The QGSM description of baryon production at modern colliders: < Pt> vs energy and vs mass + charge asymmetry vs energy

by Olga Piskounova arXiv: 1602.08003

Average Pt vs. energy

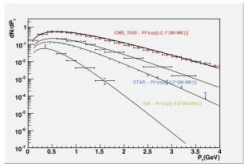

Fig.1 QGSM description of ISR,STAR,ALICE and CMS at proton-proton collisions of different energies.

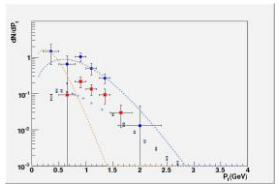

Fig.4 Λ^0 hyperon spectra: STAR(200GeV)-blue stars, UA5(200GeV)red squares, UA5(900GeV) blue squares. QGSM explanation is shown with blue dashed lines..

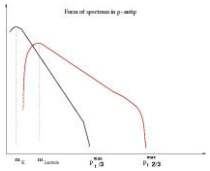

Fig.5 Contributions from quark-antiquark and diquark-antidiquark sides.

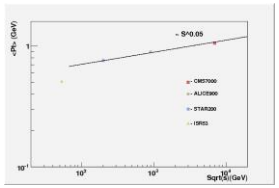

Fig.8 The slow growing of <Pt> at the energies of modern p-p colliders.

<Pt> vs. mass

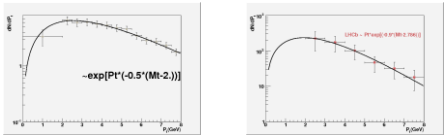

Fig.2 QGSM transverse momentum spectra for B-meson (LHCb,7TeV) left side and Λc (LHCb, 7TeV) – right. Side.

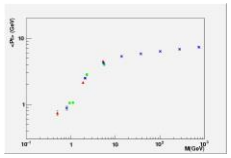

Fig.6 Average Pt vs energy: baryons (green circles), mesons (red triangles), the suggested symmetry states are shown with blue stars.

Conclusions

The suggestion of hidden symmetry between meson and baryon states of same flavor gives new states: 13.7, 37.3, 101.5, 276, 750 GeV etc.

QGSM diagrams and formulas

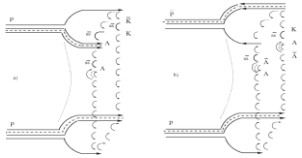

Fig. 9 Proton-proton collision diagram(left side) and antiproton-proton one (right side) in Quark-Gluon Strings Model. The difference in p-p and antip-p diagrams explains the different form of pt spectra of hyperons (see fig.4).

The transverse momentum spectra of produced hadrons in p-p collisions were described with the dependence:

$$Ed^3\sigma/dx_F/d^2p_t = d\sigma/dx_F * A_0 * \exp\{-B_0 * (m_t - m_0)\}, \quad (1)$$

where m_0 is the hadron mass, $m_t = \sqrt{(p_t^2 + m_0^2)}$ and B_0 is a slope of spectrum.

Asymmetry vs. energy

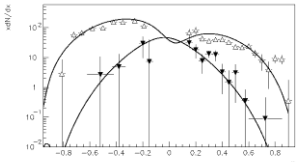

Fig.3 Typical QGSM baryon/antibaryon spectra in complete $-1<X_F<1$ region: Λc – empty triangles, anti Λc – black triangles for Σ–p collision in E781 , as compilation of Σ –A and p-A (proton target fragmentation takes left side).

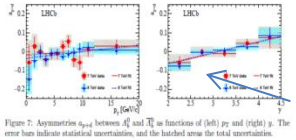

Fig.7 Negative hyperon asymmetry in LHCb for the near-centrer-rapidity area at 7 TeV (see right plot)..

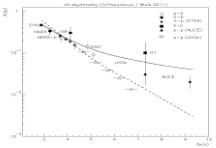

Fig.10 QGSM expectations for Λ^0/antiΛ^0 hyperon asymmetry at LHC enegies.

Asymmetry A(y) between spectra of baryons and antibaryons is defined as:

$$A(y) = (dN^B/dy - dN^{aB}/dy)/(dN^B/dy + dN^{aB}/dy) \quad (2)$$

Conclusions

The growing of <Pt> doesn't contradict to multi pomeron pattern of hadron interactions at high energies. No dramatic changes on the range between Tevatron and LHC help us to conclude that the "knee" in CR proton spectrum has an astrophysical origin. The asymmetric reactions, like antip-p, reveal the structure of one pomeron exchange.

Conclusions

QGSM describes baryon spectra in the entire rapidity diapason.

The possibility of negative asymmetry exists in the spectra of heavy quark baryons. Form of spectra determines the growing antiparticle-to-particle ratios in lab.system of CR interactions. The study of baryon asymmetry through all hadron collider experiments gives the limits on important parameter of string junction: $\alpha_{SJ}(0)$!