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

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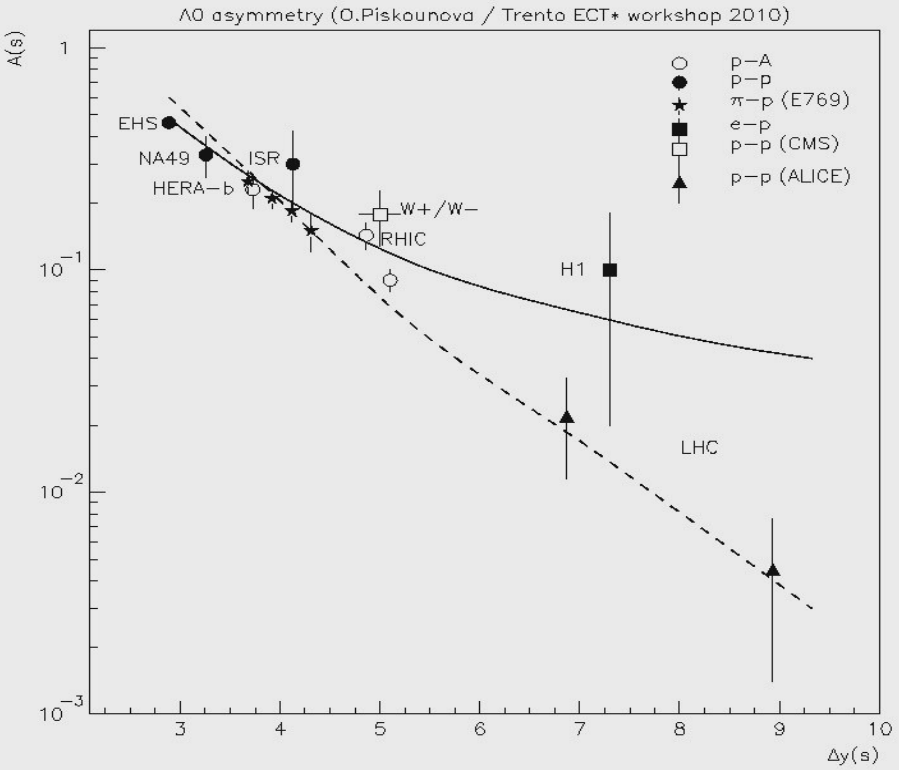
Hyperon asymmetries from all experiments

$$A_{\gamma p} = 2\frac{N(p) - N(\bar{p})}{N(p) + N(\bar{p})} = 8 \pm 3\% .$$

Asymmetries were described in QGSM: **Phys.Atom.Nucl.70:1107-1109, 2007, e-Print: hep-ph/0604157.**

String junction intercepts are taken: $\alpha_{SJ}(0)$=0.5 and $\alpha_{SJ}(0)$= 0.99



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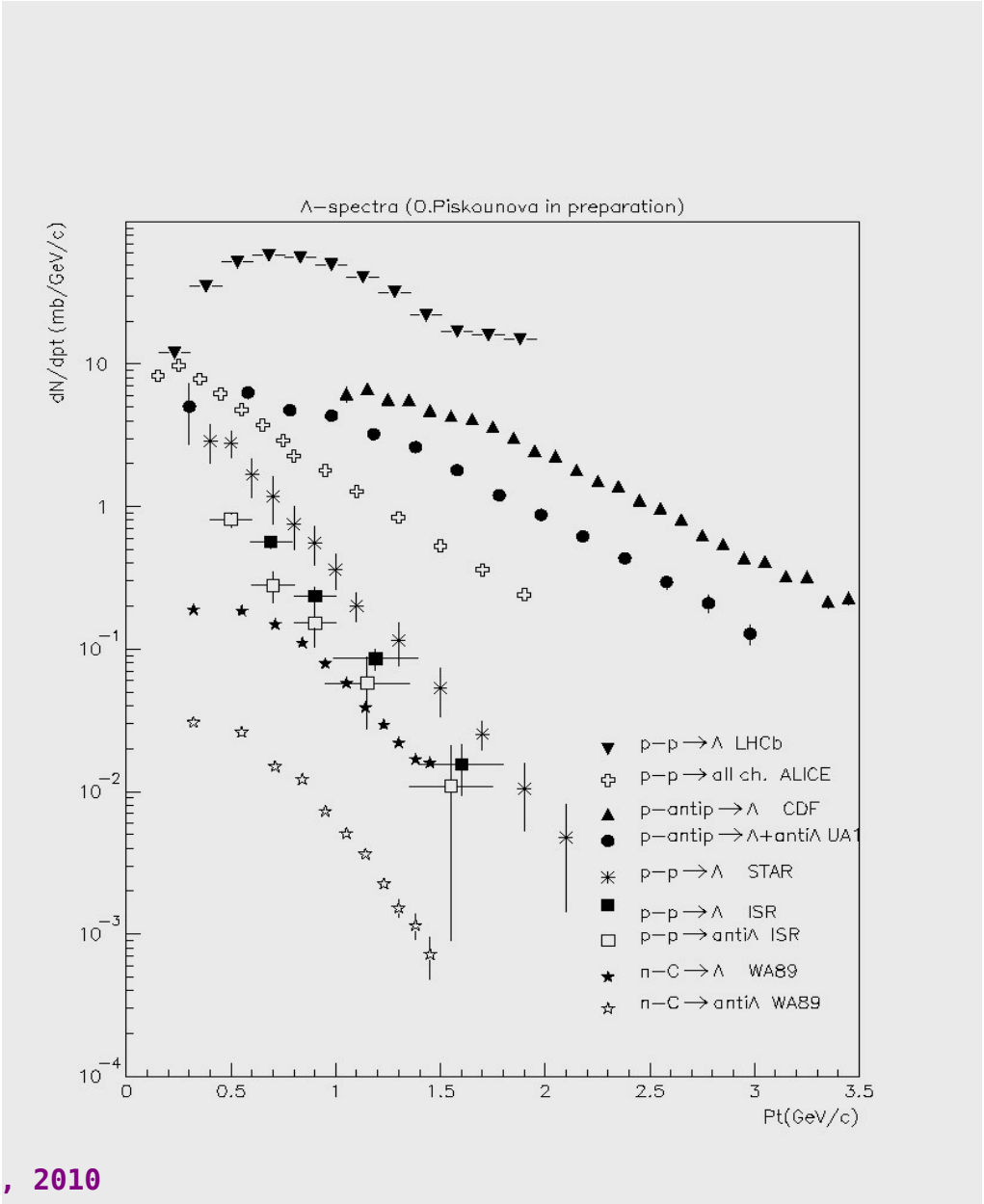
Hyperon spectra from all experiments



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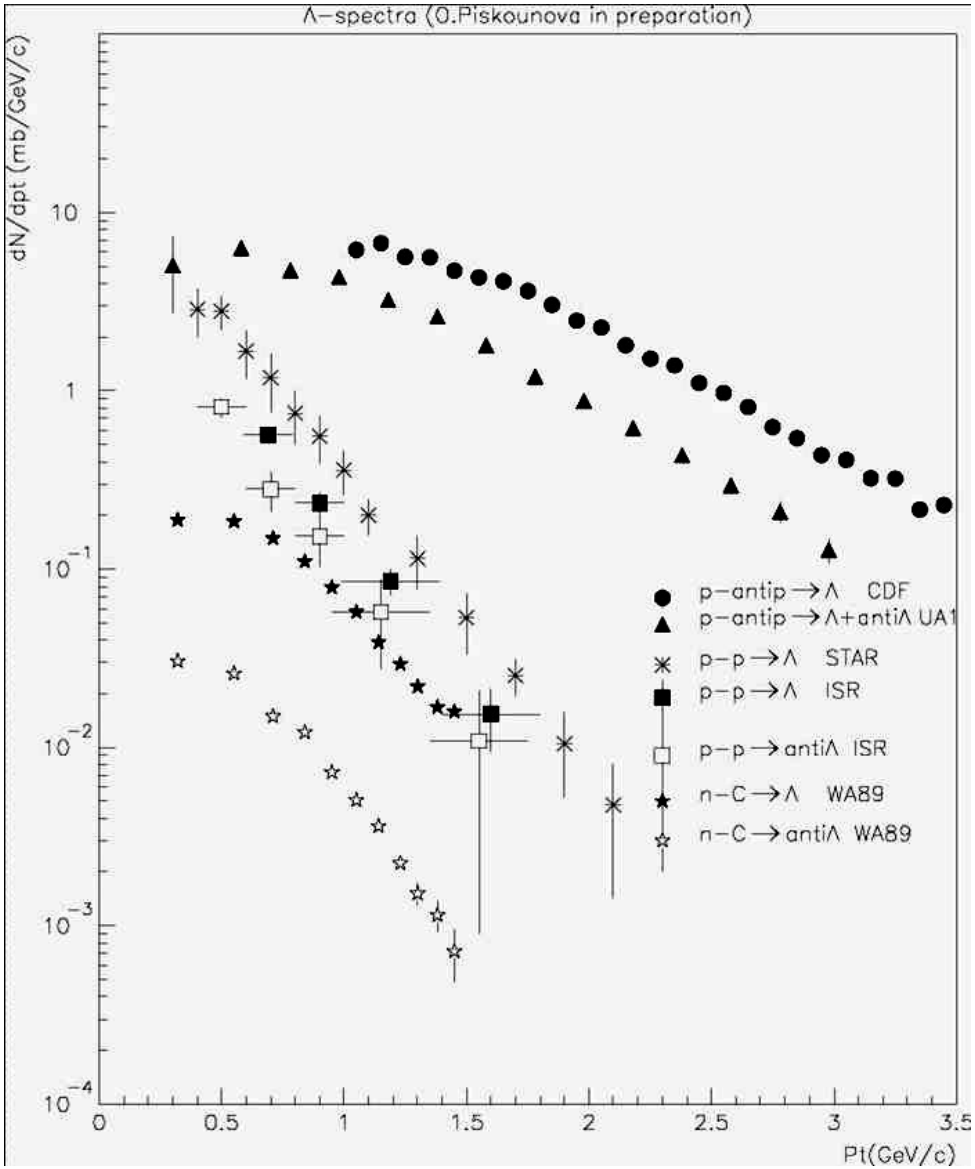
Hyperon distributions at the different beams



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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.

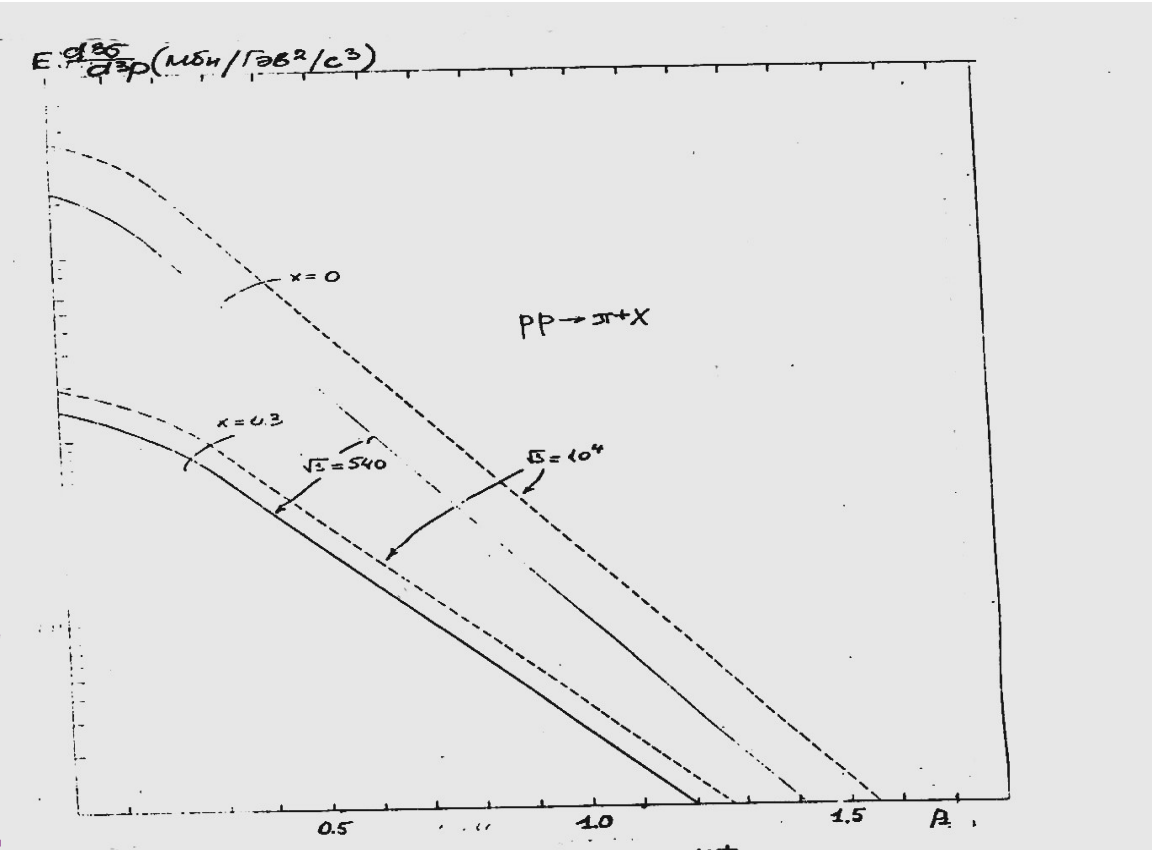
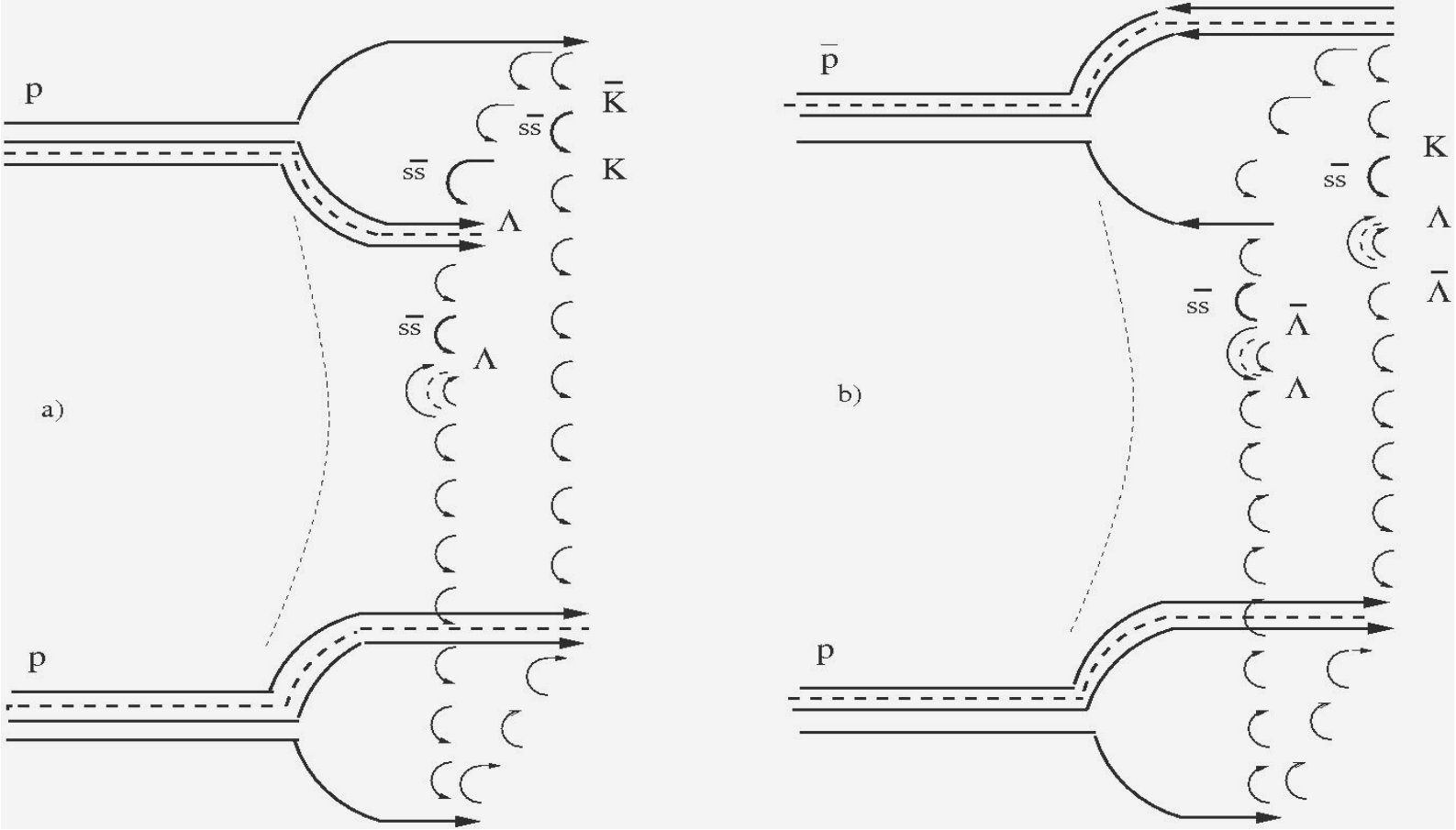
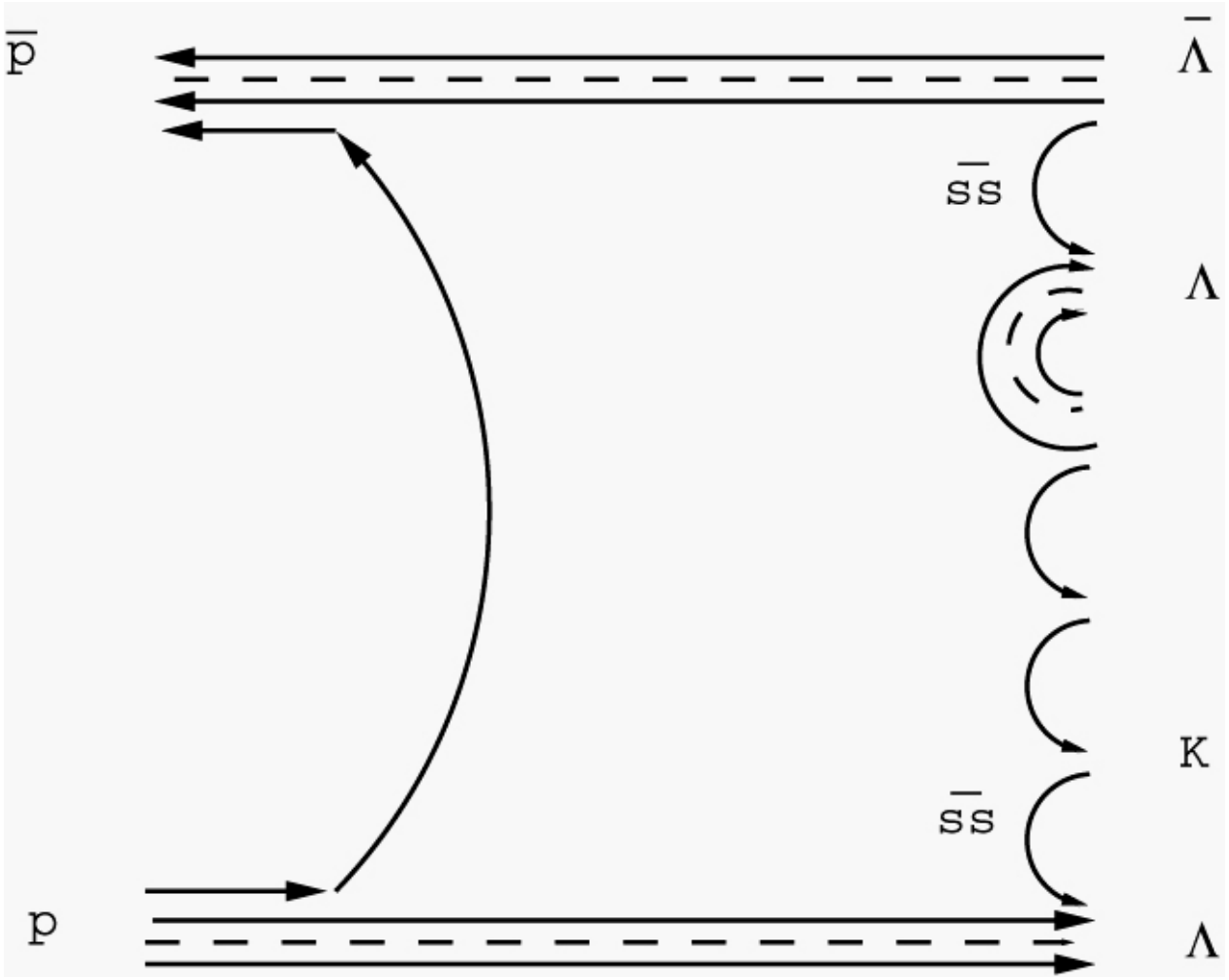


Рисунок 38. Изменение распределений π^+ мезонов поперечному импульсу при переходе от энергии $\sqrt{S}$ = 540 Гэв (сплошная кривая) к $\sqrt{S} = 10^4$ Гэв (штриховая) при $x = 0$. и $x = 0{,}3$.

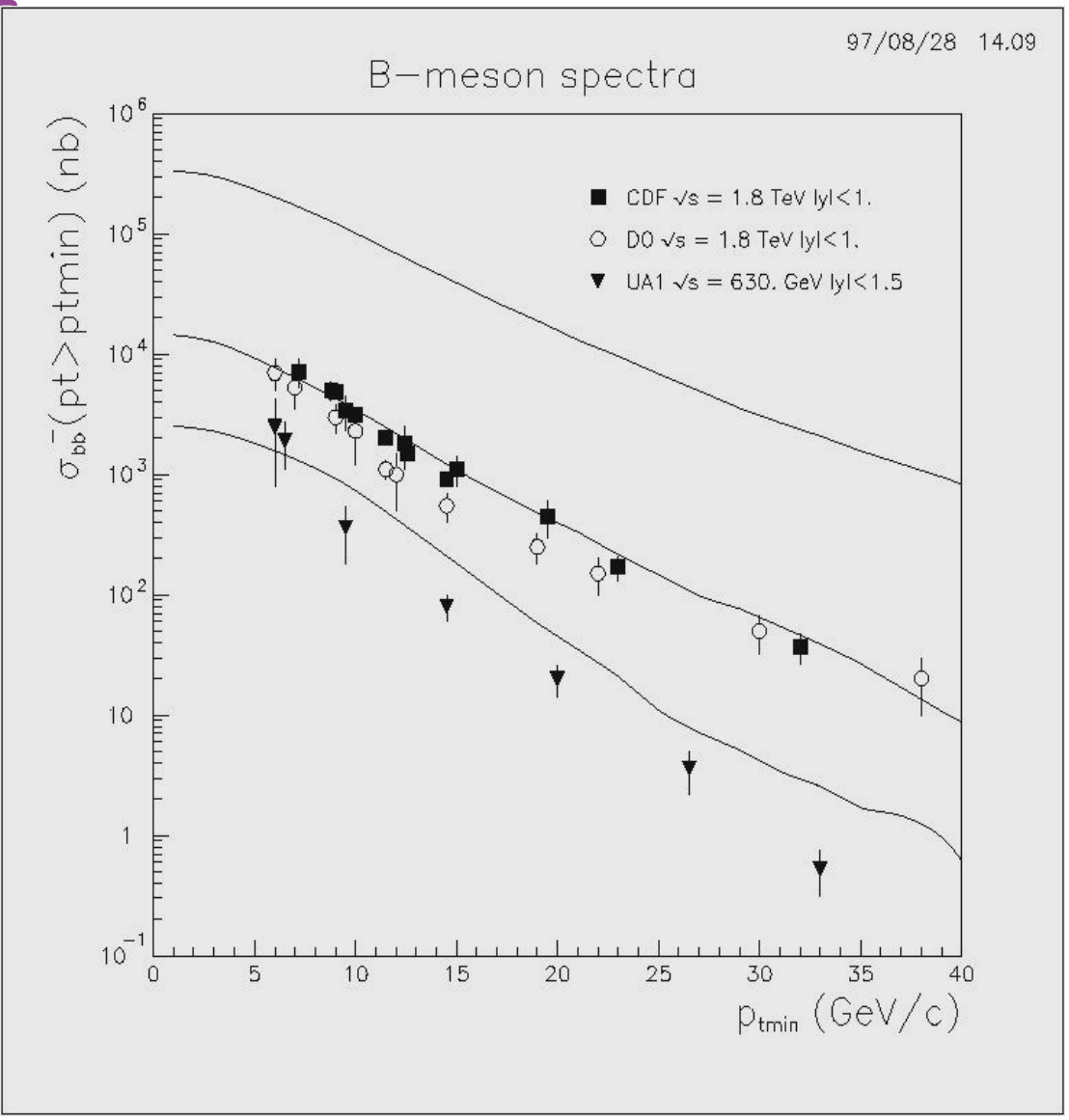
QGSM diagrams for pp and pp

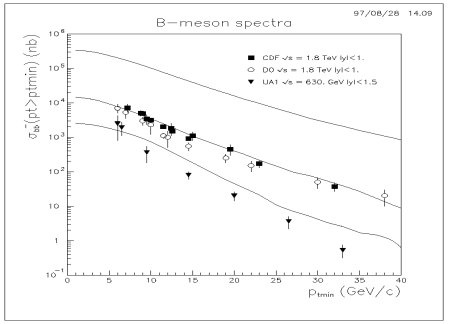


Λ production diagram at low energies

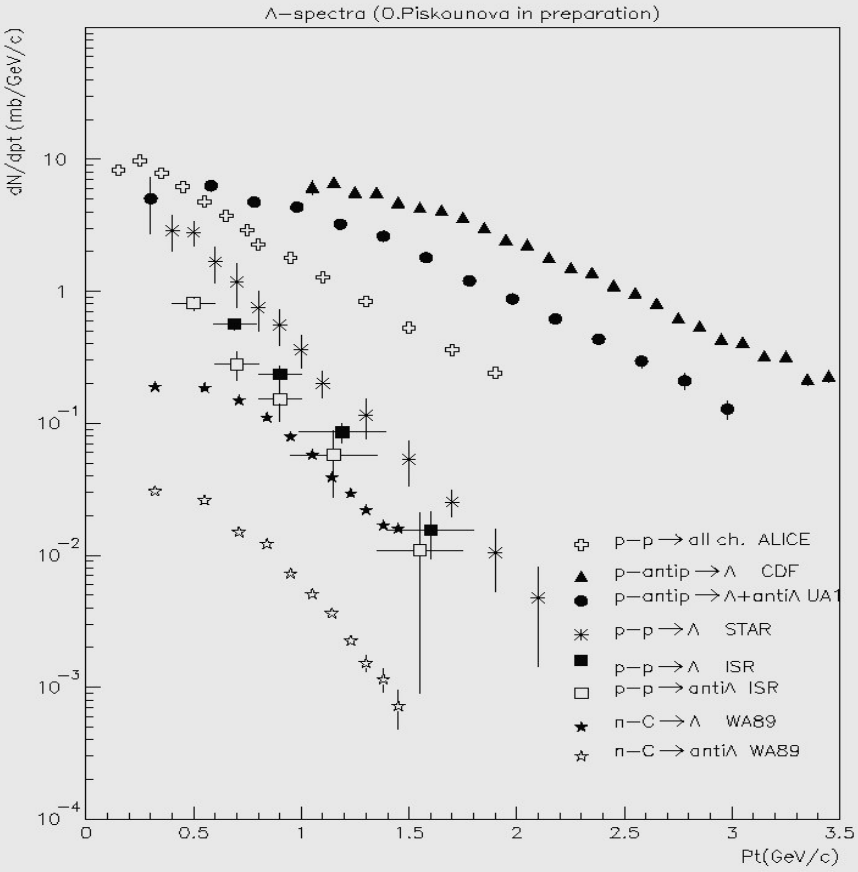


Previous evidence of different slope of spectra



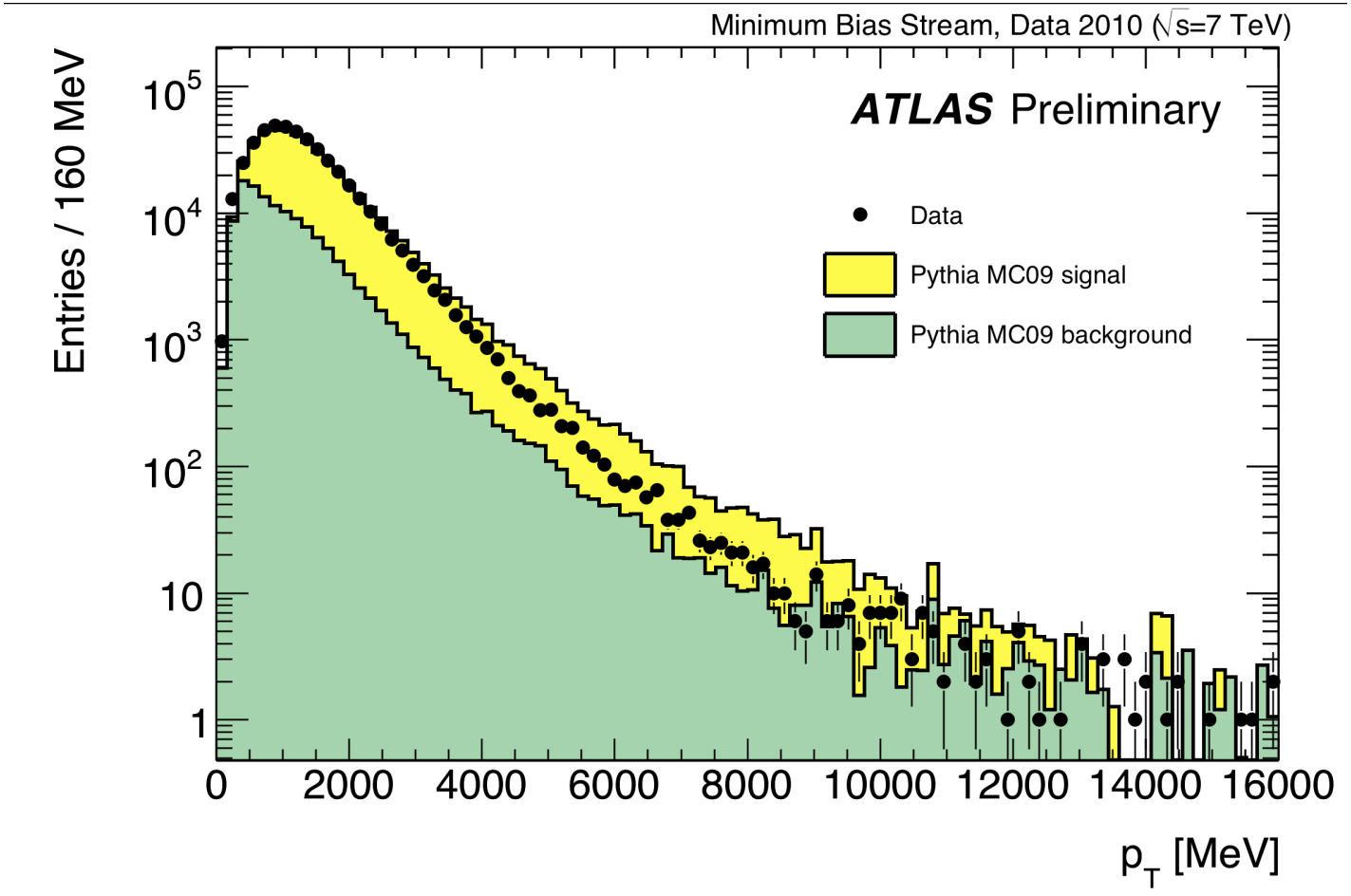


LHC results



- 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 are providing us with a new “stereoscopic” view on the hadroproduction mechanism.

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.

Baryon spectra are sensitive to quark-diquark structure of interacting particle 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