



Contribution ID: 94

Type: **Talk**

A search for axionlike dark matter with the CASPER-gradient Low-Field experiment

Thursday, 19 September 2024 11:30 (20 minutes)

Axions and other light pseudoscalar bosons with masses below $1 \text{ eV}/c^2$, collectively referred to as axionlike particles (ALPs), are among the most well-motivated dark matter (DM) candidates.

The Cosmic Axion Spin Precession Experiment (CASPER)\,[1] aims at detecting axionlike DM with nuclear magnetic resonance techniques.

CASPER-Gradient in Mainz probes the coupling of nuclear spins to a galactic DM halo consisting of ALPs. Here, a spin-polarized sample within a leading field could acquire a measurable transverse magnetization due to the effect of the ALP field gradient, which acts as a pseudo-magnetic field\,[2].

The Low-Field apparatus of CASPER-Gradient was designed to search for ALPs with Compton frequencies between 1 kHz and 4.3 MHz, corresponding to an approximate mass range of 10^{-12} to $10^{-8} \text{ eV}/c^2$.

We report the first measurement on a thermally polarized liquid methanol sample at a 317 G leading field, where we scanned for ALP signals within a 250 Hz bandwidth around 1348500 Hz.

[1] D. F. J. Kimball et al. “Overview of the Cosmic Axion Spin Precession Experiment (CASPER)”. In: *\emph{Microwave Cavities and Detectors for Axion Research.}* Cham: Springer International Publishing, 2020, pp.~105–121. ISBN:~978-3-030-43761-9

[2] P. W. Graham and S. Rajendran. “New observables for direct detection of axion dark matter”. In: *\emph{Phys. Rev. D}*~88 (3 Aug. 2013), p.~035023. DOI: 10.1103/PhysRevD.88.035023.

Primary author: WALTER, Julian (Helmholtz-Institut, GSI Helmholtzzentrum für Schwerionenforschung, 55128 Mainz, Germany // Johannes Gutenberg-Universität Mainz, 55128 Mainz, Germany)

Presenter: WALTER, Julian (Helmholtz-Institut, GSI Helmholtzzentrum für Schwerionenforschung, 55128 Mainz, Germany // Johannes Gutenberg-Universität Mainz, 55128 Mainz, Germany)

Session Classification: Morning 4