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Geometric Theory of Stark Resonances in Multielectron Systems

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Abstract. In this paper we consider a class of many-body systems in a weak homogeneous electric field. This class includes atoms and molecules with infinitely heavy nuclei. It follows from one of the results of this paper and a result of [S 3] that the bound states of such systems in the absence of electric field turn into resonances (which we call the Stark resonances) as soon as the electric field is switched on. (The stability part of this result was earlier proven in [HeSi] (see also [Hu 2]) under an assumption of dilation analyticity.) The main result of this paper is exponential bounds on the width (and therefore the lower exponential bounds on the life-time) of the Stark resonances. These bounds are given in terms of the Stark instanton action. In contrast to the usual (one body) action the latter is not entirely classical but incorporates certain quantum data (like ionization energies). The bounds give a partial generalization to the many electron case of the well-known Oppenheimer formula for the hydrogen.

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