Abstract Submitted
for the DAMOP15 Meeting of
The American Physical Society

Striped ferronematic ground states in a spin-orbit coupled $S = 1$ Bose gas[1] WILLIAM COLE, STEFAN NATU, XIAOPENG LI, Condensed Matter Theory Center and Joint Quantum Institute, University of Maryland, College Park — We theoretically establish the mean-field phase diagram of a homogeneous spin-1, spin-orbit coupled Bose gas as a function of the spin-dependent interaction parameter, the Raman coupling strength and the quadratic Zeeman shift. We find that the interplay between spin-orbit coupling and spin-dependent interactions leads to the occurrence of ferromagnetic or ferronematic phases which also break translational symmetry. For weak Raman coupling, increasing attractive spin-dependent interactions induces a transition from a uniform to a stripe XY ferromagnet with no nematic order. For repulsive spin-dependent interactions, however, we find a transition from an XY spin spiral phase with uniaxial nematic order, to a biaxial ferronematic, where the total density, spin vector and nematic director oscillate in real space. We investigate the stability of these phases against the quadratic Zeeman effect, which generally tends to favor uniform phases with either ferromagnetic or nematic order but not both. We discuss the relevance of our results to ongoing experiments on spin-orbit coupled, spinor Bose gases.

[1]We gratefully acknowledge support from JQI-NSF-PFC, AFOSR-MURI, and ARO-MURI (Atomtronics)

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Date submitted: 30 Jan 2015 Electronic form version 1.4