Abstracts

Automatic measurement of complex tensorial permeability of magnetized materials in a wide microwave frequency range

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This paper describes a microwave measurement technique enabling the automatic and broad-band determination of the complex permeability tensor components /spl mu/, /spl kappa/ of magnetized materials. The method is applicable to ferrites, as well as magnetic composite materials. The measurement cell is composed of a nonreciprocal strip transmission line partly filled with the sample that is to be characterized. The data-processing program based on a quasi-static approach is valid whatever the magnetization state of the material is from the total demagnetization state to the saturation. The scattering matrix of the cell is measured in a wide frequency range (130 MHz-6 GHz) with a network analyzer setup. The stripline is set in the air gap of an electromagnet to magnetize the material. The electromagnetic parameters of the sample under test are deduced from the scattering matrix using analytical relations. General equations for /spl mu/ and /spl kappa/ are proposed. Some measurements of magnetized ferrites are reported and compared with values predicted by Polder's relations to validate the technique in the saturation state. To our knowledge, this is the first noniterative measurement method giving /spl mu/ and /spl kappa/ simultaneously in a wide range of frequency.

❑ Return to main document.