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Axions in electromagnetodynamics and their detection

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The Witten effect implies the electromagnetic interactions between axions and magnetic monopoles. Based on the quantum electromagnetodynamics, a generic low-energy axion-photon effective field theory was built by introducing two four-potentials (A^μ and B^μ) to describe a photon. More anomalous axion-photon interactions and couplings (g_{aAA}, g_{aBB} and g_{aAB}) arise in contrary to the ordinary axion coupling $g_{a\gamma\gamma}aF^{\mu\nu}\tilde{F}_{\mu\nu}$. As a consequence, the conventional axion Maxwell equations are further modified.

In this talk, I mainly discuss the theoretical framework of axion electromagnetodynamics. I will also show two axion searching strategies in the framework of QEMD, and give the corresponding sensitivity of couplings in different axion mass region.

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