TCSUH SPECIAL SEMINAR

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Monday, July 17, 2023

Room 102, Houston Science Center, 1:00 p.m. – 2:00 p.m.

Fermi Hubbard Model with SU(3) Symmetry

ABSTRACT: The development of quantum simulators with alkaline-earth-like atoms opens the door to the study of Fermi-Hubbard models with larger spins and enhanced SU(N) symmetry. These models are predicted to exhibit interesting magnetic orderings in the Heisenberg limit. I will present our latest results regarding the SU(3) Fermi-Hubbard model in the square lattice at 1/3-filling. For that purpose, we use finite-temperature techniques such as determinant quantum Monte Carlo (DQMC) and numerical linked-cluster expansion (NLCE), and also perform ground state calculations using Constrained Path quantum Monte Carlo (CPQMC). We present the T-U phase diagram of the model, in which we observe signatures of the metal-insulator transition and magnetic crossovers and locate the quantum critical point at Uc/t ~ 6. From the analysis of the spin correlation functions we observe the development of a short-ranged two sublattice (2-SL) antiferromagnetic structure, as well as an emerging three sublattice (3-SL) antiferromagnetic structure as the temperature is lowered below T/J <~ 0.57. Finally, I will connect with experiments and discuss how the features of the T-U phase diagram can be explored with alkaline-earth-like atoms in optical lattices.

BIO: One Eduardo Ibarra-García-Padilla received his B. Sc. in Physics from Universidad Nacional Autónoma de México (UNAM). Eduardo then moved to Houston to pursue his PhD in Atomic Physics at Rice University, where he was advised by Kaden Hazzard and worked in projects regarding quantum simulators with alkaline-earth- like atoms. After graduation in Fall 2022 he moved to California where he currently holds a postdoctoral position at the University of California Davis and San Jose State University working with Richard Scalettar and Ehsan Khatami in many-body strongly correlated systems.

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