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Recent results and future perspective in the search for Axion dark matter at LNF.

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In ecent years, we witnessed an increasing growth in the research of light Dark Matter (DM) candidates, addressing in particular axions and axion-like particles (ALPs). If axions are found to exist, they would untie the long-standing DM problem, after being originally postulated as a solution to the strong CP problem. The nature of a pseudoscalar, electrically neutral and feebly interacting particle make the axion a
strong DM candidate, and its cosmological evolution and astrophysical constraints indicate a favorable mass range between 1 μeV < m_a < 10 meV.
The axion observation technique is based upon its inverse Primakoff conversion into one photon, stimulated by a static magnetic field. The essential elements required to run a haloscope are a superconducting magnet to generate a strong magnetic field, a microwave resonant cavity where the electromagnetic field excitation builds up, an ultra-low noise receiver, a tuning mechanism to scan over the axion mass range and a cryogenic system to grant operation at low temperature.
We report on the first operation of the new QUAX haloscope located at the National Laboratories of Frascati (LNF). The experiment is conducted using a resonant cavity equipped with a tuning rod mechanism allowing to exclude the existence of dark matter axions with coupling gaγγ down to 0.861 × 10−13 GeV−1 in the mass window (36.5241 − 36.5510) μeV. We also report on future development in that haunt for axions showcasing the features of FLASH (FINUDA magnet for Light
Axion SearcH), a future experiment that will be host at
LNF.

Auteur principal: D'ELIA, Alessandro (LNF- INFN)

Orateur: D'ELIA, Alessandro (LNF- INFN)

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