H^+_2 in a strong magnetic field described via a solvable model

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Abstract

We consider the hydrogen molecular ion H^+_2 in the presence of a strong homogeneous magnetic field. In this regime, the effective Hamiltonian is almost one dimensional with a potential energy which looks like a sum of two Dirac delta functions. This model is solvable, but not close enough to our exact Hamiltonian for relevant strength of the magnetic field. However, we show that the correct values of the equilibrium distance as well as the binding energy of the ground state of the ion can be obtained when incorporating perturbative corrections up to second order. Finally, we show that He^{3+}_2 exists for sufficiently large magnetic fields.