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Study of the galactic cosmic ray energy spectrum with the ARGO-YBJ experiment

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The CR spectrum has been studied by the ARGO-YBJ experiment in a wide energy range (TeVs⟶ PeVs) . This study is particularly interesting because not only it allows a better understanding of the so called 'knee' of the energy spectrum and of its origin, but also provides a powerful cross-check among very different experimental techniques.

The unique detector features (full coverage, time resolution, large dynamic range) and location (4300 m above sea level) allowed both lowering the energy threshold down to the region covered by direct measurements and reaching the knee of the all-particle spectrum, where data from many ground-based experiments are available since long time. Moreover, the possibility of a detailed study of the particle distribution at ground in the first few meters from the shower axis, provided a new and efficient way of selecting events initiated from light mass primaries (i.e. protons and alpha particles), without relying on the muon signal, thus avoiding sizeable systematic dependencies on the adopted hadronic interaction model.

The resulting all-particle spectrum (measured in the energy range 100 TeV - 10 PeV) is in good agreement with both theoretical parametrizations and previous measurements, thus validating the selection and reconstruction procedures.

The light-component (i.e. p + He) has been measured from 3 TeV up to about 3 PeV. The ARGO-YBJ result, while being in agreement with highest energy direct measurements, shows a clear indication of a bending below 1 PeV. This provides new important inputs to acceleration/propagation models for galactic cosmic rays.

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