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Investigation of anomalous effects in cosmic rays.

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Abstract.
Studying the spectrum of secondary particles at the Large Hadron Collider (LHC) at energies equivalent to 1-100 PeV in the laboratory system, scaling behavior is observed. At the same energies, a number of effects are observed in cosmic rays (CR) that are incompatible with this behavior. In the spectrum of extensive atmospher showers (EAS), a break (knee) is observed at an energy of 3 PeV. According to the large ionization calorimeter at the Tien Shan, the absorption length of hadron showers increases in the same energy region. In the hybrid HADRON experiment, there is a scaling violation in the spectrum of secondary hadrons and an anomalous excess of muons in proton showers. According to the data of X-ray emulsion chambers , events with halos appear in the knee area and effect of alinement in energy centers of gamma-hadron events are observed.. Given the LHC data, these anomalies should be explained by astrophysical reasons, i.e. changes in the composition of cosmic rays.

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