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Describing the ultra fast very-high-energy gamma-ray flare of IC 310 with relativistic reconnection models

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Blazars and radio galaxies are famously known to be variable sources across the entire electromagnetic spectrum due to rather close alignment of their jet with our line of sight and relativistic jet speeds. In the very-high-energy (VHE, E > 100 GeV) gamma rays, the fastest flares reach hour-to-minute timescales that cannot be explained by the typical shock acceleration scenario. Magnetic reconnection has been proposed as a prospective mechanism on several blazar cases, and models have been applied in the past successfully via a simulated light curve comparison. We build on the past work by using particle-in-cell simulations of plasmoids generated in a relativistic reconnection event in combination with radiative transfer to describe an extremely fast flaring event of the radio galaxy IC 310. Using literature values to restrict our initial simulation priors, we statistically searched for models that reproduce the observed spectral energy distribution (SED) and the light curve simultaneously. We compared the resulting simulated light curves in a statistical manner developed in our previous work. The results of our analysis show that simulations that produce realistic light curves and spectra are necessary in gaining a better understanding of the parameters that describe the jet physics.

Primary author: JORMANAINEN, Jenni (Finnish Centre for Astronomy with ESO)

Co-authors: LINDFORS, Elina (University of Turku); Dr CHRISTIE, Ian; PETROPOULOU, Maria (National and Kapodistrian University of Athens); Dr HOVATTA, Talvikki (Finnish Centre for Astronomy with ESO)

Presenter: JORMANAINEN, Jenni (Finnish Centre for Astronomy with ESO)

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