

Dayashankar Dubey, Online monitoring of dielectric dissipation factor, M. Tech. Thesis, Department of Electrical Engineering, Indian Institute of Technology Bombay, 2005.

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Abstract - A technique for online monitoring of dissipation factor in the range of $500\text{e-}5$ to $5000\text{e-}5$, with a precision better than $5\text{e-}5$ is investigated using numerical simulation, a low voltage setup with loss angle simulator circuit, and a high voltage setup with test objects operating at 1 kV. The technique is based on synchronous detection method of phase measurement. The dissipation factor is obtained by processing the simultaneously sampled signals corresponding to voltage and current, and involves dividing the low pass filtered product of voltage and current signals by the RMS values of the two signals. The measurement update rate depends on the response time of the low pass filters. It is shown that the desired precision can be obtained using asynchronous sampling with (a) sampling rate much larger than the power line frequency, giving high update rate, and (b) sampling rate lower than the power line frequency and processing the aliased periodic waveforms retaining the original phase relationship. The second method can be used for low cost instrumentation for condition monitoring applications with low measurement update rate.