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Axion Magnetic Resonance in Low-Energy Precision Experiments

It is well-known that axions and photons can coherently convert into each other in a background magnetic field, a phenomenon commonly observed in a mixed two-level quantum system such as neutrino oscillations and nuclear spin processions. Similar to the nuclear magnetic resonance and spin flips in a qubit system, we point out that an periodic (in time or space) background magnetic field can significantly enhance the axion-photon conversion. We denote this resonance as the Axion-Magnetic Resonance (AMR).

In this talk, I will illustrate the theoretical and experimental implications of the AMR, in particular in the context of laser-based axion searches and solar axion experiments (helioscopes). I will show its relevance for interesting some ALPs models and its capability in distinguishing different QCD axion models (KSVZ and DSFZ), independent of the axion relic abundance or cosmological history.

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