

Breakdown Voltage Measurement of High Voltage Transformers Oils Using an Active Microwave Resonator Sensor

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Abstract : This work suggests a new microwave resonator sensor (MRS) device for measuring the oil's breakdown voltage of high voltage transformers. A precise high-sensitivity sensor is designed and manufactured based on a microstrip split ring resonator (SRR). To improve the sensor sensitivity, a RF amplifier of 30 dB gain is linked through a transmission line of 50Ω . The sensor operates at a microwave band (L) with a quality factor of 1.35×10^5 when it is loaded with an empty tube. In this work, the sensor has been tested with three samples of high voltage transformer oil of different ages (new, middle, and damaged) where the quality factor differs with each sample. A mathematical model was built to calculate the breakdown voltage of the transformer oils and the accuracy of the results was higher than 90%.

Keywords : active resonator sensor, oil breakdown voltage, transformers oils, quality factor

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