Abstracts

Magnetically Tunable Nonreciprocal Band-Pass Filters Using Ferrimagnetic Resonators

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Possibilities of a small-bandwidth, small-insertion loss, magnetically tunable band-pass filters with nonreciprocal characteristics have been studied. the unloaded Q(Q/sub u/) for a ferrimagnetic sample has been derived, considering the fundamental definition of Q for a resonator. Theoretical analysis is given for coupling due to ferrimagnetic resonance, between two RF transmission circuits when the RF magnetic fields due to the two circuits are circularly polarized or, in general, elliptically polarized. The analysis gives the open-circuit impedance parameters for the equivalent circuit representing the ferrimagnetic coupling mechanism, from which the external-loading Q's (Q/sub e1/ and Q/sub e2/) are obtained. This analysis, applied to the case of the waveguides, shows that the behavior of the Q/sub e/ vs frequency characteristic depends upon the ellipticity of the RF magnetic field, and hence, upon the location of the off-axis position of the ferrimagnetic resonator. Also, the nonreciprocity depends upon the ellipticity of the RF magnetic field--the nonreciprocal behavior being optimum when the RF magnetic field is circularly polarized. Thus, again, for the case of waveguide circuits, the off-axis position determines the reverse-coupling-vs-frequency characteristic. The measurements on the experimental filters, tunable from 8.2 to 12.4 kMc, verify the results obtained from the theory. The forward and the reverse directions of the operation of these filters can be interchanged by reversing the dc magnetic field. Power limiting with these filters is briefly described.

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