



Contribution ID: 12

Type: Talk

Status and prospects of the DALI Experiment

Tuesday, 17 September 2024 12:30 (20 minutes)

The Dark photons & Axion-Like particles Interferometer (DALI) proposes a new experimental setup to detect wavy dark matter: the magnetized phased array (MPA). In the MPA haloscope, a large flat mirror is housed in a solenoid-type magnet. The data acquired by each of the antennas forming the MPA are combined by post-processing similar to radio interferometry. A resonator can also be magnetized to enhance the faint signal originating from axion-to-photon conversion via the inverse Primakoff effect (or through kinetic mixing of dark photons), for which we employ a tunable Fabry-Pérot that enables quality factors of $Q > 20,000$ within the ~ 25 to ~ 250 μeV range (6-60 GHz). Therefore, DALI can reach sensitivity to benchmark QCD axion models in a sector non-accessible to previous haloscopes.

This versatile experimental approach has synergies with: (A) the dish-antenna haloscope—with the profit that the MPA allows to magnetize more strongly a flat mirror since it fits in a superconducting magnet bore—; (B) the dielectric haloscope—with the advantage that DALI employs a common solenoid instead of a challenging, and much more expensive, large dipole magnet of long and costly construction—; (C) the plasma haloscope—since an MPA would allow the magnetization of metamaterials with a larger surface area—; (D) and even the resonant-cavity haloscope—as the same DALI method for channel combination is potentially transferable to multicavity haloscopes proposed for high-frequency scanning.

DALI brings additional benefits for the *dark sector* detection community: (i) it incorporates an altazimuth mount that improves sensitivity to transient events such as substructures; (ii) DALI, with its MPA architecture, is capable of scanning two (or three) resonant frequencies simultaneously within its band, thus doubling (tripling) its scanning speed; (iii) DALI is designed to require only available equipment, which renders the experiment cost-effective while giving it faster readiness in a highly competitive axion search landscape.

Starting in 2018, the DALI project is currently in the prototyping phase. In this talk, we will also expand on its status, and a proof of concept run in preparation.

Primary author: DE MIGUEL, Javier (RIKEN, IAC, ULL)

Co-authors: HERNÁNDEZ-SUÁREZ, Elvio (IAC); JOVEN-ÁLVAREZ, Enrique (IAC); OTANI, Chico (RIKEN); RUBIÑO-MARTÍN, J. Alberto (IAC, ULL); ZIOUTAS, Konstantin (University of Patras); (DALI COLLABORATION)

Presenter: DE MIGUEL, Javier (RIKEN, IAC, ULL)

Session Classification: Morning 2