ID de Contribution: **73** Type: **Non spécifié**

Insights from modelling the brightest Fermi-LAT blazar flare

The electromagnetic flare of the flat-spectrum radio quasar (FSRQ) 3C 454.3 in November 2010 was the brightest γ-ray flare ever observed by the *Fermi*-LAT from a blazar. We performed the data analysis of the multiwavelength (from infrared photons to γ rays) quasi-simultaneous 1-day-averaged spectral-energy distributions (SEDs) for seven days of the flare and modelled the observed emission with the AM^3 program for the time-dependent simulation of radiative processes. We show that each of the 1-day averaged SEDs can be well described with a leptonic model producing the observable emission originating from a $\sim 10^{16}$-cm-sized region located beyond the outer radius of the broad-line region (BLR). The emission region (blob) should be a stationary feature in the jet into which the relativistic plasma with a high bulk Lorentz factor ($\Gamma \sim 20-40$) is injected. On the contrary, modelling the blob as moving along with the bulk motion of the jet plasma results in an underprediction of the γ-ray flux due to the lack of target photons for the inverse Compton process in the later days of the flare. We demonstrate that the γ-ray data support that the observed emission comes from the electrons with a rather low maximum injection energy $E_e'^{\max} \sim 10^9$ eV implying small acceleration efficiency. Assuming protons might be accelerated along with electrons with the same efficiency, we obtain the constraints on the neutrino yield from 3C 454.3.

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