

Spin-orbit Coupled Boson Superfluid

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Recently, spin-orbit coupled boson condensate has been realized in NIST experiment, and there are many proposals to generate various types of spin-orbit coupling in cold atom setup. I will present our theoretical results about ground state and finite temperature properties of spin-orbit coupled interacting bosons. At zero temperature this system exhibits two different phases, the plane wave phase and the stripe phase. At finite temperature, melting of stripe order gives rise to a novel phase, i.e. boson paired superfluid which supports fractionalized vortices. I shall present the phase diagram of this system in terms of temperature, interaction and anisotropy of spin-orbit coupling. Moreover, I will discuss collective modes, vortices and the response to optical lattices of spin-orbit coupled superfluids;^{1 2}

¹Chunji Wang, Chao Gao, Chao-Ming Jian and Hui Zhai, Phys. Rev. Letts. **105**, 160403 (2010).

²Chao-Ming Jian and Hui Zhai, to be published