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Exotic Phases of Hard-core Bosons with Correlated Hopping KAI P. SCHMIDT, JULIEN DORIER, Institute for Theoretical Physics, Ecole Polytechnique Federale de Lausanne, Switzerland, ANDREAS LAEUCHLI, Institut Romand de Recherche Numerique en Physique des Materiaux (IRRMA), Lausanne, Swizterland, FREDERIC MILA, Institute for Theoretical Physics, Ecole Polytechnique Federale de Lausanne, Switzerland — We investigate the interplay of correlated hopping and repulsive interactions for hard-core bosons on a square lattice using quantum Monte Carlo simulations. The first part of this contribution is on a remarkable low-density pairing phase. While for non interacting hard-core bosons the effective attraction induced by the correlated hopping leads to phase separation at low density, we show that a nearest-neighbor repulsion suppresses phase separation, leading to a low-density pairing phase with no single particle Bose-Einstein condensation but long-range two-particle correlations, signalling a condensation of pairs. The second part of this contribution targets at the physics at higher densities. Here, the most important question is the possible existence of a supersolid phase in such a model with correlated hopping.
[1] K.P. Schmidt, J. Dorier, A. Laeuchli, and F. Mila, Phys. Rev. B 74, 174508 (2006).

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