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Searches for exotic spin-dependent interactions[1]

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The existence of exotic bosons are hypothesized by a variety of theories proposed to solve the mysteries of dark matter, dark energy, the hierarchy problem, and the matter-antimatter asymmetry of the universe. Interactions mediated by such exotic bosons can be searched for in laboratory experiments by measuring spin-dependent energy shifts in atoms and molecules. We review our efforts to detect such exotic spin-dependent interactions, including a search for a monopole-dipole coupling between the mass of the Earth and rubidium nuclear spins [Jackson Kimball et al., Phys. Rev. D **96**, 075004 (2017)] and searches for dipole-dipole couplings by analyzing helium fine-structure [Ficek et al., Phys. Rev. A **95**, 032505 (2017)], studying J-coupling in deuterated molecular hydrogen [Ledbetter et al., Phys. Rev. Lett. **110**, 040402 (2013)], and investigating the interaction between trapped strontium ions [Kotler et al., Phys. Rev. Lett. **115**, 081801 (2015)].

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