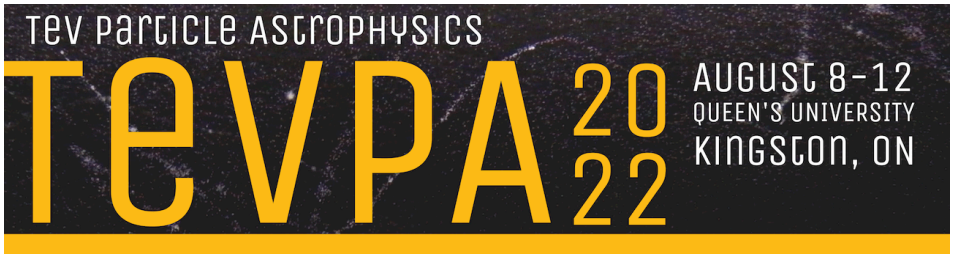

Contribution ID: **77** Type: **Parallel Talk**

Absorption features in gamma-ray spectra of BL Lac objects

Monday, August 8, 2022 4:10 PM (20 minutes)

Absorption and emission lines in the optical spectrum are typically used to investigate the presence of large-scale environments in active galactic nuclei. In BL Lac objects, this approach is hampered by the dominant non-thermal continuum of their relativistic jet, which prevents us from identifying the thermal emission of the photon fields produced by such large-scale structures.
However, these photon fields may eventually interact with the gamma rays traveling in the blazar jet, and produce observable effects. In our contribution, we discuss this indirect method that may help to unveil the presence of ambient structures in BL Lac objects through the analysis of their gamma-ray spectrum. Passing through structures at different distances from the black hole, gamma rays of the jet interact with the corresponding photon fields via gamma-gamma pair production, producing absorption features in their spectral energy distribution. An interaction of the gamma-ray photons with a narrow-line region producing optical-UV seed photons may reduce the observed gamma-ray flux and cause absorption features at a few hundreds GeV.
Sources with spectra reaching TeV energies, such as high synchrotron-peaked BL Lac objects (HBLs) and extreme HBLs (EHBLs, extreme blazars), may represent exceptional probes to investigate this topic. At this scope, we discuss recent observations of sources that may show evidence of such absorption features in their gamma-ray spectra.
Finally, we examine how sub-TeV absorption features in the spectra of BL Lac objects may affect their broad-band modeling, and eventually represent a powerful diagnostic tool to constrain the gamma-ray production site and the jet environment.

Collaboration name

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Session Classification: Extragalactic Sources

Track Classification: Extragalactic Sources