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Rotation Sensing with Trapped Ions[1] ADAM WEST, No Company Provided, RANDY PUTNAM, WES CAMPBELL, PAUL HAMILTON, UCLA — We report on work towards realizing a precision rotation sensor with a single trapped $^{138}Ba^{+}$ ion [1], building on the recently-developed technique of spin-dependent kicks (SDKs) [2,3] with a novel scheme based on a Zeeman qubit. We have demonstrated single-qubit manipulations in the ground state manifold of $^{138}Ba^{+}$, using a picosecond pulsed laser to drive Raman transitions, 44 THz detuned, with Rabi frequencies up to $\sim$100 kHz. We also report on recent progress on using the same system to effect spin-motion entanglement. Demonstrating such entanglement will quickly enable free-oscillation interferometry with ultracold trapped ions. Anticipated rotation sensing precision will be competitive with commercial rotation sensors. Implementation of SDKs with Zeeman levels in ^{138}Ba may also provide a versatile technique of achieving large momentum transfer that could be broadly applicable to matter-wave interferometery.

References:

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

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

[3]Jaffe et al., Phys. Rev. Lett. 121, 040402 (2018)

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