Abstracts

Microwave imaging-Location and shape reconstruction from multifrequency scattering data

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The problem of determining the shape and location of an object embedded in a homogeneous dissipative medium from measurements of the field scattered by the object is considered in this paper. The object is assumed to be an infinite cylinder of known cross section illuminated by a TM plane wave and the scattered field is measured on a line segment perpendicular to the direction of incidence. Measurement data are carried out at three different frequencies for a homogeneous cylinder of known dielectric constant. The location and contour shape are determined using two different reconstruction algorithms, a Newton-Kantorovich (NK) method and the modified gradient (MG) method whose effectiveness and robustness are compared. Both methods are based on domain integral representations of the field in the body. They involve an iterative minimization of the defect between an integral representation of the field measured on the line and the actual measured data. The NK method involves a linearization of the nonlinear relation between the field and the contrast, as well as the solution of a direct scattering problem at each iteration. The MG method seeks the simultaneous reconstruction of the field and the characteristic function of the support of the scatterer without solving a direct problem at each step. Both methods employed the same initial guess and the a priori information that the characteristic function is nonnegative.

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