

Partial Discharge Measurements in the Sub-VLF-Range

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Testing high voltage cable systems on-site is often limited by the demand of reactive power. Reducing the test frequency can solve this problem. Therefore, VLF cable testing is already implemented in several international standards. The significantly reduced test frequency, often 0.1 Hz compared to 50 Hz and 60 Hz, respectively, is often considered by increased test voltage levels in order to compensate differences in the physical mechanism of the insulation's breakthrough process. If the withstand voltage tests are combined with diagnostic PD measurements, also the relevant PD parameters, as PDIV, PDEV and apparent charge have to be challenged with respect to their comparability to power frequency. Many studies have been published in the past, evaluating this topic in detail.

Nowadays, with further increasing cable length, and with the need to use small and lightweight test equipment for off-shore applications, even the reduction of the test frequency down to 0.1 Hz is often not sufficient to provide the reactive power for the test object. Therefore, most commercial test kits provide test frequencies below 0.1 Hz (as 0,01 Hz = 10 mHz), still in accordance to the standard IEC 60060, where VLF voltage is defined as an alternating voltage with up to 1 Hz. As a consequence, the PD behavior of the test object may also be influenced as well.

This contribution presents the results of systematic test sequences with sinusoidal voltage, using 50 Hz, 0.1 Hz, 0.05 Hz, 0.02 Hz and 0.01 Hz. Besides parameters as PDIV, PDEV and q, also phase resolved PD patterns (PRPD) were generated and compared.