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Synthetic magnetic monopole field created by two-photon Raman process in a pseudo-spin-1/2 spinor Bose-Einstein condensate ZEKAI CHEN, JOSEPH D. MURPHREE, MAITREYI JAYASEELAN, ELISHA HABER, Department of physics, University of Rochester, SUXING HU, NICHOLAS P. BIGELOW, Laboratory for Laser Energetics, University of Rochester — Since the beginning of the systematic study of electromagnetism hundreds of years ago, magnetic monopole have been an interesting problem in many research areas, especially in high energy and condensed matter physics. The search for naturally existing magnetic monopole has been going on for decades, and no convincing evidence for the natural magnetic monopole has been found in the laboratory so far. However, in the study of spinor quantum gases, it is possible to construct a synthetic monopole magnetic field by engineering the electromagnetic field interacting with the atoms. The Dirac monopole generated by superposition of quadrupole magnetic field and by the artificial gauge field in the dark state manifold has been studied in a spin-1 Bose-Einstein condensate (BEC). In this work, we present a new method of creating a synthetic magnetic monopole field by a modified two-photon Raman process in a pseudo-spin-$\frac{1}{2}$ BEC. We also explore the ground state spin texture of the pseudo-spin-$\frac{1}{2}$ BEC in a spherically symmetric harmonic trap by numerically solving the Gross-Pitaevskii equation.

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