94th Session D: *Material Measurements*

Session Chair: David Blackham

D1

Waveguide Probe Calibration Method for Permittivity and Loss Characterization of Viscous Materials

1:50 PM 2:10 PM

Seckin Sahin *(Ohio State University)**

We present a new measurement technique based on reduced-reflectometer calibration of a waveguide with a highly-reflecting termination for the complex permittivity characterization of viscous materials. In this novel method, the waveguide is simply dipped into the viscous material at 4 different depths, separated roughly by $\lambda/8$, and the reflection coefficients are recorded. Subsequently, a multi-reflect calibration procedure is applied to these measurements to determine the propagation constant of material-filled waveguide. The complex permittivity of the material is then extracted from the calculated propagation constant. The proposed approach is very simple and cost-effective, as it only requires a one-port network analyzer, and is applicable to the wide range of frequencies. We show the validity of this new technique by characterization of olive oil over 90-130 GHz band.

D2

Free-Space Characterization of Radar Absorbing Non-Magnetic Materials in the W-Band

2:10 PM 2:30 PM

Nagma Vohra *(University of Arkansas)*; Luis R. Rodriguez-Aguilar (University of Arkansas); Jose Santos Batista (University of Arkansas); Magda O El-Shenawee (University of Arkansas)*

In this paper, a time gated free-space measurement setup for characterizing radar absorbing non-magnetic materials at W-band is presented. The measurement setup uses a pair of horn lens antennas and a two micrometer precise positioning fixture that allows the use of thru, reflect, and line (TRL) calibration technique for the error corrections. The measurements are performed using a network analyzer with the millimeter wave frequency extenders to provide four S-parameters over the W-band. The implemented extraction method provides the correct complex permittivity values of the samples. Excellent agreement is achieved between the calculated and measured S-parameters of the samples.

D3

Terahertz Experimental Measurements of Human Breast Tissue

2:30 PM 2:50 PM

Nagma Vohra *(University of Arkansas)*; Keith Bailey (University of Illinois); Magda O El-Shenawee (University of Arkansas)*

In this paper, the pulsed terahertz (THz) system is proposed for characterizing electrical properties of freshly excised human breast tumors. Single point THz transmission spectroscopy is used to collect data to calculate the refractive index and absorption coefficient of different tissue types across the frequency range from 0.1 – 3.5 THz. Additionally, a THz reflection imaging method is used to collect data to extract the refractive index and absorption coefficient at each pixel on the tissue. THz images are then constructed based on the extracted coefficients that show good differentiation between different tissue types. The overall goal of this work is to establish THz characterization methodology to be used intraoperatively for the margin assessment of excised breast tumors.