Contribution ID: **19** Type: **Talk**

Insights from modelling the brightest Fermi-LAT blazar flare

Friday 28 February 2025 09:15 (30 minutes)

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 one-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 one-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). We show that the emission region (blob) should be a quasi-stationary feature in the jet into which the relativistic plasma with a high bulk Lorentz factor ($\Gamma \sim 20 - 40$) is injected while an attempt to model the blob as moving along with the bulk motion of the jet plasma results in a poor description of the data. By adding protons into the blob and using the high-statistics X-ray data to constrain the hadronic contribution, we obtain the expected neutrino yield from 3C 454.3 in different states of its activity. Extending the model of 3C 454.3 to the whole population of *Fermi*-LAT FSRQs we estimate their contribution to the observed IceCube neutrino flux at energies ≥ 100 TeV.

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Session Classification: Session 1