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Progress of spin-dependent mesoscopic force experiments with rare-earth garnet test masses EVAN WEISMAN, RAKSHYA KHATIWADA, HAIYANG YAN, HANS-OTTO MEYER, ERIC SMITH, JOSH LONG, Indiana University — We report on an experimental search for mesoscopic forces, with emphasis on interactions that depend on spin. Our technique uses 1 kHz mechanical oscillators as test masses with a stiff conducting shield in between them to suppress backgrounds, which has been used successfully to constrain mass-coupled forces in this range. With suitable modifications, including spin-polarized test masses, this experiment can be used to explore essentially all of the 15 possible forms of the spin-dependent interaction between electrons described in a recent review. We report on the progress of the test mass development, for which we are investigating ferrimagnetic rare earth iron garnet compounds that exhibit orbital compensation of the magnetism associated with the intrinsic electron spins. Another experiment, which uses a SQUID magnetometer to monitor the induced magnetization of a related garnet compound in the presence of a dense mass in close proximity, could provide even greater sensitivity to several of the possible interactions.

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