Can one bind three electons with a single proton?

P. Duclos Centre de Physique Théorique, Marseile

Of course not for an ideal H^{--} atom. But with the help of an intense homogenous magnetic field B, the question deserves to be reconsidered. It is known (see e.g. [BSY, BD]) that as $B \to \infty$ and in the clamped nucleus approximation, this ion is described by a one dimensional Hamiltonian (in ad hoc units)

$$H := \sum_{i=1}^{3} -\frac{\Delta_i}{2} - Z\delta(x_i) + \sum_{i<j} \delta(x_i - x_j) \quad \text{acting in} \quad L^2(\mathbb{R}^3) \qquad (1)$$

where $Z = 1$ is the charge of the nucleus, and δ stands for the well known "delta" point interaction. We shall present an extension of the "skeleton method", see [CDR1, CDR2], to the three degree of freedom case. This is a tool, that we learn from [R], which reduces the spectral study of H to the study of the kernel a system of linear integral operators acting on the support of the delta interactions. Finally we shall show numerical results which indicate that the critical value of Z is indeed below 1. This the result of a collaboration with D. Bressanini, R. Brummelhuis and R. Ruamps.

References

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