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Search for QCD axion dark matter around $24.5 \mu\text{eV}$ using an 8-cell microwave resonant cavity haloscope and a flux-driven Josephson Parametric Amplifier

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Axion, a hypothetical particle originally emerging from a proposed solution to the strong CP problem of particle physics, is one of the most favored candidates addressing the dark matter puzzle. As part of the efforts within the Center for Axion and Precision Physics Research (CAPP) of the Institute for Basic Science (IBS), we are searching for axion dark matter using the haloscope method sensitive to masses around $24.5 \mu\text{eV}$ at KSVZ sensitivity. A unique 8-cell cavity, used for the first time in search of KSVZ axions, is cooled down to 40 mK within a background magnetic field of 8 T. The expected axion signal resonating with the TM010-like mode of the cavity is picked up using an antenna and transferred to the readout chain. Implementing a flux-pumped Josephson Parametric Amplifier with 20 dB gain at the first stage of amplification, the background represented as a system noise temperature was estimated to be 450 mK, corresponding to 1.6 photons. In this talk, we present our results from the physics data taken since December 2021, covering approximately 100 MHz.

In-person participation

Yes

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