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A compact guided-atom interferometer gyroscope with Earth-rate sensitivity[1] CHARLES SACKETT, EDWARD MOAN, ZHE LUO, SETH BERL, ADAM FALLON, University of Virginia — We describe the implementation of a Sagnac interferometer using atoms in a magnetic trap. A Bose-Einstein condensate is manipulated using Bragg laser beams to produce four wave packets constituting two simultaneous interferometers. Each packet moves along a near-circular orbit of radius 0.2 mm in a cylindrical harmonic trap with frequency 10 Hz. The interferometers close and exhibit a visibility of about 60%. A variety of common-mode noise sources cause each individual interferometer output to fluctuate, but the differential phase is stable and depends on the platform rotation, with small corrections from residual asymmetries in the trap potential. We have characterized the gyroscopic performance by slowly rotating the floating optical table on which the apparatus rests, obtaining a sensitivity of about 10^{-5} rad/s with an effective enclosed area of 0.5 mm^2. We also characterize the residual phase from the trap, and find that it can be understood using a simple model. We will discuss potential applications and prospects for further improvements.

[1]NASA, NSF

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