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# Inverse Scattering for Schrödinger Operators with Singular Miura Potentials

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We study direct and inverse scattering problems for one-dimensional Schrödinger operators with highly singular Miura potentials  $q \in H^{-1}(\mathbb{R})$ , i.e., potentials of the form  $q = u' + u^2$  for some  $u \in L_2(\mathbb{R})$ . Under some additional assumptions there exist unique Riccati representatives  $u_+$  and  $u_-$  that are integrable respectively at  $+\infty$  and  $-\infty$ , and there is a well-defined reflection coefficient  $r$  that determines  $u_+$  and  $u_-$  uniquely. We show that the map  $(u_+, u_-) \mapsto r$  is continuous with continuous inverse and obtain an explicit reconstruction formula. Among potentials included are, e.g., potentials of Marchenko–Faddeev class and their perturbations by compactly supported distributions from  $H^{-1}(\mathbb{R})$  (e.g., delta-functions and regularized Coulomb  $1/x$ -type interactions) and some highly oscillating unbounded potentials.

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