

Contribution submission to the conference Dortmund 2021

New method to search for axion-like particles demonstrated with polarized beam at the COSY storage ring — ●SWATHI KARANTH for the JEDI-Collaboration — Marian Smoluchowski Institute of Physics, Jagiellonian University, Cracow, Poland

The axion was originally proposed to explain the small size of CP violation in quantum chromodynamics. If sufficiently abundant, it might be a candidate for dark-matter in the universe. Axions or axion-like particles (ALPs), when coupled with gluons, induce an oscillating Electric Dipole Moment (EDM) along the nucleon's spin direction. This can be used in an experiment to search for axions or ALPs using charged particles in a storage ring.

In spring of 2019, at the Cooler Synchrotron (COSY) in Jülich, we performed a first test experiment to search for ALPs using an in-plane polarized deuteron beam with a momentum of 0.97 GeV/c. At resonance between the spin precession frequency of deuterons and the ALP oscillation frequency there will be an accumulation of the polarization out of the ring plane. Since the axion frequency is unknown, the momentum of the beam was ramped to search for a vertical polarization jump that would occur when the resonance is crossed. At COSY, four beam bunches with different polarization directions were used to make sure that no resonance was missed because of the unknown relative phase between the polarization precession and the EDM oscillations. We scanned a frequency window of about a 1-kHz width around the spin precession frequency of 121 kHz. This talk will describe the experiment and show preliminary results.

Part: T
Type: Vortrag;Talk
Topic: 4.05 Suche nach dunkler Materie; 4.05 Search for Dark Matter
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