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Multipoint formulas in inverse problems and their numerical implementation

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We present the first numerical study of multipoint formulas for finding leading coefficients in asymptotic expansions arising in potential and scattering theories. In particular, we implement different formulas for finding the Fourier transform of potential from the scattering amplitude at several high energies. We show that the aforementioned approach can be used for essential numerical improvements of classical results including the slowly convergent Born-Faddeev formula for inverse scattering at high energies. The approach of multipoint formulas can be also used for recovering the X-ray transform of potential from boundary values of the scattering wave functions at several high energies. Determination of total charge (electric or gravitational) from several exterior measurements is also considered. In addition, we show that the aforementioned multipoint formulas admit an efficient regularization for the case of random noise.

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