LABORATOIRE D'ELECTROTECHNIQUE ET D'ELECTRONIQUE DE PUISSANCE DE LILLE

Master project, 2020-2021

— IMPACT OF THE ENVIRONMENT ON FERRITE INDUCTANCE —

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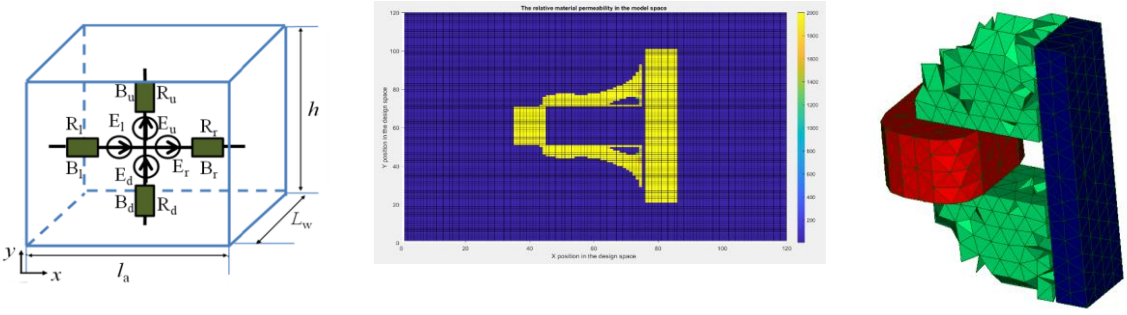
Objective

The first step in the work will be the modeling of an E-ferrite inductance(E30/15/7). The model to be developed will be a 2D magnetic equivalent circuit (MEC) representing magnetic phenomena and allowing to rapidly take into account various geometries [1,2]. A base model exists and will be resumed. The consideration of magnetic saturation and thermal coupling should be added in order to obtain a realistic behavior. From this model, the impact of the environment (position of other metal parts) on inductance behavior will be studied.

The second step of the work, which can iterate with the first, will be a step of measurements and tests to validate the model and seek solutions to reduce the impact of external parts. The form can be changed, the addition of a barrier can be proposed. Solutions can be obtained by topological optimization. The imagined solutions will be tested by making additive samples. Measures will be taken to demonstrate the relevance of the proposed solution.

Figure 1a shows the basic element of a 2d MEC. Figure 1b and 1c shows the electromagnet shapes obtained by topological optimization. Figure 2a presents a filament printer available in the laboratory. Figure 2b is a charged filament with a magnetic material and figure 2c is the 3d printing and test inductances.



a b c

Figure 1. a: mech element in 2D [2]– b,c: electromagnet shape obtained by topology optimization [1] [3]

a b c

Figure 2. a: printer FFF – b: loaded filament – c: built inductance in test

Keywords

magnetic equivalent circuit (MEC); additive fabrication, topology optimization, electric measurements

References

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