RICE QUANTUM GROUP MEETING SEMINAR SERIES

Presenter: Diego Fallas Padilla

Research Group: Prof. Han Pu's group

Date: June 30, 2023, Friday

Time: 4PM - 5PM

Venue: SST 301A

The tricritical Dicke model with and without dissipation

Abstract:

The Dicke model, which describes a quantized light field interacting with an ensemble of two-level atoms, is a cornerstone model of quantum optics. It illustrates the collective phenomena of superradiance in a non-transient way through the second-order superradiant phase transition observed when the light-atom interaction strength is varied. Here we present a generalization of this model, the tricritical Dicke model (TDM), where the transition between the normal and superradiant phases can be tuned from second- to first-order, across a tricritical point. This is achieved by replacing the two-level atoms with three-level atoms. A full characterization of all different critical manifolds is done through the determination of the scaling behavior of the different observables. Additionally, we consider the robustness of these rich phase diagram regions when losses are incorporated into the model, leading to multiple stable phases and a modification of the phase boundary geometries. The richness of the phase diagram of the TDM and other associated generalized Dicke models makes them attractive candidates to explore quantum criticality both in and out of equilibrium.

Short Bio:

Diego Fallas Padilla is a 5th year PhD candidate working in Professor Han Pu's group. He is interested in quantum many body physics in the context of boson-spin interacting systems. He has worked in different generalizations of the Dicke and Rabi models that allow the study of multicriticality, quantum entanglement, chiral phases of matter, and quantum metrological aspects in such systems. Moving forward, he is interested in studying entanglement generation in these platforms, especially, when dissipation is included in the mix. Before joining Rice in 2019, he obtained his BSc. in Physics at the University of Costa Rica.

Note: *Snacks and Coffee will be served during the event Wine & cheese will be served after the talk. Everyone is welcome to stay around after the seminar for further informal discussions.*