

Abstract Submitted  
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**Search for a long-range, monopole-dipole (spin-mass) coupling of the proton**<sup>1</sup> JORDAN DUDLEY, JULIAN VALDEZ, CLAUDIO SANCHEZ, DOMINIC FUENTES, DEREK JACKSON KIMBALL, California State University - East Bay — We discuss progress in our search for a hypothetical long-range coupling between rubidium (Rb) nuclear spins and the mass of the Earth [D. F. Jackson Kimball et al., *Annalen der Physik* 525(7), 514-528 (2013)]. The experiment consists of simultaneous measurement of the spin precession frequencies of overlapping ensembles of Rb-85 and Rb-87 atoms contained within an evacuated, antirelaxation-coated vapor cell. Because of the nuclear structure of Rb-85 and Rb-87, the experiment is particularly sensitive to anomalous spin-dependent interactions of the proton. We have studied a number of important systematic effects related to vector and tensor light shifts, the nonlinear Zeeman effect, the ac Zeeman effect, collisions, and the rotation of the Earth. We anticipate that our experiment can improve sensitivity to anomalous long-range spin-mass couplings of the proton compared to previous experiments by an order of magnitude.

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