

Measurement of the total cosmic ray energy spectrum using HAWC in the TeV regime

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Abstract

The energy spectrum of cosmic rays contains crucial information about the propagation and acceleration mechanisms of these particles, on their astrophysical sources and about the presence of possible nearby cosmic-ray accelerators. The energy region between 10 TeV and 1 PeV in the spectrum has received recent interest since new observations have revealed a break in this energy regime and because cosmic-ray direct and indirect detection techniques have an overlap in this energy interval, which could be exploited to study the systematics that affect both detection methods. The HAWC observatory is a ground-based detector well suited for cosmic-ray exploration in this energy range, therefore, it offers an excellent opportunity to study the energy spectrum, composition, arrival directions of TeV cosmic rays and to compare HAWC's measurement with direct data. In this work, we present an update of the total energy spectrum of cosmic rays from 10 TeV up to 1 PeV based on four years of HAWC data, which were collected from January 2017 to December 2018. The result was derived by implementing an unfolding algorithm. We compare the HAWC energy spectrum with other measurements from direct and indirect experiments. We confirm that the all-particle cosmic-ray energy spectrum breaks at TeV energies.

Comments

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