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Searching for Wavelike Dark Matter with SRF Cavities

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Haloscopes consisting of a microwave cavity with a high quality factor (Q) connected to low noise electronics have been deployed to directly detect wavelike axions and dark photons. But the dark matter mass is unknown, so haloscopes must be tunable to search through the photon coupling vs. mass parameter space. The scan rate for haloscope experiments is a key figure of merit and is dependent on the cavity's quality factor. State-of-the-art experiments like ADMX currently use copper cavities with Q~80000. But implementing SRF cavities with Q~10^10 can increase the scan rate by possibly a factor of 10^5.

This poster will describe the principles behind operating a haloscope whose bandwidth is much narrower than the dark matter halo energy distribution. The poster will highlight proof-of-principle measurements that already demonstrate that ultra-high Q cavities have unprecedented sensitivity to dark photon dark matter and current plans to commission a dark photon dark matter search over a wide frequency range. The poster will also describe implications for axion searches and progress toward realizing ultra-high Q cavities under multi-Tesla magnetic fields

In-person or Virtual?

In-person

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