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**Berry-gauge tuned Bose-Einstein condensate gyroscope**[1] RUDRA KAFLE, Worcester Polytechnic Institute, Worcester, MA 01609, EDDY TIMMERMANS, T- 4, Los Alamos National Laboratory, Los Alamos, NM 87544 — If stable, the many-body ground state of a dilute gas of ultra-cold, bosonic atoms occupying a superposition of two internal (hyperfine) states is a Bose-Einstein condensate (BEC) of effective spin 1/2 bosons. The superfluid BEC dynamics admits long-lived quantized vortex states in which the complex phase of the superfluid order parameter, which we call the charge phase, undergoes an integer number of $2\pi$ windings along a multiply connected path - a closed trajectory that encloses a region in which the superfluid density vanishes. In response to an overall rotation of the ring, a quantization event can occur that can be used to sense rotation. Unfortunately, the sensitivity of the ring BEC gyroscope would be limited as the quantization event sets in at a rotation frequency that is not as low as the frequencies measured by other devices such as ring laser gyroscopes. We show that the recently realized synthetic magnetic fields, in which the controlled position dependence of the spin results in an effective gauge field, can tune the BEC ring gyroscope to trigger a quantization event at much smaller rotation frequency. In addition, the effective gauge field can undergo its own quantization events in which the spin vector undergoes an integer number of $2\pi$ or $4\pi$ windings.

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