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Recent results and future perspective in the search for Axion dark matter with QUAX

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In recent years, we witnessed an increasing growth in the research of light Dark Matter (DM) candidates, addressing in particular axions and axion-like particles (ALPs).
The axion observation technique is based upon its in- verse Primakoff conversion into one photon, stimulated by a static magnetic field.

Here, recent results of the QUAX experiment are presented.
In particular, the recently assembled haloscope in the LNF site was able to collect data with an 8.8 GHz copper resonant cavity in a 9T field. The cavity was equipped with a tuning rod mechanism moved by piezo motors at a temperature of 20 mK, allowing to exclude the existence of dark matter axions with coupling $g_{a\gamma\gamma}$ down to 0.861×10^{-13} GeV^{-1} in the mass window $(36.5241 - 36.5510)$ μeV.

Next-future improvements are also presented here, since there is much room for improvement to reach the sensitivity to the KSVZ line. These are improving the fabrication of the metallic rod, the inclusion of a JPA (which we already tested) to reduce the noise, and we are testing YBCO superconducting cavities for their resilience to the magnetic field.

Moreover, recent results with the QUAX haloscope at LNL are also presented, featuring a data collection with a dielectric cavity and a Traveling-Wave JPA as a broadband preamplifier.

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