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JOHANNES GUTENBERG UNIVERSITÄT MAINZ

Seminar über Quanten-, Atom- und Neutronenphysik (QUANTUM)

April 27, 2023 at 2 p.m. c.t.
IPH Lorentzraum 05-127

Dr. Jack A. Devlin
Imperial College, London, UK

A new search for dark matter axions using quantum technologies

The toolkit of quantum technologies developed in atomic, molecular and optical physics are ideally suited to enhance the search for dark matter axions with masses above ~40 μeV. I will present an overview of a new experimental effort under construction at Imperial College, developing technologies to detect DFSZ axions with masses 120-250 μeV. We plan to use a large mode area Fabry-Perot cavity to efficiently convert axions into microwave photons. Compared to other geometries, the Fabry-Perot cavity can present a large mode volume and high Q, and can be easily tuned. To detect the microwaves, we will use an electron in a Penning trap as a single photon counter. Individual microwave absorption events will change the cyclotron state of the electron, causing measurable shifts in the trapped particle's oscillation frequencies. This versatile device will also open other possible detection routes for alternative dark matter candidates and cosmological phenomena.

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