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

Master project, 2020-202

— Development of High Frequency Model of Power Cables dedicated to Power System Application—

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Context

In the context of the simulation of an electrical network, different models of power lines / cables are available. Among these, we can cite the PI models (Figure 1), the frequency dependent models (FD-Line) or the models called Wideband [1]. This last type of modeling is considered in the power system community as a sufficiently precise model to simulate the behavior of the cable under non-symmetrical faults and more particularly in the case of underground or submarine cables. However, the parameters of this type of model are generally still calculated from a standard geometry (Figure 2). These models are often based on assumption by neglecting some phenomena like the proximity effect or by simplifying the geometry [2-4]. The Finite Element (FE) model enables to account for complex geometry and also physical phenomena like proximity effects. Nevertheless, this model cannot be directly used to represent the behavior of cables in the power system simulation because they are too time consuming. However, "light" models of cables can be derived from a Finite Element model by extracting well fitted lumped parameters or frequency response.

Objective

The aim of the work is to develop a methodology enabling to construct a model of power lines compatible with the simulation of power systems (even in real time) from a Finite Element model.

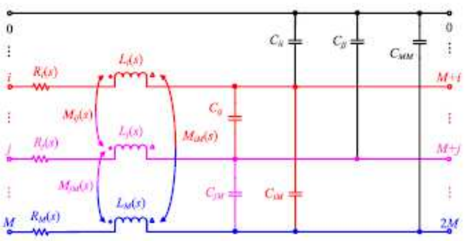

Figure 1: PI model of a cable

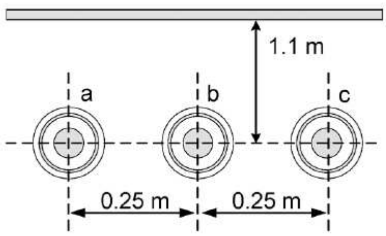

Figure 2: standard geometry of a cable

Work steps

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First, a state of art in the domain of cable for power system application will be carried out in order to extract the most efficient one. This model will be implemented and tested on real scenarii and for different geometry of cables in order to clearly show their limits of application. Then, by using the software *code_carmel* (https://code-carmel.univ-lille.fr/fr/), FE models of cables will be studied. Finally, "light" models will be derived from FE models in order to represent the behavior of power cables for power system simulation.

Key word

Power Cable, Simulation model, Finite Element Method

References

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