JOURNAL OF INTEGRAL EQUATIONS
AND APPLICATIONS
Volume 19, Number 3, Fall 2007

IDENTIFICATION OF PARTIALLY COATED ANISOTROPIC BURIED OBJECTS USING ELECTROMAGNETIC CAUCHY DATA

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ABSTRACT. We consider the three dimensional electromagnetic inverse scattering problem of determining information about a target buried in a known inhomogeneous medium from a knowledge of the electric and magnetic fields corresponding to time harmonic electric dipoles as incident fields. The scattering object is assumed to be an anisotropic dielectric that is (possibly) partially coated by a thin layer of highly conducting material. The data is measured at a given surface containing the object in its interior. Our concern is to determine the shape of this scattering object and some information on the surface conductivity of the coating without any knowledge of the index of refraction of the inhomogeneity. No a priori assumption is made on the extent of the coating, i.e., the object can be fully coated, partially coated or not coated at all. Our method, introduced in [**14, 17**], is based on the linear sampling method and reciprocity gap functional for reconstructing the shape of the scattering object. The algorithm consists in solving a set of linear integral equations of the first kind for several sampling points and three linearly independent polarizations. The solution of these integral equations is also used to determine the surface conductivity.

1. Introduction. The inverse scattering problem we consider in this paper is to determine the shape and surface conductivity of an anisotropic dielectric that is partially coated by a thin conducting material from a knowledge of the scattered electromagnetic wave due to time-harmonic point sources. The scattering object is embedded in a known inhomogeneous background. Such problems arise in the detection of chemical waste deposits as well as certain problems arising in the nondestructive evaluation of urban infrastructure, testing the integrity of coatings, etc. The literature on this subject is particularly rich, see, e.g., [**4, 14, 26** and the references therein], and for a scholarly review of some aspects of its history we refer the reader to [**4**].

The research of the first author was supported in part by the U.S. Air Force Office of Scientific Research under Grant FA9550-05-1-0127.
Received by the editors on July 21, 2006, and in revised form on September 7, 2006.