Abstracts

Theory of Operation of a 3-Port Y-Junction Ferrite Circulator

E.N. Skomal. "Theory of Operation of a 3-Port Y-Junction Ferrite Circulator." 1963 Transactions on Microwave Theory and Techniques 11.2 (Mar. 1963 [T-MTT]): 117-122.

An analysis is made of the operation of a 3 port Y-junction ferrite circulator wherein it is assumed that the ferrite cylinder can support the propagation of a bound surface wave. The incident wave guided by the air-dielectric interface of the ferrite cylinder is taken to be linearly polarized parallel to the ferrite axis and after incidence on the cylinder is assumed to divide and propagate in opposite directions about the cylinder as two linearly polarized signals. By appropriate selection of ferrite cylinder diameter, permeability, magnetizing field and saturation magnetization, constructive and destructive interference of the RF components are shown to occur at the two output ports. The conditions for reinforcement and null at the outputs are discussed and compared with published experimental data. It is possible to predict the occurrence of ferrite circulator diplexing reported by Brown and Clark although good quantitative comparison is lacking. The theoretical dependence of ferrite diameter upon free space wavelength is computed and compares satisfactorily with recorded experimental data. The experimental observations that greater circulator bandwidths are achievable when below resonance magnetizing fields are employed are shown to have a theoretical basis. In addition, interrelationships among the designed variables: saturation magnetization, applied magnetic field, ferrite resonance linewidth and circulator insertion loss are noted in the theoretical results.

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