Abstracts

Propagation Properties of Ferromagnetic Insular Guide

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In order to realize new ferrite planar devices for applications at millimeter-wavelength frequencies, we have considered in our development of nonreciprocal ferrite devices schemes of incorporating ferromagnetic layers in dielectric insular guide geometries. Our research program involves both the calculation and the measurement of device characteristics. For the calculational part a method of effective permeability is introduced to characterize the ferrite material in which the permeability is a tensor. The propagation properties of the insular guide were calculated by using a single-mode approach. Our calculational results of dispersion, dielectric, and conductivity losses show resonant behavior with the application of a magnetic bias field for a guide configuration in which the ferrite replaces the insular dielectric. Ferrite phase shifters, filters, isolators, and circulators are potential applications of this guide configuration. For the experimental part wave dispersion and attenuation were measured in a purely dielectric insular guide from 26.5 to 40 GHz. In addition to these experiments wave attenuation was measured as a function of magnetic bias fields for the case where a hexagonal ferrite platelet was mounted on the ground plane near the insular guide. General agreement is found between calculations and measured attenuation.

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