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Proton production spectrum at Ultra High Energy: multiple Pomeron exchanges and growing cross sections, triple-Pomeron exchange and spectrum of UHE neutrinos, four-Pomeron exchange and Baryonium Dark Matter

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Proton-proton collisions are changing at High Energies (HE): total cross sections are growing and the cross sections of proton-proton reaction become equal to antiproton-proton ones. The quark-antiquark annihilation is not already the mediator of interaction because of large gap between projectiles. The new mediator is Pomeron exchange, the trajectory with vacuum quantum numbers. Visually, it can be presented as cylinder with quark-gluon-net diagram on the wall. Cross sections are growing due to unusual intercept of Pomeron trajectory: $\Delta_P(0)> 0.
The multiple Pomeron exchanges, as well as enhanced diagrams with triple-Pomeron contribution and four Pomeron exchange with torus, play important roles in QCD processes at Ultra High Energy (UHE). Pomeron exchange contributions are not disappearing with energy. Triple-Pomeron exchange is responsible for diffraction peak at the end of proton production spectrum and thus the secondary particles (gamma-photons and neutrinos) in space should reproduce this feature of proton spectra: the bump at UHE end of spectra. The Pomeron torus is closed neutral QCD object, which hides the baryon and antibaryon charges and having shrinked mass toward the sum of baryon and antibaryon masses ,so that it is the proper candidate for Dark Matter. Baryons and anti baryons do not annihilate, but build the strongly connected quasi stable state, which has been named baryonium. The Baryonium Dark Matter conglomerates that are organized as multi baryonium torus may be very heavy and rather functional constituents of Universe. The expected features of BDM will be discussed.

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