Proton/antiproton, $\Lambda/\bar{\Lambda}$ and $\Lambda_c/\bar{\Lambda}_c$ Asymmetries in p p, ep and π^- p Interactions. Sring Junction Transfer in Quark-Gluon String Model.

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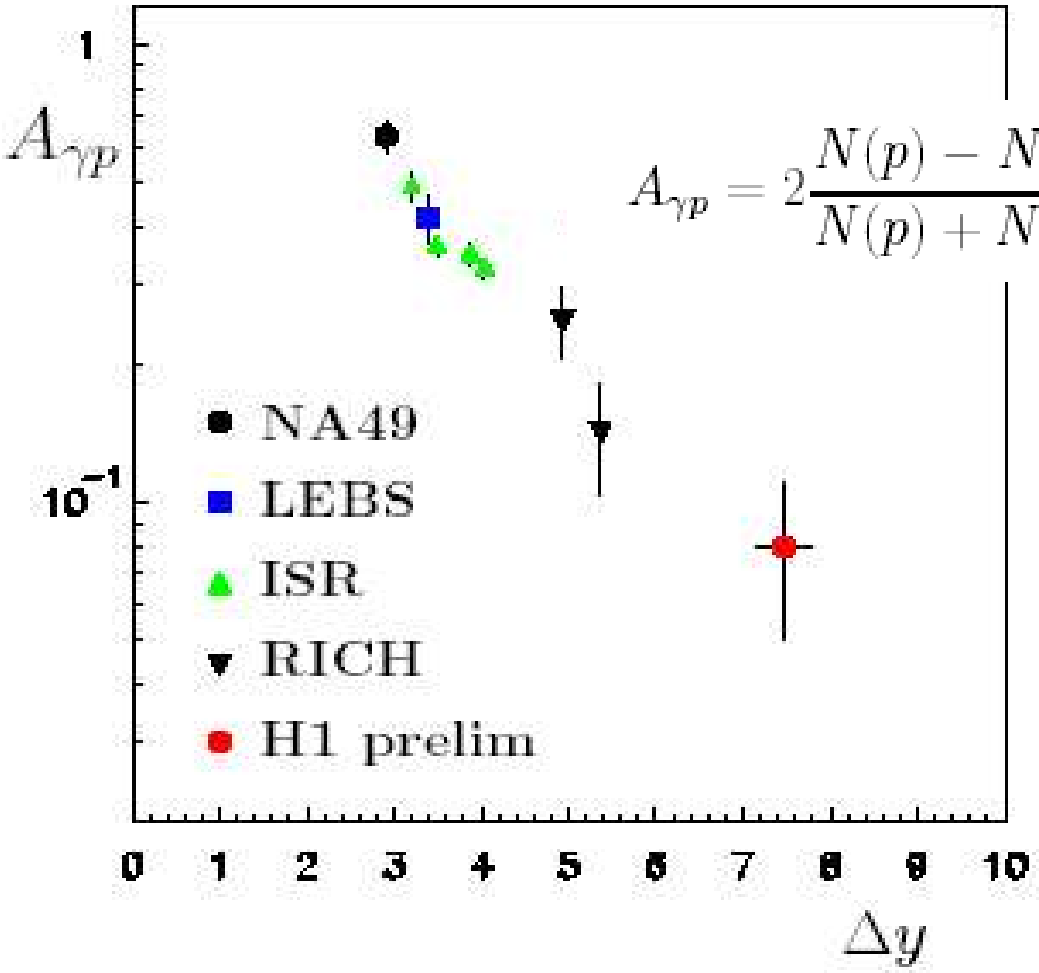
Outline:

- Data collection:
  - –p/antip measurements (pp,pA,πA,ep)
  - –Λ^0/antiΛ^0 asymmetry (pp,pA,πA,AA)
  - –Λc/antiΛc data (pp, pA, πA)
- QGSM approach:
  - –diquark fragmentation in pp collisions
  - –string junction transfer in πp interactions
- QGSM results:
  - –p/antip spectra and asymmetries
  - – Λ^0/antiΛ^0 spectra in πA
  - – Λc/antiΛc asymmetry and spectra
- Summary

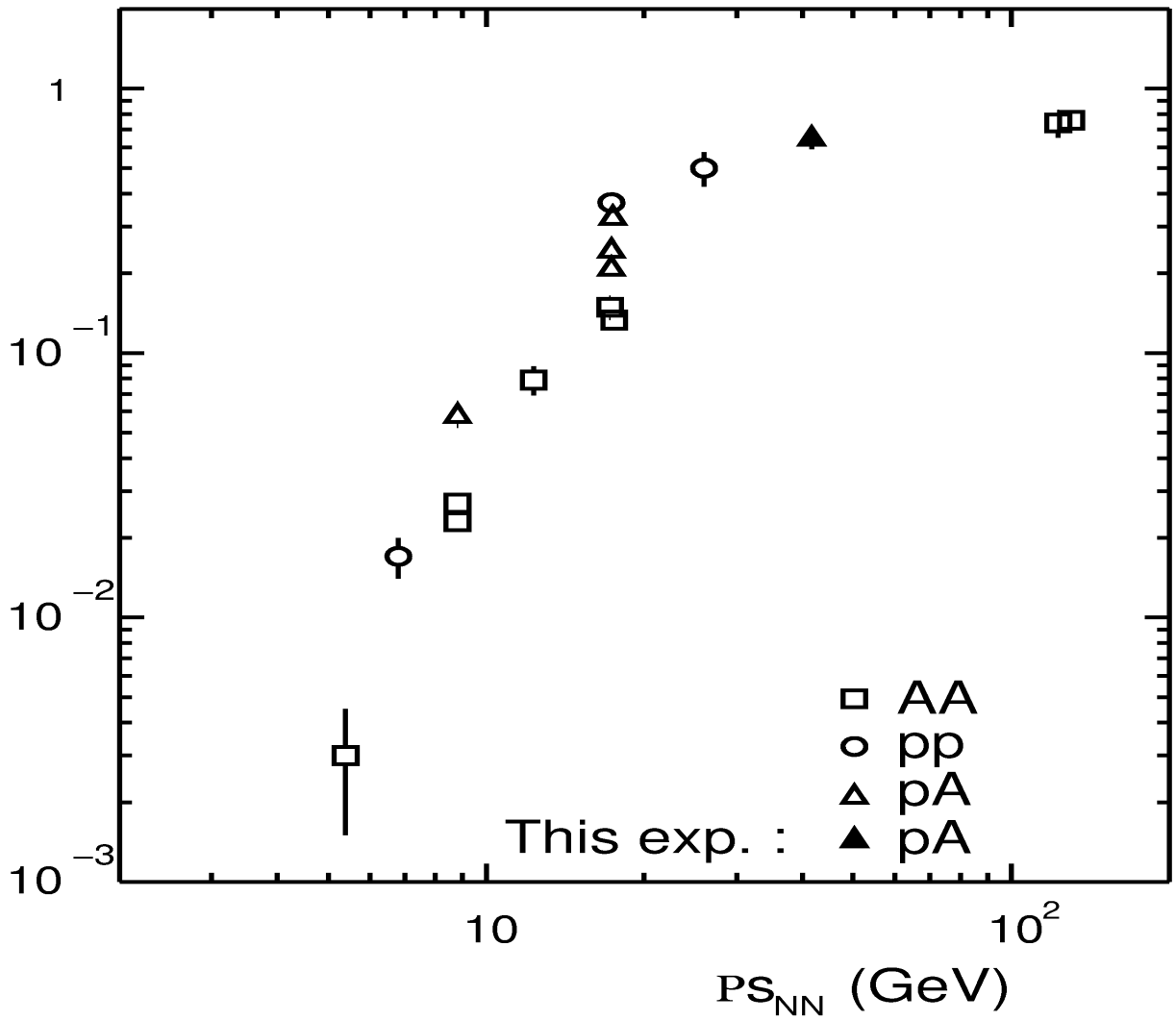
Proton/antiproton asymmetry



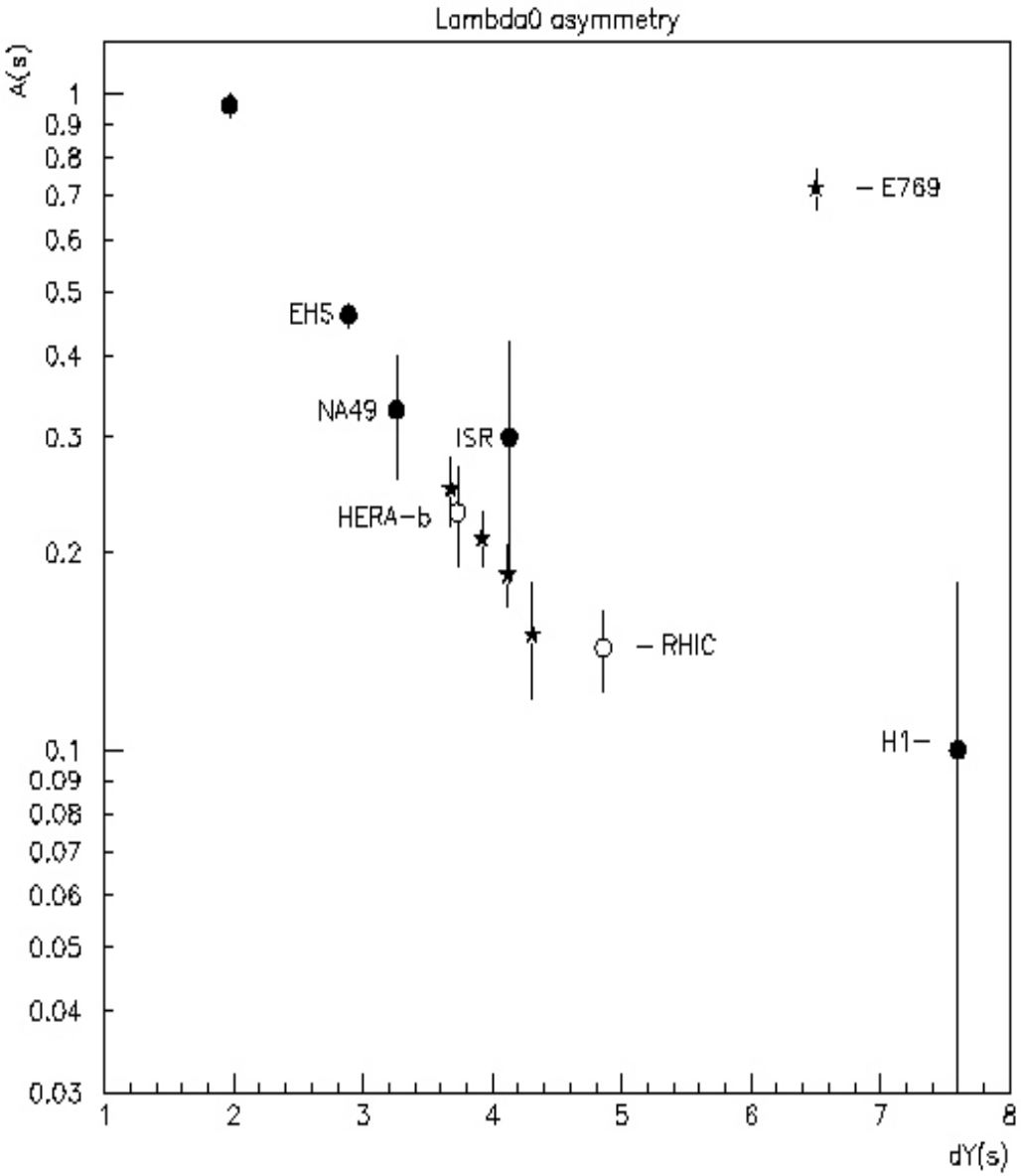
$$A_{\gamma p} = 2\frac{N(p) - N(\bar{p})}{N(p) + N(\bar{p})} = 8 \pm 3\% \,.$$

H1 result (still preliminary)

$\bar{\Lambda}/\Lambda$ ratio



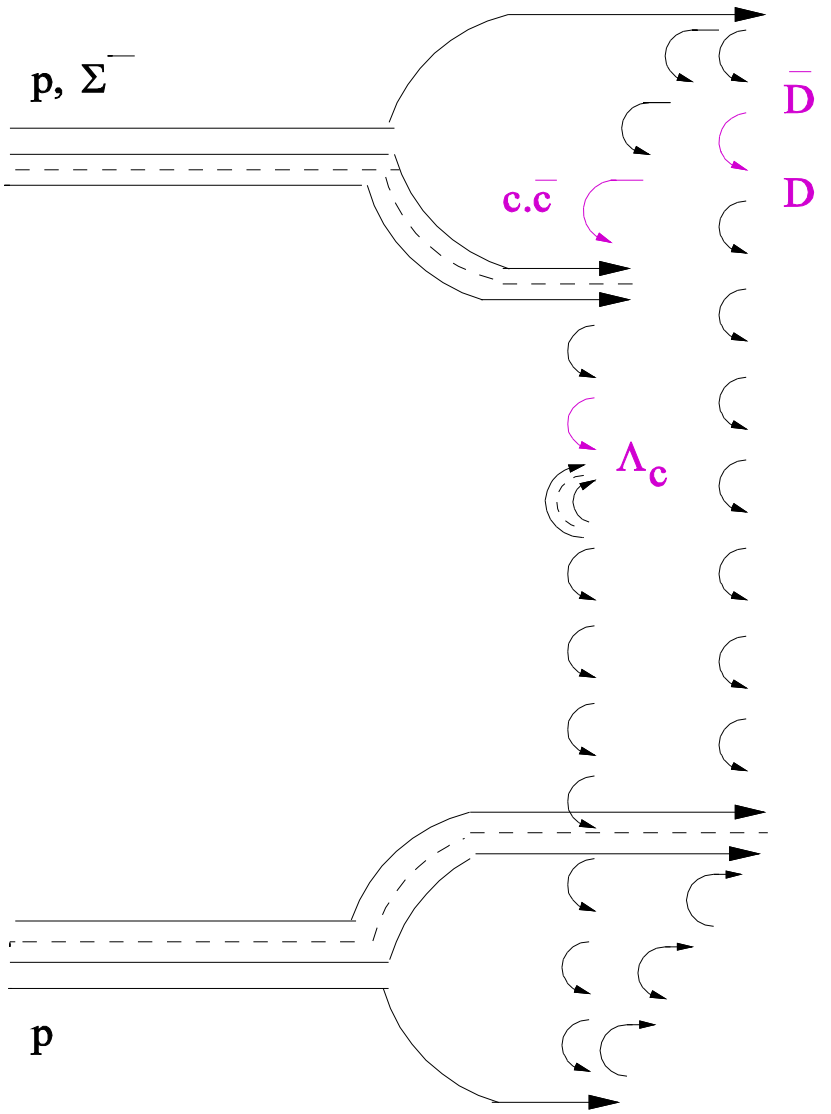
$\Lambda^0/\bar{\Lambda}^0$ asymmetry



- - pp interactions (SPS, ISR)

o – pA,AA collisions (HERA-b, RHIC)

QGSM approach



QGSM is based on N-Pomeron exchange disgrams that lead to 2N quark-antiquark chains.

Multiparticle production cross section are growing with the energy as:

$$\sigma_N(k)=\sigma_P\,(1-e^{-z\sum^{N-1}(z^k/k!)})/Nz$$

where $\sigma_P=8\pi\gamma_P(0)e^{\xi\Delta}$,

$$\xi=\ln(s/s_0),$$

$$z=3\gamma_P(0)e^{\xi\Delta}/(R^{\,2}+\alpha'_P(0)\xi).$$

Valence Quark Distributions in QGSM

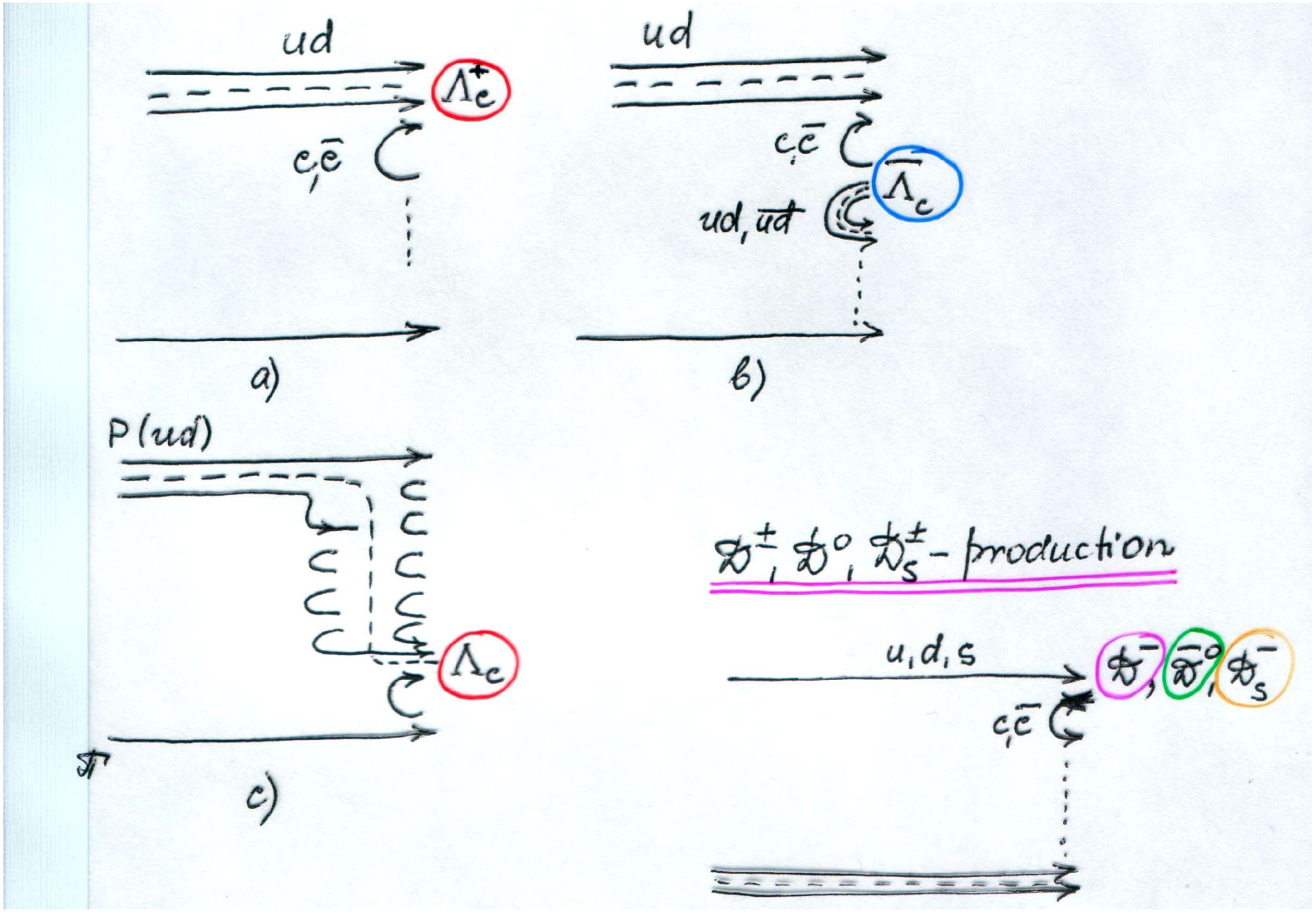
Inclusive production cross section of hadrons H is written as a sum over n-Pomeron cylinder diagrams:

$$f_1 = x\frac{d\sigma^H}{dx}(s,x) = \int E\frac{d^3\sigma^H}{d^3p}d^2p_\perp = \sum_{n=0}^{\infty}\sigma_n(s)\varphi_n^H(s,x).$$

Distribution functions of Λc in p-p collisions are given by:

$$\varphi_n^{\Lambda_c}(s,x) = a_0^{\bar{\Lambda}_c}[F_q^{(n)}(x_+)F_{qq}^{(n)}(x_-) + F_{qq}^{(n)}(x_+)F_q^{(n)}(x_-) + 2(n-1)F_{q_{sea}}^{(n)}(x_+)F_{\bar{q}_{sea}}^{(n)}(x_-)] + a_f^{\Lambda_c}F_{1qq}^{(n)}(x_-),$$

Fragmentation diagrams



Diquark Fragmentation Function and String Junction Transfer

Diquark fragmentation function includes the constant $a_f^{\Lambda c}$ that can be interpreted as "leading" paremeter:

$$D_{dd}^{\Lambda_c}(z) = \frac{a_f^{\Lambda_c}}{a_0^{\bar{\Lambda}_c} z} z^{2\alpha_R(0)-2\alpha_N(0)} (1-z)^{\alpha_\varphi(0)+\lambda+2(1-\alpha_R(0))}$$

where the term $z^{2\alpha R(0)-2\alpha N(0)}$ means the probability for diquark to have z close to 0.

Fragmentation function of string junction is of the similar form:

$$D_{SJ}^{\Lambda_c}(z) = \frac{a_f^{\Lambda_c}}{a_0^{\bar{\Lambda}_c} z} z^{1-\alpha_{SJ}(0)} (1-z)^{-\alpha_\varphi(0)+\lambda+2(1-\alpha_R(0))},$$

where $\alpha_{SJ}(0)=0,5$.

Proton/antiproton spectra

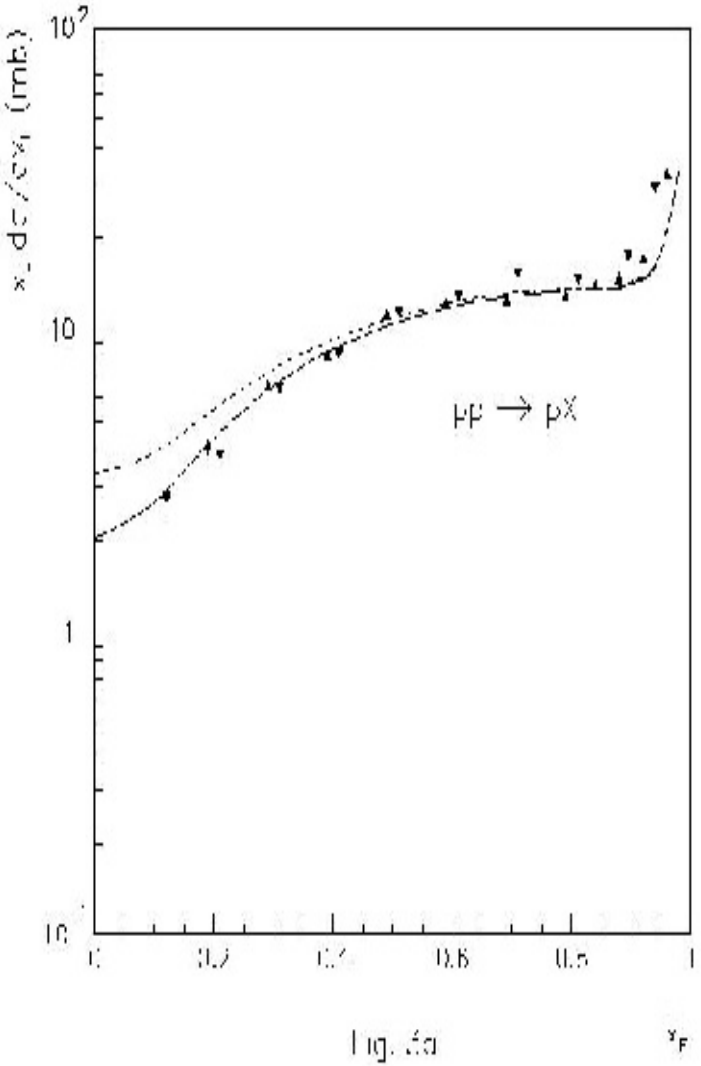


Fig. 3a

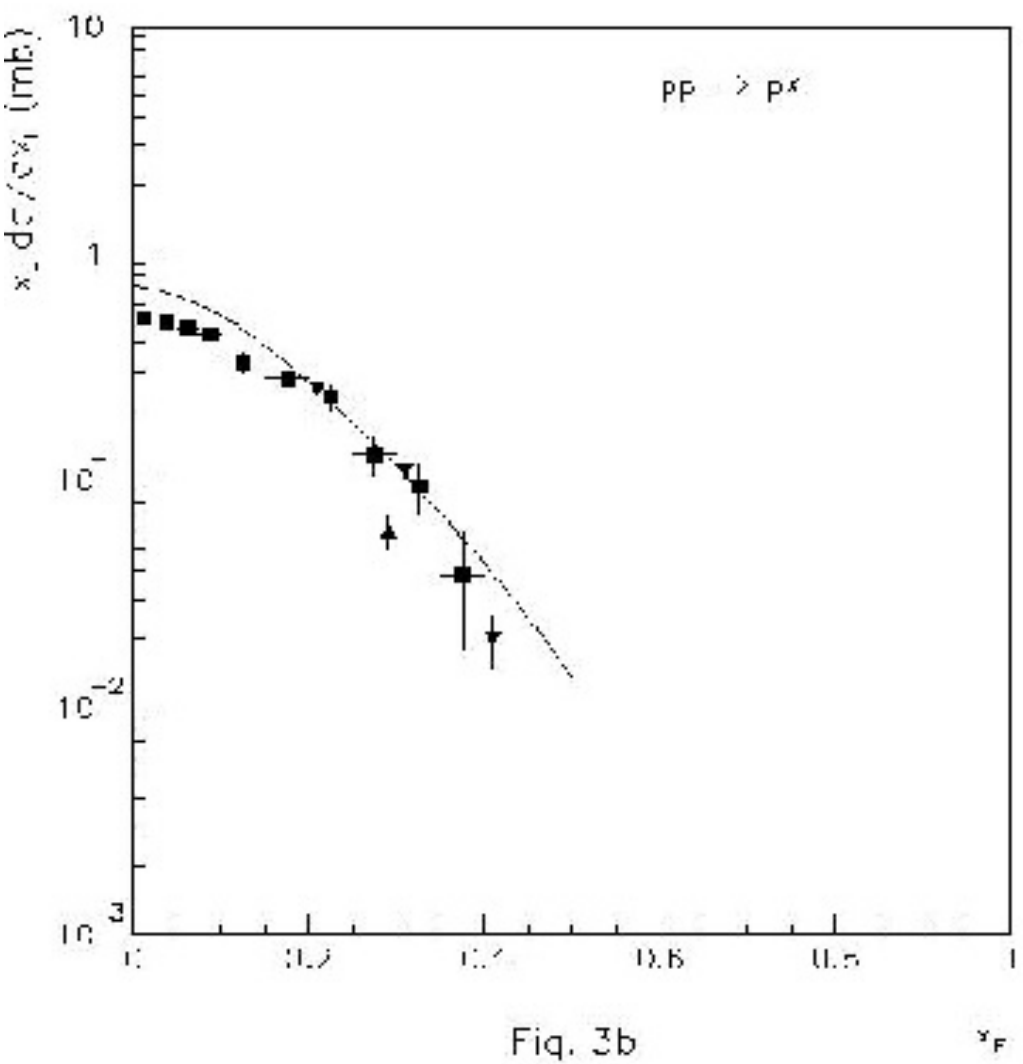
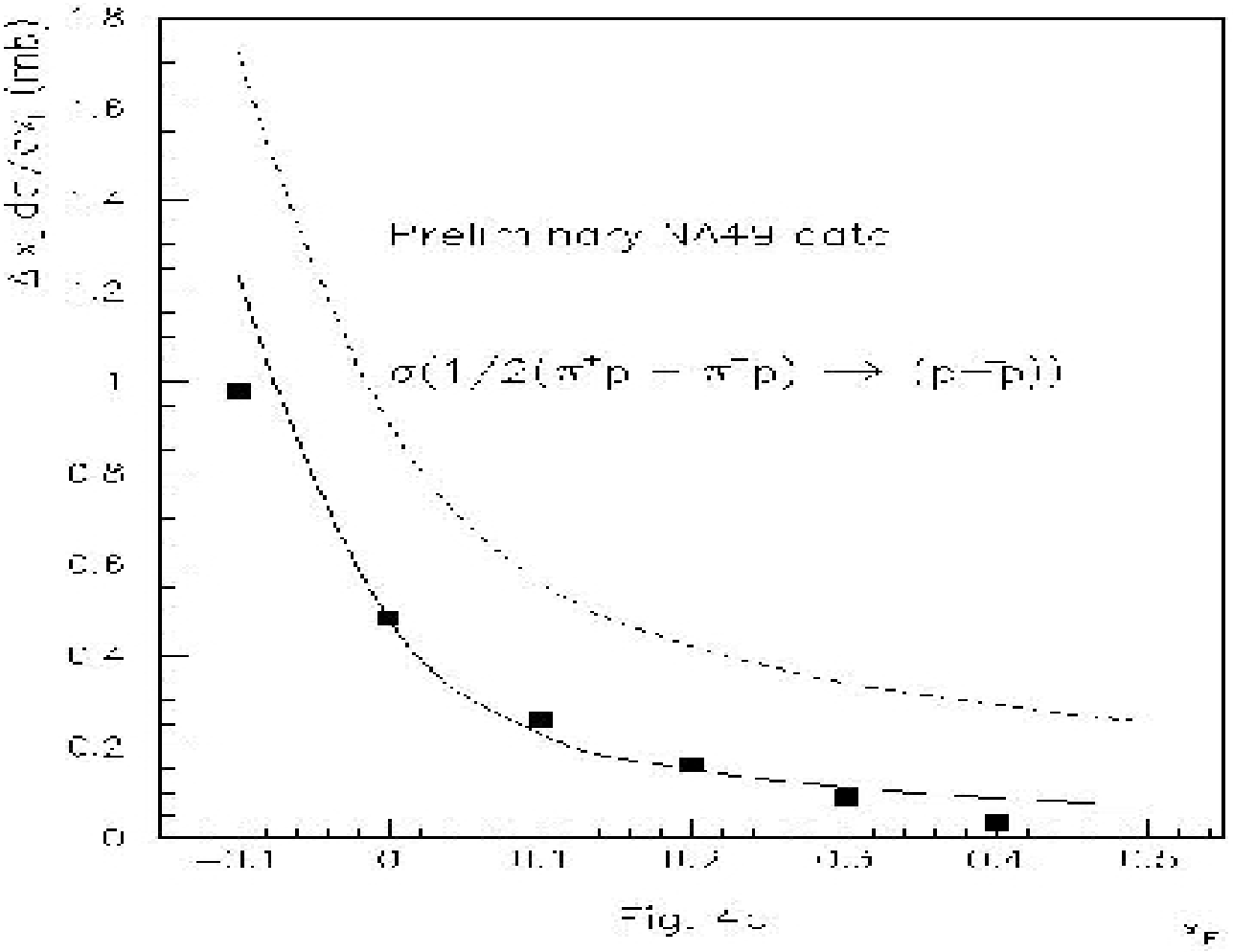


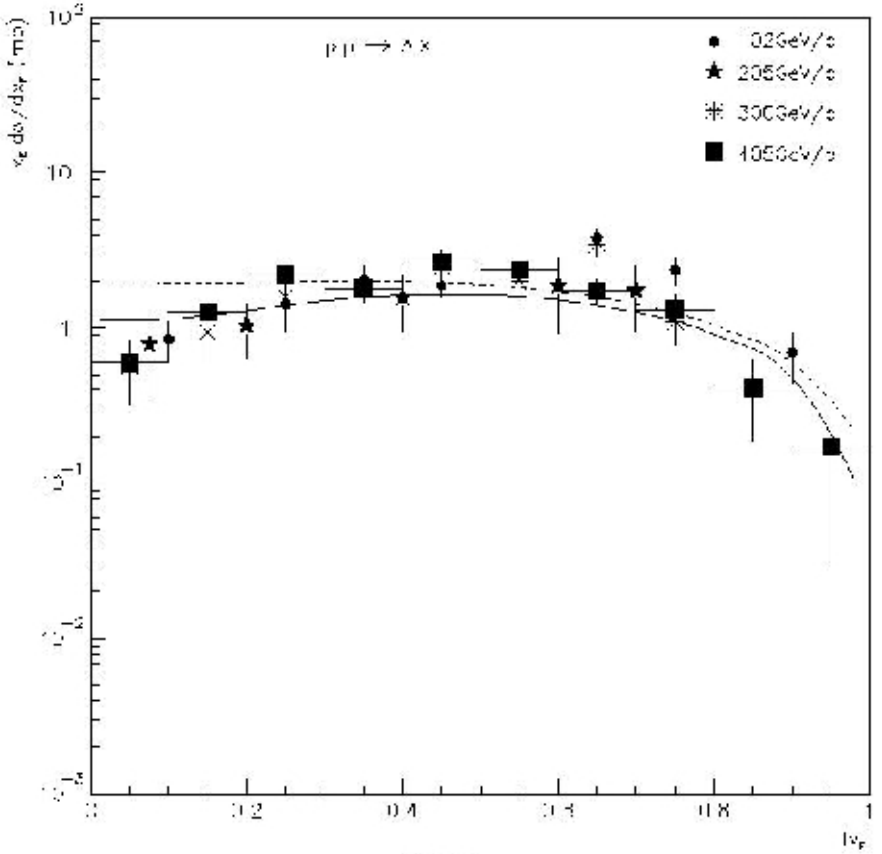
Fig. 3b

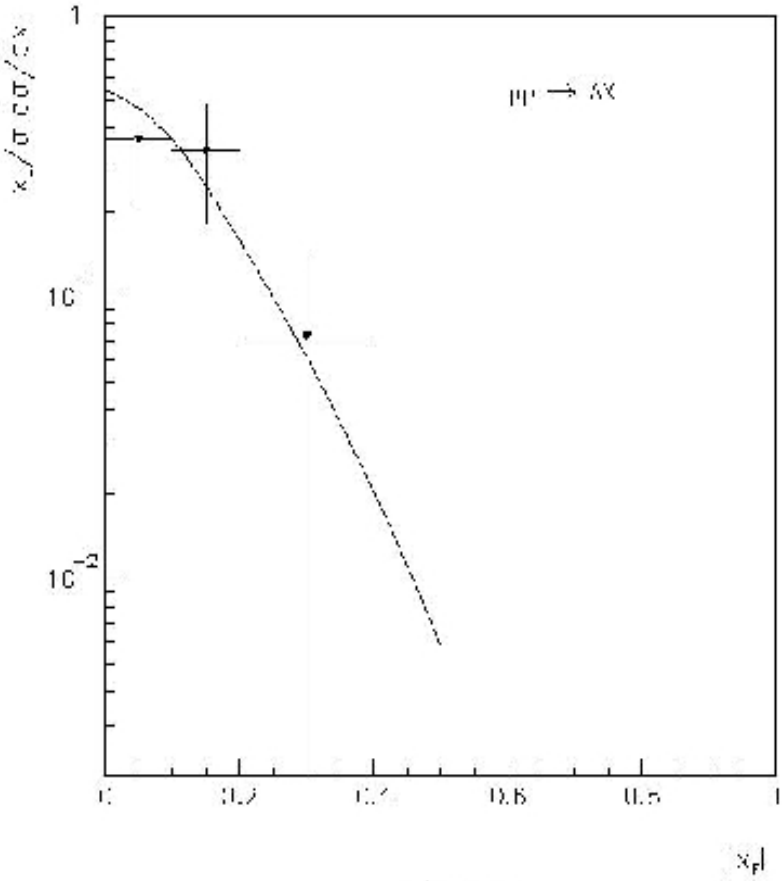
p-$\bar{p}$ spectra

NA49 data p_L=158 GeV/c



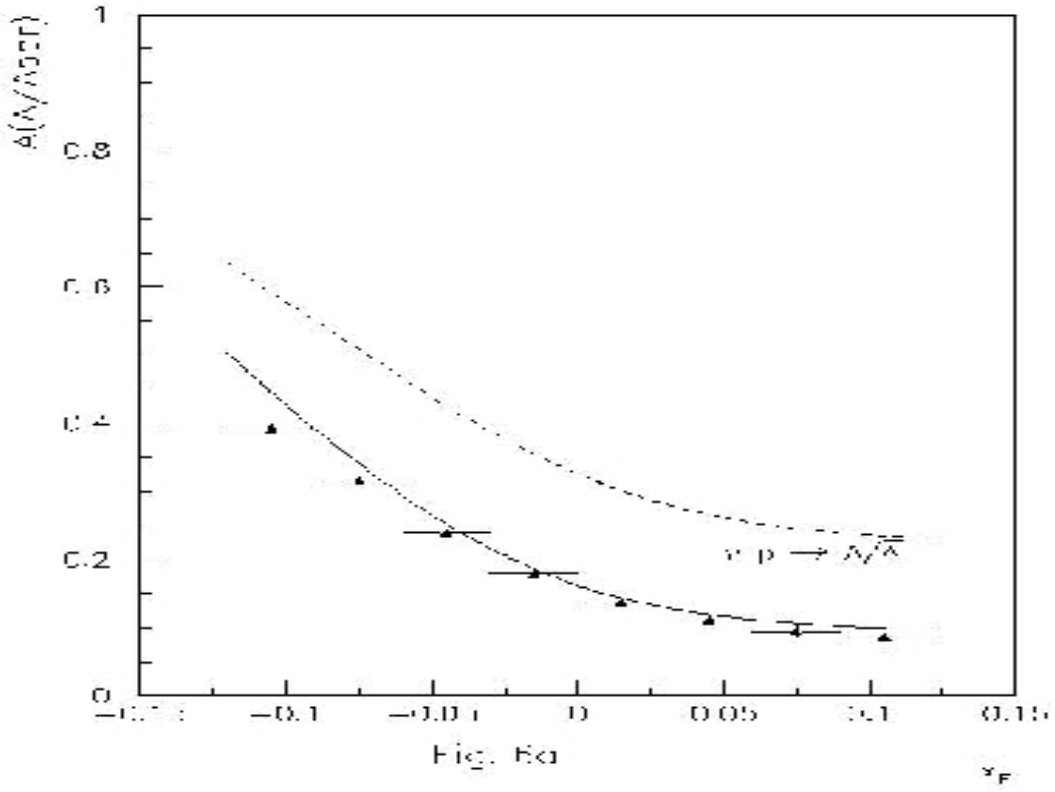
Λ and $\bar{\Lambda}$ production spectra



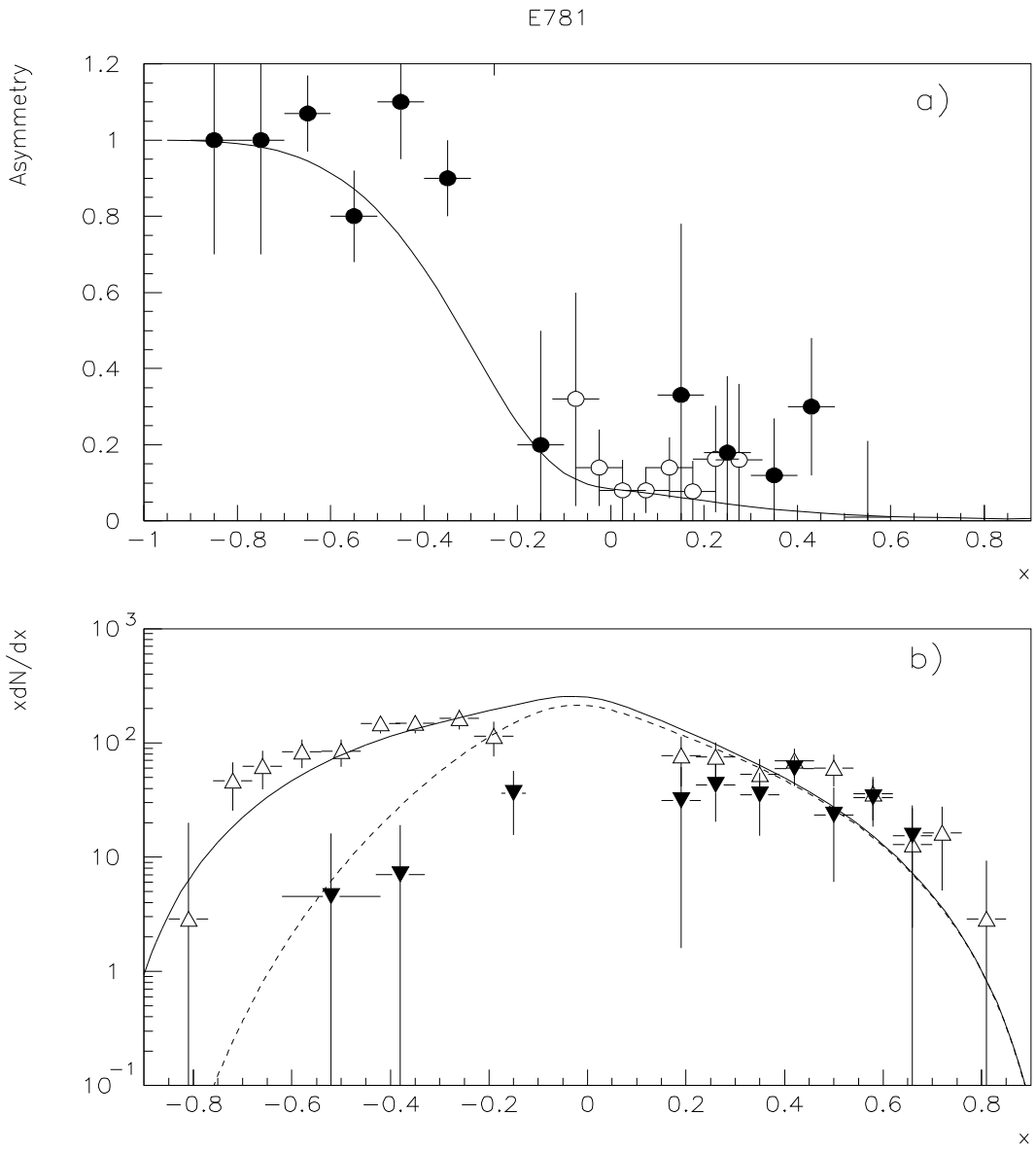


$\Lambda/\bar{\Lambda}$ asymmetry

E769 experiment, p_L=500GeV/c



Λ_c /antiΛ_c asymmetry in πp



$\alpha_{SJ}(0)=0.5$

Summary

- Valuable asymmetry between spectra of produced baryons and antibaryons still exists at $\sqrt{s}$=200 GeV that obliges us to study this effect
- The combined description of proton, antiproton, Λ, antiΛ , Λc and antiΛc spectra allows to conclude about the value of string junction intercept, $\alpha_{SJ}(0)$ =0.5 or close to 1.
- Measurements in lepton-proton collisions could give exact information about baryon production asymmetry at high energies