

Erratum

Correction to “Alternative Formulations of the Fields’ Constitutive Relations for the Efficiency of the Time Domain Analysis of Magnetized Ferrites”

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In the title paper, two efficient time-domain equations and new permeability and permittivity tensors with dispersive components were obtained for the analysis of magnetized ferrite. In this work, we will show that this is due to the use of a reference rotating around the axis of magnetization of magnetized ferrite with the resonance frequency, instead of the usual fixed reference.

In [1], a variable transformation (48) used in the frequency domain allowed obtaining later efficient time-domain equations, (58) and (59), involving only the electric and the magnetic fields. In the following, we will try to give a physical interpretation for this variable transformation.

Multiplying both sides of (48) with the complex number j , then applying the Fourier transform $j\omega \rightarrow \delta/\delta t$ on the resulting equation to get to the time domain, taking into account (47), we will get

$$\frac{\delta}{\delta t} \rightarrow \left(\frac{\delta}{\delta t} - \omega_0 \hat{z} \wedge \right). \quad (1)$$

This represents a transformation of the time-derivative operator between the fixed inertial reference and another reference rotating around the axis z (the axis of magnetization), with the frequency ω_0 (the resonance frequency of the magnetized ferrite) [2].

Note that ω_0 is an algebraic quantity, positive or negative according to the sign of the gyromagnetic ratio γ ; consequently, the sense of rotation of the rotating reference is either clockwise or counterclockwise.

As a conclusion, in the time domain, (58) and (59) represent the fields’ equations in the rotating reference. In the frequency domain, (66) and (67) represent the permeability and the permittivity tensors of the fields’ constitutive relations in the rotating reference; the transformation (48) represents a frequency-shift between the fixed reference and the rotating one.

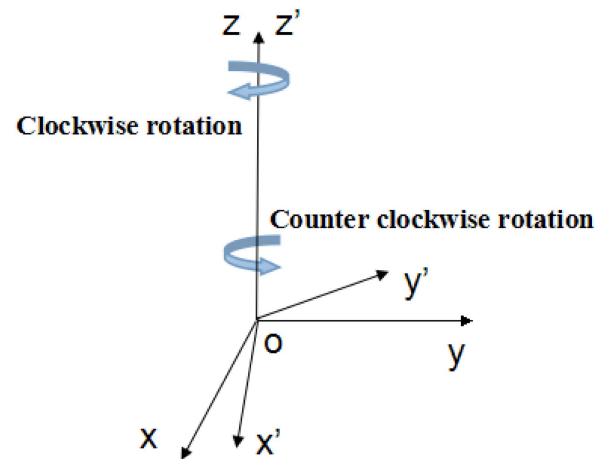


Fig. 1. Two reference frames. The first is fixed (O, x, y, z) and the second (O, x', y', z') is rotating around its axis Oz' , which coincides with Oz of the fixed reference.

REFERENCES

- [1] A. Benouatas, “Alternative formulations of the fields’ constitutive relations for the efficiency of the time domain analysis of magnetized ferrites,” *IEEE Trans. Magn.*, vol. 51, no. 10, Oct. 2015, Art. ID 1300407.
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