

Abstract Submitted  
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**Progress Toward a Free Precession Hg-Cs Co-magnetometer for  
Measurements of Long-Range Spin-Spin Interactions<sup>1</sup>** NATHAN CLAY-

BURN, CLAIRE CARLIN, STEPHEN PECK, LARRY HUNTER, Amherst College

— We report progress on the development of a Hg-Cs co-magnetometer for use in an experimental search for long-range spin-spin interactions (LRSSI) using the Earth as a polarized spin source. Our new apparatus uses a pump-then-probe geometry in which the light beams are perpendicular to the applied field such that no first-order light shifts should arise. These light shifts are believed to have limited the LRSSI bounds established by our previous experiment [1]. We have demonstrated that the statistical sensitivity of this new scheme is sufficient to achieve an order of magnitude improvement over previous limits. Investigations of systematics associated with variations of the frequency and power of the light beams are also reported. [1] L.R. Hunter, J.E. Gordon, S.K. Peck, D. Ang, and J.-F. Lin, *Science* **339**, 928 (2013).

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Nathan Clayburn  
Amherst College

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