

QUAX: Probing Axion Dark Matter through quantum technologies

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The QUest for Axion (QUAX) is a direct-detection CDM axion search which reaches the sensitivity necessary for the detection of galactic QCD-axion in the range of frequency 8.5-11 GHz.

The QUAX collaboration is operating two haloscopes, located at Padova/LNL- and LNF-INFN laboratories in Italy, that work in synergy and operate in different mass ranges.

In this talk we will report about results obtained at the Padova-LNL laboratories, using a high quality factor dielectric cavity cooled at less than 100 mK inside a dilution refrigerator equipped with a 8 T magnet with a JPA and TWPA-based amplification chain for cavity signal readout, resulting in a system noise temperature at the quantum limit.

Results will be presented for the axion-electron and axion-photon coupling around the 10 GHz frequency range.

We will also report about R&D activity aimed at increasing the scanning speed with application of transmon-based single microwave photon detectors (SMPDs) for cavity readout.

The prototype haloscope we developed is based on a cylindrical copper cavity sputtered with NbTi, resonant at 7.3 GHz frequency, and cooled at mK temperatures inside a dilution refrigerator equipped with a SC magnet.

Results obtained employing a moderate magnetic field will be described.

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