

# Common Mode Choke Electromagnetic Simulation

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## Abstract

Common mode chokes are used in electrical circuits to filter out the electromagnetic interference (EMI). The goal of this study is to simulate the impedance of the choke within a range of frequency from 0.01 MHz to 50 MHz. In this simulation model the COMSOL® AC/DC Module with magnetic and electric field coupled with electrical circuit setup is used. The result is very sensitive on the permeability values on the frequency domain. Therefore, the relative characteristic curves measured in laboratory are imported as a function of the frequency into the material properties (in Real and Imaginary contribute) and used as input in the magnetic losses magnetization model.

The study starts from magnetic field physics, and it considers step by step the influence of skin effect, core conductivity, air volume dimensions, winding geometry, electric field and magnetic permeability, correlated with specific laboratory test measurements. The final COMSOL simulation result is also compared with a circuital simulation (1D software) and the two methods are convergent to the real measured impedance of the choke. This toroidal coil model is a first step toward simulating a more complex structure model or a complete EMI filter model.

## Figures used in the abstract



Figure 1

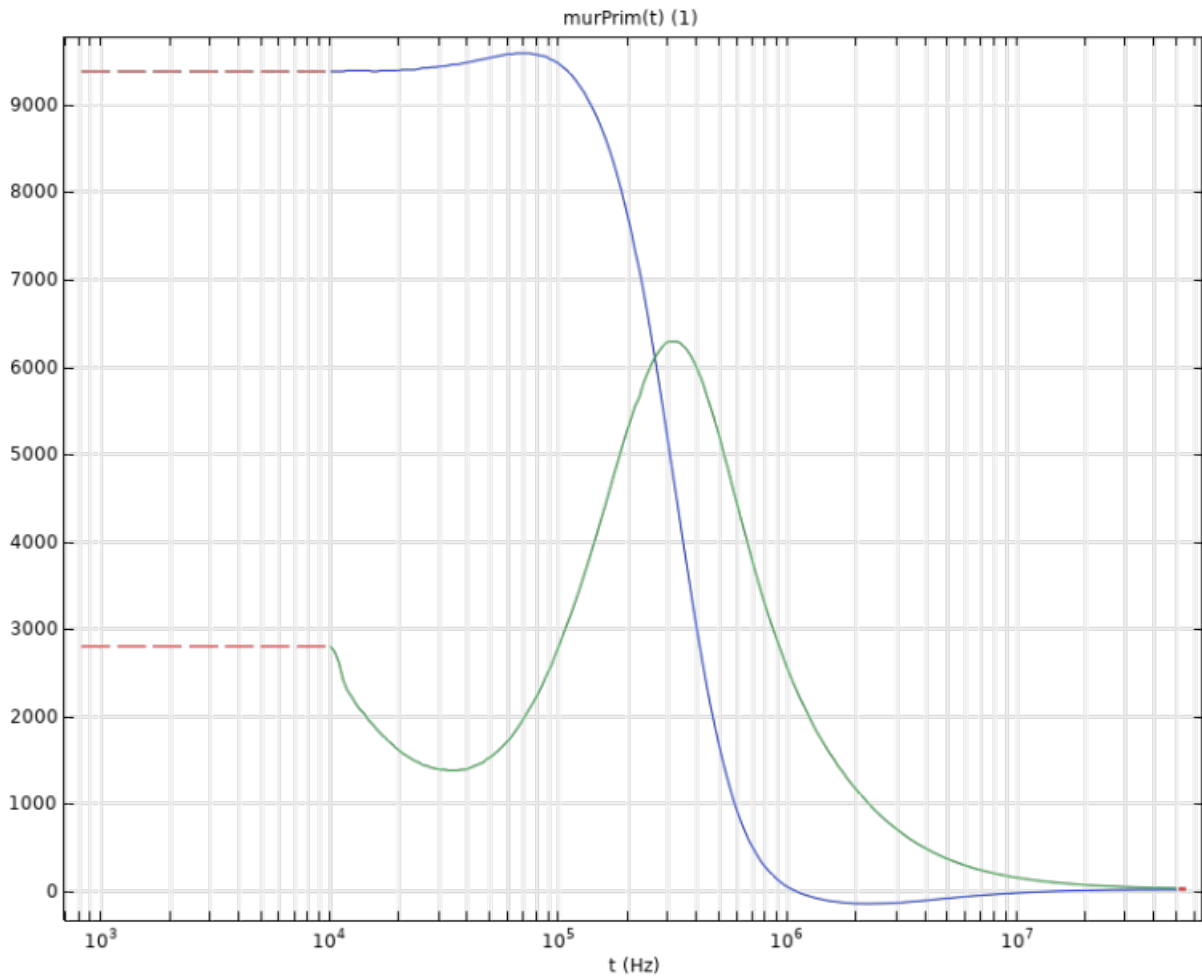


Figure 2

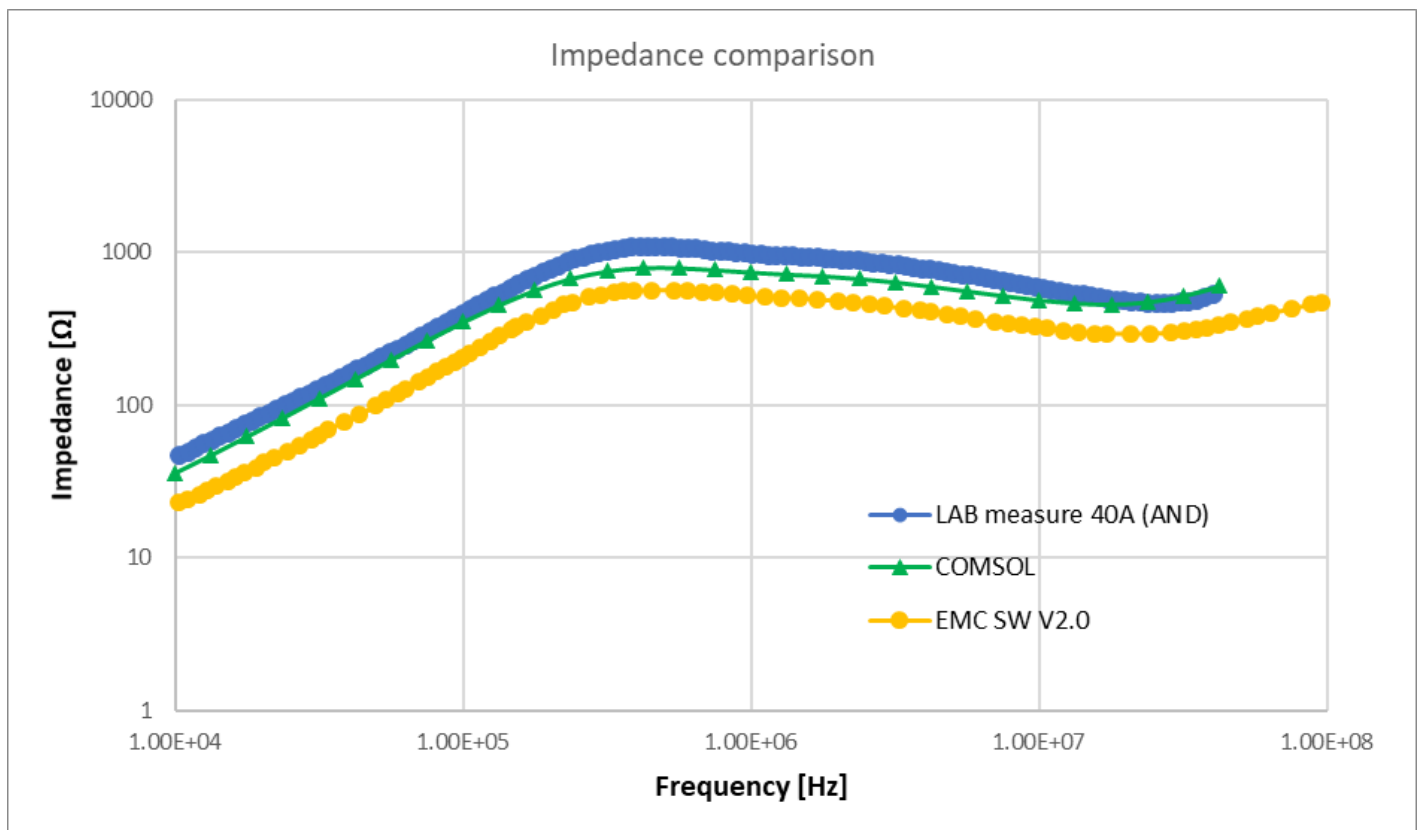


Figure 3

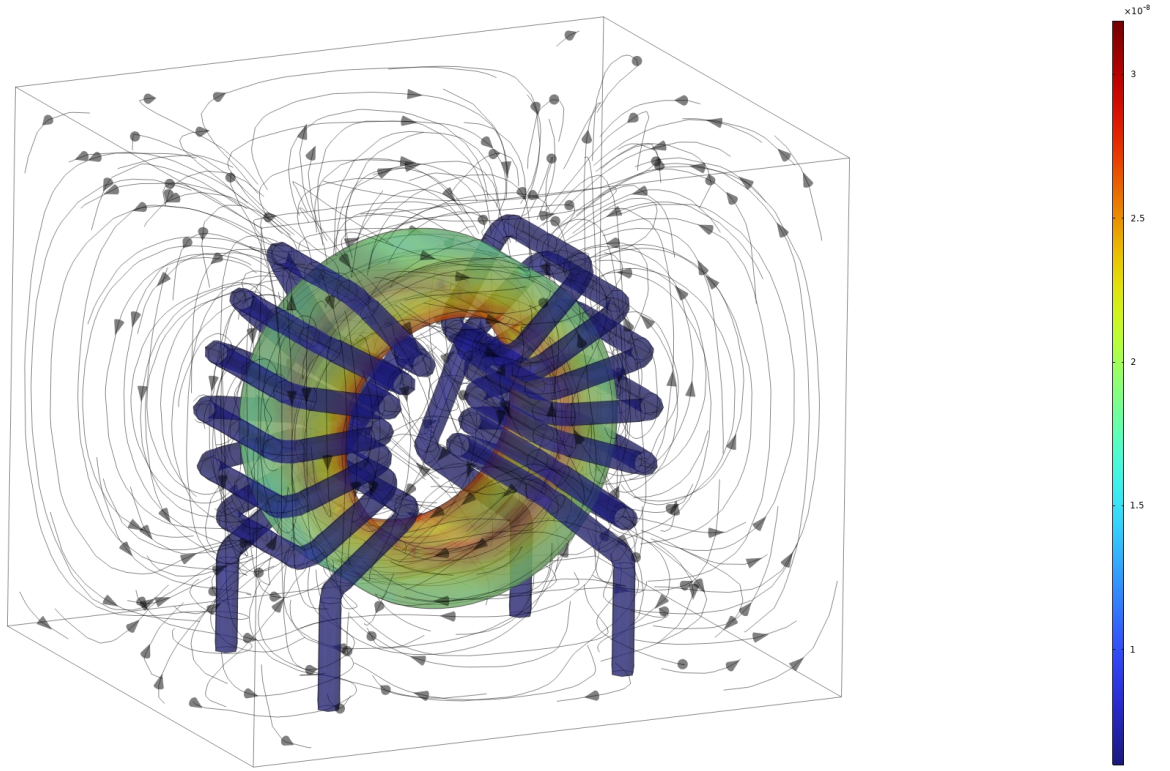


Figure 4