

# Spying on the next-door blazar Markarian 501 during multiple years

*Monday, 26 October 2015 17:58 (15 minutes)*

We present recent results on the high-frequency-peaked BL Lac object Markarian 501 derived from extensive multi-wavelength campaigns in the years 2009, 2012 and 2013. The blazar is located in our extragalactic neighborhood ( $z=0.034$ ), which reduces spectral uncertainties due to absorption effects of the Extragalactic Background Light and allows for significant detections on sub-hour timescales, thus permitting precise studies of its multi-band flux variability and evolution of its broadband spectral energy distribution.

We will present the first broadband SED that includes the sensitive hard X-ray data from NuSTAR, the first light curves with FACT compared to those of MAGIC and VERITAS, and we will report about the first physics result obtained with Cherenkov telescope data taken under challenging atmospheric conditions and corrected with information from the MAGIC LIDAR. We will show that also in the HBL Mrk 501 a rotation of the optical polarisation vector can be measured coinciding with gamma-ray flares, as it was observed in LBLs and FSRQs. We will also discuss the finding that the X-ray and gamma-ray spectra of Mrk 501 can be harder than those of many known extreme blazars, suggesting that being “extreme” may be a temporal state rather than an intrinsic characteristic of a blazar. A novel technique to model broadband SEDs with a substantially smaller bias in terms of assumptions will also be presented, leading to the conclusions that some SSC model parameters can be strongly constrained by the data, while others not, and that the broadband SED of Mrk 501 during a flaring state can also be successfully modelled with Doppler factors one order of magnitude smaller than those typically used in the literature.

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**Session Classification:** Gamma-Ray Astrophysics

**Track Classification:** Gamma-ray Astrophysics