

## Master project, 2024 - 25

— Iron Loss Measurement by Infrared Thermography Imaging —

Supervisors: O. Messal ; A. Benabou | [oualid.messal@univ-lille.fr](mailto:oualid.messal@univ-lille.fr) ; [abdelkader.benabou@univ-lille.fr](mailto:abdelkader.benabou@univ-lille.fr)  
L2EP – Univ. de Lille

### Context

Iron losses are unavoidable in the magnetic circuits used in electrical energy conversion devices. The energy efficiency of these devices relies on the knowledge of the iron losses that must be taken into account as of the design stage. To do so, it is essential to perform iron loss measurements; these measurements however can be tricky at both local and global scales. In this context, a new method for measuring iron losses in electrical steel specimens has been developed in collaboration with the [I2M](#) in Bordeaux in the framework of the iC-ARTS project. The novelty of this approach lies in employing infrared imaging to perform thermography measurements. Then, these measurements are used to quantify the iron losses.

### Objective

Installation, test and validation of the experimental setup in Lille through measurement series on electrical steel specimens and comparison with standard characterization techniques.

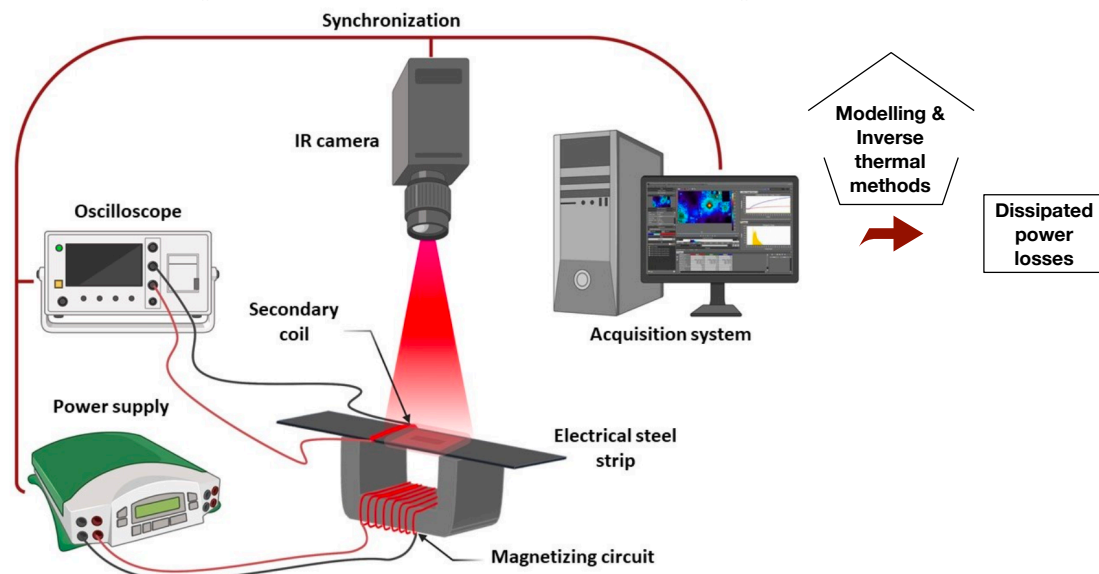


Fig. 1: Experimental setup for 2D temperature field measurements in an electrical steel strip.

### Work steps

Bibliographic study on magnetic materials, electrical steels, infrared thermography, thermal modeling and inverse problems.

Installation, test and validation of the experimental setup on electrical steel reference specimens.

Quantification of iron losses on specimens which underwent the effects encountered during the manufacturing processes of the magnetic cores of electrical machines: *e.g.* mechanically cut specimens, pre-strained specimens, etc.

Measurements on specimens which underwent thermal aging.

### Key words

Iron losses; Infrared Thermography; Inverse Problem

### References

[1] A. Aouali, O. Messal, A. Benabou, A. Sommier, J-C. Batsale, "Développement d'une méthode de caractérisation des pertes magnétiques par thermographie Infrarouge", *Symposium de Génie Electrique, Lille, 5-7 juil. 2023.*

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