

Can Quantum Gases Conclude the Search for an Electron Pseudotransfer over Distance?

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This work argues that hybrid experiments on Bose-Einstein condensates provide currently the best candidate to observe a long-distance electron pseudotransfer process that has been predicted in 2009 known as Interatomic Coulombic Electron Capture.¹

Interatomic coulombic electron capture describes the non-local process of attachment of an electron to a cation mediated by ionisation of an atom from the environment. If the involved electrons are not being resolved, the process can therefore mask as an electron transfer over large distance from the environment to the recombining cation.

This can, for instance, potentially explain or be hidden in observations of electronic transitions at ultracold temperatures between trapped barium (I) cations and a surrounding Bose-Einstein condensate of neutral rubidium atoms as investigated by the Barium Rubidium Interaction Experiment (BaRbIE).^{2,3}

To this extent, we will present here electron-dynamical and electron-structural calculations to promote the discussion within the community of quantum gases on observability and first experimental proof of interatomic coulombic electron capture.

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- [2] A. Krükow, A. Mohammadi, A. Härter and J. Hecker Denschlag, *Phys. Rev. A* **94**, 030701 (2016).
- [3] A. Mohammadi, A. Krükow, A. Mahdian, M. Deiß, J. Pérez-Ríos, H. da Silva Jr., M. Raoult, O. Dulieu and J. Hecker Denschlag, *Life and death of a cold BaRb⁺ molecule inside an ultracold cloud of Rb atoms*, (2020)