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Complete Sets of Radiating and Nonradiating Parts of a Source and Their Fields with Applications in Inverse Scattering Limited-Angle Problems

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Abstract

Many algorithms applied in inverse scattering problems use source-field systems instead of the direct computation of the unknown scatterer. It is well known that the resulting source problem does not have a unique solution, since certain parts of the source totally vanish outside of the reconstruction area. This paper provides for the two-dimensional case special sets of functions, which include all radiating and all nonradiating parts of the source. These sets are used to solve an acoustic inverse problem in two steps. The problem under discussion consists of determining an inhomogeneous obstacle supported in a part of a disc, from data, known for a subset of a two-dimensional circle. In a first step, the radiating parts are computed by solving a linear problem. The second step is nonlinear and consists of determining the nonradiating parts.