

# Designing and Implementation of a 4000/5A Current Transformer

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**Introduction:** This paper presents a measurement type 4000/5A current transformer which has 4 primary bars. The magnetic circuit of the prototype can be separable presenting easy installation inside the distribution panel. Time domain and frequency based simulations are obtained using the COMSOL Multiphysics® AC/DC Module and the electric circuit of the primary bars is modeled separately [1]. The finite element (FE) simulation results are then compared to real time measurements.

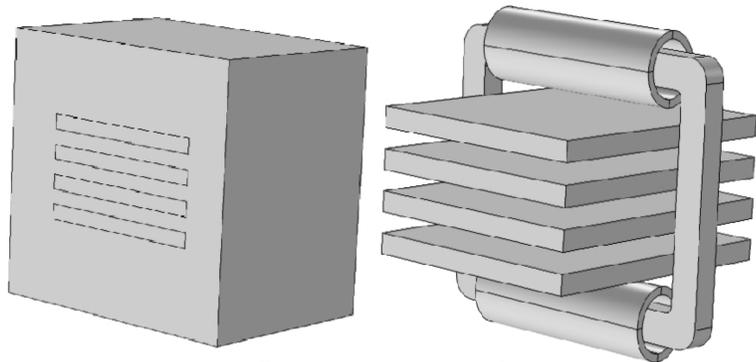


Figure 1. Geometry of the suggested model, a) enclosed by air, b) without air

**Computational Methods:** The electrical circuit is seen in Figure 2. As seen in Figure 2, it has 4 primary bars and 2 secondary windings and external resistances are used to simulate real life environment.

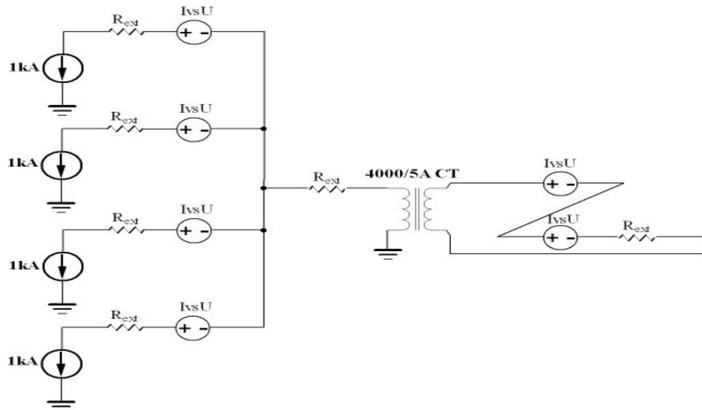


Figure 2. Primary and secondary circuits coupled to the FE model of 4000/5A CT.

The proposed model is first tested electromagnetically and then coupled with heat transfer model to evaluate the performance curves. Primary bars are assumed as heat source carrying 1kA each. The core material is selected as M23 type laminated sheet and related BH curve is defined in the model.

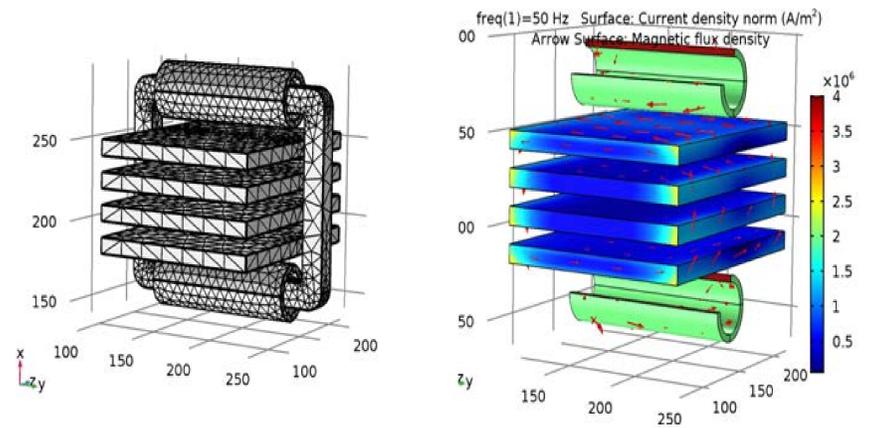


Figure 3. a) Meshed view, b) current density of the windings

Frequency response (50Hz) of current density and surface arrow lines is given in Figure 3. The model has the following simulation steps:

a) It is created using COMSOL® and run using IBM M3 server (Intel(R) Xeon(R) CPU X5650 @ 2.67GHz, 2x12 cores).

b) AC/DC and Heat Transfer Modules are used.

c) The geometry is created using AutoCAD software.

d) The core material is selected as lossy core and related BH curve is defined.

**Results and Conclusions:** This paper presents a 4000/5A low voltage measurement type CT modeling using FE approach. Then the proposed model is compared to real time measurements. The proposed FE model is based on actual geometry and had 4 bus bars instead of using a bulk bus bar. The suggested electrical circuit is suitable for analyzing the whole model. This paper analyzes different core designs (with/without air core), primary current distribution, and electric circuitry (with different burden values), and secondary current measurement.

## References:

- Vladimir Lebedev, Vladimir Shuin, Andrey Yablokov, Galina Filatova, Modeling of measuring current and voltage transformers in dynamic modes, 2014 International Conference on Mechanical Engineering, Automation and Control Systems (MEACS), 16-18 Oct. 2014.