

# Checker-board supersolid phase in the multi-component Bose-Hubbard model on the square lattice

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Supersolid phase is a phase that has diagonal and off-diagonal long-range order simultaneously [1, 2]. It was shown that checker-board supersolid (CSS) phase with non-zero component of static structure factor  $q = (\pi, \pi)$  and non-zero superfluid order is unstable on the square lattice with short-range of interactions[1, 2].

In this work we introduce a generalized Bose-Hubbard model with two component bosons and stable CSS phase in the short-range of interactions. We calculated ground state phase diagram numerically by using cluster mean-field approach that is the case of mixing mean-field and exact solution. Finally we found effects of temperature on the phase diagram.

[1] G. G. Batrouni and R. T. Scalettar, Phys. Rev. Lett. **84**, 1599 (2000).

[2] D. Yamamoto, A. Masaki, and I. Danshita Phys. Rev. B **86**, 054516 (2012).