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Searching for Axions and Axion-Like Particles via Spin-Dependent Interactions

The solutions to several important problems in modern physics may lead to new spin-dependent interactions mediated by axions or axion-like particles beyond the Standard Model. Experimental methods based on precision measurements are suitable for detecting these new interactions. We review various studies on detecting spin-dependent exotic interactions using polarized 3He, 129Xe+131Xe, polarized neutrons, and other particles. We also report recent experimental results for spin-velocity-dependent new interactions using rotating modulation mass sources and SERF magnetometer arrays. Additionally, we discuss the latest progress in constraining these exotic interactions on astronomical scales, using celestial bodies such as the sun and the moon as sources.

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