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Measurement of the Proton Spectrum with the MAGIC Telescopes

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Recently, precision measurements of cosmic rays have revealed spectral structures that deviate from the previously assumed simple power law. These features offer a wealth of theoretical interpretations to obtain a consistent picture of cosmic ray acceleration, propagation and/or injection, including potential contributions from nearby sources. Among the different species, protons, the most abundant and the least charged of all nuclei in the Universe, represent an important probe to test these scenarios and understand the observed features. In this work, we report on our measurement of the proton spectrum from one to several hundred TeV. This is derived from the existing MAGIC data collected during observations of celestial gamma-ray sources. Our analysis is based on neural networks to build the energy regressors and event classifiers. This is the first measurement of the proton spectrum over a broad energy range from 1 to 500 TeV using the ground-based imaging air Cherenkov telescope technique.

Collaboration(s)

MAGIC

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