Abstract Submitted
for the DAMOP18 Meeting of
The American Physical Society

Rotation Sensing with a Trapped Barium Ion RANDY PUTNAM, ADAM WEST, WESLEY CAMPBELL, PAUL HAMILTON, UCLA — To date, the best rotation sensors are Sagnac interferometers. The associated phase Φ due to a rotation rate $\vec{\Omega}$ is proportional to the particle energy E and the enclosed area $\vec{A}$ of the interferometer:$\Phi = \frac{4\pi E}{hc^2}\vec{A}\cdot\vec{\Omega}$. We present an experiment using a ground state Zeeman qubit and a modified version of the recently developed spin-dependent kicks technique [1] to create an interferometer with a single $^{138}Ba^{+}$ ion in a linear Paul trap ($r_0 = 1$ cm) [2]. With a trap this large it is difficult to operate in the Lamb-Dicke regime, but the initial ion velocity may only reduce contrast and will not produce an additional phase shift. We will reach sensitivities comparable to other matter-wave interferometers (~ 1 μrad $s^{-1}Hz^{-1/2}$) by taking advantage of the extra energy afforded by using massive particles and the long coherence time of the ion (at least 1 s), allowing it to orbit in the trap many times before closing the interferometer.

References

[1] J. Mizrahi et al., Phys. Rev. Lett.**110**, 203001 (2013)

[2] W. C. Campbell and P. Hamilton, J. Phys. B.**50**, 064002 (2017)

Randy Putnam
UCLA

Date submitted: 09 Apr 2018 Electronic form version 1.4