

Joint Quantum Institute Seminar
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Physics 1201

Exploring new states of matter in the p -orbital bands of optical lattices

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Optical lattices with cold atoms have become a new frontier for exploring interesting physics in strongly correlated systems. In particular, recent experiments on high orbital bands provide a wonderful new opportunity for studying orbital physics, which is characterized by orbital degeneracy and spatial anisotropy. In this talk, we will present new features of orbital physics in the p -orbital bands with bosons and fermions, which are not usually realized in solid state systems. These include quantum stripe ordering of orbital angular momentum moments in the triangular lattice, Wigner crystallization of neutral atoms in the flat band of the honeycomb lattice, and frustrated superfluidity with time-reversal symmetry breaking in the double-well lattice. Signatures of these new states in the time of flight experiments will be discussed.

References:

1. W. V. Liu, and C. Wu, "Atomic matter of nonzero-momentum Bose-Einstein condensation and orbital current order", Phys. Rev. A 74, 13607 (2006).
2. C. Wu, W. V. Liu, J. Moore, and S. Das Sarma, "Quantum stripe ordering in optical lattices", Phys. Rev. Lett. 97, 190406 (2006).
3. C. Wu, D. Bergman, L. Balents, and S. Das Sarma, "Flat band and Wigner crystallization in the honeycomb optical lattices", to be submitted.

Host UMD: Steven Rolston

