

Unveiling the complex correlation patterns in Mrk 421

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The blazar Mrk421 (redshift $z = 0.031$) is one of the brightest and closest BL Lac type objects, making it an ideal target to probe blazar physics. We report on an extensive multi-wavelength observing campaign in 2017, during which the intra-band correlation patterns show some disparity and complex behaviours. Observations from several instruments are used to achieve an optimal temporal coverage from radio to TeV energies. In particular, four multi-hour NuSTAR observations organised simultaneously with MAGIC allow to obtain a precise measurement of the falling segments of the two spectral components. A detailed investigation of the very-high-energy (VHE; >100 GeV) versus X-ray flux correlation is performed, by binning the data into several sub-energy bands. A positively correlated variability is observed, but the correlation characteristics change substantially across the various bands probed. Furthermore, during the simultaneous MAGIC and NuSTAR observations a clear change of the Compton dominance is detected without a simultaneous change in the synchrotron regime, indicating “orphan gamma-ray activity”. We also investigate an intriguing bright flare at VHE without a substantial flux increase in the X-rays. Within a leptonic scenario, this behaviour is best explained by the appearance of a second population of highly-energetic electrons spanning a narrow range of energies. Finally, our multi-wavelength correlation study also reveals an anti-correlation between the UV/optical and X-ray bands at a significance level above 3 sigma.

Keywords

BL Lacertae objects; AGN ; gamma rays; radiation mechanisms; modelling

Collaboration

MAGIC

other Collaboration

FACT, Fermi-LAT

Subcategory

Experimental Results

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