

# Partial discharges in bulk oil and at oil-pressboard interface under negative lightning impulse voltages

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The presence of oil-pressboard interface has been associated with creepage discharge in large power transformers. Creeping discharge or surface discharge is considered as a serious fault condition that can lead to catastrophic failure under normal operating conditions. The studies on this fault condition are normally on the inception and extinction voltage under AC voltages. Recently, there are interest on the white marks formation and leakage current during the surface discharges. On the other hand, most studies related to creepage discharges under lightning impulse (LI) voltages focused on the pre-breakdown streamer propagation. The use of LI voltages is important in standard material breakdown test such as multiple-level method in IEC 60060-1. This paper investigates the partial discharge (PD) behaviour in the bulk oil and at the oil-pressboard interface from accumulative effect of breakdown test by using different configurations of electrodes. A point-plane electrode is used to study the PD behaviour in the oil bulk, whilst two setup of needle-bar electrode, i.e. needle placed in parallel with the pressboard surface and needle place at an angle close to the horizontal of pressboard are used to study the creepage discharge behaviour at the oil-pressboard interface. In addition, the PD behaviour under certain level of negative LI voltage that less than the statistical withstand voltage (SWV) is also studied by measuring the PD current using radio frequency current transformer (RFCT).