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Nickel Measurements in DAMPE Cosmic Ray Data

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The Dark Matter Particle Explorer (DAMPE) is a calorimetric, satellite-borne detector that has been operating in orbit for over nine years. One of its key scientific objectives is measuring the flux of cosmic-ray nuclei, crucial for understanding the origins of cosmic rays and their propagation mechanisms.

Nickel, one of the most stable elements alongside iron, is the most abundant heavy element beyond iron in cosmic rays. Measuring its energy spectrum provides valuable insights into the acceleration sources of heavy nuclei and their propagation through the interstellar medium. With DAMPE's excellent charge resolution ($\sim 0.33e$ for iron) and broad energy range from 10 GeV/n to 1 TeV/n, we can achieve high-precision measurements of the nickel spectrum.

From 2016 to 2024, DAMPE collected over 50,000 nickel candidate events. To minimize iron contamination in heavy nuclei beyond iron, we implemented a machine learning-based track reconstruction method and an updated charge reconstruction algorithm. This work presents these methods and preliminary results on the nickel spectrum in cosmic rays.

Collaboration(s)

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