

Axion detection with optomechanical cavities

Thursday 30 March 2023 17:45 (15 minutes)

We propose a novel technique to search for axions with an optomechanical cavity filled with a material such as superfluid helium. Axion absorption converts a pump laser photon to a photon plus a phonon. The axion absorption rate is enhanced by the high occupation number of coherent photons or phonons in the cavity, allowing our proposal to largely overcome the extremely small axion coupling. The axion mass probed is set by the relative frequency of the photon produced in the final state and the Stokes mode. Because neither the axion mass nor momentum need to be matched to the physical size of the cavity, we can scale up the cavity size while maintaining access to a wide range of axion masses (up to a meV) complementary to other cavity proposals.

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Session Classification: SESSION 9: Dark Matter Theory (CHAIRS: Volodymyr Takhistov- QUP-KEK, Japan, and Edoardo Vitagliano- Hebrew U. of Jerusalem, Israel)

Track Classification: Dark matter theory