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Spectral Properties of Many-body Schrödinger Operators with Dilatation-analytic Interactions

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Abstract. Quantum mechanical N-body systems with dilatation analytic interactions are investigated. Absence of continuous singular part for the Hamiltonians is proved together with the existence of an absolutely continuous part having spectrum $[\lambda_e, \infty)$, where λ_e is the lowest many body threshold of the system. In the complement of the set of thresholds the point spectrum is discrete; corresponding bound state wave-functions are analytic with respect to the dilatation group.

Introduction

Some important progress has been made during the last years in the mathematical analysis of multiparticle quantum scattering systems. The main results concern non-relativistic three or four particle systems with smooth short-range forces (see e.g. [1]). However no definite step has been made toward a general proof of some fundamental problems such as asymptotic completeness except for repulsive potentials [1, 2] or locally for general multichannel systems [3]. Another troublesome situation concerns the inclusion of more general forces, Coulomb like or electromagnetic, in multiparticle formalisms. First steps in this direction have been made by proving existence of generalized wave-operators for multichannel systems with potentials g/r^{β}, $<\beta \leqq 1$ ([4, 5]); these improvements on traditional time-dependent methods should support the future extension to multiparticle systems of recent formulations of scattering theory with such general forces (see e.g. [6]). It has to be expected that further progress in these domains can be made from a systematic study of the spectral properties of Schrödinger Hamiltonians. For example the experience of the N particle problem with short-range potentials strongly suggests that fundamental ingredients of asymptotic completeness are the absence of continuous singular spectrum and the