Abstracts

Nonreciprocal cell for the broadband measurement of tensorial permeability of magnetized ferrites: direct problem

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In this paper, a broad-band characterization method for measuring the complex permeability tensor components and complex scalar permittivity of magnetized ferrites is described. The technique is based on the reflection/transmission measurement of a rectangular waveguide partly filled with the ferrite that is to be characterized. The fundamental principle of the measurement consists in using the anisotropy of the material to lead to the nonreciprocity of the device in order to have the same number of measurable parameters (the S-parameters of the cell) for the characteristics we want to determine. Here, we will recall the principle of the mode-matching method used for the electromagnetic analysis of the cell (direct problem). We will bring to the fore the difficulties linked to the determination of the complex propagation constants of the different modes and will present a calculation procedure that makes this determination in a wide-frequency range easier. We will then compare at X-band frequencies (8-12 GHz) the theoretical S-parameters with those measured for ferrites of well-known properties in order to validate the direct problem. The determination of the permittivity and permeability values from the measured parameters (inverse problem) is not addressed here.

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