INVERSION OF THE ANISOTROPIC CONDUCTIVITY PROBLEM

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Abstract

An inverse problem is considered to identify the geometry of discontinuities in a conductive material - ½ R^d with anisotropic conductivity (I + (K ¡ I)$\hat{A}_D$) from Cauchy data measurements taken on the boundary @ -, where D ½ -, K is a symmetric and positive de¯nite tensor not equal to identity and $\hat{A}_D$ is the characteristic function of the domain D. As an example this models the determination of the shape, size and location of the anisotropic inner core of the Earth from measurements taken at its mantle. There are also other applications in electrical impedance tomography (EIT). The previous results of Ikehata (1998) for estimating the size of the inclusion D are proved and applied to several examples. Further, we develop an integral representation of the solution and we propose an e±cient boundary element method (BEM) in conjunction with a least-squares constrained minimization procedure to detect the anisotropic inclusion D, such as a circle, by a single boundary measurement. Several numerical results are discussed con¯rming the previous theoretical estimates of the size of the inclusion and giving an insight into the unresolved uniqueness issues of detecting ellipses.

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