

are also implemented. As a program option, it is also possible to compute the number of resonators of each type (between specified limits) in order to fulfill an attenuation requirement. However, the total number of filter elements is always limited to 20. This is mainly due to the accumulation of roundoff errors inherent with most network synthesis techniques. Running time is very short, but fairly unpredictable due to the root-finding process. A normal case with 7 or 9 elements will take about 4 or 5 s on an IBM 360/65.

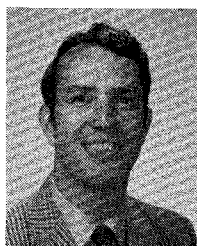
The produced output is readily used for practical design purposes; an attenuation versus frequency plot is optional, and the results are the normalized characteristic immittances of the transmission lines. In many cases the only step left is the computation of line dimensions,

while for other cases (e.g., interdigital filters) the results are directly usable for capacitance matrix transformations or Kuroda-type element interchanges.

REFERENCES

- [1] M. C. Horton and R. J. Wenzel, "General theory and design of optimum quarter-wave TEM filters," *IEEE Trans. Microwave Theory Tech.*, vol. MTT-13, pp. 316-327, May 1965.
- [2] H. S. Carlin and W. Kohler, "Direct synthesis of band-pass transmission line structures," *IEEE Trans. Microwave Theory Tech.*, vol. MTT-13, pp. 283-297, May 1965.
- [3] P. I. Richards, "Resistor-transmission-line circuits," *Proc. IRE*, vol. 36, pp. 217-220, Feb. 1948.
- [4] G. L. Matthaei, L. Young, and E. Jones, *Microwave Filters, Impedance Matching Networks and Coupling Structures*. McGraw-Hill: New York, 1964.

Contributors



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Since 1959 he has worked in a variety of microwave areas, including radar antennas, ferrimagnetic materials and devices, filters, and computer-aided design. His employment history includes positions with the Georgia

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R. H. T. Bates (M'60) was born in Sheffield, England, on July 8, 1929. He received the B.Sc.(Eng.) degree in electrical engineering from University College, London University, London, England, in 1952.

He has worked in antennas, microwaves, and radar and communication systems, and has recently become interested in bioengineering problems. From 1952 to 1955 he was with Vickers-Armstrongs, Weybridge, England, from 1955 to 1957 with Decca Radar, Tol-

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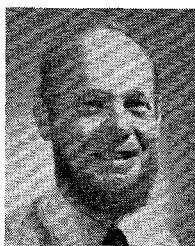
Mr. Bates is a member of the IEE. He is an Editorial Review Board member for both the *IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES* and the *IEEE TRANSACTIONS ON ANTENNAS AND PROPAGATION*. He is Editor of the *Canterbury Engineering Journal*.



Douglas G. Corr was born in London, England, on March 29, 1945. He received the B.Sc. degree in physics in 1966, the M.Sc. degree in microwave engineering in 1967, and the Ph.D. degree in electrical engineering in 1970, all from the University College, London.

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J. Brian Davies was born in Liverpool, England, on May 2, 1932. He received the B.A. degree in mathematics from Jesus College, Cambridge, England, in 1955, the M.Sc. degree in mathematics in 1957, and the Ph.D. degree in mathematical physics in 1960, both from the University of London, London, England.

From 1955 to 1963 he worked at the Mullard Research Laboratories, Salfords, Surrey, England, except for the period between 1958

and 1960 spent at University College, London. In 1963 he joined the staff of the Department of Electronic and Electrical Engineering, University of Sheffield, Sheffield, England. Since 1967 he has been on the staff at University College, London, where he is now Reader in Electrical Engineering. For the year 1971-1972, he is a Visiting Scientist at the National Bureau of Standards, Boulder, Colo. His work has been concerned with problems of electromagnetic field theory, and he is currently interested in computer methods of solving such problems.

Dr. Davies is a member of the Institution of Electrical Engineers (London).



Marvin F. Estes (S'67-M'71) was born in Warren, Pa., on August 12, 1942. He received the B.S.E.E. (honors) degree from Purdue University, Lafayette, Ind., in 1965, and the M.S. degree from Clarkson College of Technology, Potsdam, N. Y., in 1968.



From 1968 to 1970 he was an Aerospace Engineer at NASA in Huntsville, Ala., where he did work on the magnetic hammer, levitation by electromagnetic fields, and electrets. He is currently a graduate student at Colorado State University, Fort Collins, working towards the Ph.D. degree in microwave plasma diagnostics.



George I. Haddad (S'57-M'61-SM'66-F'72), for a photograph and biography please see page 196 of the February 1972 issue of this TRANSACTIONS.



G. H. Bertil Hansson, for a photograph and biography please see page 423 of the June 1972 issue of this TRANSACTIONS.



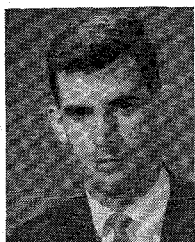
Mark K. Krage (S'67-M'72) was born in Cayuga, Ontario, Canada, on July 16, 1943. He received the B.S. degrees in electrical engineering and mathematics, both in 1965, the M.S. degree in electrical engineering in 1968, and the Ph.D. degree in 1971, all from the University of Michigan, Ann Arbor.

He is presently employed at the General Motors Research Laboratories, Warren, Mich., and is carrying out research in the area of automotive radar.

Dr. Krage is a member of Eta Kappa Nu and Sigma Xi.



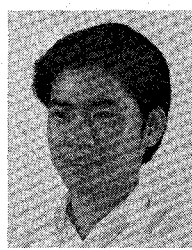
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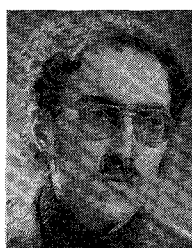
In 1961 and from 1963 to 1968 he was a Radio Systems Engineer with the New Zealand Post Office in Wellington, New Zealand. From 1961 to 1963 and 1968 to 1971 he was

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David J. Richards was born in Winnipeg, Man., Canada, on July 27, 1946. He received the B.Sc. degree in electrical engineering from the University of Manitoba, Winnipeg, in 1968.

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Burkhard Schiek was born in Elbing, East Prussia, on October 14, 1938. He received the Diplom-Ingenieur degree in electrical engineering in 1964 and the Doktor-Ingenieur degree in 1966, both from the Technische Universität Braunschweig, Braunschweig, West Germany.

From 1964 to 1969 he was Assistant at the Institut für Hochfrequenztechnik of the Technische Universität Braunschweig, where he worked on frequency multipliers, parametric amplifiers, and varactor phase shifters. From 1966 to 1969 he was involved in MIS interface physics and in the development of MIS varactors. Since 1969 he has been working in the microwave application group of the Philips Forschungslaboratorium Hamburg GmbH, where he has mainly been concerned with the stabilization of solid-state oscillators and microwave integration.

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Now he is again with the Institut für Hochfrequenztechnik of the Technische Universität Braunschweig, engaged in the field of millimeter-wave communication systems.

He was awarded an AFGRAD Fellowship from the African-American Institute in 1969. While at Washington University, he participated in satellite system studies and pursued research on Gunn-effect amplifiers. He concluded his studies in the United States with a brief apprenticeship in the Research Laboratory for Electronics, M.I.T., Cambridge, Mass. At the end of 1971 he returned to Senegal, where he is now employed as a Microwave Engineer by A.S.E.C.N.A., an international organization dealing with air traffic and navigation in Africa and Madagascar.

Mr. Séne is a member of Eta Kappa Nu.



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