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Two species Bosonic Hubbard model in a two-dimensional optical lattice KALANI HETTIARACHCHILAGE, VALY ROUSSEAU, JUANA MORENO, MARK JARRELL, Department of Physics and Astronomy, Louisiana State University, Baton Rouge, Louisiana 70803, USA — We study a two-component hardcore bosonic Hubbard model in a two- dimensional optical lattice by performing Quantum Monte Carlo (QMC) simulations. Our model contains a repulsive interspecies interaction between the two species of bosons and a hopping term between nearest neighbors. The phase diagram shows magnetic orderings, insulatings and superfluid phases as a function of doping for balanced populations. We predict the appearance of a first order phase transition from an antiferromagnetic phase to a superfluid phase near half filling. A phase transition from superfluid to an exotic phase occurs away from half filling at very low temperature.

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