

Seminar on Condensed Matter Theory

Group of Theoretical Physics at the Department of Condensed Matter Physics of Charles University has a pleasure to invite you to attend the seminar

**on 19 November 2020 at 13:00
as an online webinar**

Contact K. Carva (carva@karlov.mff.cuni.cz) for the online access information.



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Crystallization of Ultracold Dipolar Bosons

Ultracold atoms with dipole-dipole interactions have become a popular tool to simulate and understand the physics of long-range interacting systems. The competition of kinetic, potential, and interaction energy leads to the emergence of a variety of crystal state orders with characteristic one- and two-body densities and Glauber correlation functions. We probe the transitions between these orders and construct the emergent state diagram as a function of the dipolar interaction strength and the lattice depth. We find extremely rich physics going beyond the standard superfluid and Mott-insulator states for both, commensurate or incommensurate filling. Already a simple one-dimensional model system exhibits a plethora of different crystal states with intriguing many-body characteristics that we identify with an order parameter constructed from the eigenvalues of the reduced one-body density matrix. Moreover, we show that the crystal state orders and order parameter can be observed using the full distribution functions of the particle number or the variance and imbalance extracted from single-shot images, i.e., projective measurements of the many-body wavefunction.

