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Gamma-ray cosmology and fundamental physics with TeV blazars: results from 20 years of observations

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Gamma rays from TeV blazars have been detected by ground-based experiments for more than two decades. We have collected the most extensive set of archival spectra from these sources in order to constrain the processes affecting gamma-ray propagation on cosmological distances. We discuss our results on the diffuse photon field that populates universe, called the extragalactic background light, on the expansion rate of the Universe, on redshift constraints, and on fundamental physics in the form of axion-like particles and Lorentz invariance violation. Specifically, we present a spectrum of the extragalactic background light from 0.26 to 105 microns constructed from the gamma-ray observations, we measure a value of the Hubble constant compatible with other estimates, and we constrain the energy scale at which Lorentz invariance violation impacts gamma-ray absorption by the extragalactic background light to be larger than sixty percent of the Planck scale.

Collaboration

– not specified –

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363

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