

**IMPORTANT: This is an Invited Contribution for the Session
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Trabelsi and Ramahi**

Measurement of the Dielectric Properties of Arbitrary Shaped Samples in Waveguides

by

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For many applications it is necessary to know the dielectric properties of materials in the microwave range. For the determination of these properties usually a section of a waveguide is homogeneously filled with the unknown material. The permittivity and losses can subsequently be reconstructed from the measured scattering parameters. However, in many circumstances it is not possible to manufacture material samples that perfectly fit into the waveguide. Therefore we have developed a method where the unknown sample is fixed inside the waveguide by a low-loss PTFE holder. Eg., the sample consists of a small circular cylinder and the holder is a block with a corresponding hole. For such a structure the scattering parameters can only be calculated numerically. We use the MAFIA and Microwave Studio FD-TD program packages for this purpose. In order to increase the numerical efficiency of the reconstruction process we compute the broadband scattering parameters over an adequate set of material parameters a priori and then apply an interpolation scheme for the actual determination of the material parameters. The validity of new method has been proven by simulations and measurements.