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Quantum Monte Carlo study of entanglement entropy for dipolar hardcore bosons in optical lattices WEI WANG, Homer L. Dodge Department of Physics, University of Oklahoma, ARGHAVAN SAFAVI-NAINI, JILA, National Institute of Standards and Technology and Department of Physics, University of Colorado, BARBARA CAPOGROSSO-SANSONE, Department of Physics, Clark University — Entanglement entropy and its scaling with system size provide an alternative way to characterize quantum phases and phase transitions, and can be used to probe topological order. Motivated by the recent theoretical investigation of entanglement properties of the ground-states of hard-core lattice bosons, we use Quantum Monte Carlo simulations, well suited to studying equilibrium properties, to calculate the Renyi entropy and topological entanglement entropy of the ground state of dipolar lattice bosons. In contrast to the traditional observables, these probes allow us to study the emergence of long-range entanglement in the ground state, as well as its dependence on the dipolar coupling. Additionally, in light of recent experimental success in creating low entropy dipolar lattice gases we discuss the possibility of observing these phases experimentally.

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