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THE DETERMINATION OF BOUNDARY COEFFICIENTS FROM FAR FIELD MEASUREMENTS

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Dedicated to Chuck Groetsch for his fundamental contributions to the field of inverse problems.

ABSTRACT. We consider the problem of determining either the surface impedance $\lambda = \lambda(x)$ or surface conductivity $\eta = \eta(x)$ from far field data corresponding to time-harmonic incident plane waves scattered by a coated infinite cylinder. We show that λ and η are uniquely determined from the far field data and provide a numerical algorithm for determining these quantities.

1. Introduction. Inverse problems connected with the detection of decoys play a special role in inverse electromagnetic scattering theory since for such problems the shape of the scattering object is typically known a priori. For example, in order to distinguish between a real missile and a decoy coated with metallic paint the shapes are the same and known and the target identification problem is based on distinguishing between a perfect conductor and a dielectric coated with a thin highly conducting layer. Assuming that the frequency is chosen such that the thickness of the coating is less than the skin depth, the problem then becomes one of determining the surface conductivity, i.e., the problem of determining a coefficient in a boundary condition. In other decoy problems the hostile object can be a perfect conductor coated by a thin dielectric layer, i.e., in this case the surface impedance serves as target signature. Problems associated with the detection of decoys are further complicated by the fact that the far-field data is measured over a limited aperture and the directions of the incident plane waves used to interrogate the target are also restricted to a limited aperture.

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