

Abstract Submitted  
for the APR20 Meeting of  
The American Physical Society

**exotic spin-spin-velocity-dependent interaction measurement with a SERF magnetometer and a polarized DyIG sample**<sup>1</sup> PINGHAN CHU, YOUNG JIN KIM, IGOR M. SAVUKOV, SHAUN G. NEWMAN, Los Alamos National Laboratory, JOSHUA C. LONG, Indiana University Bloomington — Exotic spin-dependent interactions have recently attracted much attention because their discovery can lead to new physics beyond the Standard Model. The exotic interactions between fermions can be mediated by new fundamental spin-0 or spin-1 bosons such as the axion or the dark photon. Lately, a new experimental approach based on highly sensitive spin-exchange relaxation free (SERF) magnetometers has been introduced to search for exotic spin-dependent interactions. The current constraints have been significantly improved using SERF magnetometers to detect magnetic-field-like effects induced by the interactions. For a polarized target, ferrimagnetic dysprosium iron garnet (DyIG) was proposed due to its near-zero magnetization at the critical temperature around 220-240 K. We will present our first measurements on exotic spin-spin-velocity-dependent interactions between polarized electron spins of DyIG sample and polarized Rb spins of a SERF magnetometer. A significant challenge is minimization of magnetic noise from the DyIG sample, which can be done by keeping the sample at near-zero magnetization using thermally stabilized cooling system and using methods for subtracting systematic effects from residual magnetization.

<sup>1</sup>We acknowledge the support of the U.S. Department of Energy through the LANL Laboratory Directed Research & Development program for this work.

Pinghan Chu  
Los Alamos National Laboratory

Date submitted: 10 Jan 2020

Electronic form version 1.4