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Probing axion physics with spin

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The dynamics of spin in external electromagnetic, gravitational, and axion fields is analysed in the framework of the gravitoelectromagnetism approach in Einstein's general relativity theory. We consistently extend the recent studies from the flat Minkowski geometry to the curved spacetime manifolds, contributing to the discussion of the possible new role of a precessing spin as an "axion antenna" that can be used to detect the hypothetical axion-like dark matter. The formalism developed helps to clarify the subtle influence of the gravitational/inertial and axion fields in the ultra-sensitive high-energy spin experiments with charged particles and neutrons at accelerators and storage rings devoted to testing fundamental physical symmetries, including attempts to establish the nature of dark matter in the Universe.

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