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HE Stratosphere Event of 1975 Revisited: the Difference between the Patterns of Astroparticle Interaction and LHC Nucleus-Nucleus Collision.

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The event of astroparticle collision at high energy was detected in 1975 during the balloon flight in the stratosphere. The data of hundred particle tracks in x-ray films have been re-analyzed in the style of LHC experiments: rapidity distributions of charged particles and transverse mass spectra of multi-particle production have been built. The comparison of multiple histograms with the expectations of the Quark-Gluon String Model (QGSM) gives us, at first sight, the conclusion that it might be the carbon nucleus collision with the matter of atmosphere at the c.m.s. equivalent energy $\sqrt{s} \geq 5$ TeV.
After QGSM analysis of these scarce data, we know the following: the value of maximal rapidity of one projectile proton and the density of particle multiplicity in the central rapidity region. Besides this, the transverse mass distributions show us how many protons are in every particular range of rapidity. In such a way, we certainly can distinguish how this astroparticle interaction is similar to or differs from the average A-A collision event at LHC. Nevertheless, the data indicate the features that cannot be associated with nucleus-nucleus collision: one particle with transverse mass 16 GeV was detected and a small nucleon population is seen in the region of projectile fragmentation that doesn't correspond to the carbon nucleus collision. Both facts make us convinced that there might be a baryonic DM decay. These quasi-stable baryon-antibaryon neutral states have been suggested in the earlier paper (Piskounova O., 2018). They are to be formed under the huge gravitation pressure at giant massive objects like Black Holes. The relativistic jets are spreading baryonic DM in space. Their collisions with ordinary matter have to give the different pattern than A-A interactions. The important difference between this form of matter and the ordinary nucleus lies in the results of collision: baryonic DM is the object, where proton-antiproton String Junctions are strongly connected, so the energy between nucleon components is divided by Regge type of structure function, like for quarks in the proton. The lightest debris of baryonic DM particle interacts with the maximal rapidity and gives the small number of nucleons in the forwarding part of spectra. Baryonic DM can also split into the pair of similar DM with lower mass giving an unusual couple of hadrons with mass like 14 GeV and heavier.
Finally, we conclude that the cosmic ray experiments on the high altitudes in the atmosphere are, on one hand, good supplements to the LHC measurements. On the other hand, they are able to discover events of unknown astroparticle collisions in the full kinematical range, while colliders are studying nuclear interactions only in the central rapidity region. Such experiment, which is detecting the very first collision of the astroparticle with the atmosphere, but it is preferred to be constructed with the application of up-to-date electronic methods.

In-person participation

No

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