

Manybody Ramsey Spectroscopy in the Bose Hubbard Model

Wednesday, 13 September 2023 09:20 (35 minutes)

In this talk I will describe work in the Simon/Schuster collaboration exploring protocols to build and probe manybody states of light. Beginning with an overview of the analogy between photons in a lattice of cavities and electrons in solids, I will then focus in on our explorations of Hubbard physics in a quantum circuit, where we have demonstrated the ability to build crystals of light using reservoir engineering, and more recently, disorder-assisted adiabatic preparation of fluids. I will then extend the adiabatic preparation protocol to an ancilla-controlled protocol, where we entangle the state of the fluid with the state of the ancilla. By subsequently undoing this entanglement, and sandwiching the entanglement/disentanglement sequence within an ancilla Ramsey sequence, we are able to develop thermodynamic probes of the manybody system, and even enhance the coherence of these probes through manybody spin-echo. I'll conclude with application of these ideas to photonic NOON state generation for quantum-enhanced sensing, and pose the question: can small quantum computers fundamentally change how we probe quantum matter?

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