

Relentless multi-wavelength variability of Markarian 421 and Markarian 501

Thursday, July 15, 2021 12:36 PM (12 minutes)

The high-synchrotron-peaked blazars Markarian 421 and Markarian 501 are close bright and well-studied active galactic nuclei, which feature persistent GeV and TeV emission. FACT and Fermi-LAT have been monitoring these two sources providing the densest long-term dataset of unbiased gamma ray observations. Light curves in the TeV and GeV energy bands, spanning over a five-year period, were used to study the multi-wavelength emission. To characterize the variability and derive constraints on the emission mechanism model parameters, the dataset was augmented with contemporaneous multi-wavelength observations from radio to the X-rays. The blazars were found in various activity states, particularly a quiescent state of Markarian 501 after August, 2016. We correlate the light curves from radio to gamma rays, identify individual flares and look for inter-band connections, which are expected from the shock propagations within the jet. The fractional variability for both blazars shows a two-bump structure with the highest variability in the X-ray and TeV bands. The lag between X-ray and TeV light curves in Markarian 421 was found to be close to zero, supporting the SSC emission scenario. The timing between both TeV and X-ray flares in Markarian 421 is consistent with periods expected in the case of Lense–Thirring precession of the accretion disc. The variability of Markarian 501 on the long-term scale is also consistent with SSC, with a sub-day lag between X-ray and TeV variability.

Keywords

AGN, Mrk 421, Mrk 501, blazars, FACT, IACT

Collaboration

other (fill field below)

other Collaboration

FACT

Subcategory

Experimental Results

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Session Classification: Discussion

Track Classification: Scientific Field: GAI | Gamma Ray Indirect