

## Investigating Active Galactic Nuclei variability with the Cherenkov Telescope Array Observatory

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Blazars, a type of active galactic nuclei (AGN) with relativistic jets aimed at the observer, display flux variability across the electromagnetic spectrum due to particle acceleration within their jets. The power spectral density (PSD) of blazars reveals breaks at specific frequencies, especially in X-rays, which correlate with the accretion regime and the mass of the central black hole. However, the predicted break in the very-high-energy gamma-ray PSD has not been explored due to the limitations of current instruments. The upcoming Cherenkov Telescope Array Observatory (CTAO) offers significantly improved sensitivity, up to five to ten times better than existing telescopes. This advancement will not only allow for precise PSD reconstruction but also enable the study of blazar flares with unprecedented temporal resolution. Blazar flares provide crucial insights into particle acceleration, photon production, jet structure, and physical properties. This contribution highlights the AGN long-term monitoring and flare programs within CTAO, essential components of the AGN Key Science Project, which are expected to greatly enhance our understanding of the complex processes driving blazar emissions.

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