

## New Windows on Fundamental Physics: from tabletop devices to large scale detectors



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### **A high quality factor dielectric Fabry-Perot cavity for detecting dark matter axions**

*Monday, 19 January 2026 16:00 (30 minutes)*

The axion is a well-motivated dark matter candidate that was originally proposed to solve the Strong CP problem. The talk presents the development of a dielectric Fabry-Perot cavity haloscope within the Imperial College Quantum enhanced Particle Astrophysics (QuEPA) project. Our approach is optimised to search for axion dark matter in the 125–250  $\mu\text{eV}$  mass range (30–60 GHz) via photon conversion. Our Fabry-Perot cavity design offers a high quality factor ( $Q$ ) in its fundamental TEM mode and a large mode volume, while the all-dielectric construction means  $Q$  does not degrade in a strong magnetic field. These features significantly boost the detection sensitivity over cylindrical cavities in this mass range, in a simple and compact design. We have constructed and tested a 50 mm diameter prototype whose performance validates our chosen approach.

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