

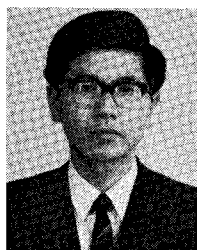
first floating point number is less than -1.0 and the others are arbitrary but must be present or the program will hang up for lack of data.

The program uses the Calcomp subroutines PLOTS, PLOT, NUMBER, and SYMBOL to generate the plotting of the mode chart, grid, and grid labels. Since continuous grid lines were found to be difficult to distinguish from the mode curves, the program generates dashed grid lines. In order to

eliminate the problem of storing inconveniently large arrays of data, the program produces a point by point plot of the curves as they are generated by the computer.

TYPE 2 If a plotter is not available, statements 134, 135, 136, 181, 191, 204, 208 through 249 inclusive, 255, 258, and 259 may be removed and statement 195 replaced by PRINT 105, FR, Z. The printed output may then be plotted up by hand if charts are desired.

Contributors



Kazuhiko Atsuki was born in Tokyo, Japan, on November 2, 1942. He received the B.S. and the M.S. degrees in 1965 and 1967, respectively, from the University of Electro-Communications, Tokyo, both in electrical engineering.

Since April 1967 he has been a Research Assistant at the University of Electro-Communications, Tokyo. He has been studying switching transistors and strip transmission lines.

Mr. Atsuki is a member of the Institute of Electronics and Communication Engineers of Japan.



William A. Edson (M'41 - SM'43 - F'57) was born in Burchard, Neb., on October 30 1912. He received the B.S. and M.S. degrees in electrical engineering from the University of Kansas, Lawrence, in 1934 and 1935, respectively, and

the Sc.D. degree from Harvard University, Cambridge, Mass., in 1937.

From 1937 to 1941 and from 1943 to 1945 he was employed by Bell Telephone Laboratories, New York, N. Y. During this period he was engaged in engineering research and development of terminal apparatus for long-distance carrier communications systems, broad-band video, and intermediate frequency amplifiers for radar. In 1952 he was appointed a Research Associate and Visiting Professor of Electrical Engineering at Stanford University, Stanford, Calif., where he also taught graduate classes in circuit and electromagnetic field theory, and supervised research by doctoral candidates. He had an

active part in the formation of the General Electric Microwave Laboratory at Stanford University in 1954, and subsequently served the Laboratory as Consulting Engineer and Manager of Microwave Techniques. While at the Microwave Laboratory he contributed to the development of methods for measuring and suppressing unwanted signals in high-power microwave systems. He has taught graduate and undergraduate courses in electrical engineering at the Illinois Institute of Technology, Chicago, and was Professor and Director of the School of Electrical Engineering, Georgia Institute of Technology, Atlanta. He was a founder and later President of Electromagnetic Technology Corporation, Mountain View, Calif., the west coast subsidiary of American Electronic Laboratories, Inc. He is currently Senior Scientist at VIDAR Corporation, Mountain View, Calif. He is the author of two books and sixteen major technical publications. He has been granted fourteen patents.

Dr. Edson is a member of the American Physical Society, Tau Beta Pi, Sigma Tau, Phi Kappa Phi, Eta Kappa Nu, Sigma Xi, and is a registered Professional Engineer in the state of California. He is a member of several professional groups and national committees of the IEEE and is a Past Chairman and Director of the San Francisco section.



David A. Leedom (S'67) was born in Turlock, Calif., on April 4, 1945. He received the B.S. degree in 1967 and the M.S. degree in 1969, both from the University of California, Santa Barbara.

At present he is pursuing graduate studies at the University of California, Santa Barbara, where he is a Research Assistant.

Mr. Leedom is a member of Eta Kappa Nu.



George L. Matthaei (S'49 - A'52 - M'57 - F'65) was born in Tacoma, Wash., on August 28, 1923. He received the B.S. degree from the University of Washington, Seattle, in 1948 and the Ph.D. degree from Stanford University, Stanford, Calif., in 1952.

From 1951 to 1955 he was on the faculty of the University of California, Berkeley, where he was an Assistant Professor, and his specialty was network synthesis. From 1955 to 1958 he was engaged in system analysis and microwave component research at the Ramo-Wooldridge Corporation. From 1958 to 1964 he was at the Stanford Research Institute where he was engaged in microwave device research and became Manager of the Electromagnetic Techniques Laboratory in 1962. In July 1964 he joined the Department of Electrical Engineering at the University of California, Santa Barbara, where he is a Professor. He is the author or co-author of numerous papers and coauthor or contributor to four books.

Dr. Matthaei is a member of five IEEE professional groups. He was the winner of the 1961 Microwave Prize.



Arthur A. Oliner (M'47 - SM'52 - F'61) was born in Shanghai, China, on March 5, 1921. He received the B.A. degree from Brooklyn College, Brooklyn, N. Y., and the Ph.D. degree from Cornell University, Ithaca, N. Y., both in

physics, in 1941 and 1946, respectively. While at Cornell he held a Graduate Teaching Assistantship in the Physics Department and also conducted research on a project

of the Office of Scientific Research and Development. He joined the Microwave Research Institute of the Polytechnic Institute of Brooklyn, Brooklyn, N. Y., in 1946, and was appointed Professor in 1957. During the summer of 1964 he was a Walker-Ames Visiting Professor at the University of Washington, Seattle, and during the 1965-1966 academic year he was on sabbatical leave at the École Normale Supérieure, Paris, France, under a Guggenheim Fellowship. In 1966 he was made head of the Electrophysics Department, and since 1967 he has also been Director of the Microwave Research Institute, responsible for the Joint Services Electronics Program at the Polytechnic Institute of Brooklyn. He has been engaged in research in a wide variety of topics in the microwave field, including network representations of microwave structures, precision measurement methods, guided-wave theory with stress on surface waves and leaky waves, traveling-wave antennas, plasmas, open periodic structures, and nonlinear optics. His latest interests include phased arrays and microwave acoustics.

Dr. Oliner is a past Chairman of both the Group on Microwave Theory and Techniques and the Committee on Antennas and Waveguides. He is a member of Commissions I and VI of the International Scientific Radio Union and a past Chairman of USA Commission I. He is also a former Chairman of a National Academy of Sciences Advisory Panel to the National Bureau of Standards. In 1964 he won the Institution Premium, the highest award of the IEE (London), and in 1967 he received the IEEE Microwave Prize. He also served during 1967 as the first National Lecturer of the Group on MTT.

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István Palócz (SM'59) was born in Budapest, Hungary, on September 24, 1920. He received the Engineering Diploma (equivalent to the M.S. degree) from the University of Technical Sciences, Budapest, in 1945, and became

Docent at the same university in 1954. He received the Ph.D. degree in electrophysics from the Polytechnic Institute of Brooklyn, Brooklyn, N. Y., in 1962.

From 1943 to 1944 he was associated with the University of Technical Sciences, Budapest, as a Research Assistant; he joined the faculty in 1950 and was an Associate Professor from 1954 to 1956. He also worked for Tungstam Company, Hungary, from 1945 to 1950, first as a Research Staff Member, then as Manager of Quality Control. He was retained as a consultant for the Research Department from 1950 to 1956. From 1957 to 1965 he was with IBM Corporation, first as a

Staff Member at the Watson Laboratory, Columbia University, New York, N. Y., then at the IBM Research Center, Yorktown Heights, N. Y., working on electromagnetic theory, microwave electronics, applied mathematics, and memory research. In 1965 he joined the Department of Electrical Engineering, New York University, Bronx, N. Y., as an Associate Professor. He was promoted to the rank of Professor in 1967.

Dr. Palócz was the recipient of the Hungarian National Award for Excellent Teaching in 1956. He is a member of Tau Beta Pi, Eta Kappa Nu, and the New York Academy of Sciences.

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H. Richard Phelan was born in Conneaut, Ohio, on September 21, 1942. He received the B.S. degree in engineering science and the M.S. degree in electrical engineering from Pennsylvania State University, University Park, in 1964 and

1967, respectively.

From 1963 to 1967 he was with the Antenna Laboratory of HRB-Singer, Inc., State College, Pa. His work there centered on electrically small and wide-band antenna types. In 1967 he joined the Antenna and Microwave Section of Radiation Incorporated, Melbourne, Fla. His initial work at Radiation dealt with highly efficient and wide-band paraboloid feed systems. Presently he is head of the Antenna Array Development Group at Radiation and is leading an in-house effort dealing with the application of the phased array technology to advanced communications systems. Typical technology topics under study and development with which he is involved are computer-aided analysis and synthesis of array patterns both far field and near field, hybrid integrated circuits for communications array application, and highly efficient paraboloid scanning feed systems.

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Yuuki Shimada was born in Obihiro, Hokkaido, Japan, on July 4, 1940. He received the B.S.E.E. degree in 1964 from Hokkaido University, Sapporo, Japan.

Since 1964 he has been associated with the Electrical Communication Laboratory, Nippon Telegraph and Telephone Public Corporation, Tokyo, Japan, where he worked in the Circuit Components and Parts Division. He specialized in wide-band transformers and high-speed pulse transformers.

Mr. Shimada is a member of the Institute of Electronics and Communication Engineers of Japan.

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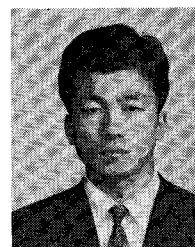
Joseph Wakabayashi (S'55-M'62) was born in Tacoma, Wash., on July 27, 1928. He received the A.B. degree in mathematics, and the M.S. and Ph.D. degrees in electrical engineering from the University of California, Berkeley, in 1953,

1957, and 1961, respectively.

He was employed as a Teaching Associate from 1957 to 1958 at the University of California. He returned to teach in the Department of Electrical Engineering of the University of California from 1961 to 1965. In August 1965 he joined the staff of Electromagnetic Technology Corporation, Mountain View, Calif. where he assumed responsibility for the direction of several research and development projects, principally in the areas of high-power filters, channelizing filters, and broad-band frequency converters.

Dr. Wakabayashi is a member of Sigma Xi.

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Eikichi Yamashita (M'66) was born in Tokyo, Japan, on February 4, 1933. He received the B.S. degree from the University of Electro-Communications, Tokyo, in 1956, and the M.S. and Ph.D. degrees from the Uni-

versity of Illinois, Urbana, in 1963 and 1966, respectively, all in electrical engineering.

He was a member of the research staff on millimeter-wave engineering at the Electro-technical Laboratory, Tokyo, from 1956 to 1964. He was with the Electro-Physics Laboratory at the University of Illinois from 1961 to 1963 and from 1964 to 1966. From 1966 to 1967 he was with the Antenna Laboratory at the University of Illinois. Since September 1967 he has been an Associate Professor at the University of Electro-Communications in Tokyo. His research work since 1956 has been on microstrip transmission lines, hybrid modes of Goubau lines, wave propagation in a gaseous plasma, the pyroelectric effect detector in the submillimeter wave region, tunnel diode oscillators, and thermal diffusion in integrated circuits.

Dr. Yamashita is a member of the Institute of Electronics and Communication Engineers of Japan and Sigma Xi.