Joint CQSE and CASTS Seminar

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TITLE Full-polaron master equation approach to dynamical steady states of a driven two-level system

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Abstract

We apply a full-polaron master equation and a weak-coupling non-Markovian master equation to describing the steady-state time-averaged properties of a driven two-level system, an electron coherently tunneling between double quantum dots (DQD's), interacting with a bosonic phonon bath. Comparing the results obtained using these two master equations with those from a recent DQD experiment and its corresponding weak-coupling theoretical method, we find that the original parameter set used in the experiment and theoretical method is not in the weak-coupling parameter regime. By using the full-polaron master equation with a slight adjustment on only the value of the interdot separation in the original experimental parameter set, we find that a reasonable fit to the experimental measured time-averaged steady-state population data can be achieved. The adjusted interdot separation is within the possible values allowed by the geometry of the surface gates that define the DQD in the experiment. Our full-polaron equation approach does not require the special renormalization scheme employed in their weak-coupling theoretical method, and can still describe the experimental results of driving-induced phonon-enhanced step-like shoulder behaviors in the experiment. This demonstrates that the full-polaron master equation approach is a correct and efficient tool to describe the steady-state properties of a driven spin-boson model in the case of strong system-environment coupling.