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Emergence of Reflectionless Scattering from Linearizations of Physically Relevant Integrable PDEs around Solitons[1] ANDREW KOLLER, JILA and University of Colorado, Boulder, ZAIJONG HWANG, MAXIM OLSHANII, University of Massachusetts, Boston — We present four examples of integrable partial differential equations (PDEs) of mathematical physics, that when linearized around a localized stationary solution, exhibit scattering without reflection—at *all* energies. Starting from the most well-known and the most empirically relevant phenomenon of the transparency of one-dimensional bright bosonic solitons to Bogoliubov excitations, we proceed to the sine-Gordon, Korteweg-de Vries, and Liouville's equations whose stationary solitons also support our assertion. The proposed connection between integrability and reflectionless scattering seems to span two distinct integrability mechanisms: Lax pairing in the first three cases, and a nonlinear differential map to a linear PDE in the last one. We argue that the transparency shown by linearized integrable PDEs is necessary to ensure that they can support the transparency of stationary solitons at the level of the original nonlinear PDE.

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