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Analysis of the cosmic proton and helium fluxes towards PeV energies with DAMPE

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The DARK Matter Particle Explorer (DAMPE) is a satellite-borne experiment, in operation since 2015, aimed at studying high-energy gamma rays and cosmic rays. Proton and helium are the first- and second-most abundant components in cosmic rays. Given their smaller interaction cross-sections with the interstellar medium, compared to heavier nuclei, they can travel larger distances, thereby becoming important probes to cosmic-ray sources as well as acceleration and propagation mechanisms. Recently, in the DAMPE collaboration, machine learning (ML) techniques were developed and deployed with the aim of improving particle tracking and identification as well as compensating for the energy lost in the calorimeter at high energies due to saturation of the electronics. This work presents a direct measurement of the energy spectra of cosmic-ray proton and helium nuclei, using 7 years of data recorded by DAMPE. Application of the above-mentioned ML techniques helps in extending the spectra to higher kinetic energies than those previously reported by DAMPE.

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