

MADMAX: A new road to axion dark matter detection

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The Axion is a 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, simultaneously solving two major problems of nature. All existing experimental efforts to detect QCD axions focus on a range of axion masses below 20 μeV . The mass range above $\sim 40\mu\text{eV}$, preferred by models in which the Peccei-Quinn symmetry was restored after inflation, could not to be explored so far.

The MADMAX project is designed to be sensitive for axions with masses $40\mu\text{eV} - 400\mu\text{eV}$. The experimental design is based on the idea of enhanced axion photon conversion in a system with several layers with alternating dielectric constants.

The experimental idea and the proposed design of the MADMAX experiment will be discussed. First results from measurements with a prototype dielectric haloscope will be discussed. 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.

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