Unconventional Bose-Einstein condensation in high orbital bands
CONGJUN WU, The Department of Physics, University of Science and Technology of China, ZI CAI, The Department of Physics, University of California, San Diego, ANDREAS HEMMERICH, Institut für Laser-Physik, Universität Hamburg, Luruper Chaussee 149, 22761 Hamburg, Germany — We perform the theoretical study on unconventional Bose-Einstein condensations (UBEC) in higher orbital bands of optical lattices observed by Hemmerich’s group. These exotic states of bosons are non-zero condensation wavevectors, and thus beyond the “no-node” paradigm. We have studied various effects on UBECs including lattice asymmetry and interactions. The interplay between the kinetic and interaction energies gives rise to two different UBECs with the real and complex-valued condensation wavefunctions, respectively. The latter spontaneously breaks time-reversal symmetry, which is impossible in usual BEC systems.