Abstracts

Magnetostatic Wave Propagation in a Finite YIG-Loaded Rectangular Waveguide

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The propagation of magnetostatic waves (MSW) in a waveguide partially loaded with a low-loss ferrite slab is investigated theoretically. The most common low-loss ferrite material used for MSW propagation is epitaxial yttrium iron garnet (YIG). A YIG slab is placed inside and along the guide and not in contact with the sidewalls of the waveguide. The dc magnetic field is assumed to be parallel to the YIG slab and perpendicular to the direction of propagation. Using the integral equation method, the dispersion relation is found to be an infinitely large determinant equal to zero. Proper truncation of this determinant and numerical analysis to find its roots are carried out in this work. It is seen that in order to obtain high values of group time delay, the YIG slab must be narrow and placed at the bottom of the guide. On the other hand, to maximize the device bandwidth, a narrow YIG slab positioned at the top inside surface of the waveguide is preferred. It is also noticed that there exists a tradeoff between the time delay and the device bandwidth and that maximization of one property leads to a poor value in the other. Thus, some design compromises should be made. It is also observed that the frequency range of operation of the device can be adjusted by an external magnetic bias field. This property of tuning the device to operate in any frequency range adds an extra dimension of flexibility to the operation and also to the design of these devices.

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