

Abstract Submitted
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Singular Atom Optics with Spinor BECs JUSTIN T. SCHULTZ, AZURE HANSEN, NICHOLAS P. BIGELOW, University of Rochester — We create and study singular spin textures in pseudo-spin-1/2 BECs. A series of two-photon Raman interactions allows us to not only engineer the spinor wavefunction but also perform the equivalent of atomic polarimetry on the BEC. Adapting techniques from optical polarimetry, we can image two-dimensional maps of the atomic Stokes parameters, thereby fully reconstructing the atomic wavefunction. In a spin-1/2 system, we can represent the local spin superposition with ellipses in a Cartesian basis. The patterns that emerge from the major axes of the ellipses provide fingerprints of the singularities that enable us to classify them as lemons, stars, saddles, or spirals similar to classification schemes for singularities in singular optics, condensed matter, and liquid crystals. These techniques may facilitate the study of geometric Gouy phases in matter waves as well as provide an avenue for utilizing topological structures as quantum gates.

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