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

Master project, 2020-2021

— 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 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 (WB) [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 still generally calculated from a standard geometry like the one illustrated in Figure 2. These models are often based on assumption by neglecting some phenomena like the proximity effect or by simplifying the geometry [2-4]. Preliminary works have showed that a Finite Element Model (FEM) analysis could be used as an input to parametrize a WB model. However, a fitting process is still needed to go form frequency domain to time domain because the WB model is mainly based on the telegrapher's expression expressed in the frequency domain.

Objective

The aim of the work is to develop a methodology to obtain a WB model of a transmission line or cable from a FEM analysis without using a fitting procedure. A model order reduction method, based on Cauer circuit extratcted from FE model can be probably used [5]. In addition, the results obtained last year will be enhanced by a comparison with the MoM-SO method introduced in [6].

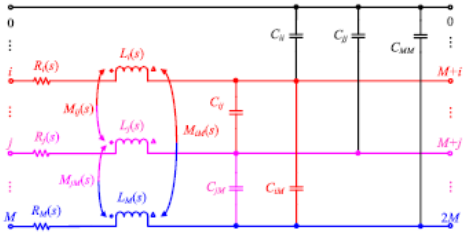

Figure 1: PI model of a cable

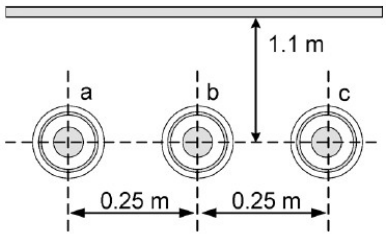

Figure 2: standard geometry of a cable

Work steps

First, a state of art in the domain of model order reduction methods will be carried out in order to extract the most efficient one for the study. This method will be implemented and tested on a real test case. In parallel, the results obtained from a MoM-SO approach will be compared with the results coming from a FEM analysis.

Key word

Power Cable, Simulation model, Finite Element Method

References

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