

## Non-Contact Characterization of Standard Liquids Using Waveguide at 12.4 to 18 GHz Frequency Span

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**Abstract :** This work presents an approach to characterize a non-contact microwave sensor using waveguides for different standard liquids such as ethanol, methanol and 2-propanol (Isopropyl Alcohol). Wideband waveguides operating between 12.4GHz to 18 GHz form the core of the sensing structure. Waveguides are sensitive to changes in conductivity of the sample under test (SUT), making them an ideal tool to characterize different polar liquids. As conductivity of the sample under test increase, the loss tangent of the material increase, thereby decreasing the S21 (dB) response of the waveguide. Among all the standard liquids measured, methanol exhibits the highest conductivity and 2-Propanol exhibits the lowest. The cutoff frequency measured for ethanol, 2-propanol, and methanol are 10.28 GHz, 10.32 GHz, and 10.38 GHz respectively. The measured results can be correlated with the loss tangent results of the standard liquid measured using the dielectric probe. This conclusively enables us to characterize different liquids using waveguides expanding the potential future applications in domains ranging from water quality management to bio-medical, chemistry and agriculture.

**Keywords :** Waveguides, , Microwave sensors,, Standard liquids characterization, Non-contact sensing

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