

CAVITY METHOD OF POLARIZABILITY AND PERMITTIVITY MEASUREMENTS OF SPHERICAL COMPOSITE OBJECTS

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Measuring complex dielectric characteristics of materials at microwave frequencies is becoming increasingly important, particularly in various sectors such as material science, microwave circuit design, absorber development, and so on. Many approaches, such as time domain or frequency domain techniques with one or two ports, have been devised to measure these complex parameters. It's impossible to measure permittivity directly. Computations are made with the help of other quantifiable factors such as propagation constant, transmission/reflection coefficients, and resonance frequency [1, 2].

In this research, we investigate the cavity method of polarizability and permittivity measurements of spherical composite objects. The method is to measure the eigenfrequencies of a cavity resonator with and without a ball inside. The technique is not new. It is described in a lot of papers, where a ball is treated as a small perturbation [2, 3]. The main problem of the method appears while calculating the permittivity. The values of polarizability remain unchanged from measurement to measurement, but the values of permittivity change significantly. A small variation of experimental results leads to a completely different complex value of permittivity.

The novelty of our work lies in a study of the stability of the numerical method which is used for calculating complex dielectric permittivity and polarizability. Also, we study the impact of a sphere's radius on the results. A comparison of theoretical results to experimental is made.

References

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