An Inverse Conductivity Problem with a Single Measurement

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Abstract: We revisit in this paper the inverse boundary value problem of Calderon for a coated domain, where the conductivity is constant in each subdomain. This geometric distribution of conductivity corresponds to the well accepted model of heads in ElectroEncephaloGraphy (EEG). For instance, the inmost interior domain is occupied by the brain, and it is surrounded by the skull and then the scalp. The so-called spherical model, where these regions are concentric spherical layers, is also frequently used. We show for this distribution of conductivity that the inverse problem is completely solved with only one suitably chosen Cauchy data, instead of the whole Dirichlet-to-Neumann operator. The criterion of choice for these Cauchy data is completely set up in the spherical model, using spherical harmonics. Also, a stability result is established. As for the numerical method to compute the conductivity, we propose a least square procedure with a Kohn-Vogelius functional, and a boundary integral equation method for the direct problem.

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