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Searching for Axion-like Particles signatures in the M87 spectrum with HAWC

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Exploring Dark Matter (DM) scenarios through the TeV emission from Active Galactic Nuclei (AGNs) has the potential to provide constraints on the existence of DM candidates such as the Axion-like Particles (ALPs). The very high-energy gamma-ray spectrum of nearby AGNs is expected to be attenuated due to pair production interactions with the Extragalactic Background Light (EBL). However, if photon-ALP oscillations occur in the presence of magnetic fields, some gamma rays could evade EBL attenuation, leading to an observable spectral signature. Previous observations of the radio galaxy M87 by multiple observatories at very high energies have shown that its energy spectrum extends above 10 TeV, making it a good candidate for placing constraints on the ALPs parameter space. The High Altitude Water Cherenkov (HAWC) observatory provides unique observations that could complement and extend the constraints on the ALPs parameter space with M87 serving as an excellent target for DM searches. This work presents exclusion limits on the ALP parameter space, obtained by analyzing seven years of HAWC data from M87, while accounting for systematic uncertainties associated with different EBL models.

Collaboration(s)

The High Altitude Water Cherenkov (HAWC) observatory

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