

Detection of axion dark matter in solid state materials: exploiting the axion-electron coupling

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The properties of the QCD axion are described by several models that can be grouped into the KSVZ and DFSZ classes, depending on zero of full axion coupling to leptons, respectively. The axion-electron coupling, explicitly predicted by DFSZ models, has been considered to envisage the two types of haloscopes described in this talk. Due to their complementarity to conventional axion DM experiments, the present schemes may prove crucial to determine the fractional amount of axions as DM constituent. For detection purposes, axion DM can be viewed as a background, oscillating microwave field with frequency and amplitude fixed by the axion mass and coupling respectively. This equivalent magnetic field would produce spin flips in a magnetized sample (QUAX proposal) or excite the upper Zeeman level of rare earth atoms in suitable crystalline matrices (AX-IOMA project). We discuss experimental parameters required in both approaches to achieve cosmologically relevant sensitivity.

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