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Striped Ferronematic ground states in a spin-orbit coupled spin-1 Bose gas STEFAN NATU, XIAOPENG LI, WILLIAM COLE, University of Maryland and the Joint Quantum Institute — Motivated by recent experiments on spin-orbit coupled quantum gases, and the recent cooling to degeneracy of large spin atoms, we explore the ground state phase diagram of a spin-orbit coupled spin-1 Bose gas. A key new feature of large spin systems is the appearance of liquid crystalline order such as nematic or more exotic platonic solid order, which has no analog in solid state. Here we explore the interplay between spin order, translational symmetry breaking induced by spin-orbit coupling and these liquid crystalline order parameters in the experimentally relevant spin-1 system, finding a rich phase diagram. For repulsive spin-dependent interaction, we find a transition from a uniaxial ferronematic phase with XY spiral spin order but uniform total density to a biaxial ferronematic phase with stripes in the total density. As a function of the quadratic Zeeman shift (q), for attractive spin dependent interactions, we find a transition from a ferromagnetic stripe phase which breaks translational symmetry in real space to a uniform ferromagnet for q¿0 and a uniform nematic phase for q¡0. We discuss the implications of our predictions to ongoing experiments on spin-orbit coupled large spin quantum gases.

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