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PCR energy spectrum and composition above the knee: new approach to experimental data interpretation

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EAS investigation is the only way to obtain information about PCR energy spectrum and composition above the knee. Usually it is assumed that primary particle energy is equal to EAS energy, which is evaluated from measured EAS parameters. At that, it is also assumed that interaction model at such energies is known as a continuation of models verified at accelerator energies. Therefore it is supposed that all changes of EAS characteristics in dependence on energy are results of PCR energy spectrum and composition changes only (cosmophysical approach).
In this talk another approach (nuclear-physical one) is considered. It is supposed that interaction model at energies above the knee is drastically changed. The reasons of consideration of such approach are the following: the difficulties in explanation of behavior of the energy spectrum and especially mass composition in dependence on energy in the frame cosmophysical approach; unusual behavior of some EAS parameters: excess of muons compared to simulations at limiting suppositions about composition (pure iron) and interaction model (with maximum muon yield); observations of unusual events in various experiments (halo, alignment, penetrating cascades, long-flying component, Centauros and AntiCentauros, excess of muons with energy above 100 TeV), which cannot be explained in the frame of existing interaction models.
The proposed approach based on the production of blobs of quark-gluon matter (plasma) with a large orbital momentum allows explain behavior of PCR energy spectrum and mass composition and all observed above the knee events and phenomena from a single point of view. Experiments for checking of new interpretation models are discussed.

Collaboration

– not specified –

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