Contribution ID: **86** Type: **Talk**

The magnetic field structure in CTA 102 from high resolution mm-VLBI observations during the high-energy flares in 2016-2017

Wednesday, 23 January 2019 11:30 (20 minutes)

Investigating the magnetic field structure in the innermost regions of relativistic jets is fundamental to shed light on the crucial physical processes giving rise to the jet formation, as well as to their extraordinary radiation output up to gamma-ray energies.
We study the variability and magnetic field structure of the quasar CTA 102 with 3 and 7 mm-VLBI polarimetric observations during a very active state of the source over the entire electromagnetic spectrum. Combining information from the polarization images with the Faraday rotation analysis between 3 and 7 mm we obtain the three-dimensional structure of the magnetic field in the innermost jet regions with unprecedented angular resolution.
We compare the obtained rotation measure map with the polarization evolution in 7 mm VLBA images when a new superluminal component is ejected from the core and travels along the jet. At the same time, the source undergoes extraordinary multi-wavelength flares. We study the kinematics and variability at 7 mm and infer the physical parameters associated to the variability. We put the latter in context with the minimum Doppler factor value required to explain the observed high energy emission, as well as with the Doppler factor value needed to explain the increase of 6-7 magnitudes in optical reported in Raiteri C. et al., 2017, Nature, 552, 374.

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Session Classification: Observational results

Track Classification: Main track