

Searching for axion-like particles through the photon disappearance channel

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Axions and axion-like particles (ALPs) comprise theoretically well-motivated extensions of the Standard Model. ALPs can be naturally light, very weakly interacting, and may interconvert with photons in magnetic fields. I will discuss efforts over the past several years that leverage precision observations of X-ray emission from active galactic nuclei in galaxy clusters to search for signals from ALPs through the “photon disappearance channel”. These searches have led to world-leading limits on light ALPs, and can be further improved over the coming decade through the launch of the next generation of X-ray telescopes. I will briefly discuss new theoretical results that draw on elementary properties of quantum perturbation theory and Fourier analysis to drastically simplify the analysis of weak axion-photon mixing, leading to new conceptual insights and more robust phenomenology.

Author: MARSH, David

Presenter: MARSH, David

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