

# Intrinsic time delays and Lorentz invariance violation searches with the Cherenkov Telescope Array Observatory: A feasibility study for flaring blazars

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Lorentz Invariance Violation (LIV) effects could be spotted by Imaging Atmospheric Cherenkov Telescopes (IACTs) by searching for energy-dependent time delays in the gamma-ray photons coming from distant and highly variable astrophysical sources. As part of its scientific program, The Cherenkov Telescope Array Observatory (CTAO) will explore problems in fundamental physics, including studying and constraining the Extragalactic Background Light (EBL), searching for LIV effects and setting constraints on the characteristic LIV energy scale. This work presents the results from a feasibility study performed by simulating realistic observations with the CTA-AGN-VAR pipeline, a Python package based on Gammapy. Using an AGN Evolution Simulator Code (AGNES), the broadband spectra of a TeV blazar flare were modelled using a time-dependent one-zone Synchrotron-Self-Compton (SSC) scenario, and the presupposed LIV delays were introduced as linearly energy-dependent time-lags. Observations with the CTAO Alpha and Omega configuration arrays were assumed for our simulations, taking into account observational constraints. The response and significance to intrinsic and LIV time delays are predicted for both configurations under the assumed scenario, and one method to discriminate LIV from intrinsic time delays is also presented.

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