Abstracts

Four-Port Crossed-Waveguide Junction Circulators

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A detailed account is given of the experimental investigation which has led to the design of 4-port circulators at frequencies from 2.5 to 25 Gc. The complex behaviour of these devices is clarified by establishing the modes of circulation in any particular waveguide passband. The modes are defined in terms of the static magnetic field (H) required, the microwave frequency (f) and the direction of circulation. The shape of the mode characteristic depends upon the ferrite/brass configuration in the center of the junction and the mode charts are given for two possible ferrite arrangements. The fixed-field bandwidths of the two configurations are, respectively, 2-4 per cent and 4-8 per cent. The performances are: isolation (ports 1-4) >20 db, cross-coupling (ports 1-3) >20 db, VSWR <1.2 and insertion loss (ports 1-2), respectively, <0.5 db and <1.0 db for the two configurations. The tunable bandwidth depends upon the mode of circulation and varied from 5 to 15 per cent. The positions of the modes in the waveguide pass-band can be adjusted by changing the diameter of the center ferrite/brass post. This shifting of the center frequency is described in detail for both ferrite arrangements and, for particular modes of circulation, figures are given of the frequency shift per 0.001" change in ferrite and brass diameter.

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