Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Half-quantum vortex state and its excitations in a spin-orbit coupled spinor Bose-Einstein condensate[1] B. RAMACHANDHRAN, Department of Physics and Astronomy, and Rice Quantum Institute, Rice University, Houston, TX 77005, USA, BOGDAN OPANCHUK, XIA-JI LIU, ACQAO and Centre for Atom Optics and Ultrafast Spectroscopy, Swinburne University of Technology, Melbourne 3122, Australia, HAN PU, Department of Physics and Astronomy, and Rice Quantum Institute, Rice University, Houston, TX 77005, USA, HUI HU, ACQAO and Centre for Atom Optics and Ultrafast Spectroscopy, Swinburne University of Technology, Melbourne 3122, Australia — We investigate theoretically the condensate state and collective excitations of a spin-orbit coupled spinor Bose gas in two-dimensional harmonic traps. In the weakly interacting regime, when the inter-species interaction is larger than the intra-species interaction ($g_{\uparrow\downarrow} > g$), we find that the condensate state has a half-quantum-angular-momentum vortex configuration (half-vortex state) with spatial rotational symmetry and skyrmion-type spin texture. We investigate the stability of half-vortex state in the regime when g is greater than a threshold g_c, and in the regime when $g_{\uparrow\downarrow} < g$, by solving the Bogoliubov equations for collective density oscillations. In addition, we also investigate the dynamical properties of the half-vortex state. We present the phase diagram as a function of interatomic interaction and spin-orbit coupling.

[1]HP is supported by the NSF, the Welch Foundation (Grant No. C-1669) and the DARPA OLE program.

Ramachandhran Balasubramanian
Department of Physics and Astronomy, and Rice Quantum Institute,
Rice University, Houston, TX 77005, USA

Date submitted: 28 Nov 2011 Electronic form version 1.4