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R-matrix type parametrization of the Jost function for analysing experimental total cross-sections to obtain partial-wave cross sections and resonance parameters.

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A new method is proposed for fitting nonrelativistic two-body scattering data and for extracting the bound state energies or resonance parameters in the compound system that is formed during the collision. The method combines the well-known R-matrix approach with the analysis based on the semi-analytic representation of the Jost function. It is shown that such a combination has the advantages of both these approaches. As with the R-matrix approach, the number of the fitting parameters remains relatively small, since prior knowledge of the resonance parameters is incorporated in the fitting. As with the Jost function approach, the proper analytic structure of the S-matrix is preserved. It is also shown that the new formalism, although closely related to the R-matrix method, has the benefit of no dependence on an arbitrary channel radius. The efficiency and accuracy of the proposed method are tested using a model single-channel potential. Artificial "experimental" total cross-section datapoints generated with this potential are fitted, and the partial wave cross-sections are obtained. The resonance parameters are also successfully recovered as zeros of the Jost function on the appropriate sheet of the Riemann surface of the energy.

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