Ferromagnetic Phase Separated Region in the Polarized Two-species Bose Hubbard Model[1] KALANI HETTIARACHCHILAGE, VALERY G. ROUSSEAU, KA-MING TAM, JUANA MORENO, MARK JARRELL, Louisiana State University, Baton Rouge, Louisiana 70803, USA — We study a doped two-dimensional bosonic Hubbard model with two hard-core species using quantum Monte Carlo simulations [Phys. Rev. B 88, 161101(R) (2013)] . Upon doping away from half-filling, we find several distinct phases including a phase separated ferromagnet with Mott behavior for the heavy species and both Mott and superfluid behaviors for the light species. Introducing an imbalance in the population between two species, we find a perfect phase separated ferromagnet. This phase exists for a broad range of temperatures and polarizations. By using finite size scaling of the susceptibilities, we find the critical exponent of the correlation length, $\nu = \dfrac{7}{4}$ which is the critical exponent for a two-dimensional Ising ferromagnet. Importantly, since the global entropy of this phase is relatively high, experimental observations in cold atoms may be achievable.

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