

Searches for Axion-Like Particles with NGC1275: Current and Future Bounds

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Axion-like particles (ALPs) can induce localised oscillatory modulations in the spectra of photon sources passing through astrophysical magnetic fields. Ultra-deep *\emph{Chandra}* observations of the Perseus cluster contain over 5×10^5 counts from the central NGC1275 AGN, and represent an extraordinary dataset for ALP searches. In this talk I will describe how we used these to search for spectral irregularities from the AGN. No irregularities were found at the $\sim 30\%$ level, allowing us to place leading constraints on the ALP-photon mixing parameter $g_{a\gamma\gamma} \simeq 1.5 - 3.5 \times 10^{-12} \text{GeV}^{-1}$ for $m_a \lesssim 10^{-12} \text{eV}$, depending on the magnetic field realisation along the line of sight. I also discuss prospects for improving these bounds, with the ATHENA X-ray Observatory, due for launch in 2028.

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