

MADMAX: A new road to axion dark matter detection

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The Axion is the hypothetical low-mass boson predicted by the Peccei-Quinn mechanism solving the strong CP problem. It is naturally also a cold dark matter candidate, thus it could simultaneously solve two major problems of nature. Up to recently there was no existing experimental effort aiming to detect QCD axions in the mass range around 100 μeV , preferred by models in which the Peccei-Quinn symmetry was restored after inflation.

The MADMAX project is designed to be sensitive for axions with masses 40 μeV – 400 μeV . The experimental design is based on the idea of enhanced axion photon conversion in a system with several layers with alternating dielectric constants inside a $\sim 10\text{T}$ dipole magnet.

The experimental idea and the proposed design of the MADMAX experiment will be discussed. Some results from proof of principle measurements and magnet design studies will be shown. The status of R&D towards realization of the MADMAX experiment will be discussed and the prospects for reaching sensitivity enough to cover the parameter space predicted for QCD dark matter axions with mass in the range 40-400 μeV will be presented.