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Integrated rotation sensing platform based on matter-wave solitons AVINASH DESHMUKH, HIL FUNG HARRY CHEUNG, YOGESH S PATIL, Cornell University, SUNIL BHAVE, Purdue University, MUKUND VENGALATTORE, Cornell University — Matter-wave Sagnac interferometers are capable of extraordinary levels of rotation sensitivity when compared to state-of-the-art fiber optic gyroscopes [1,2]. However, actual implementations of such matter-wave rotation sensors in a compact, integrated platform have remained elusive due to various technical and fundamental considerations. We propose an experimental implementation of a matter-wave Sagnac interferometer based on confinement of an ultracold gas in the evanescent wave optical dipole trap around a microfabricated Silica microresonator. We consider the Sagnac effect on matter-wave solitons created within this ultracold gas. We show that soliton-based rotation sensing can exhibit superior performance compared to conventional matter-wave Sagnac interferometry. We present theoretical and preliminary experimental results of stability, bias and sensitivity of soliton-based rotation sensing.

[1] P. Berman, Atom Interferometry, Academic Press
[2] T L Gustavson, et al., Classical and Quantum Gravity 17 (12), 2385

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