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**C.8.1.8.****Early detection of electrical tree through advanced PD measurement inference techniques**

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An approach leading to early detection of electrical tree active in polymeric insulation is presented in this paper. Tree inference is carried out through partial discharge (PD) measurements, performed by a new methodology which provides enhanced tools for PD processing. In particular, classification of PD pulses and identification of PD source typologies is achieved resorting to fuzzy algorithms, which are able to assign specific classes of PD pulses to different phenomenology, among those tree growth. This may support maintenance decisions of, e.g., network operators, as well as speed up testing of insulation systems. The algorithm described in the paper has been developed resorting to tests performed on needle-plane objects, constituted by slabs cross-linked polyethylene (XLPE) where a needle is inserted and partially retracted in order to generate a cavity in front of needle tip. The electric field amplification in this cavity is able to incept PD and induce electrical tree. Tests were also carried out on cables having artificial defects, as well as on other insulation systems. An application of the proposed approach to a MV cable shows that tree is detected successfully before the final breakdown.