Challenges for Electron Dynamics in Open Quantum Systems

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In our Young Investigator Group we aim at the proof of inter-Coulombic energy transfer processes in paired semiconductor quantum dots (QDs) [1] that include up to two continuum electrons. Our original predictions on two distinct processes, the inter-Coulombic decay and electron capture (ICD and ICEC), were done using the Heidelberg MCTDH program [2] with electrons being manually antisymmetrized and with QDs being modeled by inverse Gaussian potentials. We explored geometry [3], laser [4], impinging electron [5], and spin control [6], moreover we recently showed that competing phonon processes can be ruled out [7].
Besides a short review on our established workflow I will describe the limitations we foresee, among them the expansion of the continuum dimensions leading to a nearly (?) untractable Coulomb interaction operator file and the inclusion of more particles, namely further electrons as well as holes.

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