Abstracts

The Point-Matching Solution for Magnetically Tunable Cylindrical Cavities and Ferrite Planar Resonators

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This paper presents an exact field theory treatment for a cylindrical cavity containing a full-height triangular ferrite post as well as for ferrite planar resonators of arbitrary shape. The knowledge of the resonant frequencies of the cavity is essential for the construction of circulators with a triangular ferrite post; those of the planar circuits are needed for the design of microwave integrated circuits. The treatment is general and depends neither on the location of the ferrite post inside the cavity nor on the geometry of the planar resonator. The solution of the wave equations in the ferrite material and in a possible surrounding air region is written as an infinite summation of cylindrical modes. In the case of the cavity, the individual modes are exactly matched along the internal cylindrical metallic boundary of the cavity. The fields at the ferrite-air interface in both cases are matched using the point-matching technique, which leads to a finite system of homogeneous, simultaneous equations for which the determinantal equation must be zero. An example of a cavity with a triangular ferrite post is studied and calculated, and measured results are compared. Furthermore, examples of application of the theory on triangular and quadratic planar resonators are described and compared with published experimental measurements.

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