Impedance modeling of simple structures of ferrite EMI suppressors in different ferrite materials

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The aim of this paper is to investigate the efficiency of simple structures of ferrite electromagnetic interference (EMI) suppressors in different ferrite materials. The EMI suppressors are fabricated using the ceramic co-processing technology. As a basic material is used Ni-Zn ferrite material. In the middle of a ferrite body, a Pt conductive layer is embedded, which provides a low DC resistance of component. Due to the presence of ferrite material, EMI suppressor behaves as low pass filter (i.e. as a frequency dependent resistor) and provides signal free from distortions.

The electrical characteristics of EMI suppressor depend on the geometry of the conductive layer and core, and on the permeability of ferrite material. In order to achieve better suppression and greater insertion loss (i.e. larger impedance), conductive layer should be longer or/and permeability should be greater. Nevertheless, longer conductive line causes the shift of frequency range in which the component introduces attenuation towards lower frequencies, and designing process should be very careful.

In our previous work [1], Zig-zag structure of EMI suppressor is analyzed. The goal of this paper is to explore the frequency shift effect and its influence on the efficiency of EMI suppressor if different ferrite materials (F14 and F19 [2]) and structures (Line and Zig-zag) are used. The measured values are compared with simulated (using equivalent circuit model and 3D electromagnetic simulator COMSOL).

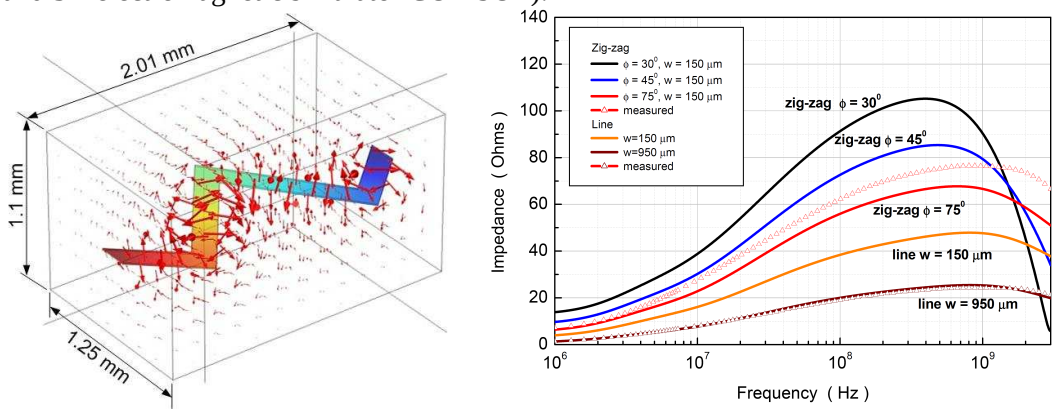

Figure 1. (a) The analysis of ferrite EMI suppressor using 3D electromagnetic simulator COMSOL, (b) measured (dot line) and modeled (solid line) impedance of planar structures (Line: width w, thickness t = 10 μm, and Zig-zag: angle ϕ between neighboring segments, w= 150 μm, t = 10 μm) in F19 materials

[1] M. Damnjanovic, Lj. Zivanov, G. Stojanovic, A. Menicanin: ”Influence of Conductive Layer Geometry on Maximal Impedance Frequency Shift of Zig-zag Ferrite EMI Suppressor”, Transaction on Magnetics, Vol. 46, No. 6, June 2010, pp. 1303-1306.

[2] http://www.mmg-neosid.com