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Search for spin dependent exotic interactions using mechanical sensors and magnetic structures

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Extensions to the Standard Model often introduce new bosons that can mediate exotic spin-dependent interactions. The hypothetical bosons, including axions, majorons, dark photon, Z'bosons etc., may be candidates for dark matter particles. Searching for such spin-dependent interactions can extract important information about the bosons, such as mass and coupling strength with the Standard Model particles, thus providing an indirect approach for exploring dark matter particles. Here I will present the experiments we are conducting to search for spin- and velocity- dependent exotic interactions with mechanical sensors. These interactions may be mediated by spin-1 bosons, such as the generic Z'boson. Mechanical sensors are used to measure the force between a nucleon source and a spin-polarized electron source (magnetic structure). To distinguish between the exotic interaction and the electromagnetic forces, the spin-polarized electron sources are specially designed to generate space-modulated exotic interaction signals with a constant electromagnetic force background. Based on the preliminary experimental data, stronger constrains on the exotic interaction are given.

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