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Magnetic phase diagram of a spin-1 condensate in two dimensions with dipole interaction JONAS KJÄLL, ANDREW ESSIN, University of California, Berkeley, JOEL E. MOORE, University of California, Berkeley and Lawrence Berkeley National Laboratory — Several new features arise in the ground-state phase diagram of a spin-1 condensate trapped in an optical trap when the magnetic dipole interaction between the atoms is taken into account along with confinement and spin precession. The boundaries between the regions of ferromagnetic and polar phases move as the dipole strength is varied and the ferromagnetic phases can be modulated. The magnetization of the ferromagnetic phase perpendicular to the field becomes modulated as a helix winding around the magnetic field direction, with a wavelength inversely proportional to the dipole strength. This modulation should be observable for current experimental parameters in ^{87}Rb. Hence the much- sought supersolid state, with broken continuous translation invariance in one direction and broken global $U(1)$ invariance, occurs generically as a metastable state in this system as a result of dipole interaction. The ferromagnetic state parallel to the applied magnetic field becomes striped in a finite system at strong dipolar coupling.

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