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Unveiling the Nature of the Cosmic Ray All-particle Spectrum Knee by LHAASO-KM2A

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The nature of the cosmic ray all-particle spectrum knee has been a long-standing puzzle since its discovery. The high altitude near the shower maxima of cosmic rays in the knee region has enabled the LHAASO experiment to conduct calorimetric energy measurements, significantly reducing the dependence of energy measurement on cosmic ray composition and interaction models typical in ground-based experiments. The all-particle energy spectrum and mean logarithmic mass have been measured with unprecedent precision. By introducing a novel concept called the total logarithmic mass, which is highly sensitive for evaluating the proton contribution to the knee, along with a cocktail method that allows for a natural light composition, the cosmic ray all-particle spectrum knee has been attributed to proton and helium, featuring rigidity-dependent cutoff energy with remarkable significance.

Collaboration(s)

LHAASO collaboration

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