

The Sensitivity of Spin-Precession Axion Experiments

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Spin-precession experiments are the leading efforts to detect axion dark matter interacting with nuclei. The experimental strategy is to polarize the nuclear spin in one direction with a background magnetic field and search for spin-precession induced by the oscillating axion field using a sensitive magnetometer. I revisit the experimental strategy over all hierarchies between the relevant time scales: the axion coherence time, the integration time, and the spin-relaxation time. The calculation reveals new features in how the axion interacts with nuclear magnetic resonance experiments. The results are applicable to searches for the axion coupling to nucleons, and also the coupling to gluons, which would be responsible for solving the strong CP problem.

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