NON-CONTACT BROADBAND FREE SPACE MEASUREMENTS OF THE COMPLEX PERMITTIVITY OF BIOLOGICAL TISSUES

Tarek M. Said[1*], Binh T. Tran[2], Vasundara V. Varadan[2]

[1]Department of Electrical Engineering, Fayoum University, Fayoum 63514, Egypt
[2]Department of Electrical Engineering, University of Arkansas, Fayetteville, AR 72701, USA

ABSTRACT The measurement of the complex permittivity of beef fat tissue is reported from 8 to 18 GHz using a unique focused beam free space measurement system. The system consists of horn/lens antennas with double plano-conves lenses for obtaining a focused beam with a constant phase front. A picture frame sample holder can hold slices of biological tissues. Full TRL calibration is implemented at the input plane of the tissue sample. The sample is somewhat heterogeneous, but the focused beam system can be used to illuminate different spots on the sample and an effective complex permittivity can be obtained by averaging. This is a non-contact method and the tissue sample can be characterized over different frequency bands. This is a decided advantage of this measurement method relative to contact probe methods.

KEYWORDS Biological tissues; dielectric permittivity measurements, free space system

[*]Address all correspondence to: Tarek M. Said, Fayoum University, Faculty Group, Electrical Engineering Department, E-mail: tms02@fayoum.edu.eg