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Predetermination Partial Discharge Features in cables using Various Electrode Gaps in Air under AC voltage

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The breakdown of insulation in cables while in service can cause considerable damage to equipment and the accessories to which it is connected. It has been understood that such failures may be related to the occurrence and severity of partial discharges. Protrusions are one of the most critical types of imperfection, and affect primarily the semiconductor shields. The effects are more severe depending on the shape and size of the protrusion. Sharp protrusions can lead to extremely high electric stress concentrations and accelerating electrical aging.

To study the effect of protrusions in cables on PD due to electrical field enhancement, PD features were experimentally investigated under different electrode configuration. In this experiment, four types of electrode configuration such as point-point, point-plane, point-rod and point-sphere having different dimensions with variable spacing were used to study the electrical field enhancement, which initiates PD. This gives the voltage range at which PD initiates in cables for different type of defects having different dimensions.

As the current flowing through the cable increases, I2R loss associated with current increases, which in turn increase the temperature of the cable. Partial discharges in electric insulation are also depends on temperature. To study the effect of cable temperature on PD features, the experiment was conducted at various temperatures.

Test cell, which contains electrode configurations are energized using IEC60270 measurement setup with high frequency CTs clamped around in the ground terminal. The various features such as phase resolved PD pattern, PD inception voltage, PD extinction voltage were extracted. These features were strongly depending on the type of defect and the instantaneous applied voltage.

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