

Design Note on a Serrated Choke*

The serrated choke described by Dr. Kiyo Tomiyasu and J. J. Bolus¹ is a very effective device to employ whenever long cuts or gaps are present on the walls of rectangular waveguide. This communication is concerned with the application of a serrated choke to an X-band waveguide ring switch,² wherein the waveguide was split longitudinally at opposite corners to form a rotor section and a stator section.

The final choke design arrived at is shown in Fig. 1. It consists of 0.050×0.050 -inch square pins of 0.330-inch length spaced 0.040 inch apart, with a gap of 0.015 inch between the pins and the adjacent choke surface. The reason for using such a small gap was to obtain as low an impedance as possible from the quarter-wavelength open-ended two-wire line stubs formed by the pins and the adjacent choke surface. The mechanical configuration involved was chosen so as to permit the choke to be easily

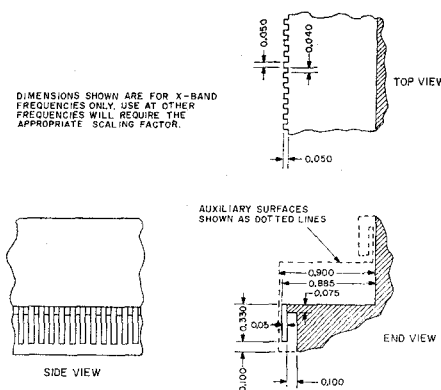


Fig. 1—X-Band serrated choke design.

and accurately cut by standard machining methods into the same piece of metal which forms the walls of the half-waveguide section, thus eliminating the need for any tedious soldering or adjustment of individual pins. Another advantage of this design is that the metallic surfaces are continuous (no cracks) at all points of high current density, thus permitting higher RF power capacity. The point of attachment of a choke cover and the gap necessary to permit relative movement of the two half-waveguide

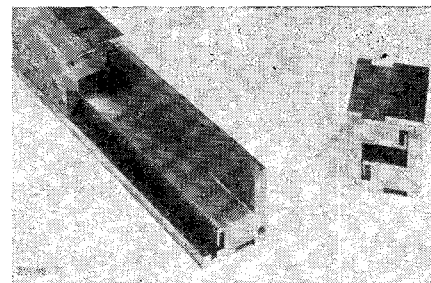


Fig. 2—Experimental test sections of serrated choke machined from aluminum castings.

sections both occur in the low current density region of the choke. Fig. 2 shows aluminum X-band experimental test sections which were constructed for the purpose of evaluating the machined serrated choke. RF tests conducted upon such a section 37 inches in length showed a loss of only 0.1 db per foot, a power handling capacity in excess of 200 kw peak, and no main-guide interference from choke channel propagation over the frequency band of 8200 to 10,000 mc.

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¹ K. Tomiyasu and J. J. Bolus, "Characteristics of a new serrated choke," IRE TRANS. ON MICROWAVE THEORY AND TECHNIQUES, vol. MTT-4, pp. 33-36; January, 1956.

² W. F. Gabriel, G. D. Peeler, H. P. Coleman, and D. H. Archer, "Volumetric Scanning GCA Antenna Design," Naval Res. Lab., Washington, D. C., Rept. No. 5019, pp. 34-48; November, 1957.

Contributors

Morris Cohen was born in Brooklyn, N. Y., on March 31, 1925. He attended RCA Institutes, Brooklyn, N. Y., from 1947 to 1949, graduating in 1949. He received the B.E.E. and M.E.E. degrees from the Polytechnic Institute of Brooklyn, N. Y., in 1954 and 1958.



M. COHEN

From 1950 to 1955, he was a research assistant at the Microwave Research Institute, Polytechnic Institute of Brooklyn. From 1955 to 1956 he was employed as a microwave engineer in the microwave components section of the Polarad Electronics Corp., Long Island City, N. Y. In 1956, he joined the Polytechnic Research and Development Company, Brooklyn, N. Y., and at present he is a section head in the microwave research department, engaged in the design and development of microwave components and systems.

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S. B. COHN

From 1942 to 1954 he was employed as a special research associate by the Radio Research Laboratory of Harvard University, also representing that laboratory as a technical observer with the U. S. Army Air Force in the Mediterranean theater of operations. He worked at Sperry Gyroscope Company, Great Neck, N. Y., from 1948 to 1953, where he held the position of research engineer in the microwave instruments and components department. Since February, 1953, he has been with the Stan-

ford Research Institute, Menlo Park, Calif., as head of the Microwave Group, and, since 1957, as manager of the Electromagnetics Laboratory.

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A. F. Harvey was born in Monmouthshire, England, on March 21, 1910. He received the B.Sc. degree in electrical engineering from the University College of Wales, Cardiff, in 1930, and the D.Phil. degree from Oxford University, Oxford, Eng., in 1940.



A. F. HARVEY

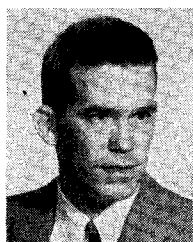
From 1930 to 1932, he was a college apprentice with Metropolitan-Vickers, Manchester. During the next six years he was on the technical staff of, successively, General Electric Co., Wembley; Johnson and Phillips, London;

and the Royal Aircraft Establishment, Farnborough. Since 1940, he has served at what is now the Royal Radar Establishment, Malvern. His work has been concerned mainly with ultra-high and microwave frequencies, in which fields he holds several patents and has published many survey papers and a book. He has also made original contributions on waveguides, electron tubes, millimeter-wave components and ferrite devices.

Dr. Harvey was for several years chairman of the R.C.R.D. and R.C.S.C. waveguide committees and also of the NATO working group on waveguides. He is a member of the IEE.



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E. M. T. JONES

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Walter K. Kahn (S'50-A'51-M'56-SM'59) was born on March 24, 1929, in Mannheim, Germany, and came to the United States in 1938. He completed his undergraduate studies at the Cooper Union School of Engineering, New York, N. Y., receiving the B.E.E. degree in 1951. He received the M.E.E. degree from the Polytechnic Institute of Brooklyn, N. Y., in 1954.



W. K. KAHN

In 1951, he was employed at the Wheeler Laboratories, New York, where he was engaged in microwave radar system development. After receiving the M.E.E. degree, he joined the staff of the Microwave Research Institute of the Polytechnic Institute of Brooklyn, N. Y., where he is presently studying general diffraction theory and propagation in multimode waveguides.

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George L. Matthaei (S'49-A'52-M'57) was born in Tacoma, Wash., on August 28, 1923. After leaving college for three years of military service, he returned to the University of Washington, Seattle, and received the B.S. degree in electrical engineering in 1948. He then did graduate work at Stanford University, Stanford, Calif., and received the Ph.D. degree in electrical engineering in 1952.



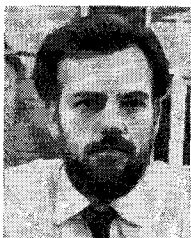
G. L. MATTHAEI

While at Stanford, he was a research assistant in the Electronics Research Laboratory where he did research on network synthesis. In 1951, he joined the faculty of the Division of Electrical Engineering of the University of California at Berkeley, where he was an assistant professor. He continued research on network synthesis and supervised graduate student research in that field. From 1955 to 1958 he was a member of the technical staff of the Ramo-Wooldridge Corporation, Los Angeles, Calif., and was engaged in system analysis and research on microwave components. In September, 1958, he joined the staff of Stanford Research Institute, Menlo Park, Calif., where he is presently a senior research engineer in the electromagnetics laboratory. His work is concerned with research on microwave components.

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K. G. PATTERSON

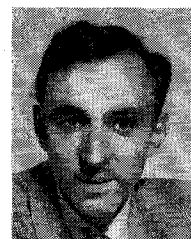
In 1946 he joined the Research Laboratories of the Electrical and Musical Industries, Ltd., Hayes, Middlesex, where he worked on pulse circuitry for television. Since 1952 he has been employed at the Research Laboratories of the General Electric Company, Ltd., North Wembley, Middlesex, working on the development of microwave filters and couplers.



Raymond Redheffer was born on April 17, 1921, in Chicago, Ill. He received the B.S., M.S., and in 1948, the Ph.D. degree from Massachusetts Institute of Technology, Cambridge, Mass.

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R. REDHEFFER

His interest in antennas led to the design of a machine for computing Fourier transforms which was later built by the Navy.

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A. Y. RUMFELT

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J. H. VOGELMAN

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In 1945, after several years at the Signal Corps Radar Laboratory at Ft. Hancock and Bel-

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Laboratories in Red Bank, N. J., where he served as chief of the Development Branch until 1951, responsible for research and development of test equipment and microwave components and techniques. In 1951, he moved to the Rome Air Development Center, Griffiss Air Force Base, N. Y. From 1951 to 1953, he was chief scientist in the general engineering laboratory and consultant on UHF and SHF theory and techniques to the U. S. Air Force. From 1953 to 1956, he was chief of the electronic warfare laboratory, directing all research and development in ground based electronic warfare for the USAF. From 1956 to June, 1959 he has been technical director of the Communications Directorate with responsibility for the Air Force research and development effort in ground based and ground to air communications. He is now director of research and development at Dynamic Electronics—New York, Inc.

Dr. Vogelmann is a Fellow of the American Association for the Advancement of Science, a member of Eta Kappa Nu, Sigma Xi, the AIEE, and the Armed Forces Communications and Electronics Association.