

Supersolid Mechanism of Dipolar Bosons and Double Peak Structure in Momentum Distribution

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We study the checkerboard supersolid¹ of the hard-core Bose-Hubbard model with dipole-dipole interactions. This supersolid is qualitatively different from all other supersolids found in lattice models in the sense that *superflow paths* for interstitials or vacancies are absent in the crystal. We reveal that the long-range repulsive interaction plays an important role for the appearance of this supersolid. By exact quantum Monte Carlo simulations, we also observed the double peak structure in the momentum distribution of bosons, indicating the coexistence of superfluidity and solidity. This can be measured by time-of-flight experiment in optical lattice systems.

¹Capogrosso-Sansone *et. al.*, Phys. Rev. Lett. **104**, 125301 (2010)