The Quantum Inverse Scattering Problem for Coupled Channels at Fixed Energy

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The content of this talk is a review on the quantum inverse scattering problem for coupled channels at fixed energy. One of the major fields of application is nuclear physics. The task of the inverse problem is to calculate the direct and coupling potentials from the knowledge of the S matrix obtained from measured differential cross sections. With the method of Newton and Sabatier one can calculate elastic complex potentials from experimental phase shifts at fixed energy. The elastic inverse scattering problem can be thought of as solved for local potentials which dependent on the internuclear distance. For the inverse coupled channel problem we extended the procedure of Newton and Sabatier. The coupled channel problem is now solvable with this mathematical approach. However, the method is not suitable for practical applications, since the complete S matrix can only partly extracted from experimental data. There exists an approximative method based on the first Born approximation and developed earlier where only a line of the S matrix elements is needed for the inversion procedure. This method seems us to be more useful for applications, but has still to be tested for nuclear reactions.