

# The influence of long transmission lines on the overvoltage distribution across power transformer windings

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**Abstract**— This is a study presenting the impact of the long transmission lines on the overvoltage distribution across power transformer windings. The overvoltage propagates along the transmission line until reaches a HV winding, then is distributed across it. For the purpose of transient overvoltage evaluation, the HV winding is considered with distributed parameters. The long transmission line is substituted then by an equivalent circuit composed by series connected two-port elements. According to simulation results, the values of the line parameters play a significant role in determining the voltage across the HV winding. The strongly capacitive character of long power lines causes a larger voltage measured across the HV winding, compared to the line input. Moreover, the effective length of the transmission line is in direct correlation with the overvoltage amplitude across the HV winding. For this study, the model based upon lumped parameters and disk coils is suitable and provides appropriate information regarding the insulation requirements, as well. The signal which emulated the commutation overvoltage had a time variation closed to a step-up. All the numerical simulations from this paper have been performed running a software package called SYSEG (Symbolic State Equation Generation), prior developed by the authors.

**Keywords**—transmission line, transformer, overvoltage, very fast transients, disk coil, modeling, eigenvalues

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