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PD characteristics of typical MV XLPE power cable termination defects at VLF and power frequency test voltages

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ABSTRACT

It has been reported in literature that newly installed cable accessories can pass typical commissioning tests and yet show significant PD activity leading to premature failure in the long term. This research report details the partial discharge (PD) characterisation of three artificial defects in MV cable terminations, at both power and very low frequency (VLF). The defects included a semi-conductor feather, a tram line in the cross-linked polyethylene (XLPE) insulation and an XLPE ring cut. The experimental methodology involved subjecting the terminations to a standard overvoltage withstand test, after which the PD activity was monitored, at 0.1 Hz and at 50 Hz excitation frequencies. All the defects passed the overvoltage test, despite some showing significant discharges. The defects gave distinct phase-resolved PD patterns that are effectively invariant of excitation frequency. The PD magnitudes at power frequency were typically bigger than at VLF, while the PD inception voltages tended to be lower at VLF. The PD magnitudes of the semi-conductor feather defect surface discharges were found to increase with increasing applied voltage, while no increase was observed for the tram line and ring cut void discharges. The results show that common installation defects in MV cable terminations can be suitably characterised using VLF PD measurements.