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Observation of a knee in the p+He energy spectrum below 1 PeV by using a bayesian technique for the data analysis of the ARGO-YBJ experiment.

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The measurement of the cosmic ray (CR) spectrum plays a fundamental role in the understanding of the production and acceleration mechanisms of high energy CR. Moreover the determination of the CR composition at energies > 100 TeV could provide a better understanding of the origin of the knee in the all-particle CR spectrum.

The ARGO-YBJ experiment is a full coverage air shower detector operated at the Yangbajing international cosmic ray observatory (Tibet, P.R. China, 4300 m a.s.l.) and has been in stable data taking in its full configuration since November 2007 to February 2013. The detector has been designed in order to detect showers produced by primaries of energies down to few Tev up to the PeV region. The high segmentation of the detector allow a detailed measurement of the lateral particle distribution, that can be exploited in order to discriminate showers produced by light primaries. In this work the measurement of the CR p+He energy spectrum is presented in the energy range 10-3000 TeV. In particular, a bayesian technique has been used for the statistical measurement of the energy spectrum. A deviation from a single power law is cleary evident at energies below 1 PeV. This is in agreement with other two independent analysis of ARGO-YBJ data (one of them also using the Cherenkov signal as measured by a LHAASO telescope prototype), and provides new important inputs to acceleration/propagation models for galactic cosmic rays.

Collaboration

ARGO-YBJ

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