

# Long-term multi-wavelength variability of Markarian 421 and Markarian 501

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Markarian 421 (Mrk 421) and Markarian 501 (Mrk 501) are two close bright and well-studied high-synchrotron-peaked blazars, which feature bright and persistent GeV and TeV emission. We use the longest and densest dataset of unbiased observations of these two sources, obtained at TeV and GeV energies during 5 years with the FACT telescope and Fermi LAT. To characterize the variability and derive constraints on the emission mechanism model parameters we augment the dataset with contemporaneous multi-wavelength observations from radio to X-rays. We study and 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 conical jet. For Mrk 421 we find that the X-rays and TeV are well correlated with close to zero lag, supporting the SSC emission scenario. The timing between the TeV, X-ray flares in Mrk 421 is consistent with periods expected in the case of Lense–Thirring precession of the accretion disc. Mrk 501 variability on long-term periods is also consistent with SSC, with a sub-day lag between X-rays and TeVs. We investigate two periods of source activity before and after MJD 57600, later the source is in the quiescent state. Fractional variability for both blazars shows two bump structure with the highest variability in X-ray and TeV bands.

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## Summary

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