XIV. MICROWAVE COMPONENTS

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A. FERRITES AT MICROWAVE FREQUENCIES

This work will be presented in Technical Report No. 284.

ERRATUM. In the Quarterly Progress Report of January 15, 1954, page 53, second line from end, C = 1.4 should read C = 1.04.

A. D. Berk

B. T-RIDGE WAVEGUIDES

Some further results are given concerning the T-ridge waveguides that were described in a previous report (1). Figure XIV-1 is a plot of the cutoff wavelengths of the dominant mode (λ'_{c1}) and of the next mode (λ'_{c3}) that can be excited by a symmetric electric probe, as a function of the normalized ridge gap g; the symbols used are defined in Fig. XIV-2. Both curves were obtained experimentally with a standard S-band rectangular waveguide in which L/H = 2.12, with a ridge having 2/3 of the guide width. The single-mode transmission bandwidth ratio $\lambda'_{c1}/\lambda'_{c3}$ is plotted in Fig. XIV-3. For large values of g, the curve falls somewhat below the value 3 corresponding to the TE_{10} and TE_{30} modes of a rectangular guide, but for small gaps it increases rapidly to very large values.

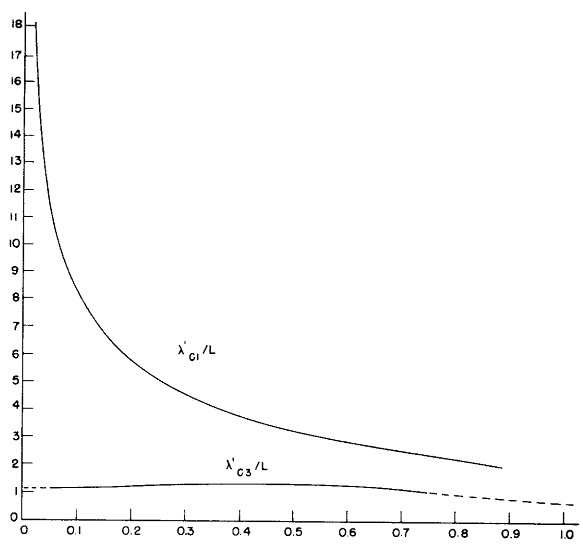

Fig. XIV-1
Cutoff wavelengths of lowest symmetric modes in a T-ridge waveguide.

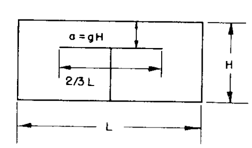

Fig. XIV-2
Cross section of T-ridge waveguide.

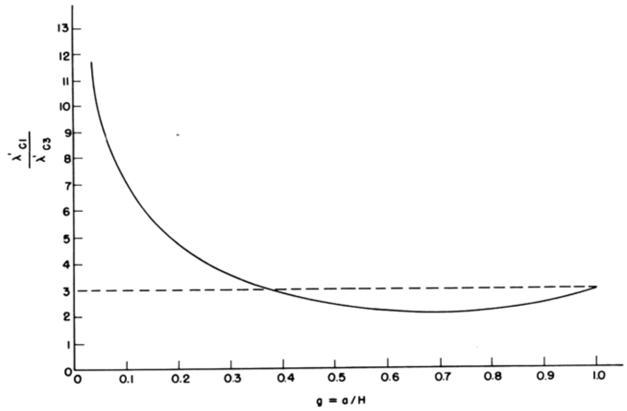

Fig. XIV-3
Ratio of the cutoff wavelengths of the first and second symmetric modes.

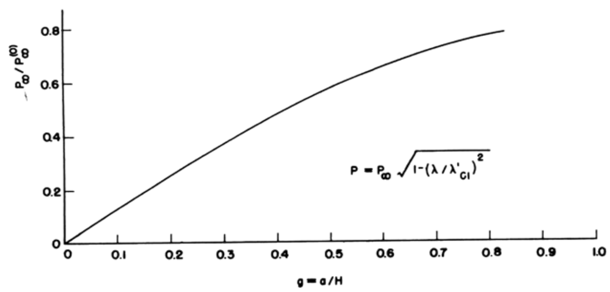

Fig. XIV-4
Power handling capacity.

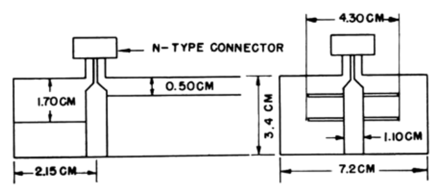

Fig. XIV-5
Coaxial cable to the T-ridge guide broadband junction.

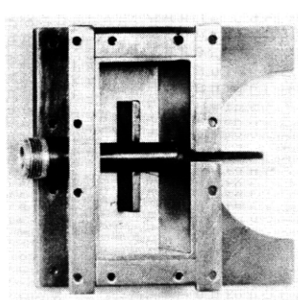

Fig. XIV-6
Photograph of junction shown in Fig. XIV-5.

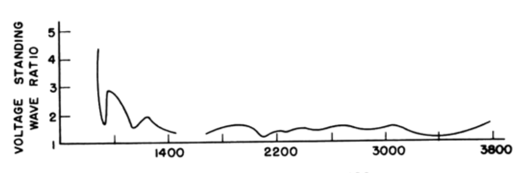

Fig. XIV-7
Test curve of the broadband junction.

The computed maximum power transmissible for a maximum allowable electric field is plotted on Fig. XIV-4; $P_{\infty}^{(o)}$ corresponds to the rectangular guide without a ridge. It can be observed that the wider the single-mode band is, the smaller the transmissible power becomes.

Figures XIV-5 and XIV-6 show a junction designed to feed a T-ridge waveguide having a characteristic impedance equal to that of a 50-ohm coaxial cable. The low impedance of the guide eliminates the necessity of impedance-matching devices and allows operation over a large frequency band with low standing-wave ratios; the back section to the left of the junction operates as an open circuit over the whole range. Figure XIV-7 is an experimental plot of the voltage standing-wave ratio in the ridge guide when a lossy cable is connected to the coaxial output; the high-frequency limit of the range of operation is determined by the neighborhood of the next cutoff.

J. Fontana

References

1. Quarterly Progress Report, Research Laboratory of Electronics, Jan. 15, 1954, p. 51.
2. J. Fontana, T-ridge waveguides, M. Sc. Thesis, Department of Electrical Engineering, M.I.T., May 24, 1954.