

STUDENT SECTION

Temperature Gradient Effect on Partial Discharge Activity-Modelling and Simulation

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Abstract— For condition monitoring of the power cable insulation system, different diagnosis procedures are available. The measurement of partial discharge (PD) activity is still an issue of great importance. This paper deals with the effect of the temperature gradient and different voltage waveforms/ frequencies on PD phenomena within voids of power cables insulation. The results of PD measurements and computer simulations are underlined. The current study explains the behaviour of PD considering the effect of different testing conditions. The PD tests were performed considering AC, DC Step and Oscillating Voltage (OVW) voltage waveforms at 50 Hz, Very Low Frequency (0.1 Hz/ VLF) and 1 kHz using the Step-up Voltage Test Method. During PD tests, Partial Discharge Inception Voltage (PDIV) was recorded after measurements developed using polyethylene specimens with artificial cavities embedded. The specimens were realized using three thermally-soldered layers of cross linked polyethylene/ low density polyethylene (XLPE-LDPEXLPE) and in each specimen the central layer has a circular hole punched of around 400 μm . The computer simulations were developed using Comsol Multiphysics 4.2, Heat Transfer/ Electromagnetic Heating/ Joule Heating. The aim of computer simulations was to fit the experimental results. According to the measured values, PDIV is frequency dependent, as the frequency increases the PD are incepted at higher voltage levels. According to computer simulations, the cavity embedded within specimen is a heat source and this could be an explanation of the frequency dependency behavior of PDIV.