

On the correlation between X-rays and TeV gamma-rays in HBL Blazars

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Correlations between the fluxes of X-rays and TeV gamma-rays in blazars have been reported by observational studies. These correlations are expected in the context of the leptonic Synchrotron Self-Compton (SSC) model. The high-frequency peaked BL Lac object (HBL) blazar Mrk 421 exhibits a linear correlation between these two energy ranges. However, this correlation breaks down at the highest gamma-ray fluxes, suggesting the involvement of additional mechanisms such as hadronic and lepto-hadronic contributions. Understanding the strength of the correlation between X-rays and gamma-rays can provide insights into the relative contributions of these mechanisms responsible for the gamma-ray emission in blazars. In this study, we extend the analysis to four HBL blazars: Mrk 501, 1ES 1959+650, PKS 2155-304, and 1ES 2344+514, utilizing gamma-ray data from ground-based Imaging Atmospheric Cherenkov Telescopes and X-ray data from satellite observations at different epochs and testing different correlation models. Our analysis reveals flux correlations described by a power law function with indices ranging from 1 to 2, similar to the observed correlation in Mrk 421. A deviation from the correlation is also observed at high-energy gamma-ray fluxes. This research was supported by the UNAM-PAPIIT project number IG101323 and the Gestion I+D 02-2021 project of the Secretaría Nacional de Ciencia y Tecnología de Guatemala (SENACYT).

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