JournalofLiglltning Research, Volume 1, *2007,pages* 111-131
(Q *JOLR 2006 (www.jolr.org)*

Lightning Transients on LV Networks Caused by Indirect Strokes

Alexandre Piantini
IEE/USP - University of São Paulo, Av. Prof. Luciano Gualberto, 1289,05508-010, São Paulo - SP, BRAZIL.

Abstract

The growing use of sensitive equipment and the ever-increasing demand for improving system reliability have motivated the development of many studies related to electromagnetic transients on power distribution systems. As lightning is a major source of faults on overhead lines and damages to or malfunction of sensitive electronic equipment, it is essential to evaluate the lightning electromagnetic environment in order to mitigate its effects and improve the power system quality. Due to the lower withstand capabilities of low-voltage networks in comparison with those of medium voltage lines, they are more susceptible to lightning electromagnetic interferences.

There are various ways by which lightning can disturb low-voltage lines. This paper addresses two types of overvoltages related to indirect strokes, which are among the most important ones on account of their magnitudes and frequencies of occurrence. The first is associated with the coupling between the line and the stroke channel (induced voltage) and the second refers to the transference from the medium voltage line (transferred voltage). The former is evaluated using the Extended Rusck Model (ERM), which had been validated earlier through many experiments. Then, using the ERM in conjunction with a high frequency transformer model, the transferred voltages are investigated. In both cases the presence of loads connected to the secondary is taken into account. The presented simulations enable us to evaluate the basic characteristics of the induced and transferred voltages and further to assess their dependence upon line configuration and lightning parameters.

Index Terms

Distribution Transformer, Electromagnetic Induction, Indirect Strokes, Lightning Induced Voltages, Low-voltage Lines, Power Distribution lines and Transferred Voltages.