Inverse Scattering for Planar Cracks via Nonlinear Integral Equations

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Abstract

We present a Newton-type method for reconstructing planar sound-soft or perfectly conducting cracks from far-field measurements for one time-harmonic scattered with plane wave incidence.

Our approach arises from a method suggested by Kress and Rundell (Kress/Rundell:2005) for the inverse boundary value problem for the Laplace equation. It was extended to inverse scattering problems for sound-soft obstacles (Ivanyshyn/Kress:2005) and for sound-hard cracks (Lee:2006). In both cases it was shown that the method gives accurate reconstructions with reasonable stability against noisy data.

The approach is based on a pair of nonlinear and ill-posed integral equations for the unknown boundary. The integral equations are solved by linearization, i.e., by regularized Newton iterations. Numerical reconstructions illustrate the feasibility of the method.