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Abstract

Quantum Simulation of SU(4) Symmetric Spin Lattice Models †

Bruno Uchoa

Department of Physics and Astronomy, University of Oklahoma, Norman, OK 73019, USA; uchoa@ou.edu

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Quantum spin-orbital liquids are strongly correlated states that emerge from quantum frustration between spin and orbital degrees of freedom. Those states are highly entangled, have non-local excitations but do not break any symmetries. A promising route towards observing those elusive states is the creation of artificial Mott insulators, where antiferromagnetic correlations between spins and orbitals can be designed. I will show that Coulomb impurity lattices on the surface of gapped honeycomb substrates, such as graphene on SiC, can be used to simulate SU(4) symmetric spin-orbital lattice models in the Mott regime. The antiferromagnetic correlations follow from super-exchange interactions between Coulomb impurity bound states at quarter filling, with spin and valley degeneracies. I propose that quantum spin-orbital liquids can be engineered in artificially designed solid-state systems at vastly higher temperatures than achievable in optical lattices with cold atoms.