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Alexander Millar (MPI Munich): Dielectric haloscopes: a new way to search for axion dark matter

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We propose a new strategy to search for dark matter axions in the mass range of $40\text{--}400\mu\text{eV}$ by introducing dielectric haloscopes, which consist of dielectric disks placed in a magnetic field. When an interface between different dielectric media is inside a magnetic field, the oscillating axion field acts as a source of electromagnetic waves, which emerge in both directions perpendicular to the surface. The emission rate can be boosted by multiple layers judiciously placed to achieve constructive interference and by a large transverse area. A sensitivity to QCD axion models is conceivable with 80 disks of 1 m^2 area contained in a 10 Tesla field. This concept is being pursued by the new MADMAX Collaboration.

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