Abstracts

An inverse technique to evaluate permittivity of material in a cavity

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A numerical technique to estimate the dielectric constant and loss factor of a homogeneous dielectric material placed in an arbitrary shaped cavity has been developed. The values of S-parameters are measured experimentally by placing the sample in the cavity. Starting with a trial set of permittivity values, the computation is carried out using the finite-element method (FEM) to match the S-parameters around the fundamental resonance frequency. The FEM routine is run several times while optimizing the values of dielectric constant and conductivity of the sample. During the process of optimization, eight different measures of error between computed and experimental values of complex S-parameters are examined. It is found that there is no single measure of error, which can be minimized to estimate two parameters (dielectric constant and the loss factor), but the combination of errors has to be minimized to get the exact solution. The computer program can generate the solution with an accuracy of less than 0.01% in a few hours on a Pentium-based personal computer.

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