Interferometry of Multi-Level Systems: Rate-Equation Approach for a Charge Qudit

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Abstract:

We theoretically describe a driven two-electron four-level double-quantum dot (DQD) tunnel coupled to a fermionic sea using the rate-equation formalism. This approach allows to find occupation probabilities of each DQD energy level in a relatively simple way, compared to other methods. Calculated dependencies are compared with the experimental results. The system under study is irradiated by a strong driving signal, and as a result, one can observe Landau–Zener–St¨uckelberg–Majorana (LZSM) interferometry patterns which are successfully described by the considered formalism. The system operation regime depends on the amplitude of the excitation signal and the energy detuning, so one can transfer the system to the necessary quantum state in the most efficient way by setting these parameters. Obtained results give insights about initializing, characterizing, and controlling the quantum system states.