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Reconstruction of Sturm–Liouville operators with energy-dependent potentials

We study the direct and inverse spectral problems for energy-dependent Sturm–Liouville equations arising in many models of classical and quantum mechanics. In contrast to the classical case, energy-dependent Sturm–Liouville problems with real-valued potentials can possess nonreal and nonsimple spectra. We give a complete characterization of their spectra and suitably defined norming constants and then solve the inverse problem of reconstructing energy-dependent Sturm–Liouville equations from either two spectra or one spectrum and the sequence of the norming constants. The approach is based on connection between the spectral problems under consideration and those for Dirac operators of special form.

The talk is based on a joint project with Natalia Pronska (Lviv, Ukraine).