Contribution ID: **214**   Type: **oral**

ALPs searches with LST1

Thursday, 26 September 2024 15:26 (17 minutes)

Axions and axion-like particles (ALPs) are hypothetical particles predicted by several extensions of the Standard Model and are viable candidates for solving one of the ultimate mysteries of the Universe: dark matter. By exploring the spectra of astrophysical objects obtained from observations with the Large Size Telescope (LST1), we can search for signatures that such particles may leave. In particular, we look for oscillations in the spectra due to conversions between ALPs and very-high-energy (VHE) gamma rays. Our targets of interest include blazars Mrk 421, Mrk 501, BL Lac, and 1ES1959+650, extensively observed with LST1. In addition to the magnetic field in the relativistic jet, we also consider the impact of the Extragalactic Background Light in the intergalactic magnetic field and the magnetic field of the Milky Way for each source separately. For ALP masses in the neV range and magnetic field strengths of O(μG), these oscillations occur in the GeV energy range, making LST1 an optimal instrument for testing the ALP hypothesis in the VHE gamma-ray range. By exploring LST1 data of several blazars, our aim is to combine constraints from each source at the likelihood level, ultimately creating unique constraints on the ALP parameter space. These would be the first combined constraints obtained with a dataset from a group of blazar sources.

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Session Classification: Indirect Dark Matter Detection