

MADMAX: A new way of probing QCD Axion Dark Matter with a Dielectric Haloscope - Foundations

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WISPy Dark Matter candidates have increasingly come under focus of scientific interest. In particular the QCD Axion might also be able to solve other fundamental problems such as strong CP-violation and could be responsible for inflation and structure formation in the early universe. Galactic Axions, Axion-Like-Particles and Hidden Photons can be converted to photons employing a surface boundary of different dielectric constants under a strong magnetic field. Combining many such surfaces, one can enhance this conversion significantly utilizing constructive interference. The proposed MADMAX setup containing 80 high dielectric discs in a 10T magnetic field might probe the well-motivated mass range of (40-400) μeV , a range which is inaccessible by existing cavity searches. We present the foundations of this approach, discussing implications on the accuracy of disc placement, dark matter velocity effects and expected sensitivity.

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