



Contribution ID : 365

Type : Oral talk

Cosmological Axion Sarov Haloscope (CASH): search for dark-matter axions beyond the quantum limit. Status and Preparation for the First Stage.

Wednesday, 28 October 2026 10:45 (15)

Recently [Phys. Rev. D 112 (2025) 035003; arXiv:2506.18595 [hep-ph]], we proposed an experimental project called the Cosmological Axion Sarov Haloscope (CASH), aimed at searching for dark-matter axions via their conversion into microwave photons in a magnetic field. The key feature of the experiment is the use of Josephson-junction single-photon detectors (JJ SPDs) operating at ultralow temperatures, where thermal noise is negligibly small. This allows us to probe the axion–photon coupling with ultrahigh precision, with sensitivity to $g_{A\gamma\gamma} \sim (10^{-14} - 10^{-15}) \text{ GeV}^{-1}$ for axion masses in the range 38–54 μeV , motivated by generic QCD axion models.

In this talk, we also describe the current preparation for the launch of the first stage of the experiment: measurements of the parameters of fabricated JJ SPDs and a high-quality-factor cavity. In addition, we discuss the design features of tunable cavities and existing prototypes.

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Session Classification : High energy physics: experiment

Track Classification : High energy physics: experiment