

Introducing the longitudinal ferromagnetic haloscope

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A photon-magnon hybrid system naturally interacts with Dark Matter axions via the axion-electron coupling, and can therefore be used as an haloscope. We introduce a scheme where the axion field is detected through sidebands induced on a microwave tone on resonance with cavity-magnon polaritons. The signal is proportional to the system quality factors and to the tone power, but, remarkably, not to the system volume, allowing for a pocket-size setup. The experimental configuration features a negligible tone noise and a high frequency readout, resulting in performances fundamentally limited by thermal or quantum fluctuations. We illustrate the detection scheme, present the results of a demonstrator experiment, and outline the possibilities for future developments.

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