BEC with Spin-Orbit coupling

Shuai Chen*[1]

[1]University of Science and Technology of China – China

Abstract

We report the experiment of quantum simulations with synthetic spin-orbit coupled Bose gas.
Raman coupling technique is applied to generate the spin-orbit (SO) coupling in 1D with ultracold

Bose gas of 87Rb. It also leads to many new phenomena of boson superfluidity and various

condensate phases. We experimentally determine the phase diagram of SO coupled Bose gas at

finite temperature, including the critical temperature, the phase transition and phase boundary

between density striped (ST) phase and magnetized plane wave (MG) phase, as well as the

temperature that the magnetic order is established. Furthermore, Bragg spectroscopy is applied to

study the excitation of SO coupled BEC. "Roton" mode and its softening is observed in the

excitation spectrum, which only short range and weak atom-atom interactions is presented. The

softening of phonon modes is also observed, which give us some new understanding of the superfluidity in SO coupled Bose gas. Our study shows the true power of quantum simulation.

*Speaker