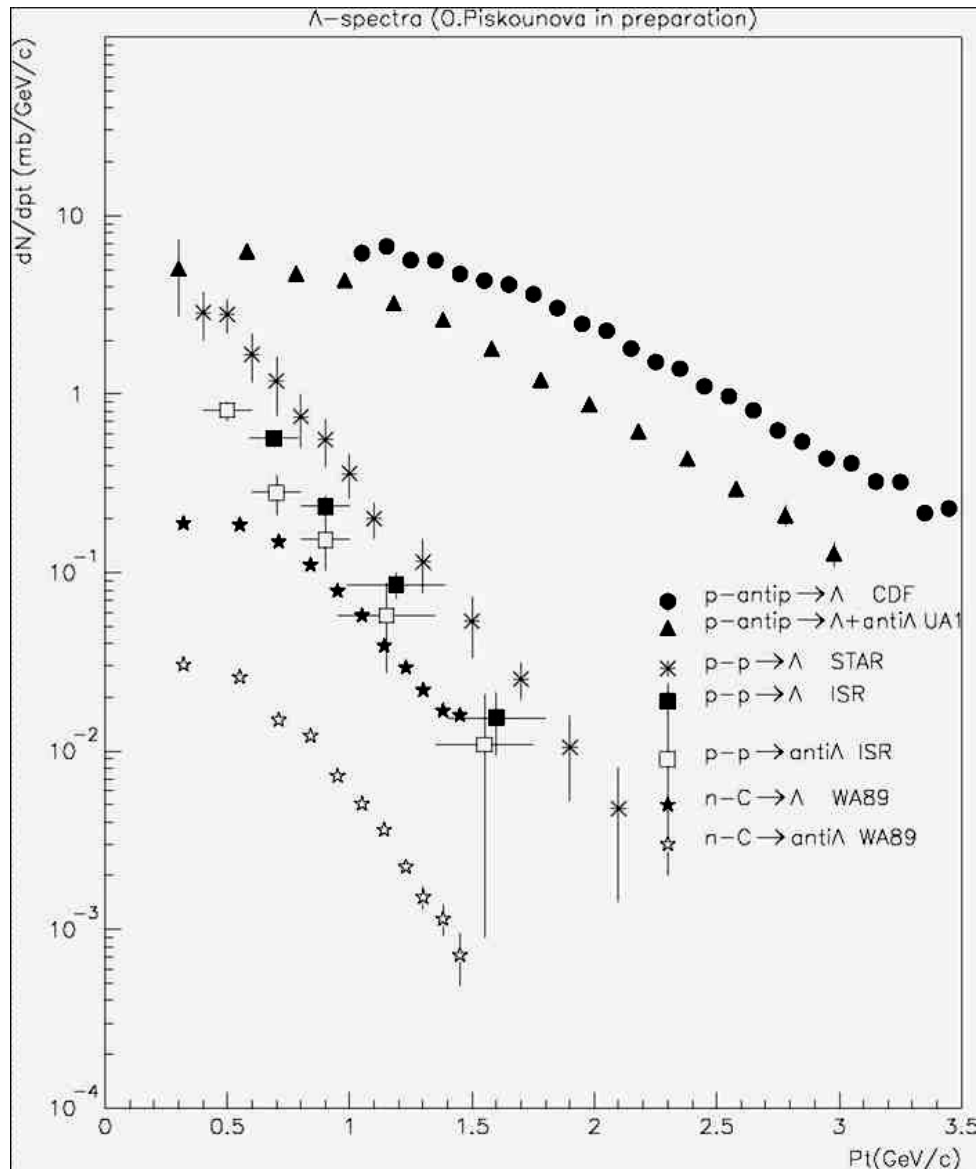


**The hyperon transverse
momentum distributions and
dynamical
difference between proton-
proton and antiproton-proton
collisions**

**Olga Piskounova
P.N.Lebedev Physical
Institute of Russian
Academy, Moscow**

Hyperon distributions at the different beams



Pomeron Pt distributions in proton-proton collisions (QGS model)

published in A.I. Veselov, O.I. Piskunova, K.A. Ter-Martirosian, Phys.Lett.B158:175,1985.

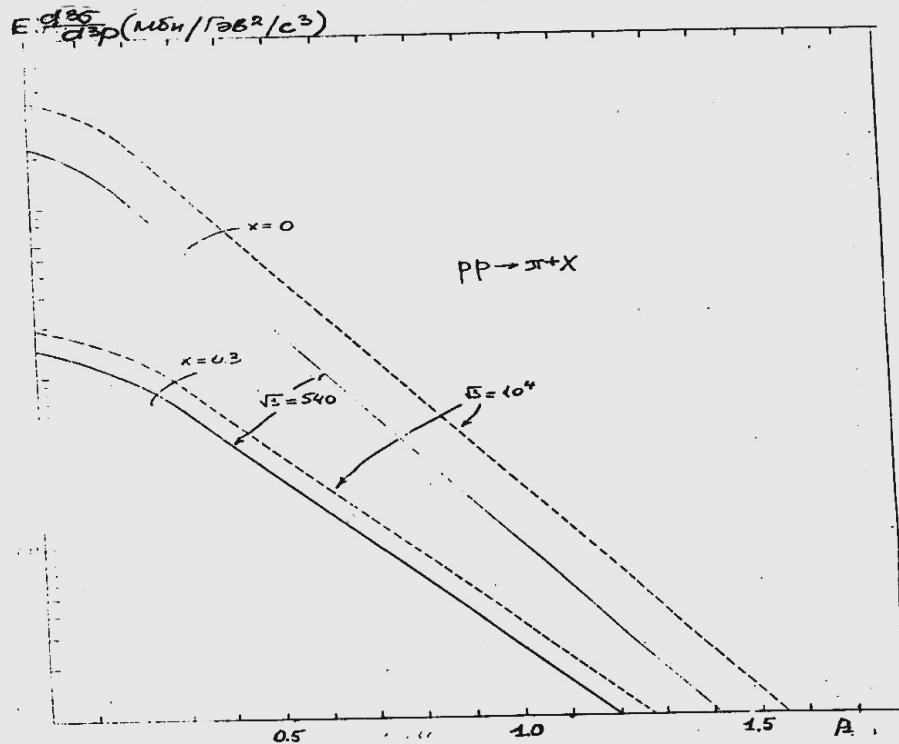


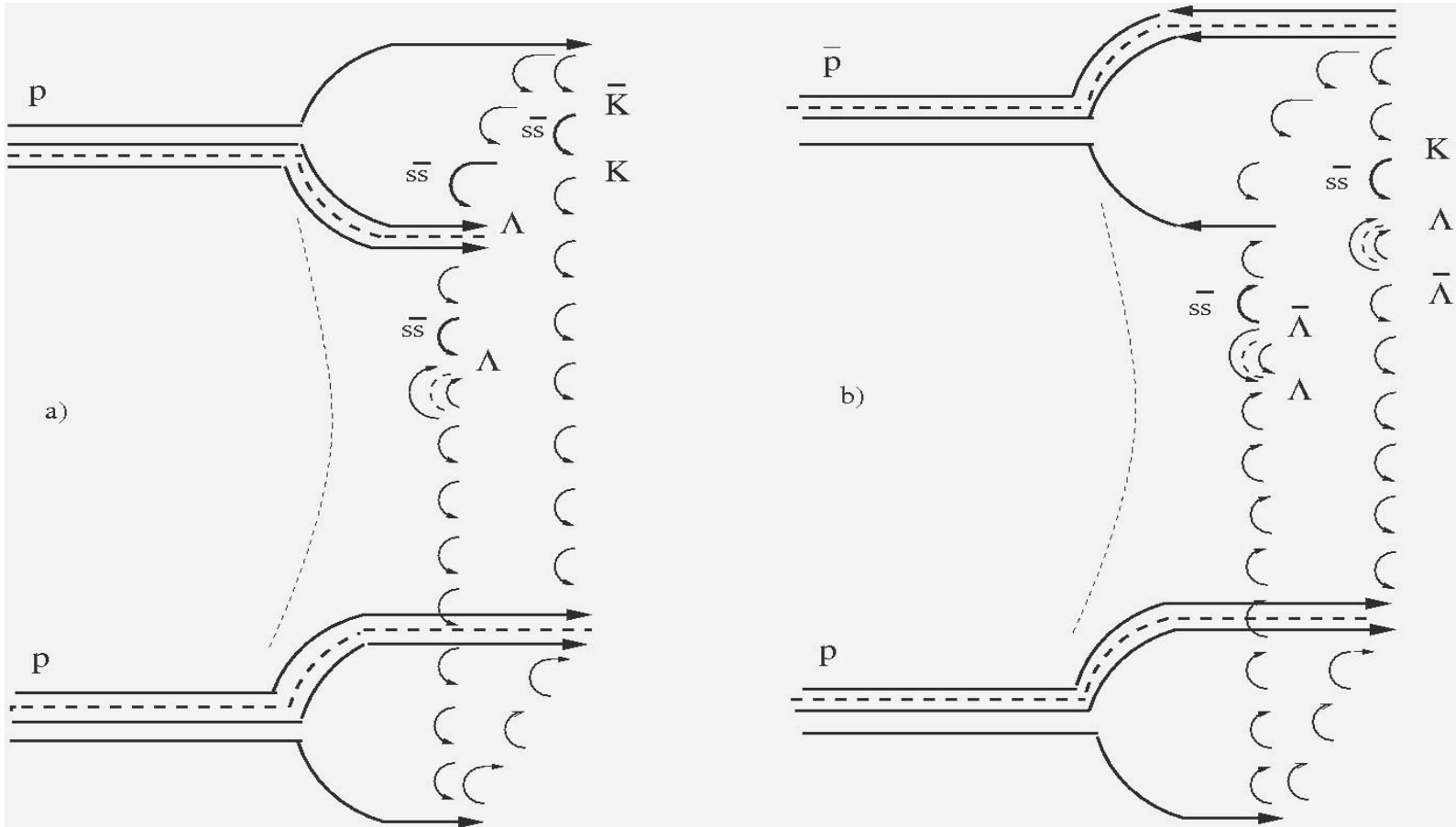
Рисунок 38. Изменение распределений π^+ мезонов поперечному импульсу при переходе от энергии $\sqrt{s} = 540$ ГэВ (сплошная кривая) к $\sqrt{s} = 10^4$ ГэВ (штриховая) при $x=0$, и $x=0,3$.

The QGSM approach:

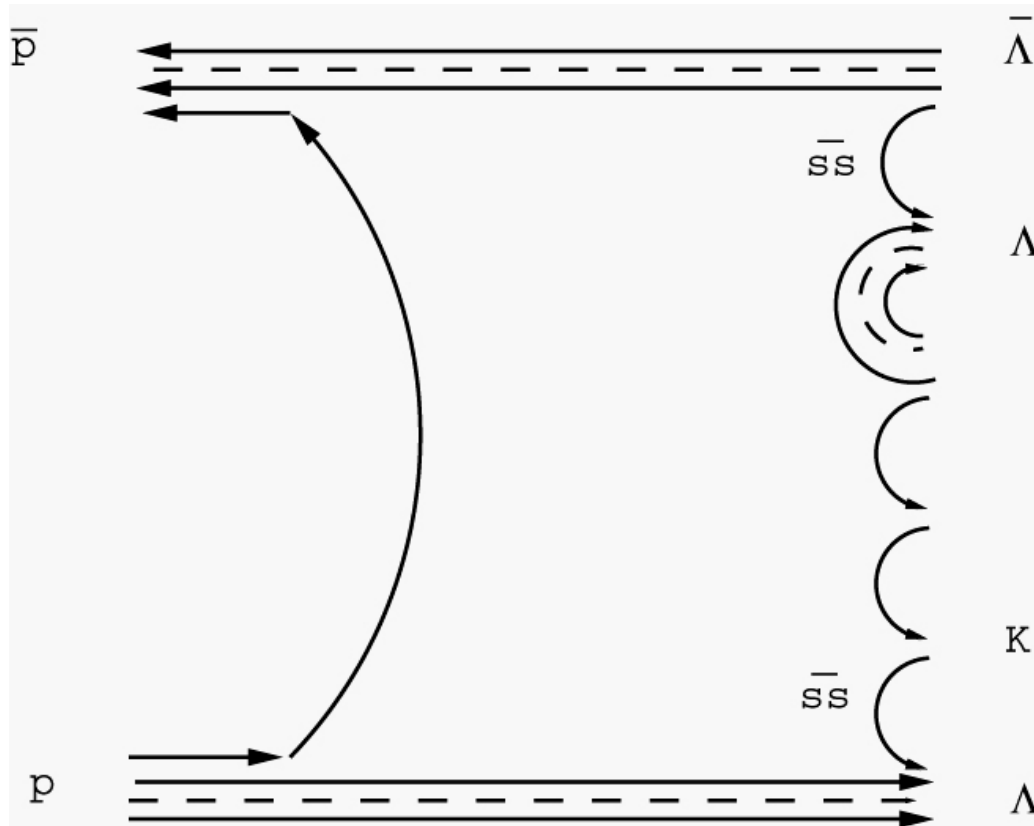
Pt spectra were described with one exponent $\sim e^{-B(m_{\perp}-m_0)}$, $B \sim 6.0$ GeV^{-1} , $m_{\perp} = \text{sqrt}(m_0^2 + \langle p_{\perp}^2 \rangle)$,

up to $p_{\perp} = 1.5$ GeV/c . Spectra are growing due to total cross section. The exponential form is remained. With $x \rightarrow 1$ the slope becomes more flat. Spectra of pions, kaons, protons and antiprotons were described in this way.

QGSM diagrams for pp and antipp



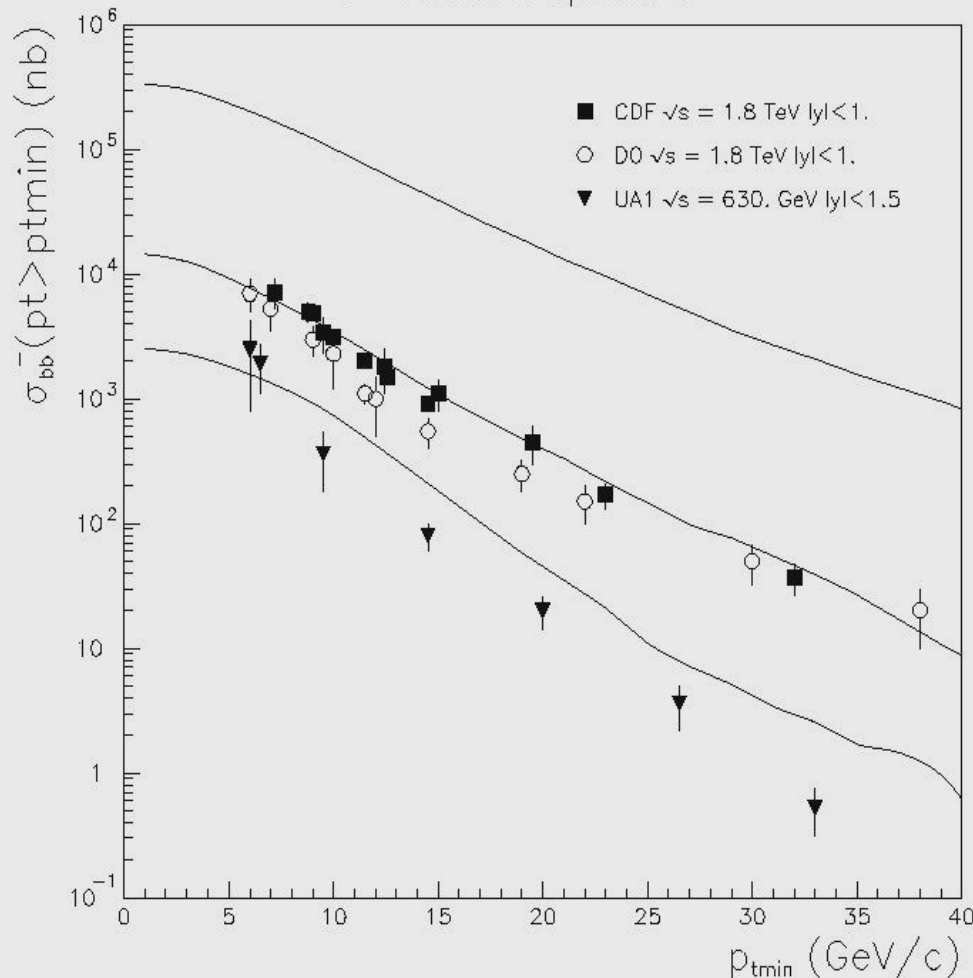
Λ production diagram at low energies



Previous evidence of different slope of spectra

B-meson spectra

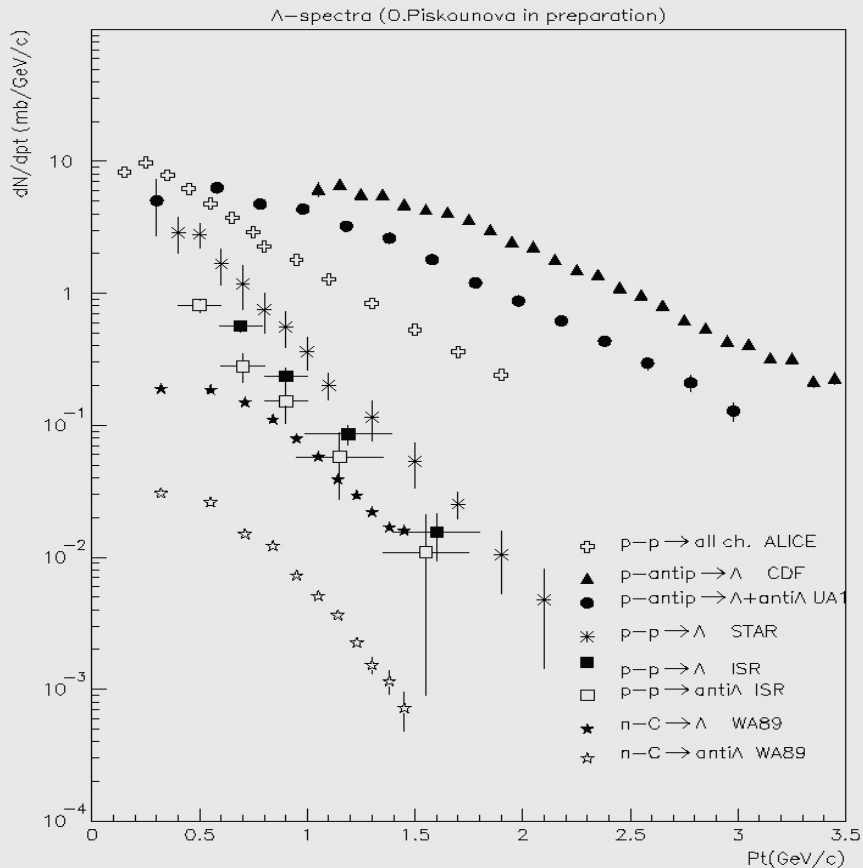
97/08/28 14.09



This slope gave rather low production X section of B-meson in Tevatron experiments (published in **Phys.Atom.Nucl.64:392,2001**. e-Print: hep-ph/0001252)

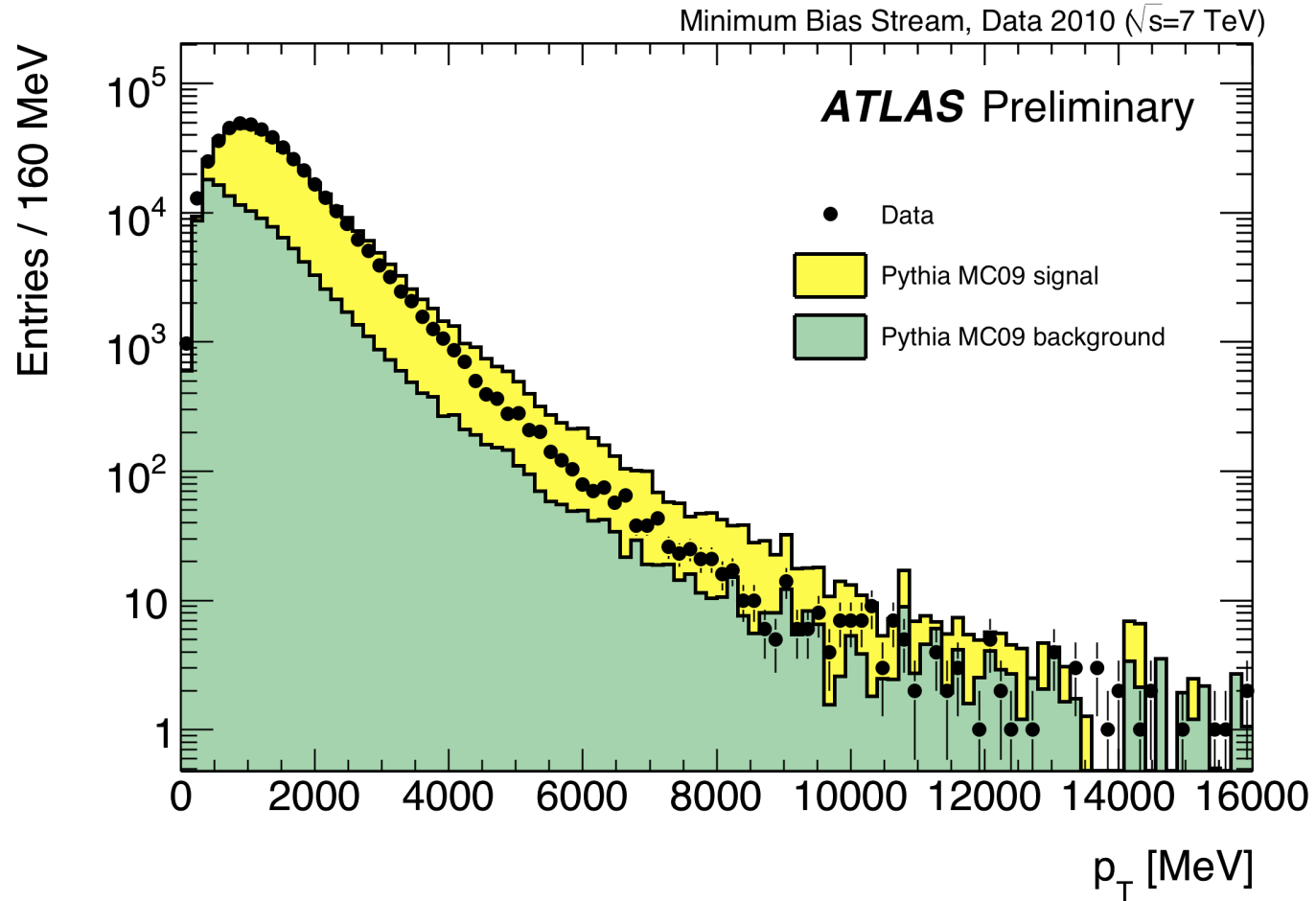
The slope is influenced by mass of produced hadrons that means we are selecting the harder quark-diquark contributions while looking for heavy mass particle production.

LHC results



- LHC spectrum has low Pt exponential part
- The contribution from high Pt component has grown and seems similar as in antiproton beams
- Remember: there are mostly pions in charged particle spectrum. Spectra for baryons will be different (may be like STAR spectrum)
- Low Pt exponential part has the universal slope and goes from vacuum pair production (QGP ?)

Spectrum of Λ in ATLAS



Summary

The analysis of data on hyperon transverse momentum distributions, dN/dp_t , that were gathered from various experiments (WA89, ISR, STAR, UA1 and CDF) allows us to conclude about the important difference in the dynamics of multiparticle production in proton-proton and antiproton-proton collisions.

Asymmetric reactions may provide us with a new “stereoscopic” view on the hadroproduction mechanism.

The important fact is that the latest experiments of highest energies were carried out with antiproton beams. It was a mistake to suggest that pp and p \bar{p} reactions at high energy are giving the similar transverse momentum distributions. The spectra of hyperons that are produced with proton beam have the sharp exponential slope at low p_t , while the spectra with antiproton beam have not.

Hadroproduction spectra are sensitive to quark-diquark structure of interacting hadrons and to the energy splitting between these components.

The impact of different spectra in asymmetric reactions on charge asymmetry in cosmic rays and cosmology has to be accounted with MC calculations