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Towards a Measurement of the Nuclear Magnetic Octupole Moment of ^{137}Ba[1] MATTHEW HOFFMAN, ADAM KLECZEWSKI, ERIC MAGNUSON, E.N. FORTSON, BORIS BLINOV, University of Washington — Measurements of hyperfine structure in a ^{133}Cs atom resolved a nuclear magnetic octupole moment, Ω, much larger than expected.[2] To explore this anomaly further, we are undertaking an experiment to measure the hyperfine structure of the 5D levels of ^{137}Ba. We will selectively populate the m=0 states in the $5D_{3/2}$ manifold by driving the $6S_{1/2}$ to $5D_{3/2}$ electric quadrupole transition using a commercially available Tm,Ho:YLF laser. Using the Pound-Drever-Hall frequency stabilization method we locked this laser to a high finesse cavity made of ULE glass and demonstrated a laser linewidth of less than 750 Hz. Once the barium ion is initialized to an m=0 state of a chosen $5D_{3/2}$ hyperfine sublevel, we will perform RF spectroscopy to measure the hyperfine splittings with mHz precision. A measurement the $5D_{3/2}$ hyperfine intervals combined with a similar measurement of the $5D_{5/2}$ hyperfine intervals (using a 1762 nm fiber laser) will allow theorists to extract a value for Ω.

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[2]V. Gerginov, A. Derevianko, and C. E. Tanner, Phys. Rev. Lett. 91, 072501

Matthew Hoffman
University of Washington

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