

MADMAX: A Dielectric Haloscope Experiment

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Axions emerge naturally from the Peccei-Quinn (PQ) mechanism which addresses the absence of CP violation in QCD; they also turn out to be a good cold dark matter (CDM) candidate. If PQ symmetry breaking had occurred after inflation, the axion mass is likely to range from $\sim 26 \mu\text{eV}$ to $\sim 1 \text{meV}$, which is yet to be explored experimentally.

We present a novel dielectric haloscope experiment dedicated to the direct detection of axion CDM in the mass range of 40 to 400 μeV – the MAGnetized Disc and Mirror Axion eXperiment (MADMAX). Multiple dielectric discs and a metal mirror are placed in a strong magnetic field ($\sim 10 \text{T}$ dipole) to utilize the axion-induced coherent electromagnetic waves emitted from each disc surface and their resonances within the discs-mirror system, such that the axion-induced signal can be boosted to a level detectable by state-of-the-art low noise amplifiers. The design and sensitivity of MADMAX, ongoing R&D activities and the project roadmap will be presented.

Secondary track (number)

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