Reconstruction of the Klein-Gordon Equation

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We study the direct and inverse spectral problems related to the Klein–Gordon equations on $(0,1)$,

$$-y''(x) + q(x)y(x) - (\lambda - p(x))2y(x) = 0,$$

that model a spinless particle moving in an electromagnetic field. Here $p(x) \in L2(0,1)$ and $q(x) \in W_2^{-1}(0,1)$ are real-valued functions describing the electromagnetic field, and we impose suitable boundary conditions at the points $x = 0$ and $x = 1$. We give a complete description of possible spectra for such operators and solve the inverse problem of reconstructing p and q from the spectral data (two spectra or one spectrum and the corresponding norming constants).