. The calculation of the "touch and step" potentials involves the solution of sets of simultaneous equations for the isolated section and Kirchoff's equations for the external equivalent circuit. (ERA citation 03:006572)

EPRI-7825-FR PC **A11**/MF **A01**
I-T-E- Imperial Corp., Greensburg, Pa.
Optimized Design for Gas Cable Systems. Final Report.
J. C. Cronin. Sep 75, 226p
Contract E(49-18)-1615

Descriptors: *Hv systems, Gas-insulated cables, *Gas-insulated cables, Design, Comparative evaluations, Computer codes, Cost, Economics, Electrical insulation, Optimization, Performance, Performance testing, Sulfur fluorides, Underground power transmission.
Identifiers: ERDA/200301, *Power transmission lines.

The results of an 18-month research study on the optimization of gas-filled cables for high voltage underground power transmission are presented. Information is included on computer programs for evaluating single- and three-conductor designs and for comparing aboveground and underground installation modes; systems capability; economics and demand; cost of SF sub 6 transmission line; development of metallic and nonmetallic enclosures and of conductor joints; insulation performance; and field testing.

EUR-5285e PC **E99**/MF **A01**
Commission of the European Communities, Ispra (Italy). Joint Research Centre.
Interactive System for the Automatic Layout of Printed Circuit Boards (Araignee).
M. Combet, J. Eder, and C. Pagny. 1974, 34
U.S. Sales Only.

Descriptors: *Printed circuits, *Fabrication, Automation, Computer codes.
Identifiers: ERDA/420800.

For abstract, see ERA 75 05, number 00907.

HMI-B-182 PC **A03**/MF **A01**
Hahn-Meitner-Institut fuer Kernforschung Berlin G.m.b.H. (F.R. Germany). Bereich Datenverarbeitung und Elektronik.
Computer Aided Production of Manufacturing Camac-Wired Boards by the Multiwire-Technique.
M. Martini, and W. Brehmer. Oct 75, 27p
In German. U.S. Sales Only.

Descriptors: *Electronic circuits, *Fabrication, Camac system, Computer codes, Design.
Identifiers: ERDA/420800, West Germany.

The multiwire-technique is a computer controlled wiring method for the manufacturing of circuit boards with insulated conductors. The technical data for production are dimensional drawings of the board and a list of all points which are to be connected. The listing must be in absolute co-ordinates including a list of all soldering points for component parts and a reproducible print pattern for inscription. For this wiring method a CAMAC standard board, a layout plan with alpha-numeric symbols, and a computer program which produces the essential technical data were developed. A description of the alpha-numeric symbols, the quality of the program, recognition and checking of these symbols, and the produced technical data is presented.

IS-3691 PC **A09**/MF **A01**
Ames Lab., Iowa.
Computer Controlled Data Measurement and Analysis System Used for Measuring Switching Parameters of Semiconductors
C. H. Culp, and D. E. Eckels. Jan 76, 197p
Contract W-7405-eng-82

Descriptors: *Computer codes, *On-line measurement systems, *Semiconductor switches, Data acquisition systems, Design, Electric conductivity, Electronic circuits, Hp computers, Measuring methods, Performance testing, Pulses, Semiconductor materials, Timing properties.
Identifiers: ERDA/420800, ERDA/360603, ERDA/990200, Amorphous semiconductors.

A computer-controlled data acquisition system which was employed to measure the threshold switching parameters of amorphous semiconductors is described. This system is capable of measuring the delay time required for a sample to switch, the electrical energy put into a sample and the charge passing through it during the delay time, and its ambient temperature. With this equipment an experimenter is able to control the magnitude and maximum duration of the voltage applied to a sample, the time interval between applications of voltage, and the load resistor in series with a sample. An HP 2114B minicomputer provides control and analysis capabilities for this system. Basically, this apparatus is a constant voltage pulse generator and signal processor. Major modules of this system are a transistorized high voltage switch, a digitally controlled high voltage resistor and power supply, a low-thermal-noise input-scanner, a precision timer, and two analog integrators. The amplitude of a voltage pulse can be varied from 0V to 1 kV and the maximum duration can be varied from 10 mu s to 300 s. During the voltage pulse, a signal which represents the current through a sample is processed by analog integrators and signal multipliers. If the sample switches to a low-resistance state during a voltage pulse, this equipment automatically detects the event and removes the voltage from the sample to prevent sample deterioration. Following the voltage pulse, a teletypewriter prints the raw data from the integrators, power supply, and timer and the calculated values of the charge and energy input. 44 figures, 2 tables. (ERA citation 01:013994)

ITEF-22(1976) MF **A01**
Gosudarstvennyi Komitet po Ispol'zovaniyu Atomnoi Energii SSSR, Moscow. Inst. Teoreticheskoi i Ehksperimental'noi Fiziki.
System for Connection of a Scanning Measuring Equipment with a Computer. Hardware and Software on the Basis of the BESM-4 Computer
N. F. Avdeev, M. N. Bogomolov, and G. A. Volkov. 1976, 36p
Available in microfiche only. U.S. Sales Only.

Descriptors: *Interactive display devices, *Scanning measuring projectors, BESM computers, Computer codes, Data processing, Diagrams, Equipment interfaces, On-line measurement systems.
Identifiers: ERDA/440300, ERDA/990200, USSR, BESM-4 computers.

A system of communication of viewing and measuring devices is considered ensuring an on-line operation with BESM-4 computer. A program of film data processing is presented. A detailed description is given with respect to an interface. Modifications are mentioned in some units of the semi-automatic devices which ensure a communication with a computer. The communication system allows for a man-machine dialogue. (Atomindex citation 08:344322)

JAERI-M-6865 MF **A01**
Japan Atomic Energy Research Inst., Tokyo.
Two-Dimensional Stress Analysis Computer Code for Element Coil Test by Finite Element Method
H. Nishimura, and S. Shimamoto. Jan 77, 48p
Available in microfiche only. U.S. Sales Only.

Descriptors: *Superconducting coils, *Superconducting magnets, *Stress analysis, Computer calculations, Electromagnetic fields, Finite element method, Manuals, Spatial distribution, T codes, Toroidal configuration, Two-dimensional calculations.
Identifiers: ERDA/420201, Japan, Finite element analysis.

In the element coil test examining properties of a superconductive toroidal coil, the computer code estimates the stress distribution based on the electromagnetic force in a test module coil. The code consists of the programs of electromagnetic force calculation, automatic mesh generation and stress calculation respectively. The input procedure is described, with some example calculations. The following were revealed: the stress in superconductive wires is highest at top and bottom of the coil. And, the external reinforcement dose not much contribute to reducing the stress. In the case of 226 nodes, the code requires a main memory core of 216 kW and a CPU time of 15.2 sec. in FACOM 230-75. (Atomindex citation 08:344341)

JINR-10-9553 MF **A01**
Joint Inst. for Nuclear Research, Dubna (USSR).
Translator for Symbolic Language of Printed Plate Description
N. Yu. Shkobin. 1976, 19p
Available in microfiche only. U.S. Sales Only.

Descriptors: *Computer codes, *Printed circuits, Algorithms, Computer aided design, Manufacturing, Microprocessors, Optimization, Performance, T codes, Translators.
Identifiers: ERDA/420800, Computer aided manufacturing, TROPA computer program, USSR.

The structure, operating principle and manuals on utilization of the 'Tropa' program are described. The program transforms symbolic description of a printed circuit card into control codes of the 'ADMAR' semiautomatic device. An algorithm is given with respect to optimization of 'idle running' of semiautomatic device technological components. The algorithm provides a 30-40% time saving for manufacture of printed circuit cards. The 'Tropa' program is oriented for a small-size computer of a PDP-8 type operating in dialogue with an operator. Equipped with trouble-shooting and editing systems, the program is well accommodated for industrial use and easy in operation. (Atomindex citation 08:341273)

LA-4205(Add.) HC E01 MF **A01**
Los Alamos Scientific Lab., N. Mex.
The B Modification of TACS1.
Charles L. Wilson. 3 Mar 70, 38p
Contract W-7405-eng-36

Descriptors: *Semiconductor devices, Mathematical models, Computer programs, Boundary value problems, Transistors.
Identifiers: TACS1 computer program, Fermi surfaces, Schottky barriers.

For abstract, see NSA 2416

LA-4539 PC **E01** MF **A01**
Los Alamos Scientific Lab., N. Mex.
Andymg3- the Basic Program of a Series of Monte Carlo Programs for Time-Dependent Transport of Particles and Photons
D. R. Harris. Oct 70, 21p
Contract W-7405-ENG-36

Descriptors: *Computer programs, *Elementary particles, *Photons.

For abstract, see NSA 25 05, number 09601.

LBL-4805 PC **A02**/MF **A01**
California Univ., Berkeley. Lawrence Berkeley Lab.
Calculation of Magnetic Fields for Engineering Devices
J. S. Colonias. Jun 76, 7p Rept no. CONF-760619-5
Contract W-7405-ENG-48
Joint international magnetics and magnetism and magnetic materials intermag conference, Pittsburgh, Pennsylvania, United States of America (USA), 15 Jun 1976.

Descriptors: *Magnetic fields, Accelerators, Calculation methods, Computer calculations, Computer codes, Doublet-3 device, Electric cables, Mathematical models, Superconducting magnets, Uses.
Identifiers: ERDA/420200.

The methodology of magnet technology and its application to various engineering devices are discussed. Magnet technology has experienced a rigid growth in the past few years as a result of the advances made in superconductivity, numerical methods and computational techniques. Included are discussions on: (1) mathematical models for solving magnetic field problems; (2) the applicability, usefulness, and limitations of computer programs that utilize these models; (3) examples of application in various engineering disciplines; and (4) areas where further contributions are needed. (ERA citation 02:003642)

LBL-564 PC **E01**/MF **A01**
California Univ., Berkeley. Lawrence Berkeley Lab.
Computer Programs for Accelerators and Electronic Circuit Designs
John S. Colonias. Dec 71, 59p
Contract W-7405-ENG-48

Descriptors: *Accelerators, *Circuits, *Computer programs, *Electric fields, *Electromagnetic fields.

For abstract, see NSA 26 11, number 26167.

N70-23656/CP HC E01 MF **A01**
Massachusetts Inst. of Tech., Cambridge. Electronic Systems Lab.
Circal-2 - a General-Purpose on-Line Circuit-Design Program. User'S Manual.
M. L. Dertouzos, and J. R. Stinger. May 69, 75p
Rept nos. NASA-CR-109363, ESL-R-381
Contract NGL-22-009-019, NONR-4102/01/

Descriptors: *Circuits, *Computer programs, *Manuals, *Network analysis, *On-line programming, Circuit diagrams, Input/output routines, Optimization.

For abstract, see STAR 0810

N70-26353/CP HC E01 MF **A01**
Weapons Research Establishment, Salisbury (Australia).
Transformer Designs by Computer Programmes.
R. N. Davie. Oct 69, 95p Rept no. WRE-TN-ECD-55

Descriptors: *Computer programs, *Structural design, *Transformers, Electric power plants, Electrical engineering.

For abstract, see STAR 0812

N70-26441/CP HC E01 MF **A01**
Technical Univ. of Denmark, Lyngby. Lab. of Electromagnetic Theory.

Laboratory of Electromagnetic Theory of the Technical University of Denmark Annual Report, 1967e1968.
1968, 18p Rept no. D-82

Descriptors: *Electrical engineering, *Research and development, Antenna radiation patterns, Bibliographies, Computer programs, Conferences, Fortran, Numerical analysis.

For abstract, see STAR 0812

N70-28433/CP HC E01 MF **A01**
National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Description and Evaluation of Digital-Computer Program for Analysis of Stationary Outside- Coil Lundell Alternators.
G. Bollenbacher. Jun 70, 119p Rept no. NASA-TN-D-5814
Contract 120-27

Descriptors: *Ac generators, *Computer programs, *Digital computers, *Energy conversion efficiency, Electromagnetic properties, Equipment specifications, Leakage, Rotors, Systems engineering.

For abstract, see STAR 0814

N70-29745/CP HC E01 MF **A01**
Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
Operating Characteristics of Computer Programs for Nonlinear Transient Analysis.
W. J. Schneider. 1 Jun 70, 56p Rept nos. NASA-CR-110366, JPL-TR-32-1429
Contract NAS7-100

Descriptors: *Computer programs, *Computerized simulation, *Network analysis, Analysis (mathematics), Circuits, Nonlinear programming, Semiconductor devices.

For abstract, see STAR 0815

N70-30099/CP HC E01 MF **A01**
Weapons Research Establishment, Adelaide (Australia).
Design of Chebyshev Passband Filters Approximating a Given Attenuation Characteristic in the Stopband.
G. R. Haack. Jun 67, 34p Rept no. WRE-TN-PAD-167

Descriptors: *Bandpass filters, *Chebyshev approximation, *Computer programs, *Wave attenuation, Applications of mathematics, Attenuation coefficients, Bandwidth, Fortran, Iterative solution, Ripples.

For abstract, see STAR 0815

N70-33277/CP HC E01 MF **A01**
National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Control of Electronic Circuit Designs for Space Vehicles.
O. J. Magrini. Jul 70, 15p Rept nos. NASA-TN-D-5920, E-5460

Descriptors: *Circuits, *Electronic equipment, *Systems engineering, Aerospace environments, Computer programs, Performance prediction.

For abstract, see STAR 0817

N70-33528/CP HC E01 MF **A01**
Weapons Research Establishment, Salisbury (Australia).
Analysis of Large Dipole Arrays by Digital Computer.
J. L. Whitrow. Sep 69, 37p Rept no. WRE-TN-ED-178

Descriptors: *Antenna arrays, *Antenna radiation patterns, *Dipole antennas, Computer programs, Digital computers.

For abstract, see STAR 0818

N70-36567/CP HC E01 MF **A01**
General Electric Co., Schenectady, N. Y. Tube Dept.
Circuit Efficiency Enhancement Studies at 12 G Hz Final Report.
G. M. Branch. 29 May 70, 67p Rept no. NASA-CR-72696
Contract NAS3-11533

Descriptors: *Klystrons, *Power amplifiers, *Satellite television, Beam waveguides, Cavity resonators, Computer programs, Electron beams, Television transmission.

For abstract, see STAR 0820

N70-36972/CP HC E01 MF **A01**
Weapons Research Establishment, Salisbury (Australia).
Recursive Digital Filtering with Zero Phase Shift.
J. L. Roughan. Mar 69, 18p Rept no. WRE-TN-TSD-36

Descriptors: *Digital filters, *Phase shift, *Recursive functions, Algorithms, Computer programs, Data processing.

For abstract, see STAR 0820

N70-37184/CP HC E01 MF **A01**
Royal Aircraft Establishment, Farnborough (England).
Synthesis of Active Pulse Filters.
G. F. Kimbell. Jan 70, 21p Rept no. RAE-TR-70014

Descriptors: *Electric filters, *Electric pulses, *Low pass filters, *Network synthesis, Bandwidth, Computer programs, Electric networks, Signal transmission, Transfer functions, Waveforms.

For abstract, see STAR 0820

N70-37959/CP HC E01 MF **A01**
Technology for Communications International, Mountain View, Calif.
Theoretical Analysis of Dipole Antenna Characteristics on the Rae Satellite, Part 1 Final Report.
Aug 70, 226p Rept nos. NASA-CR-113112, TCI-2236-PT-1
Contract NAS5-11256

Descriptors: *Antenna radiation patterns, *Computer programs, *Current distribution, *Dipole antennas, *Radio astronomy explorer satellite, Damping, Libration, Orthogonality, Preamplifiers, Printouts.

For abstract, see STAR 0821

N71-11302/CP PC **A09**
Laboratoire D Automatique Et de Ses Applications Spatiales, Toulouse (France).
Contribution to the Digital Control of a Synchromachine.
Contribution A La Commande Numerique D'une Synchromachine
C. Chicoix. 1969, 183p
Lang- in French Spon- Sponsored By Compagn. Intern. de l'Informatique

Descriptors: *Binary data, *Digital to analog converters, *Field effect transistors, *Function generators, *Trigonometric functions, Computer programs, Error analysis, Real time operation, Synchronism, Transistor logic.

For abstract, see STAR 0902

N71-11374/CP PC **A12**
Laboratoire D Automatique Et de Ses Applications Spatiales, Toulouse (France).
Contribution to the Study of Logic Circuits Using Computers.
Contribution A l'Etude des Circuits Logiques Par Ordinateur
M. Diaz, and G. Hamalainen. Oct 69, 260p Rept no. LAAS-613-614
Lang- in French Spon- Sponsored By Direc. Gen. A La Rech. Sci. Et Tech.

Descriptors: *Computer programs, *Computerized simulation, *Logic circuits, *Network analysis, Equivalent circuits, Input/output routines, Mathematical models, Problem solving, Switching circuits, Transistor logic, Volt-ampere characteristics.

For abstract, see STAR 0902

N71-19172/CP PC **A04**
Weapons Research Establishment, Salisbury (Australia).
A COMPUTER PROGRAM FOR DESIGN OF LOW PASS FILTERS WITH UNIFORM OR SEMIUNIFORM DISSIPATION
G. R. Haack. May 70, 69p Rept no. WRE-TN-ED-193

Descriptors: *Computer programs, *Computerized design, *Low pass filters, Dissipation, Insertion loss, Mathematical models, Network synthesis.

For abstract, see STAR 0908

N71-21053/CP PC **A04**
Technical Univ. of Denmark, Lyngby. Lab. of Electromagnetic Theory.
Admittance of a Thick Antenna - Numerical Procedure and Results
R. A. Hurd, and J. Jacobsen. Nov 69, 69p Rept no. R-74

Descriptors: *Antenna feeds, *Computer programs, *Linear arrays, Computation, Electrical impedance, Integral calculus, Numerical integration.
Identifiers: NASA subject code 07.

For abstract, see STAR 0910

N71-25896/CP PC **E01** MF **A01**
Massachusetts Inst. of Tech., Cambridge. Electronic Systems Lab.
Computer Aided Electronic Circuit Design Final Report
M. L. Dertouzos. Nov 70, 67p Rept nos. NASA-CR-118642, ESL-FR-436
Contract NAS12-2208, NGL-22-009-019
Spon- Sponsored in Part By Arpa

Descriptors: *Circuit diagrams, *Computerized design, *On-line programming, Computer programs, Fortran, Ibm computers, Optimization.

For abstract, see STAR 0914

N71-31451/CP PC **E01** MF **A01**
Technische Univ., Berlin (West Germany). Fakultaet Fuer Elektrotechnik.
The Behavior of Plane Space Discharge Diode with Maxwellian Velocity Distribution In the Alternating- and Noise-Regimes of the Propagation Time
Das Verhalten Der Ebenen Raumladungsdiode Mit Maxwellscher Geschwindigkeitsverteilung Bei
H. K. Hubert. 1969, 91p
Lang- in German

Descriptors: *Diodes, *Electron transfer, *Propagation modes, *Signal to noise ratios, Approximation, Computer programs, Maxwell-boltzmann density function.

For abstract, see STAR 0918

N72-12093/CP PC **E01**/MF **A01**
Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
Radial Rib Antenna Surface Deviation Analysis Program
J. V. Coyner, Jr. 15 Dec 71, 70p Rept nos. NASA-CR-124570, JPL-TM-33-518
Contract NAS7-100

Descriptors: *Antennas, *Computer programs, *Ribs (supports), *Surface properties, Deflection, Mesh, Root-mean-square errors.

For abstract, see STAR 1003

N72-13158/CP PC **E01**/MF **A01**
Royal Inst. of Tech., Stockholm (sweden). Div. of Electron Physics.
Computer Program for Calculation of Electrical Parameters in Cavity Resonators with Cylindrical Symmetry
M. Sedlacek. Sep 71, 75p Rept no. TRITA-EPP-71-06

Descriptors: *Cavity resonators, *Computer programs, *Cylindrical bodies, *Relaxation method (mathematics), Dissipation, Electric fields, Electrical impedance, Energy storage, Fortran, Q factors, Resonant frequencies, Symmetry.

For abstract, see STAR 1004

N72-15208/CP PC **E01**/MF **A01**
Technische Hogeschool, Eindhoven (netherlands).
Optimization of Small AC Series Commutator Motors
Ph.D. Thesis
R. H. Dijken. 1971, 190p

Descriptors: *Alternating current, *Commutators, *Electric motors, Computer programs, Mathematical models, Optimization, Rotors.

For abstract, see STAR 1006

N72-20198/CP PC **E01**/MF **A01**
Laboratoire Dautomatique Et de Ses Applications Spatiales, Toulouse (france).
Operations Manual for the Laas 2 Electronic Circuit Simulation Program in Pulsed Mode . Notice Dutilisation de Laas 2, Programme de Simulation de Circuits Electroniques en Regime Impulsionnel
H. Jaladieu. Oct 71, 19p Rept no. LAAS-NT-SIS-71-T-03

Descriptors: *Circuits, *Computer programming, *Computerized simulation, Capacitors, Diodes, Electric current, Electric networks, Electric potential, Equivalent circuits, Resistors.

The LAAS 2 program is a computer program for simulating electric and electronic circuits including power and current sources, resistors, capacitors, diodes, and transistors giving the values of current and voltage on each branch of a network list and format of input data are defined and some explanations are given on the print-out.

N72-20230/CP PC **E01**/MF **A01**
Technische Univ., Berlin (west Germany).
Eddy Current Distribution In Parallel Conductors . Wirbelstromverteilung in Parallelen Leitern
Ph.D. Thesis
M. Ehrich. 1970, 134p

Descriptors: *Eddy currents, *Electric conductors, *Electrical properties, *Parallel plates, Computer programs, Mathematical models, Numerical analysis.

A numerical analysis of the electrical properties and distribution of eddy currents in parallel conductors is presented. The conditions existing in conductors in the form of thin plates, wide plates, and circular cylinders are examined. Computer programs for solving the mathematical relationships are explained. The following assumptions were imposed on conditions affecting the eddy currents over a cross section of the conductor: (1) omission of the capacitance mathematical relationships are explained. The following assumptions were imposed on conditions affecting the eddy currents over a cross section of the conductor: (1) omission of the capacitance current, (2) constant permeability in space, and (3) the field strength does not depend on the longitudinal direction of the conductor.

N72-22218/CP PC **E01**/MF **A01**
Caed Corp., La Canada, Calif.
Design of Microstrip Components by Computer
T. C. Cisco. Mar 72, 266p Rept no. NASA-CR-1982
Contract NAS1-10521

Descriptors: *Computer programs, *Computerized design, *Microwave equipment, *Strip transmission lines, Fortran, Integrated circuits, Microwave coupling, Microwave switching, Miniaturization.

A number of computer programs are presented for use in the synthesis of microwave components in microstrip geometries. The programs compute the electrical and dimensional parameters required to synthesize couplers, filters, circulators, transformers, power splitters, diode switches, multipliers, diode attenuators and phase shifters. Additional programs are included to analyze and optimize cascaded transmission lines and lumped element networks, to analyze and synthesize Chebyshev and Butterworth filter prototypes, and to compute mixer intermodulation products. The programs are written in FORTRAN and the emphasis of the study is placed on the use of these programs and not on the theoretical aspects of the structures. (Author)

N72-26187/CP PC **E01**/MF **A01**
National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Toroidal Transformer Design Program with Application to Inverter Circuitry
J. A. Dayton, Jr. Jun 72, 38p Rept nos. NASA-TM-X-2540, E-6785

Descriptors: *Computer programs, *Computerized design, *Inverters, *Transformers, Fortran, Magnetic cores, Spacecraft power supplies, Temperature compensation, Toroids, Weight (mass).

Estimates of temperature, weight, efficiency, regulation, and final dimensions are included in the output of the computer program for the design of transformers for use in the basic parallel inverter. The program, written in FORTRAN 4, selects a tape wound toroidal magnetic core and, taking temperature, materials, core geometry, skin depth, and ohmic losses into account, chooses the appropriate wire sizes and number of turns for the center tapped primary and single secondary coils. Using the program, 2- and 4-kilovolt-ampere transformers are designed for frequencies from 200 to 3200 Hz and the efficiency of a basic transistor inverter is estimated. (Author)

N73-10145/CP PC **E08**/MF **A01**
Autonetics, Anaheim, Calif.
Analysis of a Display and Control System Man-Machine Interface Concept. Volume 1 Final Technical Report
D. R. Karl. 8 Sep 72, 214p Rept nos. NASA-CR-128576, C71-999/401-VOL-1
Contract NAS9-12266

Descriptors: *Display devices, *Man machine systems, *Space shuttle orbiters, *Spacecraft control, Cathode ray tubes, Computer programs, Computers, Data management, Redundancy, Systems engineering.

An evaluation was made of the feasibility of utilizing a simplified man machine interface concept to manage and control a complex space system involving multiple redundant computers that control multiple redundant subsystems. The concept involves the use of a CRT for display and a simple keyboard for control, with a tree-type control logic for accessing and controlling mission, systems, and subsystem elements. The concept was evaluated in terms of the Phase B space shuttle orbiter, to utilize the wide scope of data management and subsystem control inherent in the central data management subsystem provided by the Phase B design philosophy. Results of these investigations are reported in four volumes. (Author)

N73-10147/CP PC **E04**/MF **A01**
Autonetics, Anaheim, Calif.
Analysis of a Display and Control System Man-Machine Interface Concept. Volume 3 Appendices C, D and E
Final Report
D. R. Karl. 8 Sep 72, 93p Rept nos. NASA-CR-128578, C71-999/401-VOL-3
Contract NAS9-12266

Descriptors: *Coding, *Format, *Space shuttle orbiters, Computer programs, Computers, Man machine systems, Redundancy, Spacecraft components.

For abstract, see STAR 1101

N73-10148/CP PC **A05**/MF **A01**
Autonetics, Anaheim, Calif.
Analysis of a Display and Control System Man-Machine Interface Concept. Volume 4 Appendix F
Final Report
D. R. Karl. 8 Sep 72, 78p Rept nos. NASA-CR-128579, C71-999/401-VOL-4
Contract NAS9-12266

Descriptors: *Display devices, *Space missions, *Space shuttle orbiters, *Spacecraft control, Computer programs, Computers, Man machine systems, Mission planning, Redundancy.

For abstract, see STAR 1101

N73-13422/CP PC **A03**/MF **A01**
Australian Post Office Research Labs., Melbourne.
Programmable Logic Tester
N. Gale. Jul 70, 28p Rept no. REPT-6570

Descriptors: *Circuit boards, *Computer programs, *Control equipment, *Logic circuits, Decision making, Decoders, Logical elements, Static tests, Test equipment.

A high speed static tester consisting mainly of storage and decoding was developed which is capable of performing a simple GO/NO GO test of logic ciruity. The device is computer driven

with all decision making, comparison, and sequencing under program control. The terminal, its operation, and the program description are described.

N73-16191/CP PC **E05**/MF **A01**
Laboratoire Central de Recherches Thomson-csf, Orsay (France).
Study of the Influence of Nanoelectronic Technology on the Development and Performance of Rapid Logic Circuits Using Little Power . Etude de Linfluence des Technologies Nanoelectronique sur la Conception et les Performances des Circuits Logiques Rapides a Faible Consommation
Final Report
R. Lyon-caen. 1971, 129p
Contract DEL-INF-70.80.038.00.212.75.01
Language French

Descriptors: *Computer programs, *Computerized simulation, *Electrical resistance, *Field effect transistors, *Logic circuits, Avalanche diodes, Equivalent circuits, Gates (circuits), Logic design, Quadrupoles.
Identifiers: NASA.

The program AFLOU for the calculation of FET characteristics is described and applied to calculation of the resistance. Two types of resistance samples were designed, the first for high frequency simulation studies, the second for analysis of resistance dispersion and other resistance variations. The delays due to ionization and deionization of zener diodes are evaluated.

N73-20187/CP PC **E01**/MF **A01**
Ohio State Univ., Columbus. Electroscience Lab.
An Integral-Equation Solution for TE Radiation and Scattering from Conducting Cylinders
J. H. Richmond. Apr 73, 82p Rept nos. NASA-CR-2245, TR-2902-7
Contract NGL-36-008-138

Descriptors: *Antenna radiation patterns, *Polarization characteristics, *Polarized electromagnetic radiation, Computer programs, Low frequencies, Numerical analysis.
Identifiers: NASA.

The piecewise-sinusoidal reaction technique is applied to low frequency radiation and scattering from noncircular cylinders with perfect or imperfect conductivity. This report presents the theory, computer programs and numerical results for these two-dimensional problems with the TE polarization. (Author)

N73-20258/CP PC **E06**/MF **A01**
Stanford Research Inst., Menlo Park, Calif. Electromagnetic Techniques Lab.
Avalanche-Diode Oscillator Circuit with Tuning at Multiple Frequencies
Final Report, 4 Dec. 1969 - 4 Dec. 1970
D. Parker, C. M. Ablow, R. E. Lee, A. Karp, and D. R. Chambers. Feb 71, 143p Rept no. NASA-CR-131399
Contract NAS12-2231, DOT-TSC-6

Descriptors: *Avalanche diodes, *Dynamic characteristics, *Electric current, *Harmonic oscillation, Computer programs, Efficiency, Semiconductor devices, Solid state devices, Tuning.
Identifiers: NASA.

Detailed theoretical analysis of three different modes or types of high efficiency oscillation in a PIN diode are presented. For the TRAPATT mode in a PIN diode, it is shown that a traveling avalanche zone is not necessary to generate a dense trapped plasma. An economical computer program for TRAPATT oscillations in a PIN diode is described. Typical results of diode power, dc-to-RF conversion efficiency, and required circuit impedances are presented for several different current waveforms. A semi-analytical solution for a second type of high efficiency mode in a PIN diode is derived assuming a rectangular current waveform. A quasi-static approximation is employed to derive a semianalytical solution for the voltage across a PIN diode in a third mode, where avalanching occurs during a major portion of a half cycle. Calculations for this mode indicate that the power increases proportionally to the magnitude of the drive current with a small decrease in efficiency relative to the ordinary TRAPATT mode. An analytical solution is also given for a PIN diode, where it is assumed that the ionization coefficient is a step function. It is shown that the step-ionization approximation permits one to draw possible patterns of avalanche region in the depletion layer as a function of time. A rule governing admissible patterns is derived and an example solution given for one admissible pattern. Preliminary experimental results on the high-efficiency oscillations are presented and discussed. Two different experimental circuits, which used channel-dropping filters to provide independent harmonic tuning, are described. Simpler circuits used to produce high-efficiency oscillations are discussed. Results of experiments using inexpensive Fairchild FD300 diodes are given. (Author)

N73-21082/CP PC **E01**/MF **A01**
National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Digital-Computer Program for Design Analysis of Salient, Wound Pole Alternators
D. S. Repas. Apr 73, 88p Rept nos. NASA-TN-D-7258, E-7244

Descriptors: *Ac generators, *Computer programs, *Digital computers, Flow charts, Fortran, Input/output routines.
Identifiers: NASA.

A digital computer program for analyzing the electromagnetic design of salient, wound pole alternators is presented. The program, which is written in FORTRAN 4, calculates the open-circuit saturation curve, the field-current requirements at rated voltage for various loads and losses, efficiency, reactances, time constants, and weights. The methods used to calculate some of these items are presented or appropriate references are cited. Instructions for using the program and typical program input and output for an alternator design are given, and an alphabetical list of most FORTRAN symbols and the complete program listing with flow charts are included. (Author)

N73-31764/6CP PC **A03**/MF **A01**
National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
Summary of Attitude Dynamic Analysis for Imp-J Wire Antenna Spacecraft
L. W. Bell. Sep 73, 26p Rept nos. NASA-TM-X-70465, X-732-73-256

Descriptors: *Antennas, *Explorer satellites, *Spacecraft design, Computer programs, Deployment, Mission planning.
Identifiers: NASA.

The work is reported in the determination of acceptable deployment sequences, simulation of EFM antenna deployment, and contingency analysis for the IMP-J S/C. The spacecraft, mission profile and deployment sequences are described along with the simulation of EFM deployment and deployment failure.

N74-10225/2CP PC **A02**/MF **A01**
National Aeronautics and Space Administration, Washington, D.C.
Computer Programs: Electronic Circuit Design Criteria: A Compilation
1973, 13p Rept no. NASA-SP-5963(01)

Descriptors: *Circuit diagrams, *Computer programs, *Structural design criteria, *Technology utilization, Computerized design, Electronic equipment, Information dissemination, Nasa programs.
Identifiers: NASA.

A Technology Utilization Program for the dissemination of information on technological developments which have potential utility outside the aerospace community is presented. The 21 items reported herein describe programs that are applicable to electronic circuit design procedures. (Author)

N74-17891/4CP PC **A02**/MF **A01**
Admiralty Surface Weapons Establishment, Portsmouth (England).
A Computer Program for Evaluating the Far-Field Radiation Pattern of an Omni-Directional Antenna Obstructed by a Vertical Metal Cylinder
T. J. Green. Sep 73, 18p Rept nos. TR-73-27, BR37572

Descriptors: *Antenna radiation patterns, *Computer programs, *Far fields, *Omnidirectional antennas, Cylindrical bodies, Electromagnetic scattering, Fortran, Metal shells, Time sharing.
Identifiers: NASA.

The degrading effects of cylindrical metal obstructions on the far-field radiation pattern of an omnidirectional antenna, vertically or horizontally polarized were investigated. A description is given of a computer program to evaluate the far-field radiation pattern of such a system. The program is written in FORTRAN for use on Com-Share Commander 2 time sharing facility. (Author)

N74-21892/6CP PC **A05**/MF **A01**
Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.
APLAC2: A Flexible DC and Time Domain Circuit Analysis Program for Small Computers.
M. Valtonen. 1973, 76p Rept no. S-56

Descriptors: *Computer programs, *Linear circuits, *Network analysis, *Transistor amplifiers, *Transmission lines, Basic (Programming language), Direct current, Domains, Minicomputers, Monte carlo method, Nonlinear systems, Time.

APLAC2 (Analysis Program for Linear Active Circuits) is a small nodal analysis program written in BASIC for the dc and time domain analysis of linear (and nonlinear) networks. The basic elements accepted by APLAC2 are the lumped linear (time-invariant or time-variable) resistances, inductances, and capacitances as well as independent and the two types of controlled current sources. The output consists of the node voltages. Because of the flexibility of BASIC, APLAC2 is capable of performing the analysis of nonlinear and lossless transmission line networks and dc-sensitivity, dc-worst-case and Monte-Carlo analyses. Furthermore, mutual couplings, arbitrary library models, and resistive n-ports may be used with the networks to be computed. (Author)

N74-22824/8CP PC **A04**/MF **A01**
National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
Parabolic Cylinder Antennas.
R. F. Schmidt. Sep 73, 59p Rept nos. NASA-TM-X-70631, X-811-73-221

Descriptors: *Cylindrical antennas, *Far fields, *Fresnel region, *Parabolic antennas, Antenna design, Antenna feeds, Computer programs, Polarization (Waves), Radar reflectors, Sidelobes.

Some of the features of single and dual parabolic-cylinder reflector antenna systems are discussed in terms of wave conversions, field divergence, and wavefronts in Fresnel and Fraunhofer regions. Beam-squinting, by mechanical displacement and electrical phase gradient methods, is introduced together with the combination of these methods. In the case of dual parabolic cylinders there is also a discussion of surface-truncation, parametric representation of surface intersections, main-aperture blockage by the subsystem, and beam squinting. A few diffraction patterns are presented to illustrate the type of data available via a formulation equivalent to the complex-vector Kirchhoff-Kottler formulation. Main and cross-polarization components of the solution are available as they are inherently part of the field solution in the Cartesian coordinate system. A means of displaying main and cross-polarization components for arbitrary beam-scanning in space is outlined. Extensions to monopulse tracking with variable-beamwidth (zooming) capability are introduced. (Author)

N74-26497/9CP PC **A03**/MF **A01**
National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md. Dept. of Electrical Engineering.
Digital Computer Simulation of Inductor-Energy-Storage DC-to-DC Converters with Closed-Loop Regulators.
A. K. Ohri, H. A. Owen, T. G. Wilson, and G. E. Rodriguez. 18 Jun 74, 41p Rept no. NASA-TM-X-69467
Contract NGL-34-001-001
Conf-Presented at the 1974 Spacecraft Power Conditioning Electron. Seminar, Frascati, Italy, 20-22 May 1974.

Descriptors: *Computerized simulation, *Converters, *Direct current, *Electric equipment, *Performance tests, Computer programs, Electrical properties, Performance prediction.

The simulation of converter-controller combinations by means of a flexible digital computer program which produces output to a graphic display is discussed. The procedure is an alternative to mathematical analysis of converter systems. The types of computer programming involved in the simulation are described. Schematic diagrams, state equations, and output equations are displayed for four basic forms of inductor-energy-storage dc to dc converters. Mathematical models are developed to show the relationship of the parameters. (Author)

N74-28548/7CP PC **A03**/MF **A01**
Royal Aircraft Establishment, Farnborough (England).
Small Transformer Design by Computer.
M. D. Palmer. Feb 74, 47p Rept nos. RAE-TR-73155, BR39351

Descriptors: *Computerized design, *Power supply circuits, *Transformers, Computer programs, Efficiency, Electronic modules, Ion engines.

The overall efficiency of one module in a modular power supply for an ion motor is mainly determined by the individual efficiencies of the power transistors, the output transformer, and the bridge rectifier diodes. A computer program was written to investigate transformer design under conditions compatible with the other circuit elements with the aim of obtaining improvements in efficiency and reduction in mass. Transformers produced from the resulting designs had efficiencies in excess of 98% and masses some 25% less than their predecessors. (Author)

N74-28706/1CP PC **A04**/MF **A01**
Ohio State Univ., Columbus. ElectroScience Lab.
Diffraction by a Perfectly Conducting Rectangular Cylinder Which Is Illuminated by an Array of Line Sources.
R. G. Kouyoumjian, and N. Wang. Jun 74, 73p Rept nos. NASA-CR-2405, ESL-3001-7
Contract NGR-36-008-144

Descriptors: *Aircraft antennas, *Antenna radiation patterns, *Cylindrical antennas, *Spacecraft antennas, Computer programs, Electromagnetic radiation, Magnetic fields, Scattering cross sections.

The geometrical theory of diffraction (GTD) is employed to analyze the radiation from a perfectly-conducting rectangular cylinder illuminated by an array of line sources. The excitation of the cylinder by a single electric or magnetic current line source is considered first, and a solution which includes contributions from the geometrical optics rays and all singly- and doubly-diffracted rays is obtained. A new diffraction coefficient valid in the transition regions of the shadow and reflection boundaries is employed to obtain a continuous total field, except for negligible discontinuities in the doubly-diffracted field at its shadow boundaries. Patterns calculated by the GTD method are found to be in excellent agreement with those calculated from an integral equation formulation. Using superposition the solution for array or aperture excitation of the rectangular cylinder is obtained. A computer program for this solution is included. (Author)

N74-29562/7CP PC **A03**/MF **A01**
Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
Lightweight 3.66-Meter-Diameter Conical Mesh Antenna Reflector.
D. M. Moore. 15 Jun 74, 47p Rept nos. NASA-CR-139219, JPL-TM-33-685
Contract NAS7-100

Descriptors: *Antenna design, *Computer programs, *Conical bodies, Structural engineering, Transmission lines.

A description is given of a 3.66 m diameter nonfurlable conical mesh antenna incorporating the line source feed principle recently developed. The weight of the mesh reflector and its support structure is 162 N. An area weighted RMS surface deviation of 0.28 mm was obtained. The RF performance measurements show a gain of 48.3 db at 8.448 GHz corresponding to an efficiency of 66%. During the design and development of this antenna, the technology for fabricating the large conical membranes of knitted mesh was developed. As part of this technology a FORTRAN computer program, COMESH, was developed which permits the user to predict the surface accuracy of a stretched conical membrane. (Author)

N74-29572/6CP PC **A02**/MF **A01**
Ohio State Univ., Columbus.
Mutual Impedance of Nonplanar-Skew Sinusoidal Dipoles.
J. H. Richmond, and N. H. Geary. Aug 74, 13p Rept nos. NASA-CR-138310, ESL-2902-18
Contract NGL-36-008-138

Descriptors: *Antenna design, *Dipole antennas, *Electromagnetic properties, *Monopole antennas, Computer programs, Electrical impedance, Electrical properties, Numerical analysis.

The mutual impedance of nonplanar-skew sinusoidal dipoles is presented as a summation of several exponential integrals with complex arguments. Mathematical models are developed to show the near-zone field of the sinusoidal dipole. The mutual impedance of coupled dipoles is expressed as the sum of four monopole-mobopole impedances to simplify the analysis procedure. The subroutines for solving the parameters of the dipoles are discussed. (Author)

N74-34603/2CP PC **A03**/MF **A01**
Ohio State Univ., Columbus. ElectroScience Lab.
Computer Program for Thin Wire Antenna over a Perfectly Conducting Ground Plane.
J. H. Richmond. Oct 74, 46p Rept nos. NASA-CR-140622, ESL-2902-19
Contract NGL-36-008-138

Descriptors: *Antennas, *Computer programs, Galerkin method, Load distribution (Forces), Sine waves.

A computer program is presented for a thin-wire antenna over a perfect ground plane. The analysis is performed in the frequency domain, and the exterior medium is free space. The antenna may have finite conductivity and lumped loads. The output data includes the current distribution, impedance, radiation efficiency, and gain. The program uses sinusoidal bases and Galerkin's method. (Author)

N75-14960/9CP PC **A07**/MF **A01**
Avco Corp., Wilmington, Mass. Systems Div.
Feasibility Study of a Step Scanned Omnidirectional Communications Antenna for an International Magnetospheric Explorer Spacecraft.
Final Report, 1 Apr. - 22 Jul. 1974.
R. E. Herskind. 28 Oct 74, 135p Rept nos. NASA-CR-139161, AVSD-0298-74-RR
Contract NAS5-20020

Descriptors: *Omnidirectional antennas, *Spacecraft antennas, Antenna feeds, Antenna radiation patterns, Computer programs, Graphs (Charts), Phase shift.

The results of this study has indicated that omnidirectional antennas requiring directive gains steered off broadside are limited by the feed system efficiencies. The directive gain can be increased to offset the feed losses, but this approach leads quickly to diminishing returns. While gains of 4.8 db appear feasible, a system gain of 3.0 db is considered practical. These results apply to antenna configurations limited in packaging volume to 10 cm diameter by 61 cm length. (Author)

N75-20625/0CP PC **A04**/MF **A01**
Royal Aircraft Establishment, Farnborough (England).
Notes on the Design of Microstrip and Stripline Bandpass Filters.
B. Lake, and W. V. Reeder. Aug 74, 73p Rept nos. RAE-TR-74068, BR42762

Descriptors: *Bandpass filters, *Microwave frequencies, *Strip transmission lines, *Thick films, Computer programs, Computerized design.

Microstrip and stripline bandpass filters are described. Design computer programs are included together with worked examples. Comparisons between measured and theoretical responses for a number of practical filters are also given. (Author)

N75-26202/2CP PC **A09**/MF **A01**
New Mexico State Univ., Las Cruces. Physical Science Lab.

Antenna and Radome Loss Measurements for Mfmr and Pmls with Appendix on Mfmr/Pmls Computer Programs.
K. R. Carver, and W. K. Cooper. May 75, 199p
Rept nos. NASA-CR-141871, PA-00817
Contract NAS9-95451

Descriptors: *Antenna radiation patterns, *Computer programs, *Microwave radiometers, *Radomes, Brightness temperature, Calibrating, Data reduction, Microwave imagery, Performance tests.

The NMSU/PSL radiometer antenna calibration facility is described, and the antenna and radome loss measurements made on the passive microwave imaging system and the multifrequency microwave radiometer are summarized. Antenna/radome data reduction techniques, estimation of sky brightness temperatures, and bucket performance tests are presented along with radiometer computer programs.

N75-28281/4CP PC **A06**/MF **A01**
Centro de Investigaciones Fisicas (Leonardo Torres Quevedo), Madrid (Spain).
Rf Characteristics of a Deployable Antenna for Satellites: Computer Program Manual.
1975, 119p Rept no. ESRO-CR(P)-645-B
Contract ESTEC-2070/73-HP
Subm-Prepared for Messerschmitt-Boelkow-Blohm.

Descriptors: *Radio frequencies, *Reflectors, *Satellite antennas, *User manuals (Computer programs), Antenna radiation patterns, Circular polarization, Distortion, Horn antennas, Mathematical models, Performance predi tion, Subroutines.

A computer program to supply RF characteristics of an antenna which, as a consequence of its work conditions, can become mechanically distorted, is described together with its associated subroutines. The radiant system is presented in order to know the possibilities of the program. The antenna includes as reflective surface a paraboloid of revolution fed by three horns placed around its focus. In the case of a deployable antenna, the reflector has mechanically two different parts: the rigid central disk (diameter01.70 m) which apart from thermal distorsions can be considered undistorted, and the deployable part consisting of twelve radial ribs supporting a reflecting wire grid, which are folded until the satellite becomes operational in its orbit. The system works as a multibeam one with three horns as feeders that emit with circular polarization in the lambda equals 2.5cm. Foreseen distortions refer both to the reflectors and to the system of horns.

N75-31343/7CP PC **A06**/MF **A01**
Technovators, Silver Spring, Md.
Quasi-Isotropic VHF Antenna Array Design Study for the International Ultraviolet Explorer Satellite.
Final Report.
J. K. Raines. 18 Jul 75, 104p Rept no. NASA-CR-144663
Contract NAS5-22364

Descriptors: *Antenna arrays, *Antenna design, *Iue, *Very high frequencies, Computer programs, Electromagnetic compatibility, Satellite observation.

Results of a study to design a quasi-isotropic VHF antenna array for the IUE satellite are presented. A free space configuration was obtained that has no nulls deeper than -6.4 dbi in each of two orthogonal polarizations. A computer program named SOAP that analyzes the electromagnetic interaction between antennas and complicated conducting bodies, such as satellites was developed. (Author)

N75-32317/0CP PC **A06**/MF **A01**
Auburn Univ., Ala. Dept. of Electrical Engineering.
Development of Automated Test Procedures and Techniques for Lsi Circuits.
Final Technical Report.
B. D. Carroll. 4 Sep 75, 101p Rept no. NASA-CR-143951
Contract NAS8-31190

Descriptors: *Automatic test equipment, *Electronic equipment tests, *Large scale integration, Algorithms, Computer programs, Sequential control.

Testing of large scale integrated (LSI) logic circuits was considered from the point of view of automatic test pattern generation. A system for automatic test pattern generation is described. A test generation algorithm is presented that can be applied to both combinational and sequential logic circuits. Also included is a programmed implementation of the algorithm and sample results from the program. (Author)

N75-33328/6CP PC **A04**/MF **A01**
Physics Lab. RVO-TNO, The Hague (Netherlands). Microwaves Dept.
A General Method for Calculating the Characteristics of Microstrip Transmission Lines.
W. P. M. N. Keizer. Mar 75, 71p Rept nos. PHL-1975-04, TDCK-66014

Descriptors: *Green function, *Microwave transmission, *Propagation modes, *Strip transmission lines, *Transverse waves, Computer programs, Fortran, Microwave coupling, P-i-n junctions, Phase shift circuits, Phased arrays.

A general method is proposed for analyzing the propagation characteristics of microstrip transmission lines within a transverse electromagnetic wave approximation. These transmission lines are characterized by conducting strips, large groundplanes, dielectric layer insulation, and planar geometry. The method is based on the Green's function integral approach for formulating the problem. Numerical results were obtained by solving the integral equation using the subinterval method. Numerical results are presented for single and coupled microstriplines. A synthesis procedure is described which gives the geometry of a pair of coupled microstrip lines that corresponds to prescribed electrical properties. Further application is made to the design of PIN diode phase shifters and for active phased array modules. Computer programs written in FORTRAN IV are included. (Author)

N76-13379/2CP PC **A11**/MF **A01**
Marconi Space and Defence System Ltd., Stanmore (England). Antenna Dept.
A Study of the Prediction of Antenna Performances from Near Field Measurements.
Final Report.
R. W. Ashton, K. Jolly, P. J. Wood, and B. Claydon. Jun 75, 243p Rept nos. MTR-75/43, ESA-CR(P)-694
Contract ESTEC-2239/75-HP

Descriptors: *Antenna radiation patterns, *Satellite antennas, *Test facilities, Computer programs, Cost estimates, Far fields, Field intensity meters, Performance prediction, Probe method (Forecasting).

The problem of testing satellite antennas by means of a near field method is studied. Facilities and measurement methods both in Europe and the U.S. are reviewed. Preferred techniques are selected and a test facility for antennas is defined. A cost and timescale plan is given. Procedures of antenna testing are described and a computer program for calculating the far field of an antenna from measurements in the near field is implemented. The accuracy of method is discussed.

N76-13798/3CP PC **A03**/MF **A01**
Old Dominion Univ., Norfolk, Va. School of Engineering.
Sticap: A Linear Circuit Analysis Program with Stiff Systems Capability. Volume 1: Theory Manual.
C. H. Cooke. 1975, 45p Rept no. NASA-CR-144889
Contract NAS1-9434

Descriptors: *Circuit reliability, *Computer programs, *Network analysis, Algorithms, Cdc 6600 computer, Flow charts, Fortran, Linear systems, Numerical integration, User requirements.

STICAP (Stiff Circuit Analysis Program) is a FORTRAN 4 computer program written for the CDC-6400-6600 computer series and SCOPE 3.0 operating system. It provides the circuit analyst a tool for automatically computing the transient responses and frequency responses of large linear time invariant networks, both stiff and nonstiff (algorithms and numerical integration techniques are described). The circuit description and user's program input language is engineer-oriented, making simple the task of using the program. Engineering theories underlying STICAP are examined. A user's manual is included which explains user interaction with the program and gives results of typical circuit design applications. Also, the program structure from a systems programmer's viewpoint is depicted and flow charts and other software documentation are given. (Author)

N76-13799/1CP PC **A05**/MF **A01**
Old Dominion Univ., Norfolk, Va. School of Engineering.
Sticap: A Linear Circuit Analysis Program with Stiff Systems Capability. Volume 2: User'S Manual.
C. H. Cooke, and M. N. Ransom. 1975, 79p Rept no. NASA-CR-144890
Contract NAS1-9434

Descriptors: *Circuit reliability, *Computer programs, *Network analysis, Algorithms, Cdc 6600 computer, Flow charts, Fortran, Linear systems, Numerical integration, User requirements.

For abstract, see N76-13798.

N76-13800/7CP PC **A07**/MF **A01**
Old Dominion Univ., Norfolk, Va. School of Engineering.
Sticap: A Linear Circuit Analysis Program with Stiff Systems Capability. Volume 3: systems.
C. H. Cooke, and M. N. Ransom. 1975, 126p
Rept no. NASA-CR-144891
Contract NAS1-9434

Descriptors: *Circuit reliability, *Computer programs, *Network analysis, Algorithms, Cdc 6600 computer, Flow charts, Fortran, Linear systems, Numerical integration, User requirements.

For abstract, see N76-13798.

N76-15333/7CP PC **A06**/MF **A01**
Ohio State Univ., Columbus. ElectroScience Lab.
Noise Performance of Very Large Antenna Arrays.
M.S. Thesis.
H. C. Lin. Sep 75, 122p Rept nos. NASA-CR-144716, TR-3931-1
Contract NAS5-20521

Descriptors: *Antenna arrays, *Signal to noise ratios, *Thermal noise, Computer programs, Noise measurement, Performance prediction, Radiometers.

The maximum size and resolution of receiving antenna arrays is found to be limited by signal-to-noise ratio considerations. For square arrays

containing no active elements, a practical limit at 30 GHz appears to be on the order of 10 meters for communications and one to two meters for radiometry. These limitations can be overcome by use of active devices at various levels of the array organization. The nature of the resulting tradeoffs is indicated. Explicit formulas are developed for both passive and active arrays, and sample computations and the computer programs are given. (Author)

N76-17297/2CP PC **A05**/MF **A01**
M&S Computing, Inc., Huntsville, Ala.
Artwork Interactive Design System (Aids) Program Description.
B. T. Johnson, and J. F. Taylor. Feb 76, 95p Rept nos. NASA-CR-144167, REPT-73-0002-REV-1
Contract NAS8-25621

Descriptors: *Computer graphics, *Computer programs, *Computer systems design, *Microelectronics, Data processing terminals, Design analysis.
Identifiers: *Computer aided design.

An artwork interactive design system is described which provides the microelectronic circuit designer/engineer a tool to perform circuit design, automatic layout modification, standard cell design, and artwork verification at a graphics computer terminal using a graphics tablet at the designer/computer interface. (Author)

N76-18228/6CP PC **A07**/MF **A01**
TRW Systems Group, Redondo Beach, Calif.
User'S Manual for the Shuttle Electric Power System Analysis Computer Program (Seps), Volume 2 of Program Documentation.
R. W. Bains, H. A. Herwig, J. K. Luedeman, and E. M. Torina. Jun 74, 143p Rept nos. NASA-CR-147450, TRW-25990-H036-RO-00-V-2
Contract NAS9-13834

Descriptors: *Space shuttles, *Spacecraft power supplies, *User manuals (Computer programs), Energy requirements, Flow charts, Loads (Forces).

The Shuttle Electric Power System Analysis SEPS computer program which performs detailed load analysis including predicting energy demands and consumables requirements of the shuttle electric power system along with parameteric and special case studies on the shuttle electric power system is described. The functional flow diagram of the SEPS program is presented along with data base requirements and formats, procedure and activity definitions, and mission timeline input formats. Distribution circuit input and fixed data requirements are included. Run procedures and deck setups are described. (Author)

N76-18230/2CP PC **A14**/MF **A01**
TRW Systems Group, Redondo Beach, Calif. Electrical Power Section.
Program Manual for the Shuttle Electric Power System Analysis Computer Program (Seps), Volume 1 of Program Documentation.
R. W. Bains, H. A. Herwig, J. K. Luedeman, and E. M. Torina. Jun 74, 314p Rept nos. NASA-CR-147451, TRW-25990-H040-R0-00-V-1
Contract NAS9-13834

Descriptors: *Space shuttles, *Spacecraft power supplies, *User manuals (Computer programs), Energy requirements, Flow charts, Loads (Forces), Subroutines.
Identifiers: SEPS computer program.

The Shuttle Electric Power System (SEPS) computer program is considered in terms of the program manual, programmer guide, and program utilization. The main objective is to provide the information necessary to interpret and use the routines comprising the SEPS program. Subroutine descriptions including the name, purpose, method, variable definitions, and logic flow are presented. (Author)

N76-18953/9CP PC **A05**/MF **A01**
Mississippi State Univ., Mississippi State. Dept. of Electrical Engineering.
Electrostatic Analysis of Charge-Coupled Structures.
J. D. Gassaway. Feb 76, 96p Rept nos. NASA-CR-144175, EIRS-EE-74-1
Contract NAS8-26749

Descriptors: *Charge coupled devices, *Electrostatics, *Numerical analysis, *Shift registers, Algorithms, Bucket brigade devices, Computer programs, Dielectrics, Iterative solution, Semiconductors (Materials).

An analysis is presented which is based upon a numerical solution of Gauss's law for the multiple dielectric semiconductor and electrode structure. The formulation resulted in a large set of equations, usually nonlinear, which were solved by an iterative scheme based upon the Gauss-Seidel method employing a relaxation parameter. Proper consideration of the nonlinearity of the space-charge in the semiconductor allowed convergent solutions which can give reasonable approximations to the channel potential profiles though not as good for estimating the space charge itself. The results of this work, which are three computer programs, are listed. None of the programs give the electric field explicitly as output data. However, when this information is desired, the programs can be expanded to include field estimations based on a polynominal fit to the potential field, or they may serve as subprograms for main programs dealing with general aspects of charge transfer. (Author)

N76-20337/1CP PC **A03**/MF **A01**
Centre National d'Etudes Spatiales, Toulouse (France).
Antenna Optimization In the Presence of Stabilization Errors. Program User Manual Optimisation d'Antenne en Presence d'Erreurs de Stabilisation. Manuel d'Utilisation du Programme.
C. Quere. Jan 76, 50p Rept nos. CNES-NT-26, REPT-74/81/CT/MA/EM
Misc-Supersedes Rept-74/81/CT/Ma/Em.
In French; English Summary.

Descriptors: *Antenna design, *Attitude stability, *Communication satellites, *Satellite antennas, *User manuals (Computer programs), Antenna radiation patterns, Broadcasting, Errors, Ground stations, Instrument orientation, Optimization, Satellite attitude control.
Identifiers: France.

A program is described for calculating dimensions and orientation of a satellite antenna which minimizes the power to be radiated to ground in such a way that the received level is higher than a given threshold value. Errors in satellite attitude are taken into account in this optimization. The antenna radiation pattern is approximated by an elliptical paraboloid.

N76-20370/2CP PC **A05**/MF **A01**
National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Fortran Program for Induction Motor Analysis.
G. Bollenbacher. Mar 76, 86p Rept nos. NASA-TN-D-8184, E-8486

Descriptors: *Computer programs, *Fortran, *Induction motors, Design analysis, Electrical properties, Energy conversion efficiency, Error detection codes, Input/output routines, Printouts, Torque, User manuals (Computer programs).

A FORTRAN program for induction motor analysis is described. The analysis includes calculations of torque-speed characteristics, efficiency, losses, magnetic flux densities, weights, and various electrical parameters. The program is limited to three-phase Y-connected, squirrel-cage motors. Detailed instructions for using the program are given. The analysis equations are documented, and the sources of the equations are referenced. The appendixes include a FORTRAN symbol list, a complete explanation of input requirements, and a list of error messages. (Author)

N76-20859/4CP Not available NTIS
Thomson-CSF, Paris (France). D.I.B./S.C.A.S.
Test and Simulation of Large Scale Integrated Circuits, Part 1 Outil pour la Simulation et le Test des Circuits Integres a Grande Echelle, 1ERE Partie.
Final Report.
E. Girard, J. C. Rault, and R. Tulloue. Jul 74, 331p Rept no. SCAS-74.675
Contract DGRST-73-7-1392
Language in French.

Descriptors: *Computerized simulation, *Electronic equipment tests, *Large scale integration, *Logic circuits, Performance prediction, Algorithms, Bibliographies, Computer programs, Gates (Circuits), Sequencing.
Identifiers: France.

Various computer programs are described to show the response to a given input sequence as applied to large scale integrated logical circuits. The circuit may be synchronous or asynchronous, and simple detectable faults such as short circuits, open circuits, and stuck gates are listed. The programs have different accuracy requirements as dictated by the simulation needs. A predictive algorithm is used based on construction and exploitation of event scheduling. The circuits are described at gate or macroset level. Their description and the event scheduling description are memorized by the computer in list format. A detailed bibliography containing 1,180 items is given.

N76-21919/5CP PC **A07**/MF **A01**
Intertechnique S. A., Plaisir (France). Dept. Telemesure.
Selfrepairing Semiconductor Memories. Part 3: Parametric Study Memoires Autoreparables a Semiconducteurs. Tome 3: Etude Parametrique.
Jun 75, 138p Rept nos. D6/DB/FB/1378/B-PT-3, ESA-CR(P)-794-PT-3
Contract ESTEC-2119/73-HP
Seri-5. Subm-Prepared Jointly with Microelectronic-Lewicki.
Language in French.

Descriptors: *Computer storage devices, *Metal oxide semiconductors, *Self repairing devices, Computer components, Computer programs, Feasibility analysis, Integrated circuits, Parameterization.
Identifiers: France, *Semiconductor computer storage.

Evaluations of the Philips 256 bit static memory in C.MOS technology and the S.G.S. 1024 bit dynamic memory in P.MOS technology were made. For each of the two memories the study was carried out using checking logic with standard components (type C.MOS RCA) and checking logic of the optionally monolithic circuit type. The extensive feasibility calculations made, the establishment of the feasibility formula, the corresponding programs, and the feasibility calculations of memories without selfrepairing systems are annexed.

N76-22277/7CP PC **A04**/MF **A01**
McDonnell-Douglas Technical Services Co., Inc., Houston, Tex. Astronautics Div.

Shuttle Orbiter S-Band Quad Antenna Switching Evaluation.
J. F. Lindsey, and D. H. Orr. Jan 75, 70p Rept nos. NASA-CR-147672, REPT-1.2-DN-B0203-001
Contract NAS9-13970

Descriptors: *Antennas, *Space shuttle orbiters, *Superhigh frequencies, *Switching, Airborne/spaceborne computers, Computer programs, Onboard equipment.
Identifiers: *Spacecraft antennas.

Automatic switching of the shuttle orbiter S-band quad antennas by the orbiter on-board computers was evaluated. The development and use of an extensive computer program to determine antenna switch position states as a function of time for various orbital activities is described. The selection of the optimum quad antenna element at any given time is based on the look angle to the appropriate Tracking Data Relay Satellite (TDRS). It is shown that a 2.4 second period is required for updating the S-band quad antenna switch state based on a maximum roll rate of 2 deg per second. The possibility of a variable update period is suggested since the 2 deg per second attitude rate is seldom encountered and would, for example, dictate approximately 248,000 on-board computer calculations during Reference Mission 2. The average number of antenna switch state changes was found to be in the range of 1,300 for Reference Mission 2. (Author)

N76-22943/4CP PC **A03**/MF **A01**
M&S Computing, Inc., Huntsville, Ala.
Banning Design Automation Software Implementation.
Final Report.
R. L. Kuehlthau. 28 Oct 75, 41p Rept nos. NASA-CR-144031, REPT-75-0037
Contract NAS8-25621

Descriptors: *Computer programs, *Computerized design, Fortran, Integrated circuits, Printed circuits, Systems analysis, User manuals (Computer programs).
Identifiers: Large scale integrated circuits.

The research is reported for developing a system of computer programs to aid engineering in the design, fabrication, and testing of large scale integrated circuits, hybrid circuits, and printed circuit boards. The automatic layout programs, analysis programs, and interface programs are discussed.

N76-23523/3CP Not available NTIS
Atomic Weapons Research Establishment, Aldermaston (England).
Plotem 2: A Fortran Program That Computes the Temperature Distribution Across a Thin, Rectangular Microcircuit Which Is Cooled by Conduction to Heat Sinking Edges and by Convection.
P. G. Hambling. Aug 75, 27p Rept no. AWRE-O-30/75

Descriptors: *Microelectronics, *Surface cooling, *Temperature distribution, FORTRAN, Conductive heat transfer, Convective heat transfer, Heat sinks, User manuals (Computer programs).
Identifiers: Great Britain, *PLOTEM 2 computer program, FORTRAN 4 programming language, IBM 370/168 computers.

A program in FORTRAN 4 currently used on IBM 370/168 to compute temperature distribution across a thin, rectangular conduction and convection cooled microcircuit is described. Flow charts (with a commentary), a user's manual and a worked example are given. (Author)

N76-28863/8CP PC **A03**/MF **A01**
Electronics and Control Lab.
Djanal User'S Manual.
Final Report.
E. R. Pitts. 23 Jul 76, 32p Rept nos. NASA-CR-149948, REPT-76-0023
Contract NAS8-31358

Descriptors: *Computerized design, *User manuals (Computer programs), Large scale integration, Computerized simulation, Masks, Network analysis, Transistors.
Identifiers: *DJANAL computer program.

The primary purpose of TPG interface (TPGITF) software is to create test patterns, according to a mathematical model, for a real device. In order for the device actually to be tested or to be accurately simulated, a means is required to transform the TPGITF generated test into forms acceptable as input to logic test equipment or to a software logic simulator. The MACRODATA-200 Logic Test System and the LOGSIM logic simulator are the particular systems supported by the TPGITF software. A description is presented of the TPGITF software processor. It is assumed that the reader is familiar with the TPG, LOGSIM, and TOIL systems. Flow charts are given. (Author)

N76-30448/4CP PC **A03**/MF **A01**
RCA Labs., Princeton, N.J.
Design, Processing, and Testing of Lsi Arrays for Space Station.
Quarterly Technical Report, 1 Jan. - 31 Mar. 1976.
A. C. Ipri. Apr 76, 26p Rept nos. NASA-CR-149981, PRRL-76-CR-17
Contract NAS12-2207

Descriptors: *Large scale integration, *Space stations, *Spacecraft electronic equipment, Computer programs, Data reduction, Electronic equipment tests, Fabrication, Gates (Circuits), SOS (Semiconductors).

The work on the Process Analysis Structure was continued with the layout being completed, the 100X and 10X artwork being finalized, and the process and test sequences being prepared. Test programs were written for computer-controlled integrated-circuit testing and data reduction. (Author)

N76-33374/9CP PC **A03**/MF **A01**
Fondazione Ugo Bordoni, Rome (Italy). Centro Onde Millimetriche.
Digital Analysis of Superior Electric Circular Mode Filters Analisi Numerica di Filtri Per I Modi Circolari Elettrici Superiori.
G. Falciasecca, and S. Rogai. 14 Nov 75, 37p
Language in Italian.

Descriptors: *Computer programs, *Coupled modes, *Electric filters, *Superhigh frequencies, *Wave attenuation, Circular cylinders, Dielectric properties, Numerical analysis, Performance prediction, Phase shift, Waveguides.
Identifiers: Italy.

A computer program to calculate the parameters of an electric filter for higher circular modes is presented. Starting from a circular wave guide sliced along a diametral plane, a phase shift is introduced by a dielectric concentric solid half cylinder while the restitution of the original phase is performed on the other half volume using a concentric dielectric shell. The various parameters involved are discussed with regard to attenuation of higher modes. An example is given of a filter of good characteristics up to 60 GHz. The underlying mathematical analysis is outlined.

N76-33898/7CP PC **A10**/MF **A01**
Waterloo Univ. (Ontario). Dept. of Electrical Engineering.
Analysis of Errors In Piecewise Linear Network Computations.
M. E. Zaghloul. Oct 75, 219p Rept no. UWEE/75-4
Contract NRC-A-7113

Descriptors: *Error analysis, *Network analysis, *Nonlinear systems, Computer programs, Linear programming, Matrices (Mathematics), Numerical analysis.
Identifiers: Canada.

Nonlinear networks in which the nonlinear element characteristics are approximated by continuous piecewise linear functions are considered. The network solution errors resulting from these approximations were studied first for nonlinear resistive networks and then for nonlinear dynamic networks. The measure of a matrix is used as a tool to compute bounds on these errors. These bounds are obtained both in terms of the properties of the original nonlinear network and of the properties of the approximating piecewise-linear network. The behavior of these bounds in terms of the network's physical properties is presented. Applications of these results to numerical examples of nonlinear networks and their approximating piecewise-linear counterparts are illustrated. In addition an alternative numerical method is introduced for computing, from the piecewise-linear solution, bounds on the regions in space where the exact solutions lie. A computer program for the case of resistive networks was developed and several numerical examples are presented. An extension to the dynamic networks is presented with some illustrative numerical examples. (Author)

N77-10410/7CP PC **A06**/MF **A01**
Grenoble Univ. (France). Centre d'Etude des Phenomenes Aleatoires et Geophysiques.
Numerical Simulation of the Existence Test for the Diffusion Function in a Variable Parameter Medium Simulation Numerique du Test d'Existence de la Fonction de Diffusion d'UN Milieu a Parametres Variables.
P. Ningre, and G. Jourdain. 26 Nov 75, 110p Rept no. CEPHAG-51/75
Language in French.

Descriptors: *Computerized simulation, *Low pass filters, Diffusion, Existence theorems, Independent variables, Computer programs, Correlation, Data sampling, Discrete functions, Estimating, Graphs (Charts), Marine environments, Random processes, White noise.
Identifiers: France.

A model of a filter with variable parameters excited by monochromatic waves is described. Two kinds of media are considered: the Wide Sense Stationary (WSS) and WSS with the addition of no correlation termed WSSUS. The existence or not of a diffusion function may be tested by following the time evolution of the mean value of the output power or input power as a function of frequency. The theoretical properties of the impulse response of the filter are detailed together with the estimators used. The results of computations to the second order for WSS and WSSUS media are discussed together with the interaction between two frequencies in each of these media. An application to marine environments is proposed.

N77-23328/6CP PC **A03**/MF **A01**
Ticra A/S, Lyngby (Denmark).
Snift - Computer Program for Spherical Near-Field Far-Field Technique, Volume 2.
F. Jensen. 29 Nov 76, 28p Rept nos. S-45-03-V-2, ESA-CR(P)-916-V-2
Contract ESTEC-2478/75-AK
Seri-2. Subm-Prepared Jointly with Tech. Univ. Of den.

Descriptors: *Antenna radiation patterns, *Computer programs, Far fields, Near fields,

Satellite antennas, Fourier transformation, Satellite configurations, Spherical shells, User manuals (Computer programs).
Identifiers: Denmark, SNIFT computer program.

The program described performs the transformation of a satellite antenna near field, measured on a spherical surface, to the corresponding far field. The programming language used is FORTRAN 4. The transformation applies a Fourier transformation subroutine. A program listing is included.

N77-25372/2CP PC **A04**/MF **A01**
National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Computer Program for Analysis of Coupled-Cavity Traveling Wave Tubes.
D. J. Connolly, and T. A. Omalley. May 77, 53p
Rept nos. NASA-TN-D-8492, E-8839

Descriptors: *Computer programs, *Design analysis, *Traveling wave tubes, Computerized simulation, Fortran, IBM 360 computer, Mathematical models, Time sharing.
Identifiers: Computer aided design.

A flexible, accurate, large signal computer program was developed for the design of coupled cavity traveling wave tubes. The program is written in FORTRAN IV for an IBM 360/67 time sharing system. The beam is described by a disk model and the slow wave structure by a sequence of cavities, or cells. The computational approach is arranged so that each cavity may have geometrical or electrical parameters different from those of its neighbors. This allows the program user to simulate a tube of almost arbitrary complexity. Input and output couplers, severs, complicated velocity tapers, and other features peculiar to one or a few cavities may be modeled by a correct choice of input data. The beam-wave interaction is handled by an approach in which the radio frequency fields are expanded in solutions to the transverse magnetic wave equation. All significant space harmonics are retained. The program was used to perform a design study of the traveling-wave tube developed for the Communications Technology Satellite. Good agreement was obtained between the predictions of the program and the measured performance of the flight tube.

N77-25432/4CP PC **A05**/MF **A01**
Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
Modelization of Quartz Oscillators.
Ph.D. Thesis - Paris 6 Univ.
P. Bressy. Feb 77, 97p Rept no. ONERA-NT-1976-13
Misc-Report Will Also Be Announced as Translation (Esa-TT-384).
In French; English Summary.

Descriptors: *Crystal oscillators, *Mathematical models, *Quartz crystals, Bipolar transistors, Computer programs, Excitation, Frequency measurement, Frequency stability, Frequency standards, Nonlinear systems, Time measuring instruments.
Identifiers: France, Theses.

Any improvement of the quality of quartz frequency standards requires a thorough study of all oscillator parameters, the fluctuations of which, whether random or not, may cause a degradation of frequency stability due to either the resonator or the oscillator electronics. Only the latter is developed. An attempt was made to establish as complete a modelization as possible of the oscillator active circuits and to demonstrate its validity by comparing the theoretical results issued from this modelization to experimental results. It is the oscillator starting period that permits an efficient verification of the model validity. The direct treatment of the oscillator differential equations does not yield in practice the solution describing the whole transient regime; this is due in particular to the very high value of the resonator quality factor. A mathematical model making use of the theories of the first harmonic and of perturbations makes it possible to emphasize the frequency and amplitude variations of the signal during the whole transient regime. The oscillator under study is of Pierce type. Two kinds of modelization have been considered. The first reduces the oscillator electronics to a single voltage amplifier with a nonlinear characteristic of quadratic type. The second makes use of the Ebers and Moll transistor model. The excitation level of the quartz being particularly high in this type of oscillator, it is necessary to introduce in the resonator equivalent scheme nonlinear parameters whose effect is to provoke a frequency shift in the sense opposite to that resulting from the amplifying unit. This way, through an appropriate choice of the shape of the nonlinear characteristic of the active circuit, it is possible to attenuate the frequency variations caused by the fluctuations of the oscillation amplitude.

N77-26399/4CP PC **A04**/MF **A01**
European Space Research and Technology Center, Noordwijk (Netherlands).
Computer-Aided Analysis of Electronic Filters.
J. K. Nielsen. Mar 77, 72p Rept no. ESA-TM-171

Descriptors: *Bandpass filters, *Computer programs, *Electric filters, *Network analysis, Attenuation, Chebyshev approximation, Delay, Elliptic functions, Phase shift.
Identifiers: Computer applications, Netherlands.

The ESA computer program for electric filter analysis (FILTEN) is presented. At present, the program can perform analysis on bandpass filters of the following types: Butterworth, Chebyshev, elliptic function, and special purpose filters for which the locations of the poles and zeroes in the complex frequency plane are known. The program can interface with a series of programs in the ESTEC MODSIM system.

N77-27309/2CP PC **A03**/MF **A01**
National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
Performance Characteristics of Three-Phase Induction Motors.
M. E. Wood. May 77, 40p Rept nos. NASA-TM-74762, JSC-12899

Descriptors: *Computerized simulation, *Induction motors, Performance prediction, Space shuttle orbiters, Computer programs, Electric motors, Performance tests, Space transportation.

An investigation into the characteristics of three phase, 400 Hz, induction motors of the general type used on aircraft and spacecraft is summarized. Results of laboratory tests are presented and compared with results from a computer program. Representative motors were both tested and simulated under nominal conditions as well as off nominal conditions of temperature, frequency, voltage magnitude, and voltage balance. Good correlation was achieved between simulated and laboratory results. The primary purpose of the program was to verify the simulation accuracy of the computer program, which in turn will be used as an analytical tool to support the shuttle orbiter.

N77-29353/8CP PC **A04**/MF **A01**
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
Users' Manual for Computer Program for One-Dimensional Analysis of Coupled-Cavity Traveling Wave Tubes.
T. A. Omalley, and D. J. Connolly. Aug 77, 67p
Rept nos. NASA-TM-X-3565, E-8900

Descriptors: *Traveling wave tubes, *User manuals (Computer programs), Subroutines, Computer programs, Computerized simulation, Electron trajectories.
Identifiers: IBM-360/67 computers.

The use of the coupled cavity traveling wave tube for space communications has led to an increased interest in improving the efficiency of the basic interaction process in these devices through velocity resynchronization and other methods. To analyze these methods, a flexible, large signal computer program for use on the IBM 360/67 time-sharing system has been developed. The present report is a users' manual for this program.

N77-29358/7CP PC **A06**/MF **A01**
Centre National d'Etudes Spatiales, Toulouse (France).
Study of a Digital Phase Locked Loop in Very Low Frequencies Etude et Realisation d'Une Boucle de Phase Numerique Tres Basse Frequence.
D. Dassaud. Dec 76, 101p Rept no. CNES-NT-62
In French; English Summary.

Descriptors: *Phase locked systems, *Wiener filtering, Digital systems, Synchronism, Very low frequencies, Computer programs, Computerized simulation, European space programs, Flow charts, Microprocessors, Spin stabilization, Synchronous satellites.
Identifiers: France.

The study and the implementation of a very low frequency digital phase locked loop in the specific application of the synchronization of image taking in the geostationary Meteosat satellite are described. Wiener's method was used to obtain the optimum filter and the implementation of this filter was achieved with the M 6800 microprocessor. The results are adaptable for any spinned satellite in which phases or frequencies slaved to the spin rate are desired.

N77-29424/7CP PC **A07**/MF **A01**
European Space Agency, Paris (France).
Modelling of Quartz Oscillators.
P. Bressy. Jun 77, 139p Rept nos. ESA-TT-384, ONERA-NT-1976-13
Tran-Transl. Into English of 'Modelisation des Oscillateurs a Quartz', Onera, Paris Report Onera-NT-1976-13, 1976. Misc-Original Report in French Previously Announced as N77-25432.

Descriptors: *Crystal oscillators, *Mathematical models, Quartz crystals, Bipolar transistors, Computer programs, Excitation, Frequency measurement, Frequency stability, Frequency standards, Nonlinear systems, Time measuring instruments.
Identifiers: Translations, France.

Any improvement of the quality of quartz frequency standards requires a thorough study of all oscillator parameters, the fluctuations of which, random or not, may cause a degradation of frequency stability due to either the resonator or the oscillator electronics. Only the latter was considered; an attempt was made to establish as complete a modelization as possible of the oscillator active circuits and to demonstrate its validity. It is the oscillator starting period that permits an efficient verification of the model validity. Direct treatment of the oscillator differential equations does not, in practice, yield the solution describing the whole transient regime, mostly because of the very high value of the resonator quality factor. A mathematical model using the theories of the first harmonic and of perturbations permits

emphasizing the frequency and amplitude variations of the signal during the whole transient regime. The oscillator studied was of the Pierce type. Of the two models considered, the first reduces the oscillator electronics to a single voltage amplifier with a nonlinear characteristic of quadratic type, the second makes use of the Ebers and Moll transistor model. The excitation level of the quartz being particularly high in this type of oscillator, it is necessary to introduce in the resonator equivalent scheme nonlinear parameters, provoking a frequency shift in the sense opposite to that resulting from the amplifying unit. Thus, through an appropriate choice of the shape of the nonlinear characteristic of the active circuit, the frequency variations caused by the fluctuations of the oscillation amplitude can be attenuated.

N77-30382/4CP PC **A04**/MF **A01**
Ticra A/S, Lyngby (Denmark).
Computer Programs for General Reflector Antenna Systems and Spherical Wave Expansion.
Final Report.
P. Balling, and K. Pontoppidan. Feb 77, 67p
Rept nos. S-56-02, ESA-CR(P)-939
Contract ESTEC-2646/76-NL-AK

Descriptors: *Antenna design, *Computer programming, *Horn antennas, *Parabolic antennas, Antenna feeds, Far fields, Spherical harmonics.
Identifiers: Denmark.

The theory for the analysis of very general reflector antenna systems is developed and an associated computer program (GRASP) is constructed. The physical optics method is applied. Compared to previous computer programs, a number of extensions are carried out to obtain a high degree of generality and flexibility. Various types of reflector surfaces and feed patterns are incorporated in the program package. Far-field patterns as well as finite-range patterns may be calculated. A spherical wave expansion program (SWE) is developed. This program determines the spherical wave coefficients for a given feed pattern which may be measured or calculated. Hence, it is possible to perform an accurate determination of the incident field on the reflector surface in cases where this is located in the near field of the feed.

N77-33602/2CP PC **A08**/MF **A01**
Duke Univ., Durham, N. C. Dept. of Electrical Engineering.
User'S Manual: Computer-Aided Design Programs for Inductor-Energy-Storage DC-to-DC Electronic Power Converters.
S. Huffman. 30 Jun 77, 157p Rept nos. NASA-CR-152612, S-02
Contract NAS5-22475

Descriptors: *Inductors, *User manuals (Computer programs), *Voltage converters (Dc to dc), Computer programs, Data bases, Systems engineering.
Identifiers: Electric coils, Computer aided design, Energy storage.

Detailed instructions on the use of two computer-aided-design programs for designing the energy storage inductor for single winding and two winding dc to dc converters are provided. Step by step procedures are given to illustrate the formatting of user input data. The procedures are illustrated by eight sample design problems which include the user input and the computer program output.

N77-82112/2CP PC **A05**/MF **A01**
Auburn Univ., Ala. Dept. of Electrical Engineering.
Automatic Test Pattern Generation and Simulation of Sequential Logic Circuits
Interim rept.
B. D. Carroll. 16 May 77, 84p NASA-CR-150304
Contract NAS8-31572

Descriptors: *Logic circuits, *Logic design, *Computerized simulation, Computer programs, Flip flops, Gates(Circuits), Computation, Boolean functions.
Identifiers: *SIMLOG computer program, PDP-11/40 computers, IBM-370/158 computers.

This report contains a description of the latest version of the SIMLOG logic simulation program. New features contained in the latest version include automatic race analysis, fault simulation, and a flexible starting state specification procedure. Problems that remain in the simulator are also discussed. A proposed reorganization of the program to overcome some of these problems is described. Flow charts and listings of the current program are included.

N78-11316/4CP PC **A02**/MF **A01**
Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.
A Computer Program Modeling the Behavior of a Transferred Electron Device.
D. E. Meharry. 1977, 7p Rept nos. REPT-S-92, ISBN-951-750-958-8

Descriptors: *Computer programs, *Electrical impedance, *Gunn diodes, *Mathematical models, Electron oscillations, Fourier transformation, Gallium arsenides, Iteration, Temperature effects.
Identifiers: Finland, Computerized simulation, *Transferred electron devices.

A computer program is presented which calculates the behavior of a transferred electron oscillator operating in the quenched domain mode. The program, which is based on previous theoretical work, includes options for the inclusion of diffusion effects, a temperature dependent threshold field, and calculation of the admittance of a packaged device, has no lengthy iterative calculations so that results are obtained very quickly.

N78-13328/7CP PC **A15**/MF **A01**
Systems Science and Software, La Jolla, Calif.
A Three Dimensional Dynamic Study of Electrostatic Charging In Materials.
Contractor Report, Jul. 1976 - Jul. 1977.
I. Katz, D. E. Parks, M. J. Mandell, J. M. Harvey, and D. H. Brownell, Jr. Aug 77, 334p Rept nos. NASA-CR-135256, SSS-R-77-3367
Contract NAS3-20119

Descriptors: *Electrostatic charge, *Materials tests, *Secondary emission, *Spacecraft structures, Aluminum, Backscattering, Computerized simulation, Dielectrics, Electrodynamics, Emission spectra, Kapton (Trademark), Magnesium, Teflon (Trademark).
Identifiers: NASCAP computer program.

A description is given of the physical models employed in the NASCAP (NASA Charging Analyzer Program) code, and several test cases are presented. NASCAP dynamically simulates the charging of an object made of conducting segments which may be entirely or partially covered with thin dielectric films. The object may be subject to either ground test or space user-specified environments. The simulation alternately treats (1) the tendency of materials to accumulate and emit charge when subject to plasma environment, and (2) the consequent response of the charged particle environment to an object's electrostatic field. Parameterized formulations of the emission properties of materials subject to bombardment by electrons, protons, and sunlight are presented. Values of the parameters are suggested for clean aluminum, Al2O3, clean magnesium, MgO, SiO2 kapton, and teflon. A discussion of conductivity in thin dielectrics subject to radiation and high fields is given, together with a sample calculation.

N78-13329/5CP PC **A16**/MF **A01**
Systems Science and Software, La Jolla, Calif.
Nascap User'S Manual.
Contractor Report, Jul. 1976 - Jul. 1977.
M. J. Mandell, J. M. Harvey, and I. Katz. Aug 77, 354p Rept nos. NASA-CR-135259, SSS-R-77-3368
Contract NAS3-20119

Descriptors: *Computerized simulation, *Spacecraft charging, User manuals (Computer programs), Backscattering, Dielectrics, Finite element method, Graphs (Charts), Materials tests, Poisson equation, Secondary emission.
Identifiers: NASCAP computer program.

The NASCAP (NASA Charging Analyzer Program) code simulates the charging process for a complex object in either tenuous plasma or ground test environment. Detailed specifications needed to run the code are presented. The object definition section, OBJDEF, allows the test object to be easily defined in the cubic mesh. The test object is composed of conducting sections which may be wholly or partially covered with thin dielectric coatings. The potential section, POTENT, obtains the electrostatic potential in the space surrounding the object. It uses the conjugate gradient method to solve the finite element formulation of Poisson's equation. The CHARGE section of NASCAP treats charge redistribution among the surface cells of the object as well as charging through radiation bombardment. NASCAP has facilities for extensive graphical output, including several types of object display plots, potential contour plots, space charge density contour plots, current density plots, and particle trajectory plots.

N78-14235/3CP PC **A02**/MF **A01**
Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
Calculation of the Desired Angle Values for the Alignment of a Stabilized Two Axis Rotating Platform in an Aircraft Berechnung der Winkel-Sollwerte fuer die Ausrichtung Eines Stabilisierten Zwei-Achsen-Drehstandes in Einem Flugzeug.
E. Hoermann. Feb 77, 24p Rept no. DLR-IB-552-76/27
Language in German.

Descriptors: *Airborne equipment, *Alignment, *Antennas, *Backscattering, *Meteorological parameters, Azimuth, Computer programs, Elevation angle, Scatterometers, Seas, Stabilized platforms.
Identifiers: West Germany.

A procedure to calculate from the navigation gyroscope values the desired values for the drive control of an antenna rotating platform (azimuth and elevation) on board an aircraft is described. The study is part of the scatterometer project in which the possibility of establishing from backscatter measurements, information on the motion of the sea and hence the wind direction and the wind force was investigated. To this end, a stabilizing antenna pointed slanted towards the sea is mounted on board an aircraft flying along a predetermined path. The position of the antenna should not be influenced by the movements of the aircraft. The method gives simplified equations for elevation over azimuth and for azimuth over elevation values.

N78-17280/6CP PC **A03**/MF **A01**
Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.

Calculation of the Effects of Dew on Radome Performance.
D. E. Meharry. 1977, 28p Rept nos. REPT-S-98, ISBN-951-751-044-6

Descriptors: *Radomes, Extremely high frequencies, Mathematical models, Superhigh frequencies, Antenna radiation patterns, Computer programs, Dielectric properties, Numerical analysis, Thickness.
Identifiers: DEW, Performance, Radio transmission, Finland.

It has been noted that the formation of dew on the outside of a radome adversely affects its performance, often to a severe degree. A theoretical treatment of the problem is reported, starting with a flow graph analysis of the multilayered air-dew-radome-air structure and then integrating the results over the antenna aperture. Numerical calculation of both emission and transmission at 22.2 and 78 GHz show at least qualitative agreement with measurements. Quantitative agreement cannot be checked until the development of a method for directly measuring dew thickness on the radome, for which a possible solution is also presented.

N78-18341/5CP PC **A03**/MF **A01**
European Space Agency, Paris (France).
Computer Aided Analysis of Microwave Electronic Circuits In the Frequency Domain (Esamec).
J. G. Ferrante, J. K. Nielsen, and A. Montenegro. Dec 77, 46p Rept no. ESA-TT-441

Descriptors: *Computerized design, *Microwave circuits, *Network analysis, Computer programs, Frequency response, Transfer functions, Electrical impedance, Failure analysis, Failure modes, Junction diodes, Matrices (Mathematics), Meteosat satellite, P-I-N junctions, Phase shift circuits.
Identifiers: Translations, Computer aided design, France.

Two general methods are presented for microwave network analysis to be integrated into computer-aided design software known as ESAMEC (ESA Microwave Electronic Circuits). They are the wiring operator method, based on the equivalent representation of transfer matrices, and the nodal analysis method using an infinite admittance matrix. ESAMEC is applied to the failure-mode analysis of a variable phase shift network, using PIN diodes, to be flown aboard Meteosat.

N78-19397/6CP PC **A02**/MF **A01**
National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
Up-Date of Traveling Wave Tube Improvements.
E. Buck. 1978, 15p Rept nos. NASA-TM-78852, E-9572
Conf-Presented at Electronic Warfare Symp., Warner Robins AFB, Ga., 20-24 Mar. 1978.

Descriptors: *Traveling wave tubes, Technology assessment, Accumulators, Beams (Radiation), Cathodes, Circuits, Computer programs, Research and development, Structural design.

A brief survey is presented of areas of progress on traveling wave tube designs. Data demonstrates the effect of multistage depressed collectors, the design of which is made possible by powerful NASA computer programs. Other topics include beam refocusing, RF circuit losses, and cathode testing.

N78-20805/5CP PC **A05**/MF **A01**
Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
Photomask and Pattern Programming Manual.
R. K. Kirschman. 1 Mar 78, 96p Rept nos. NASA-CR-156131, JPL-PUB-77-32
Contract NAS7-100

Descriptors: *Hybrid circuits, *Integrated circuits, *Pattern registration, *Photographic film, *Photographic plates, *Semiconductor devices, *User manuals (Computer programs), Computer graphics, Computer techniques, Computerized design, Data conversion routines, Engineering drawings, Fortran, Imaging techniques.
Identifiers: *Photomasks, Masking, Photoengraving.

A user's manual for a set of computer programs written in FORTRAN for the layout and generation of photomasks is presented. A limited amount of related information on photomasks, their design, and use is included. Input to the programs includes data descibiing the photomask design. Possible outputs include plots of the layout and a magnetic tape for controlling generation of the photomask by a pattern generator.

ORNL/MIT-242 PC **A04**/MF **A01**
Massachusetts Inst. of Tech., Oak Ridge, Tenn. School of Chemical Engineering Practice.
Design of Cryogenic Heat Exchangers for a Superconducting Magnet
W. A. Chrusciel, B. Y. Tao, and S. A. Ventura. 26 Oct 76, 56p
Contract W-7405-ENG-26

Descriptors: *Heat exchangers, *Superconducting magnets, Computer codes, Cryogenics, Design, Helium, Refrigeration, Simulation, Thermonuclear reactors.
Identifiers: ERDA/700202, ERDA/420201, Computerized simulation.

Computer programs were written to design and simulate the behavior of three heat exchangers for cooling supercritical helium to approximately 4.3 exp 0 K at 4 atm. Helium, at 1, 3, or 5 gm/sec, is cooled by passing it through 0.635-cm-diam copper tubing immersed in a liquid nitrogen bath, through a copper, concentric tube, counter-current heat exchanger, and then through 0.635-cm copper tubing immersed in a liquid helium bath. The helium then enters a superconducting test magnet and finally passes through the annulus of the countercurrent exchanger before venting to the atmosphere. Several acceptable designs are presented that meet design and space limitations. (ERA citation 02:042296)

PAT-APPL-617 895/CP PC **A02**/MF **A01**
National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
Phase Modulator.
Patent Application.
C. P. Hearn. Filed 29 Sep 75, 17p N76-10356/3, NASA-CASE-LAR-11607-1
Government-owned invention available for licensing. Copy of application available NTIS.

Descriptors: *Phase modulation, *Power series, *Signal generators, *Patent applications, Computer programs, Equipment specifications, Product development, Waveforms.

Method and apparatus are presented for producing a phase-modulated waveform having a high degree of linearity between the modulating signal and the phase of the modulated carrier signal. Two signals representing finite odd and even power series transformations of the modulating signal are produced and multiplied with two quadrature components of the input carrier signal, respectively. One of the multiplied signals is subtracted from the other and the resulting signal is hard-limited to produce a phase-modulated output signal. The means for producing the two signals representing the odd and even power series of the modulating signal includes means for varying the coefficients of the two power series. By means of an existing computer program, the coefficients of the two power series are selected such that there is an extremely high degree of linearity between the modulating signal and the phase of the modulated carrier signal.

PAT-APPL-765 165/CP PC **A04**/MF **A01**
National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
Phase Array Antenna Control.
Patent Application.
G. D. Doland. Filed 3 Feb 77, 51p N77-19320/9, NASA-CASE-MSC-14939-1
Contract NAS9-12200
This Government-owned invention available for U.S. licensing and, possibly, for foreign licensing. Copy of application available NTIS.

Descriptors: *Phased arrays, *Steerable antennas, *Patent applications, Antenna arrays, Circuits, Computer programs, Numerical control, Spacecraft antennas.

The present invention provides several improvements in steering and control of phased array antennas having a small number of elements, typically on the order of 5 to 17 elements. Among the improvements are increasing the number of beam steering positions, reducing the possibility of phase transients in signals received or transmitted with the antennas, and increasing control and testing capacity with respect to the antennas.

PAT-APPL-878 629/CP PC **A03**/MF **A01**
Department of the Navy Washington D C
Analog and Digital Circuit Tester
Patent Application
Dean A. Winkler. Filed 17 Feb 78, 45 AD-D004 789/4
Availability: This Government-owned invention available for U.S. licensing and, possibly, for foreign licensing. Copy of application available NTIS.

Descriptors: *Patent applications, *Circuit testers, Analog systems, Digital systems, Modules(Electronics), Computer programs, Automatic, Cassettes, Waveform generators.

An automatic tester is described for singularly testing a plurality of different types of standard electronic modules. A test program is written for each type of standard electronic module and this test data is stored on cassette tape. As the tester is adaptable for testing different types of modules, interface and switching matrix between the tester and the module under test is accomplished by an interface card and a matrix of relays. A plurality of programmable power supplies and programmable waveform generators are provided in the tester and instructions on the cassette tape dictate the desired values and wave shapes to be supplied to a particular module under test. The cassette tape also has data which represents the acceptable output requirements of a module under test and a measurement system measures the actual outputs and a comparison is then made with the measured output and the desired output to indicate either failure or acceptance of the module under test. (Author)

PATENT-3 996 532 Not available NTIS
National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
Phase Modulating with Odd and Even Finite Power Series of a Modulating Signal.
Patent.

C. P. Hearn, R. H. Couch, and L. R. Wilson.
Patented 7 Dec 76, 8p N77-14292/5, PAT-APPL-617 895
Misc-Filed 29 Sep. 1975 Supersedes N76-10356 (14 - 01, p 0048).
This Government-owned invention available for U.S. licensing and, possibly, for foreign licensing. Copy of Patent available Commissioner of Patents, Washington, D.C.

Descriptors: *Phase modulation, *Patents, Electric pulses, Power series, Analysis (Mathematics), Computer programs, Electronic equipment.
Identifiers: PAT-CL-332-22.

Method and apparatus is presented for producing a phase-modulated waveform having a high degree of linearity between the modulating signal and the phase of the modulated carrier signal. Two signals representing finite odd and even power serles transformations of the modulating signal are produced and multiplied with two quadrature components of the input carrier signal, respectively. One of the multiplied signals is subtracted from the other and the resulting signal is hard-limited to produce a phase-modulated output signal. The means for producing the two signals representing the odd and even power series of the modulating signal Includes means for varying the coefficients of the two power series. By means of an existing computer program, the coefficients of the two power series are selected such that there is an extremely high degree of linearity between the modulating signal and the phase of the modulated carrier signal.

PATENT-4 016 511 Not available NTIS
Department of the Air Force Washington D C
Programmable Variable Length High Speed Digital Delay Line
Patent
John L. Ramsey, and Allen E. Post. Filed 19 Dec 75, patented 5 Apr 77, 4p AD-D003 915/6, PAT-APPL-642 521
Supersedes PAT-APPL-642 521-75, AD-D002 322.
Availability: This Government-owned invention available for U.S. licensing and, possibly, for foreign licensing. Copy of patent available Commissioner of Patents, Washington, D. C. 20231 $0.50.

Descriptors: *Patents, *Delay lines, Digital systems, Switching circuits, Computer programs.
Identifiers: PAT-CL-333-29.

A variable length, digital delay line apparatus is described which uses a set of progressively increasing delay devices in conjunction with a set of digitally selectable switching units to vary the delay times over a predetermined delay range. (Author)

PB-239 306/4CP PC **A11**/MF **A01**
Massachusetts Inst. of Tech., Cambridge. Energy Lab.
Forced Cooling of Underground Electric Power Transmission Lines. Part II. Heat Conduction in the Cable Insulation of Force-Cooled Underground Electrical Power Transmission Systems
Yearly rept.
Joel V. Sanders, Leon R. Glicksman, and Warren M. Rohsenow. May 74, 240p Rept no. MIT-EL-74-004
Also pub. as Massachusetts Inst. of Tech., Cambridge. Heat Transfer Lab., Rept. no. 80619-88. Prepared in cooperation with Consolidated Edison Co. of New York, Inc., New York.
Paper copy also available in set of 4 reports as PB-239 304-SET, PC E99.

Descriptors: *Power transmission lines, *Liquid cooling, Coolants, Oils, Fluid flow, Heat transfer, Thermal conductivity, Subsurface structures, Computerized simulation, Insulation, Computer programs, FORTRAN.
Identifiers: Underground, FORTRAN 4 programming language.

Forced-cooled systems for oil-filled pipe-type cable circuits have recently been considered. In such systems the conduction resistance through the paper insulation of the cables is the limiting thermal resistance. Assuming bilateral symmetry, steady-state conditions, and two-dimensional heat transfer, a FORTRAN IV computer program was written to solve the heat conduction problem in the cable insulation for arbitrary configurations of a three-cable system. For a steel pipe, a cable system is most susceptible to overheating in the equilateral configuration with the three cables touching. Proximity effects are very significant in forced cooling, especially when cables are not provided with a copper tape under the insulation moisture seal assembly, accounting for as much as 21% of the total oil temperature rise between refrigeration stations. This figure, however, is reduced to 8% when 0.005 inch thick copper tape is present.

PB-239 307/2CP PC **A06**/MF **A01**
Massachusetts Inst. of Tech., Cambridge. Energy Lab.
Forced Cooling of Underground Electric Power Transmission Lines. Part III. The Prediction of Friction Factors in Turbulent Flow for an Underground Forced Cooled Pipe-Type Electrical Transmission Cable System
Yearly rept.
Joseph W. Beckenbach, Jr, Leon R. Glicksman, and Warren M. Rohsenow. Sep 74, 111p Rept no. MIT-EL-74-005
Also Pub. as Massachusetts Inst. of Tech., Cambridge. Heat Transfer Lab., Rept. no. MIT-HTL-80619-89. Prepared in cooperation with Consolidated Edison Co. of New York, Inc., New York.
Paper copy also available in set of 4 reports as PB-239 304-SET, PC E99.

Descriptors: *Power transmission lines, *Liquid cooling, Coolants, Oils, Fluid flow, Fluid mechanics, Friction, Turbulent flow, Subsurface structures, Computer programs, Computerized simulation, FORTRAN.
Identifiers: Underground, FORTRAN 4 programming language.

Forced cooled systems for underground, oil filled, pipe-type electrical transmission cable systems are becoming increasingly common in large urban centers. In systems of this type there exist a number of electrical transmission cables in an oil filled conduit. These cables are wrapped with a semi-circular, protective skid wire, which increases the turbulence in the flow and up until now has prevented any accurate or realistic prediction of the pressure drop. An equation has been used which correlates the friction factor of the rough surface which has been developed which combines the effects of the rough and smooth surface on the flow to obtain friction factor vs. Reynolds number plot for the entire pipe-type cable system. This theory has been written in the form of a FORTRAN IV computer program which accepts as input the geometrical dimensions of a system and yields as output the friction factor and corresponding Reynolds Number for the entire pipe-type cable geometry. The results predicted from the theory are consistently 15-30% above the experimentally determined values.

PB-247 116/7CP PC **A09**/MF **A01**
National Bureau of Standards, Boulder, Colo. Electromagnetics Div.
Time Domain Automatic Network Analyzer for Measurement of RF and Microwave Components
Final rept. 1 Jul 73-30 Jun 74
William L. Gans, and James R. Andrews. Sep 75, 177p Rept no. NBS-TN-672
Contract CCG-72-68

Descriptors: *Network analyzers, Microwave equipment, Attenuation, Fourier transformation, Insertion loss, Pulse generators, Oscilloscopes, Minicomputers, Computer programs, Spectrum analysis, BASIC programming language.
Identifiers: Time domain, Automatic, *Time domain automatic network analyzers.

The technical note describes in detail a new NBS instrument for the measurement of the scattering parameters of RF and microwave components. The instrument is the Time Domain Automatic Network Analyzer (TDANA). It uses time domain pulse measurements to obtain frequency domain parameters. The frequency range is dc to 18 GHz with a lower upper limit for large values of attenuation. The instrument consists of three major components: an ultra-fast pulse generator, a broadband sampling oscilloscope, and a digital minicomputer.

PB-252 688/7CP PC **A05**/MF **A01**
Office of Telecommunications, Boulder, Colo. Inst. for Telecommunication Sciences.
A Numerical Method for Generating Earth Coverage Footprints from Geostationary Antennas
Randy H. Ott. May 75, 83p USPS-1702-112

Descriptors: *Communications satellites, *Antenna radiation patterns, Telecommunication, Spacecraft antennas, Synchronous satellites, Power spectra, Algorithms, Computer programs.
Identifiers: Electronic message system.

An algorithm is described for generating on a microfilm out-put earth coverage footprints from geostationary satellite antennas. A separate algorithm for determining whether given stations are included in or excluded from a particular footprint is described. The antenna beam can be elliptic in cross-section with an arbitrary orientation of semi-minor and semi-major axes. Several examples of the use of the algorithms are presented.

PB-254 574/7CP PC **A16**/MF **A01**
Jet Propulsion Lab., Pasadena, Calif.
Matrix Analysis of Linear Induction Machines
Final rept. Sep 72-Dec 74
David G. Elliott. Sep 75, 358p JPL-SP-43-24, FRA/ORD-75/77

Descriptors: *Induction motors, *Matrix methods, Magnetic fields, Liquid metal pumps, Magnetohydrodynamic generators, Matrices(Mathematics), Computation, Computer programs.
Identifiers: *Linear induction motors.

A new method of analyses for linear induction machines, the matrix method, has been developed. The method handles linear induction motors, both single- and double-sided, and linear induction liquid metal pumps and generators, both flat and annular. The primary currents can be prescribed, calculated from prescribed phase voltages, or optimized for maximum machine efficiency. The matrix method incorporates accurate modeling of the magnetic field of the finite-length iron including the fields due to fringing, variable gap, slots, coils, and phase belts. The coils may have any arbitrary phase connections.

PB-260 426/2CP CP **T05**
Federal Communications Commission, Washington, D.C. Broadcast Bureau.
RADIAT Computer Program
Software
John Boursy, and Bill Lannin. Oct 76, mag tape*
FCC/DF-76/008

Source tape is in EBCDIC character set. Tape(s) can be prepared in most standard 7 or 9 track recording modes for one-half inch tape. Identify recording mode desired by specifying character set, tract, density, and parity. Call NTIS Computer Products if you have questions. Price includes documentation, PB-260 427.

Descriptors: *Software, *Antenna radiation patterns, *Radio broadcasting, *Radio stations, *Computer programs, *Directional antennas, Amplitude modulation, Computations, FORTRAN, Magnetic tapes.
Identifiers: RADIAT computer program, FORTRAN 5 programming language.

Radiation patterns are calculated for standard broadcast (AM) stations, including theoretical, standard, modified standard, stability and reradiation patterns. Also, included are related calculations such as RMS studies, nearfield studies, and computation of mutual impedances. Results of some intermediate calculations may also be printed. Limitations - maximum of 20 towers 0 50 augmentations; both can be easily changed. Known error - incorrect results for modified standard (augmented) pattern special angles will result if the first vertical angle is not on the horizontal. The program is written in the FORTRAN V programming language for implementation on a Honeywell 6023 computer using the GCOS operating system. 168K bytes of storage are required to operate the program.

PB-260 427/0CP PC **A05**/MF **A01**
Federal Communications Commission, Washington, D.C. Broadcast Bureau.
A User's Guide to RADIAT, CONTOUR, CLIPPING, SKYWAVE
Final rept.
John Boursy. 25 Apr 75, 81p* FCC/DF-76/008a
For system on magnetic tape, see PB-260 426.

Descriptors: *Instructions, *Computer programming, *Radio broadcasting, Directional antennas, Antenna radiation patterns, Ionospheric propagation, Radio waves, Radiofrequency interference, Amplitude modulation.
Identifiers: RADIAT computer program, CONTOUR computer program, CLIPPING computer program, SKYWAVE computer program.

This is a user's guide for four FORTRAN computer programs used in FCC's broadcast bureau. RADIAT is used for standard broadcast (AM) directional antenna calculations. CONTOUR is used for distance, bearing, midpoint latitude and Skywave field factor calculations. CLIPPING is used for 'clipping' studies for nighttime standard broadcast (AM) interference studies. SKYWAVE is used to calculate the extent of 10% and 50% nighttime Skywave contours for standard broadcast (AM) stations.

PB-261 770/2CP PC **A07**/MF **A01**
Mitre Corp., McLean, Va.
The Air-Core Linear Synchronous Motor - An Assessment of Current Development
Final rept.
C. A. Skalski. Jun 76, 144p MTR-7028, FRA-ORD/D-76/260
Contract DOT-FR-54090

Descriptors: *Rapid transit railways, *Electric drives, *Synchronous motors, Electric motors, Superconducting magnets, Suspension systems(Vehicles), Computer programs.
Identifiers: *Tracked air cushion vehicles, *Magnetic levitation, *Linear synchronous motors, *Guideways, Air core motors.

The development of the air-core linear synchronous motor (LSM) is examined primarily on the basis of work done in the United States and Canada during the past five years. The outstanding performance features of these motors are demonstrated in terms of a simple theory, numerous design examples, and discussions of practical aspects. Comparisons to iron-core LSMs and linear induction motors are made. Also, the possibility of using air-core LSMs as an alternative to conventional railroad electrification techniques is pointed out.

PB-263 119/0CP PC **A08**/MF **A01**
West Virginia Univ., Morgantown. Dept. of Electrical Engineering.
Evaluation of in-Mine Grounding System and Codification of Ground Bed Construction and Measurement Techniques
Annual rept.
Wils L. Cooley. 1 Aug 75, 169p BuMines-OFR-20-77
Grant G0144138

Descriptors: *Electrical grounding, *Coal mines, Safety, Electrical faults, Measurement, Design, Computer programs, FORTRAN, Evaluation.
Identifiers: Mine safety.

Measurements were made of earth currents from dc haulage lines to evaluate their effect on ground beds, grounding, and ground monitoring. Ground bed construction and measurement techniques making use of a programmable portable calculator were developed. The programs were also arranged in standard Fortran. Guides for construction and measurement are included as appendices to the report. Theoretical modeling of ground beds was conducted.

PB-264 300/5CP PC **A04**/MF **A01**
National Bureau of Standards, Boulder, Colo. Electromagnetics Div.
A Microwave Vector Voltmeter System
Final rept.
Keith C. Roe, and Cletus A. Hoer. Aug 76, 70
Rept no. NBSIR-76-844
Sponsored in part by School of Aerospace Medicine, Brooks AFB, Tex.

Descriptors: *Voltmeters, Microwave equipment, Amplitude, Calibrating, Phase angle, Automation, Computer programs.
Identifiers: Vector voltmeters.

The report presents a system description and operating procedure for a vector voltmeter system which covers the frequency range .5 to 12 GHz. The design is based upon a seven-port junction where phase and amplitude information is obtained using only power detectors. The system is computer controlled and self-calibrating for ratio measurements.

PB-267 785/4CP PC **A06**/MF **A01**
Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Electrical Engineering.
Time Domain Reflectometry Microcomputer
Final rept. Jan 75-Mar 77
Roger A. Dworak, Angel G. Jordan, and John S. Thorne. Mar 77, 113 BuMines-OFR-106-77
Contract H0346138

Descriptors: *Electrical fault location, *Microcomputers, *Reflectometers, Computer programs, Power lines, Transmission lines.
Identifiers: Time domain, Intel 8080 computers, TDRM computer program, Trailing cables.

Faults which occur in electrical coal mine trailing cables as either short circuits or open circuits have been successfully located in the past by a variety of simple techniques. On the other hand resistive faults require the use of more sophisticated techniques to provide accurate fault location, especially in the range of 50 ohms to 1 megohm. The report describes the work done on the development of the time domain reflectometry microcomputer (TDRM). Modifications to the FMC-model 302A cable fault locator is described in appendix D. The TDRM unit uses an 8080 microcomputer to accurately locate major faults in low capacitance cables to within plus or minus one foot when properly calibrated. Major faults in high capacitance cables are usually located within plus or minus 5 feet. The upper limits of fault detection are 01 kilohm shunt fault and 07 ohm series fault. In practice fault detection limits are reduced to 0300 ohms shunt fault and 030 ohms series fault because of discontinuities caused by cable repair.

PB-270 900/4CP PC **A15**/MF **A01**
West Virginia Univ., Morgantown. Engineering Experiment Station.
Mine Grounding Systems: Evaluation of Ground Beds and Ground-Bed Monitors and Evaluation of Modular Ground-Wire Monitor
Annual rept. 1 Jul 75-15 Oct 76
Wils L. Cooley. 6 May 77, 349p BuMines-OFR-122-77
Contract G0144138

Descriptors: *Electrical grounding, *Coal mines, Safety, Monitors, Monitoring, Mines(Excavations), Electrical faults, Measurement, Evaluation, Computer programs, FORTRAN.
Identifiers: Mine safety.

Several aspects of coal mine safety-ground system operation are studied. Evaluations of two sophisticated ground-wire monitors are presented, along with a detailed report of development work on a modular ground-wire monitor. A portion of the report covers stray current flow in the safety-ground system, analyzing in detail conditions surrounding the generation of both dc and ac ground wire current. Considerable detail is provided concerning studies of mine ground beds. Additional progress is reported in the development of a continuous ground-bed monitor, and new techniques are developed for the design of ground beds and their resistance measurement. New methods of accurately measuring electrical parameters of finite layered conducting structures are also reported. The effects of stray currents in ground beds is included. Touch- and step-potentials associated with mining equipment are analyzed, and methods are presented for determining earth voltage gradients around structures contacting earth. Instrumentation to determine gradients easily is suggested. Finally, an extensive effort is described dealing with lightning transients on open-pit coal mine ground systems. The nature of the transients, their expected frequency of occurrence, and the ways in which they damage equipment are analyzed in detail.

PB-271 815/3CP PC **A05**/MF **A01**
Office of Telecommunications, Boulder, Colo. Inst. for Telecommunication Sciences.
A Program Description of 'Orbit - Prints': Contours of Power Density at the Geostationary Orbit
W. A. Kissick, and D. N. Rebol. Jun 77, 95p Rept no. OTR-77-126

Descriptors: *Radio transmission, *Computer programs, *Spectral energy distribution, Radio field strength, Power spectra, Antenna radiation patterns, Fortran, Radio stations, Synchronous satellites.
Identifiers: Fortran 4 programming language, Communication terminals, ORBITPR computer program.

The report describes a computer program which calculates the contours of terrestrial-emitter power density measured at or near the geostationary orbit. The program calculates the power density for an array of points located on the inside surface of a sphere described by the geostationary orbit. The theory and calcula-

tions used assume free-space propagation. The geometry allows for arbitrary aiming of the emitter antenna, and several antenna patterns for the terrestrial emitters are included as subroutines of the computer program. The primary output of the program is a computerized plot of contour intervals of power density. The program was written in Fortran IV for the U.S. Department of Commerce, Boulder Laboratories' computer. Flow charts and program listings are included in the report.

PB-273 036/4CP PC **A08**/MF **A01**
Brookhaven National Lab., Upton, N.Y.
The Power Transmission Project. Progress Report In 1973. Part II. Cryogenic and Mechanical Engineering
Technical note
E. B. Forsyth, J. W. Dean, and K. F. Minati. 16 Apr 75, 164p PTP-26, NSF/RA/N-74-033
Grant NSF-AG-381
See also Report dated Mar 74, PB-244 583.

Descriptors: *Superconducting power transmission, *Power transmission lines, Liquid helium, Cryogenics, Refrigerating, Computer programs, Refrigerators, Capitalized costs, Cost estimates, Supercritical flow, Design.
Identifiers: *Superconducting cables, Cryogenic cables, Cryogenic refrigeration.

The progress report describes an active development program concerned with the development of cryogenic envelopes containing the superconducting cables in a thermally-insulated environment. Three concepts for the design of this envelope are under study and are discussed. Also included in the report are some thoughts concerning the design of cable terminations for superconducting cable systems. A discussion of refrigeration design for transmission line applications is included. A report of some subcontract work at the National Bureau of Standards, Cryogenic Division, on a study of the modes of instability in supercritical helium systems concludes the body of this report. Appendix I contains a study of explosive welding of joints in stainless steel pipes carried out at Battelle, Columbus Laboratories. Appendix II is entitled 'Potential Oscillations in Helium Cooling Systems for Superconducting Power Transmission Lines.' Appendix III is concerned with a transmission system refrigerator, and Appendix IV contains a computer program that calculates the thermal performance and estimates the capital cost and yearly electrical power cost for the supercritical helium refrigerator design shown in the report body.

PB-280 550/5CP PC **A10**/MF **A01**
Cambridge Systems Corp., Mass.
Optical Automatic Car Identification (OACI) Readability and Scanner Performance
Final rept. Feb-Jun 77
Hector C. Ingrao, and William I. III Thompson. Mar 78, 209p CSC-77-101, FRA/ORD-78/15.II
Contract DOT-FR-74292

Descriptors: *Railroad terminals, *Railroad cars, *Identification systems, *Optical scanners, Calibration, Legibility, Labels, Railroad trains, Electrooptics, Fortran, Computer programs, Decoders, Multiplexers, Data processing, Railroads, Information systems, Networks.
Identifiers: *Automatic railroad car identification systems, *Optical automatic car identification, *Rail scanners, Readability, TRAIN FOR computer program, Fortran 4 programming language, Decsystem-10 computers.

The results of the Optical Automatic Car Identification (OACI) study on readability and scanner performance conducted on the Chicago Railroad Terminal Information System (CRTIS) data which includes operation from February 1 to June 15, 1977 are presented. The main purpose of the study was to determine the scanner non-read and error-read contributions to overall OACI readability measurements, the use of the calibration train concept as a method of OACI network analysis, and possible network automatic checkout. The study attempts to separate the non-read and error-read components due to the scanner performance from other label factors which affect the readability measurements. The scanner performance contribution to non-read and error-reads was estimated on the basis of scanner readability differences observed by means of calibration trains. The calibration train concept is suggested as an effective tool to evaluate OACI scanner network performance. (Portions of this document are not fully legible)

SAND-75-0041 PC **A05**/MF **A01**
Sandia Labs., Albuquerque, N.Mex.
EBW1: A Computer Code for the Prediction of the Behavior of Electrical Circuits Containing Exploding Wire Elements.
T. J. Tucker, and R. P. Toth. Apr 75, 82p
Contract AT(29-1)-789

Descriptors: *Electronic circuits, Exploding wires, *Exploding wires, *Computer calculations, *Computer codes, *E codes, Detonators, Electric conductivity, Electric fuses.

Resistivity versus specific action data for 23 elemental metals and alloys are combined with a MIMIC language computer program to predict the behavior of electrical circuits containing exploding wire elements.

SAND-75-0279 PC **A03**/MF **A01**
Sandia Labs., Albuquerque, N.Mex.
Opsnap: A Users' Manual.
R. L. O'Nan. May 75, 50p
Contract AT(29-1)-789

Descriptors: *Computer codes, *O codes, *Microwave equipment, Design, *Electronic circuits, Design, *Rf systems, Design, Algorithms, Hp computers, Optimization, Simulation, Systems analysis.
Identifiers: ERDA/420800, OPSNAP computer program.

OPSNAP is a general microwave circuit analysis and optimization program that allows an engineer to describe his circuit in terms of ports rather than nodes, and to get as a result both the circuit response and the proper circuit values necessary to achieve a certain "optimum". The algorithm used works on S-parameters only; no conversions between S, Y, or Z are made. This allows the program to be extremely general in terms of the topology and types of devices allowed. It is configured to run in an HP 2100/2116 computer having 24K words of core and paper tape and teletype I/O peripherals. It was at one time a Hewlett-Packard working tool and has been donated to the ARFTG users library by H. P. This manual is intended as a guide for the use of the program. The program accepts lumped circuit elements, distributed circuit elements and circuit elements defined by their S-Parameters. OPSNAP can be operated in one of three modes. A fully defined circuit can be analyzed, the operator can interact with the program by entering circuit values via the teletype, or the circuit can optimize circuit values to achieve a required overall circuit operation.

SAND-75-0613 PC **A03**/MF **A01**
Sandia Labs., Albuquerque, N.Mex.
TA533 Function Matrix and Status Interface Test Program
T. D. Sullivan. Apr 76, 27p
Contract AT(29-1)-789

Descriptors: *Computer codes, *Electronic equipment, FORTRAN, Pdp computers, T codes, Testing.
Identifiers: ERDA/420800, ERDA/990200.

A FORTRAN program is described which allows testing of a TA533. Diagnostic information is printed by the program as an aid for localizing malfunctions in a TA533. Program control is under user input options. 1 figure, 3 tables. (ERA citation 01:017048)

SAND-75-0620A PC **A03**/MF **A01**
Sandia Labs., Albuquerque, N.Mex.
Schematic Definition Language (SDL)
T. L. Bisbee, and W. C. Burd. May 77, 36p
Contract EY-76-C-04-0789

Descriptors: *Printed circuits, *Programming languages, Cdc computers, Computer aided design, Electronic circuits, Manuals, Programming.
Identifiers: ERDA/990200, ERDA/420800, *Interactive graphics, DAVINCI-2 computer program, SDL programming language.

This document serves as the users guide for a basic language used to define electrical circuits where the data generated is input to an interactive graphics program titled DAVINCI-II. 3 figures, 2 tables. (ERA citation 02:050508)

SAND-75-6192 PC **A02**/MF **A01**
Sandia Labs., Albuquerque, N.Mex.
Design Rule Checking and Analysis of IV Mask Designs
B. W. Lindsay, and B. T. Preas. 1975, 22p Rept no. CONF-760609-7
13. design automation conference, Palo Alto, California, United States of America (USA), 27 Jun 1976.

Descriptors: *Computer codes, *Integrated circuits, Algorithms, Computer-aided design, L codes.
Identifiers: ERDA/420800, ERDA/990200.

A new mask analysis code for design rule checking is described. The code provides a number of high-level (LOGMASC) commands which allow the designer complete freedom in performing almost any design rule check desired, from simple width or tolerance checks to sophisticated checks involving pattern recognition. One of the extremely important features of the sophisticated checks is the elimination of false design rule violations normally encountered when only simple checks are performed. This feature saves much of a design engineer's time. Since only the actual errors are printed or plotted, this feature should be contrasted with the long list of possible errors obtained from most design rule checking codes, from which the engineer must sort out the actual errors. Although the use of the LOGMASC code is described for a CMOS circuit, the code is completely general and can be used for design rule checking and analysis of mask information for any technology. The LOGMASC code described is easy to use, versatile, and provides efficient use of computer time. 4 figures, 6 tables. (ERA citation 01:017049)

SAND-76-0017 PC **A03**/MF **A01**
Sandia Labs., Albuquerque, N.Mex.
SAW Devices: Description and Computer Models
D. W. Palmer. Mar 76, 48p
Contract AT(29-1)-789

Descriptors: *Sonic probes, Computer codes, Computer-aided design, Design, Equivalent circuits, Mathematical models, Operation, Piezoelectricity, Sound waves, Surfaces, Transducers, Uses.
Identifiers: ERDA/440300, Acoustic surface waves, *SAW devices.

Surface acoustic wave (SAW) devices have become common elements in radar, communication, and coded security systems. This document is intended to facilitate SAW usage at

Sandia Laboratories. This intention is forwarded by presenting a tutorial on SAW device properties and applications, and listing several computer programs which model SAW device properties. The usefulness of computer models in checking design and specification is demonstrated by comparison of the model predictions with rf measurements of SAW devices. The computer programs listed are in a format compatible with the in-house CDC 6600 computer using a SCOPE operating system along with the SC-4020 plotter. 25 figures, 1 table. (ERA citation 01:020794)

SAND-76-9216 PC **A02**/MF **A01**
Sandia Labs., Albuquerque, N.Mex.
Integrated Set of Computer Aids for Custom IC Design
C. W. Gwyn. Dec 76, 24p Rept no. CONF-770705-1
Contract EY-76-C-04-0789
Conference on computer-aided design of electronic and microwave circuits and systems, Hull, United Kingdom of Great Britain and Northern Ireland (UK), 12 Jul 1977.

Descriptors: *Integrated circuits, Cdc computers, Computer codes, Computer aided design, Production, Programming.
Identifiers: ERDA/420800, ERDA/990200.

An integrated set of computer aids was developed to reduce the time and cost for producing a custom MOS IC design. The basic codes, use of codes in the circuit design sequence, and benefits realized by using computer aids are described. 5 figures, 3 tables. (ERA citation 02:052762)

SAND-77-0939 PC **A11**/MF **A01**
Berne Electronics, Inc., Albuquerque, N.Mex.
AITRAC: Augmented Interactive Transient Radiation Analysis by Computer. User's Information Manual
Oct 77, 229
Contract EY-76-C-04-0789

Descriptors: *Computer codes, *Electronic circuits, A codes, Computer aided design, Direct current, Electric currents, Manuals, Mathematical models, Radiation effects, Transients.
Identifiers: ERDA/420800, ERDA/440200, AITRAC computer program, Surges.

AITRAC is a program designed for on-line, interactive, DC, and transient analysis of electronic circuits. The program solves linear and nonlinear simultaneous equations which characterize the mathematical models used to predict circuit response. The program features 100 external node--200 branch capability; conversional, free-format input language; built-in junction, FET, MOS, and switch models; sparse matrix algorithm with extended-precision H matrix and T vector calculations, for fast and accurate execution; linear transconductances: beta, GM, MU, ZM; accurate and fast radiation effects analysis; special interface for user-defined equations; selective control of multiple outputs; graphical outputs in wide and narrow formats; and on-line parameter modification capability. The user describes the problem by entering the circuit topology and part parameters. The program then automatically generates and solves the circuit equations, providing the user with printed or plotted output. The circuit topology and/or part values may then be changed by the user, and a new analysis, requested. Circuit descriptions may be saved on disk files for storage and later use. The program contains built-in standard models for resistors, voltage and current sources, capacitors, inductors including mutual couplings, switches, junction diodes and transistors, FETS, and MOS devices. Nonstandard models may be constructed from standard models or by using the special equations interface. Time functions may be described by straight-line segments or by sine, damped sine, and exponential functions. 42 figures, 1 table. (ERA citation 03:024913)

SAND-77-1254C PC **A02**/MF **A01**
Sandia Labs., Albuquerque, N.Mex.
Architecture for Contemporary Computer Aids to Generate IC Mask Layouts
B. T. Preas, and C. W. Gwyn. 1977, 3p Rept no. CONF-771104-2
Contract EY-76-C-04-0789
11. annual ASILOMAR conference on circuits, systems, and computers, Pacific Grove, California, USA, 7 Nov 1977.

Descriptors: *Integrated circuits, *Computer aided design, Fabrication.
Identifiers: ERDA/420800, SICLOPS computer program, Masking.

A new automatic layout code (Sandia Integrated Circuit Layout Program System-SICLOPS) is being developed which avoids earlier problems, provides flexibility for designing ICs using different technologies, and provides the basis necessary to design highly complex chips bordering on VLSI complexity. The SICLOPS layout approach relies on a structured hierarchical layout using modules consisting of assemblies of standard cells or bonding pads and macrocells. One of the keys to efficiency is the use of the same routing algorithms at each stage of the layout to optimize the layout for the individual modules prior to incorporating the modules in the overall chip layout. The SICLOPS program is expected to generate a CMOS IC layout using a silicon gate technology which is approximately a factor of five higher in device density than a metal gate technology. (ERA citation 03:004757)

SAND-77-2035 PC **A03**/MF **A01**
Sandia Labs., Albuquerque, N.Mex.
User/Programmer Guide for UCMD 47: Thin Film Resistor Layout
K. E. Wiegandt. Dec 77, 35p
Contract EY-76-C-04-0789

Descriptors: *Computer codes, *Resistors, Computer-aided design, Films, Microelectronic circuits, Pdp computers, Printed circuits, U codes.
Identifiers: ERDA/420800, UCMD 47 computer program, *Film resistors, Layout.

This document describes program UCMD 47--an Applicon AGS/870 User Command for parametrically producing thin-film resistor layouts in three generalized configurations. (ERA citation 03:026775)

SC-CR-69-3309 HC E01 MF **A01**
Mississippi State Univ., State College. Dept. of Physics.
Electromagnetic Field Penetration of Wire Screens.
Final rept.
H. Val McAdams, Jr. Jan 70, 62p

Descriptors: *Antenna configurations, Electromagnetic fields, *Integral equations, Numerical analysis, Penetration, Antennas, Computer programs, Algorithms, Electric currents, Electric wire.

For abstract, see NSA 2415

SC-DR-710831 PC **E01**/MF **A01**
Sandia Labs., Albuquerque, N. Mex.
Users Manual for the Sandia Microcircuit Mask Generation Program
D. . Schroeder, and D. . Schueler. Nov 71, 34p

Descriptors: *Circuits, *Computer programs.
Identifiers: AEC.

For abstract, see NSA 27 07, number 16916.

SC-DR-720718 PC **E01**/MF **A01**
Sandia Labs., Tonopah, Nev. (Usa).
Ticon: The Tonopah Test Range Timing and Control System
R. L. Shaum. Jun 73, 52p

Descriptors: *Control systems, *Testing, *Electronic equipment, *Time measurement, *Data acquisition systems, Electronic equipment, Computer codes, Measuring methods.
Identifiers: AEC.

For abstract, see NSA 28 10, number 26908.

SC-DR-720816 PC **E01**/MF **A01**
Sandia Labs., Albuquerque, N. Mex.
Computer Catalog for Electronic Components
L. J. Klamerus. Nov 72, 26p

Descriptors: *Computer programs.

For abstract, see NSA 27 04, number 09226.

SLA-73-133 PC **E01**/MF **A01**
Sandia Labs., Albuquerque, N. Mex.
Devlib: A Pdp-10 Semiconductor Device Library Program
G. R. Case, and J. B. Meland. Apr 73, 62p

Descriptors: *Computer codes, *D codes, *Semiconductor devices, *Information retrieval, Pdp computers.
Identifiers: AEC.

For abstract, see NSA 28 04, number 10485.

SLA-73-153 PC **E01**/MF **A01**
Sandia Labs., Albuquerque, N. Mex.
Computer Codes for Power Amplifier Design
J. . Webb. Feb 73, 28p

Descriptors: *Amplifiers, *Computer programs.
Identifiers: AEC.

For abstract, see NSA 27 10, number 24274.

SLA-73-5309 PC **A03**/MF **A01**
Sandia Labs., Albuquerque, N. Mex.
Computer Generated Visual Documentation of Theoretical Store Separation Analyses
H. R. Spahr. 1973, 29p Rept no. CONF-730925-2

Descriptors: *Interactive display devices, *Missiles, *Aircraft, Missiles, *Computer codes, *M codes, Magnetic tapes, Memory devices, Photography.
Identifiers: AEC.

For abstract, see NSA 28 10, number 26843.

SLA-73-5419 PC **A02**/MF **A01**
Sandia Labs., Albuquerque, N. Mex.
Simulation of Relativistic Electron Beam Diodes
J. W. Poukey, J. R. Freeman, and F. G. Yonas. 1973, 22p Rept no. CONF-730529-4

Descriptors: *Diode tubes, *Mathematical models, *Computer codes, *D codes, Electron beams, Electrons, Relativistic range.
Identifiers: AEC.

For abstract, see NSA 28 05, number 12489.

SLA-73-561 PC **A03**/MF **A01**
Sandia Labs., Albuquerque, N. Mex.
Cable Development Status Computer Program
L. J. Klamerus, G. Voida, and H. C. Olson. Jul 73, 31p

Descriptors: *Information systems, Electric cables, *Electric cables, *Specifications,

*Computer codes, *C codes, Pdp computers, Planning.
Identifiers: AEC.

For abstract, see NSA 28 10, number 26840.

SLA-73-661 PC **A03**/MF **A01**
Sandia Labs., Albuquerque, N. Mex.
User'S Guide to a Computerized sa Resistor Catalog (Resis)
L. J. Klamerus, and K. J. Payne. Jul 73, 48p

Descriptors: *Resistors, *Manuals, *Computer codes, *R codes, Information retrieval, Pdp computers, Specifications, Standards.
Identifiers: AEC.

For abstract, see NSA 28 10, number 26841.

SLA-73-670 PC **A02**/MF **A01**
Sandia Labs., Albuquerque, N. Mex.
Gain: An Interactive Graphics Interface for Circuit Analysis Programs
D. R. Blazek, and A. F. Schkade. Jul 73, 24p

Descriptors: *Electronic circuits, *Performance testing, *Computer codes, *G codes, *Interactive display devices, Electronic circuits, Cathode ray tubes, Cdc computers, Inspection, Pdp computers, Reliability.
Identifiers: AEC.

For abstract, see NSA 28 10, number 26842.

SLL-73-225 PC **E05**/MF **A01**
Sandia Labs., Livermore, Calif. (Usa).
Two Computer Programs for the Sensitivity Analysis of Higher Order Filters
M. A. Soderstrand, and J. F. Lathrop. Jan 74, 125p
Contract AT(29-1)-789

Descriptors: *Electric filters, *Sensitivity, *Computer codes, *C codes, Fortran, Polynomials, R codes, Transfer functions.
Identifiers: AEC.

For abstract, see NSA 29 08, number 20513.

UCID-1502(Rev.1) PC **A02**/MF **A01**
California Univ., Livermore Lawrence Livermore Lab.
Computer Analysis and Design of Electronic Circuits (Programs Available to Lrl Design Engineers).
W. G. Jr. Magnuson. 9 Oct 70, 7p

Descriptors: *Computer codes, *B codes, C codes, Design, Digital computers, E codes, Electronic circuits, Magnetic tapes, Performance, Physical radiation effects, Programming, Reliability, S codes, Semiconductor materials, Simulation.

For abstract, see NSA 30 09, number 26159.

UCID-16963 PC **E99**/MF **A01**
California Univ., Livermore Lawrence Livermore Lab.
W2t-Ariz/LLL1: A Time-Domain Code for Studying Electromagnetic Shielding by Wire Gratings.
R. M. Bevensee. 3 Nov 75, 57
Contract W-7405-Eng-48

Descriptors: *Electromagnetic radiation, *Shielding, *Magnetic shielding, *Computer calculations, *Computer codes, *W codes, Wires.
Identifiers: ERDA/644007, ERDA/420800, *Electromagnetic shielding, W2T-ARIZ/LLL1 computer code.

This code is an extension of the code ARBANG developed at the University of Arizona. The original code solved for the temporal e/sub z/(anti rho,t) field on the shadow side of a single planar grating of round, equally spaced parallel wires excited by an incident plane wave of temporal excitation composed of two decaying exponentials. The incident field is polarized parallel to the wires, the system is infinitely long in that direction, and the angle of incidence is arbitrary. The extended code W2T-ARIZ/LLL1 which was developed at Lawrence Livermore Laboratory (LLL) computes the e/sub z/(anti rho,t) field at any point in empty space for any one of three cases: (1) a single grating of ARBANG, (2) a pair of parallel gratings (with the wires parallel), and (3) one grating with a perfectly conducting plane some distance away. The theoretical basis of the code is presented and the accompanying code listing is explained. Some limitations are noted and sample computations for a particular data set are discussed. Information is given about code storage- and execution-time.

UCID-17024 PC **A04**/MF **A01**
California Univ., Livermore. Lawrence Livermore Lab.
Design of Yagi Antennas for a Doppler Radar System That Measures Ocean Surface Currents
J. L. Willows. 1 Mar 76, 66p
Contract W-7405-Eng-48

Descriptors: *Antennas, Computer codes, Design, Measuring methods, Motion, Numerical solution, S codes, Seas.
Identifiers: ERDA/420800, *Yagi antennas, SWANT computer code, *Doppler radar, *Ocean currents, Ocean surface.

The purpose of this study was to design Yagi antennas meeting the design criteria. The study consisted of numerical calculations made with the Lawrence Livermore Laboratory SWANT computer code. The code was modified to include a gain calculation, to incorporate normalized field-pattern calculations, and to output the plots and summaries presented in the 62 figures at the end of the report. These antennas were designed for the National Oceanographic and Atmospheric Administration (NOAA) for use in its Doppler backscatter radar system that monitors the near-coastline ocean surface currents. (ERA citation 01:020535)

UCID-17389 PC **A03**/MF **A01**
California Univ., Livermore. Lawrence Livermore Lab.
Stored Energy in Transformers: Calculation by a Computer Program
P. A. Willmann, and E. B. Hooper, Jr. Feb 77, 26p
Contract W-7405-ENG-48

Descriptors: *Computer codes, *Transformers, Accuracy, Energy losses, Faraday induction, Neutral beam sources, Power supplies, Stored energy, T codes.
Identifiers: ERDA/420200.

A computer program was written to calculate the stored energy in a transformer. This result easily yields the inductance and leakage reactance of the transformer and is estimated to be accurate to better than 5 percent. The program was used to calculate the leakage reactance of the main transformer for the LLL neutral beam High Voltage Test Stand. (ERA citation 02:036562)

UCID-17621 PC **A03**/MF **A01**
California Univ., Livermore. Lawrence Livermore Lab.
EFFI: A Code for Calculating the Electromagnetic Field, Force, and Inductance in Coil Systems of Arbitrary Geometry. User's Manual
S. J. Sackett. 5 May 77, 48p
Contract W-7405-ENG-48

Descriptors: *Computer codes, *Magnet coils, *MFTF devices, *Tokamak devices, Cdc computers, E codes, Electromagnetic fields, Magnetic fields, Magnetic flux.
Identifiers: ERDA/700202, ERDA/657007, EFFI computer program.

EFFI calculates magnetic flux lines, fields, forces, and inductance for an arbitrary system of coils made from circular arc and/or straight segments of rectangular cross section conductor. The preparation of input to the code and the output options available are described. Several examples, including the magnet design for MFTF and a divertor design for a Tokamak are used for illustration. All input to EFFI is format free, and is checked for validity before any calculations are done. To aid the user in correcting mistakes, each error detected produces a diagnostic giving the objection to the data and the number of the offending data card. If no errors are detected, the program automatically expands memory to the size required for the problem. EFFI produces both printed and graphical output. Each page of output is labeled with the problem title; the time, machine and data of the run; and the version number and compile date for EFFI. In addition, each column of numbers on each page is appropriately labeled. Plots of field contours, field profiles, flux lines, field magnitude along a flux line, and forces can all be obtained at the option of the user. On field contour and flux line plots, lines of intersection between the coils and the plotting plane are also shown. 5 figures. (ERA citation 03:025487)

UCID-17708 PC **A06**/MF **A01**
California Univ., Livermore. Lawrence Livermore Lab.
DASLL: (Design Automation System at Lawrence Livermore Laboratory)
R. J. Smith, II, and W. G. Magnuson, Jr. Jan 78, 109p
Contract W-7405-ENG-48

Descriptors: *Computer codes, *Printed circuits, CDC computers, Computer aided design, D codes, Lawrence Livermore Laboratory, Manuals.
Identifiers: ERDA/420800, CDC-7600 computers, Printed circuit boards, Layout, DASLL system.

This manual shows how to use the DASLL system to lay out printed circuit boards by using the OCTOPUS CDC 7600 computer system and other equipment at Lawrence Livermore Laboratory. 18 figures. (ERA citation 03:029129)

UCID-30084 PC **A06**/MF **A01**
California Univ., Livermore (Usa). Lawrence Livermore Lab.
Wamp: A Users Manual for the Wire Antenna Modeling Program.
F. J. Deadrick, and E. K. Miller. 10 Dec 73, 109p
Contract W-7405-eng-48

Descriptors: *Computer codes, *W codes, *Antennas, *Computer calculations, Boundary conditions, Electric fields, Electromagnetic fields, Fortran, Impedance, Manuals, Simulation.

For abstract, see NSA 29 10, number 26483.

UCRL-14855 HC E01 MF **A01**
California Univ., Livermore. Lawrence Radiation Lab.
Linear Network Analysis Computer Program (User'S Manual).
Darrow F. Dawson, and Waldo G. Magnuson, Jr. 9 Jun 66, 29p

Descriptors: *Electrical networks, Mathematical analysis, *Programming(Computers), Instruction manuals, Electric filters, Coupling circuits,

Transformers, Linear systems, Response, Feedback amplifiers.
Identifiers: *Network analysis theory.

For abstract, see NSA 2416

UCRL-50944 HC E01 MF **A01**
California Univ., Livermore. Lawrence Radiation Lab.
TORMAG- A PROGRAM FOR SYMMETRY OPTIMIZATION OF TOROIDAL MAGNETS
O. A. Anderson, and Dieter Fuss. 1 Oct 70, 7p

Descriptors: *Computer programs, *Magnet coils, *Thermonuclear reactors.

For abstract, see NSA 25 08, number 17212.

UCRL-51277 PC **E01**/MF **A01**
California Univ., Livermore. Lawrence Livermore Lab.
Twtd- a Computer Program for the Time-Domain Analysis of Thin-Wire Structures
M. Van Blaricum, and E. . Miller. 28 Oct 72, 124p
Contract W-7405-ENG-48

Descriptors: *Antennas, *Computer programs.
Identifiers: AEC.

For abstract, see NSA 27 10, number 24276.

UCRL-51397 PC **A02**/MF **A01**
California Univ., Livermore. Lawrence Livermore Lab.
Code for Viewing Mafco Conductors from Any Angle
T. N. Haratani, and R. W. Moir. 15 Jun 73, 14p
Contract W-7405-eng-48
U.S. Sales Only.

Descriptors: *Electric conductors, *Inspection, *Computer codes, *M codes, Magnetic fields, Rotation.
Identifiers: AEC.

For abstract, see NSA 28 08, number 20593.

UCRL-51515 PC **A03**/MF **A01**
California Univ., Livermore (Usa). Lawrence Livermore Lab.
Computer Models for Antennas.
E. K. Miller. 21 Jan 74, 32p
Contract W-7405-Eng-48

Descriptors: *Antennas, *Mathematical models, Air, Computer codes, Electromagnetic radiation, Ground level, Interfaces, Numerical solution, Programming, Wires.

For abstract, see NSA 30 01, number 02424.

UCRL-51821 PC **A09**/MF **A01**
California Univ., Livermore Lawrence Livermore Lab.
Fortran Subroutines for the Numerical Evaluation of Sommerfeld Integrals Unter Anderem.
D. L. Lager, and R. J. Lytle. 21 May 75, 176p
Contract W-7405-Eng-48

Descriptors: *Computer codes, *W codes, *Antennas, *Electric currents, *Sommerfeld integrals, *Computer calculations, Cdc computers, Fortran, Impedance, Wires.
Identifiers: ERDA/990200.

A description is given of the subroutine package added to the computer program WF-LLL2A to extend its capabilities to include solving for the currents on thin wire structures when the structures interact strongly with a lossy ground. This includes not only the case of a structure located above the ground, but also buried beneath it and with portions above and below the ground. The routines solve for the mutual impedance between two segments of the structure by the use of approximate formulas due to Norton (when appropriate) or, when necessary, by the evaluation of Sommerfeld integrals through numerical contour integration.

UCRL-52028 PC **A03**/MF **A01**
California Univ., Livermore. Lawrence Livermore Lab.
WF-SYR/LLL1: A Thin-Wire Computer Code for Antennas or Scatterers with Pulse Expansion Functions for Current
R. M. Bevensee. 18 Feb 76, 49p
Contract W-7405-Eng-48

Descriptors: *Antennas, *Computer codes, *Electromagnetic radiation, Cdc computers, Electric currents, Electric fields, Fortran, Manuals, Scattering, W codes.
Identifiers: ERDA/657007, ERDA/990200, WF-SYR/LLL1 computer program.

This report includes both the theoretical framework and the explanation of the WF-SYR/LLL1 code listing and should serve as a user's manual. The code solves for frequency domain currents and related quantities on wire structures or solid bodies modelled by grids of interconnected thin wires, acting either as antennas or scatterers. The code is a modified version of code WF-SYR. Essentially, the triangular testing functions were replaced by impulse functions at the wire segment centers, and the triangular expansion functions were replaced by pulse (rectangular) functions for current and by pulse doublets for charge. The basic method-of-moments equations of the code are developed, including a charge redistribution scheme for multiple junctions. The code listing is explained as adapted to a cross wire. Code limitations are summarized, and suggestions are made for extending the code to allow for wires of differing radii and to include subroutines for computing near or far (radiation) fields from a computed current-charge distribution. Formulas for storage and execution time are given. The modelling of physical structures to obtain greater accuracy in computed pulse currents on the segments is discussed. Along with the code listing, the test-case output for a cross wire antenna and scatterer are included. 20 figures. (ERA citation 01:021867)

UCRL-52080 PC **A03**/MF **A01**
California Univ., Livermore. Lawrence Livermore Lab.
Computer Analysis of the Twin-Whip Antenna
G. J. Burke, and A. J. Poggio. 1 Jun 76, 29
Contract W-7405-Eng-48

Descriptors: *Antennas, Communications, Computer codes, Mathematical models, N codes, Numerical analysis, Ships.
Identifiers: ERDA/420200.

Computer techniques are used to analyze the twin-whip, high-frequency, HF communication antenna employed by the U.S. Navy. The antenna is considered both on an infinite ground plane and mounted on a bracket. The program NEC, a modification of the AMP program, was used for the analysis and is very briefly described. Several models of the source region are evaluated, and the results are compared with measured input impedances. A model using a transmission line for the feed region is found to give very accurate results. (ERA citation 02:001264)

UCRL-76454 PC **A02**/MF **A01**
California Univ., Livermore Lawrence Livermore Lab.
Programs for Computer Aided Design of Metal-Oxide-Semiconductor (Mos) Lsi Electronic Circuits.
E. E. Alexander. 23 Oct 74, 6p Rept no. CONF-741001-54

Descriptors: *Electronic circuits, *Design, Computer calculations, Computer codes, Integrated circuits, Microelectronics, Mos transistors.

For abstract, see NSA 31 11, number 32455.

UCRL-77294 PC **A02**/MF **A01**
California Univ., Livermore Lawrence Livermore Lab.
Computer Program to Evaluate the Quality of a Pc Board Router.
H. H. Loomis, Jr. 5 Sep 75, 14p Rept no. CONF-751109-2

Descriptors: *Printed circuits, *Computer codes, Automation, Computers, Design, Performance testing, Programming.
Identifiers: ERDA/420800, ERDA/990200.

This paper gives a general description of the Design Automation System under development at Lawrence Livermore Laboratory and presents the details of the portion of that system which makes quantitative evaluations of a given router for a given problem. Specific defects in the solution are also identified by the program. The evaluator, therefore, aids in the debugging of routers and the improvement of router heuristics.

WFPS-TME-009 PC **A04**/MF **A01**
Westinghouse Electric Corp., Pittsburgh, Pa. Fusion Power Systems Dept.
Six Phase Rectifier Digital Computer Simulation
R. W. Miller, and J. O. Nichols. Oct 75, 66p
Contract EY-76-C-02-3073

Descriptors: *Magnet coils, *Power supplies, *Tftr device, Computer codes, Electrical properties, Fortran, Mathematical models, Simulators.
Identifiers: ERDA/700203, *Computerized simulation, Electric converters, Rectrifiers.

A digital computer program has been developed for the simulation of a six-pulse converter with a resistance-inductance load. The program calculates the time histories of the voltages and currents on both the ac and dc sides of the rectifier bridges. The grid delay angle is calculated in terms of the load current, supply voltage, and commutating reactance. The program is written in FORTRAN and is executable on the CDC 7600. P Plotted output of ten variables can be requested. This program is a preliminary effort toward the development of analytical and programming techniques that can be used in the simulation of the twelve-pulse controlled rectifiers in the TFTR toroidal field coil energy conversion system. (ERA citation 03:009459)

WFPS-TME-045 MF **A01**
Westinghouse Electric Corp., Pittsburgh, Pa. Fusion Power Systems Dept.
Structural Analysis Methods and Design Solutions for Ohmic Heating Solenoids
R. A. Smith. Sep 77, 19p
Contract W-7405-ENG-26
Portions of document are illegible.

Descriptors: *Superconducting magnets, *Tokamak type reactors, *Solenoids, Computer calculations, Computer codes, Current density, Design, Joule heating, Materials, Mechanical structures, Stress analysis, Supports.
Identifiers: ERDA/700202, ERDA/420201, Ohmic dissipation, Heating coils.

Design equations with solutions are derived for the ohmic heating coil solenoid unique to a tokamak fusion device. The solutions are provided to perform a detailed structural analysis of every conducting turn in the radial build of the solenoid. The derivations follow from the theory of elasticity for a body possessing cylin-

drical anisotropy where the material properties are different in the radial and tangential directions. Distinction is made to provide separate models for the region of the solenoid: (a) where turn-to-turn radial contact is maintained with radial compression or with a bond tensile strength in regions of radial tension, and (b) where there is turn-to-turn radial separation due to the absence or the loss of bonding in locations of would-be radial tension. (ERA citation 03:027641)

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