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Experimental study on detection equivalence of partial discharges at damped AC voltages and 50 Hz AC voltages in 110 kV XLPE power cables.

Rong **XIA** (1), Jiankang **ZHAO**(1), E. **GULSKI** (2)

1 - State Grid Electric Power Research Institute, Wuhan, China, xiarong@sgepri.sgcc.com.cn , zhaojiankang@sgepri.sgcc.com.cn
2 - Delft University of Technology, Delft, Netherlands, e.gulski@tudelft.nl

There exits the absence of study on partial discharge (PD) detection at Damped AC (DAC) voltages in field experiments for 110kV XLPE power cables in China, and the complete lack of measurement experience and data, especially including equivalence comparison of PD at between DAC voltages and 50Hz AC voltages.

A lot of studies were done at abroad for PD mechanism, characteristics and detection equivalence of XLPE cables with insulation defects at DAC voltage stresses, and also for models of typical insulation defects themselves. Nevertheless, it was reported that foreign experimental equivalence verification usually based on those simplified model defects made by insulation or composite insulation materials with cavities, sharp edges and floating parts inside, which could not realistically reflect PD characteristics of typical defects generated from installation of cables and their accessories.

In order to investigate effect differences of PD detection for HV XLPE cables under DAC voltages and 50Hz AC voltages, three kinds of typical insulation defects were designed and made in the real sample system of 110kV XLPE cables, and the first domestic trial of equivalence comparison of PD detection at above two different test voltages was completed in the laboratory. Test sample includes two parts, the long one and the short one, and each part contains one cable and two cable terminations. The total length of long Part is 338meters, while the short part is 20meters or so. Insulation defects with sharp insulation screen, prefabricated unit offset and dielectric-bounded semi-conductive grain were made inside of one termination on short part, T3. The test sample system was individually energized by 50Hz AC voltages using Haefely serial resonant testing system and by DAC voltages using OWTS HV 150. At the same time, PD activities were individually detected by Haefely TE571 and OWTS HV 150. Then PD inception delay, PD magnitudes and other PD characteristic parameters could be monitored and analyzed for equivalence comparison.