RICE QUANTUM GROUP MEETING SEMINAR SERIES

Dissipation-Assisted Steady-State Entanglement Engineering based on Electron Transfer Models

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Mingjian is a graduate student working in Prof. Han Pu's research group. His research interests include quantum simulation, quantum information, open quantum system theories, and spin-boson models.

March 7th, 2025, 12 – 1:30 PM
SST 300

ABSTRACT

In this talk, I will present a series of dissipation-assisted entanglement generation protocols that can be implemented on a trapped-ion quantum simulator. Our approach builds on the single-site molecular electron transfer (ET) model recently realized in experiment [So *et al., Sci. Adv.* **10**, eads8011 (2024)], which utilizes spin-dependent boson displacement and dissipation controlled by sympathetic cooling. I will demonstrate how coupling this model to external degrees of freedom enables precise control over both spin and phonon steady states in a target subsystem. Using realistic interactions in a trapped-ion system, our protocol can generate N-qubit and N-boson W states, as well as generalized N-qubit Dicke states with tunable excitation numbers. Potential experimental implementations of these schemes will also be discussed.

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