

Abstract Submitted
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Search for an anomalous spin-mass coupling with a dual isotope rubidium comagnetometer¹ CESAR RIOS, JULIAN VALDEZ, JERLYN SWIATLOWSKI, JACKIE KREMER, DEREK 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. The experiment employs a dual-isotope Rb comagnetometer: the valence electron dominates magnetic interactions and serves as a precise magnetic field monitor for the nuclei in a simultaneous measurement of Rb-85 and Rb-87 spin precession frequencies, enabling accurate subtraction of magnetic perturbations. The nuclear structure of Rb makes the experiment particularly sensitive to non-magnetic, spin-dependent interactions of the proton. The majority of recent searches for similar effects limit anomalous couplings of either the neutron or electron spin, so the proposed experiment searches a parameter space to some degree, depending on the theoretical model, orthogonal to that constrained by previous experiments. We have begun to collect data and carry out in-depth analysis of systematic effects. The optimized dual-isotope Rb magnetometer has the sensitivity to improve experimental limits on long-range spin-mass couplings by an order of magnitude in general and by three orders of magnitude for the proton spin in particular.

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