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Multi-TeV flaring from high energy blazars: An evidence of the photohadronic process

The high energy peaked blazars are known to undergo episodes of flaring in GeV-TeV gamma-rays involving different time scales and the flaring mechanism is not yet well understood despite long term simultaneous multiwavelength observations. These gamma-rays en route to Earth undergo attenuation by the extra galactic background light.

Using the photohadronic model, where the seed photons of the jet follow a power-law spectrum and considering a template extragalactic background light model, we derive a simple relation between the observed multi-TeV gamma-ray flux and the intrinsic flux which depends on a single parameter. We study 42 flaring epochs of 23 blazars and found an excellent fit to most of the observed spectra, further supporting the photohadronic origin of multi-TeV gamma-rays.

We note that we can also constrain the power spectrum of the seed photons during the flaring period. Moreover, for blazars of unknown redshifts whose multi-TeV flaring spectra are known, stringent bounds on the former can be placed using the photohadronic model.

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