

Asymptotic Completeness for N -Body Stark Hamiltonians

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Abstract: We prove asymptotic completeness for short- and long-range N -body Stark Hamiltonians with local singularities of at most Coulomb type. Our results include the usual models for atoms and molecules.

Section 1. Introduction

In the present paper we will prove asymptotic completeness for short- and long-range N -body Stark Hamiltonians. The results include the usual models for atoms and molecules. The Hamiltonian for N ν -dimensional particles with charges q_i and masses m_i in an external electric field \mathcal{E} is

$$\tilde{H} = \sum_{i=1}^N \left(\frac{-\Delta_i}{2m_i} - \mathcal{E} \cdot q_i x_i \right) + \sum_{1 \leq i < j \leq N} v_{ij}(x_i - x_j) \quad \text{on } L^2(\mathbb{R}^{\nu N}).$$

By a standard procedure we remove the center of mass motion and obtain the Hamiltonian

$$H = -\Delta - E \cdot x + V \quad \text{on } L^2(X),$$

where the $\nu(N-1)$ dimensional configuration space X is given by

$$X = \left\{ x \in \mathbb{R}^{\nu N} : \sum_{i=1}^N m_i x_i = 0 \right\}$$

and the resulting electric field $E \in X$ is given by

$$E = \left\{ \left(\frac{q_1}{2m_1} - \frac{Q}{2M} \right) \mathcal{E}, \dots, \left(\frac{q_N}{2m_N} - \frac{Q}{2M} \right) \mathcal{E} \right\},$$

where Q and M stand for the total charge and mass respectively.

We assume $E \neq 0$, that is $\mathcal{E} \neq 0$ and there exist $1 \leq i < j \leq N$ such that $\frac{q_i}{m_i} \neq \frac{q_j}{m_j}$.

This paper is a sequel to [HMS1], where absence of bound states and of singular continuous spectrum for H are proved. These results were obtained for a wide class

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