

Study of Current Distribution over a Power Cable Presenting Non-Uniform Geometry using the Partial Differential Equations Approach

G. Bousaleh author , F. Hassoun

Abstract. This paper presents a theoretical study of the currents and voltages characteristics transmission over an energy cable (Power Line Transmission PLT). The geometry of line is non-uniform. The proposed approach is based on the Distributed Network model, where the lumped parameters vary as the line's geometry.

Most of the numerical methods applied use a frequency approach. However, other techniques are available in the time domain that are more applicable when the perturbation is transitory or an impulse.

The partial differential equations (PDE) of telegraphers with variable coefficients are used in order to model the transmission over non-uniform lines.

This paper presents the adaptation and application of the FDTD method to solve the problem of transmission of an electric wave over a transmission line whose electromagnetic topology is non-uniform.

As an example, the final part of the paper proposes the modeling of the transmission of a transitory wave over an electric power cable.

We present an application in the case of the propagation of lightning on an energy cable composed of three twisted wires. The validation of the proposed method will be set by comparing the obtained results with those obtained from a simulation in the frequency domain followed by an IFFT.