

**NONDESTRUCTIVE AND NONCONTACT DIELECTRIC
MEASUREMENT METHODS FOR TRANSFORMER OIL USING
FREE SPACE MICROWAVE MEASUREMENT SYSTEM IN 19 –
25 GHZ FREQUENCY RANGE**

By:

**MOHD AZIZ ARIS
ERMEEY ABD KADIR
PROF. DR ZAIKI AWANG
PROF. MADYA AHMAD ISMAIL**

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ABSTRACT

Knowledge of wideband dielectric properties of liquid materials is necessary in many applications such as biomedical, remote sensing, powder technology and radar absorbing materials. Nondestructive, noncontact, in SITU and real time measurement of dielectric properties of liquids is important for evaluation of complex material systems such as service-aged transformer oil. Free-space microwave measurement (FSMM) system (which is nondestructive and noncontact) was developed for accurate measurement of dielectric properties of low-loss and high-loss liquids at microwave frequencies. The purpose of this research is to measure the dielectric properties of transformer oil by using free-space microwave measurement system between 18 – 26 GHz (K-band), to compare measured results with published results for transformer oil and to collect the variation values of dielectric properties in microwave frequency between 18GHz to 26GHz (k-band). FSMM system consists of spot focusing horn lens antennas, mode transitions, coaxial cables and vector network analyzer (VNA). Dielectric constants and loss factors were measured for new transformer oil and all results close agreed with published data. It is observed that metal-back method is suitable for dielectric measurement of transformer oil.

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