ЛМНС в 2006 году. Основные научные результаты.

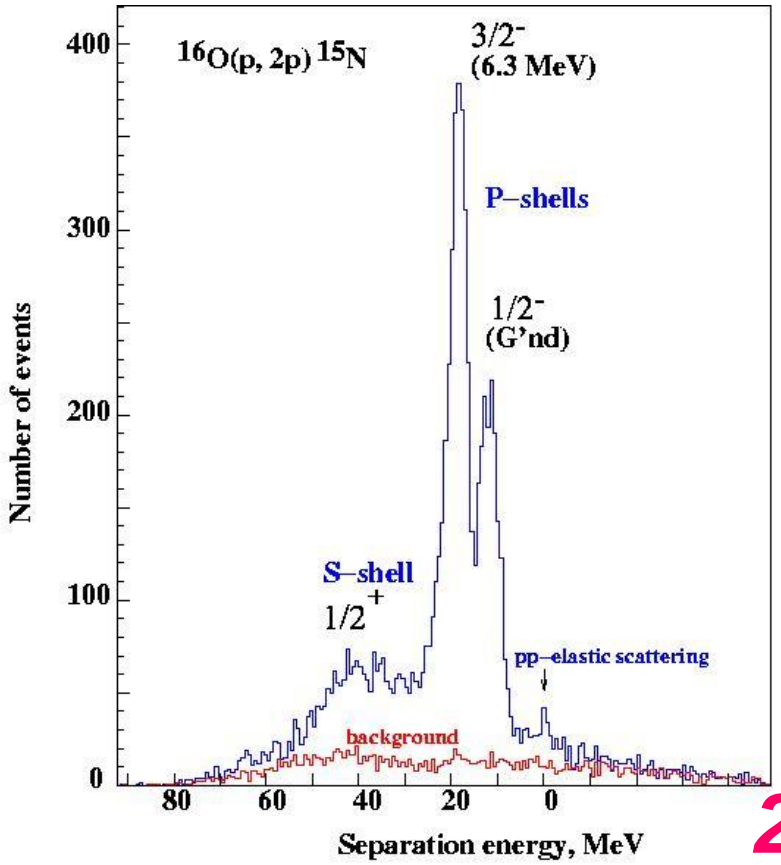
Отчет заведующего лабораторией

Содержание

- *Основные результаты 2006*
- *Финансы*
- *Планы*

Modification NN-amplitude in nuclear medium

O Миклухо



He4 published ЯФ 2006

Модернизация
Спектрометра
-проп камеры для улучшения
углового разрешения

-new readout-when??

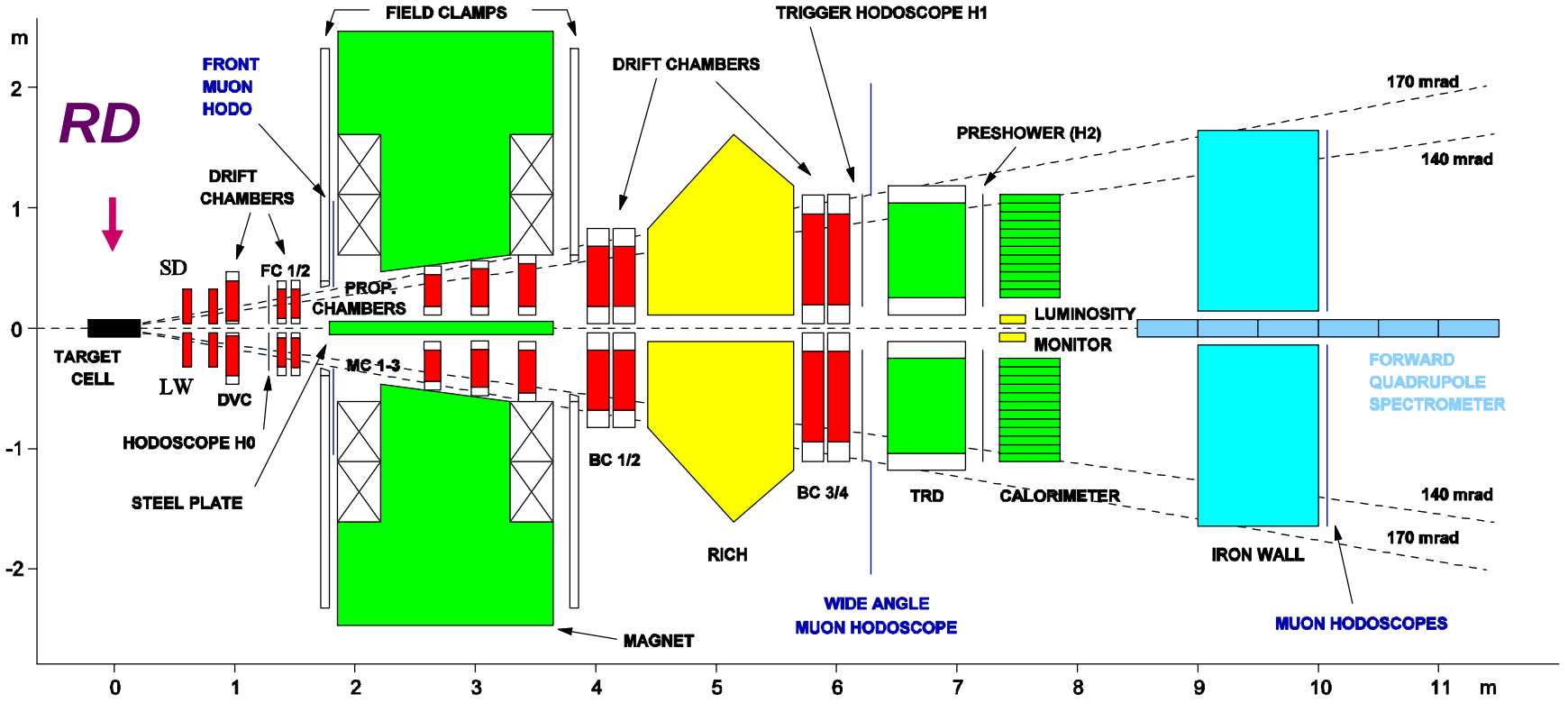
2006

Spectrometer upgrade allows for a high resolution
P→2P experiment on Ca40 target aimed at
clarifying whether the **nucler density** *or* **Es** *is the*
correct parameter for NN –amplitude modification

Hermes spectrometer

E_e=27.5 GeV , polarized P_b≈50% (longitudinal)

Polarized H2,D2 gas target,P_t~90%, longitudinal and transverse, unpolarized A target



Команда ПИЯФ в обслуживании эксперимента

experts on call:

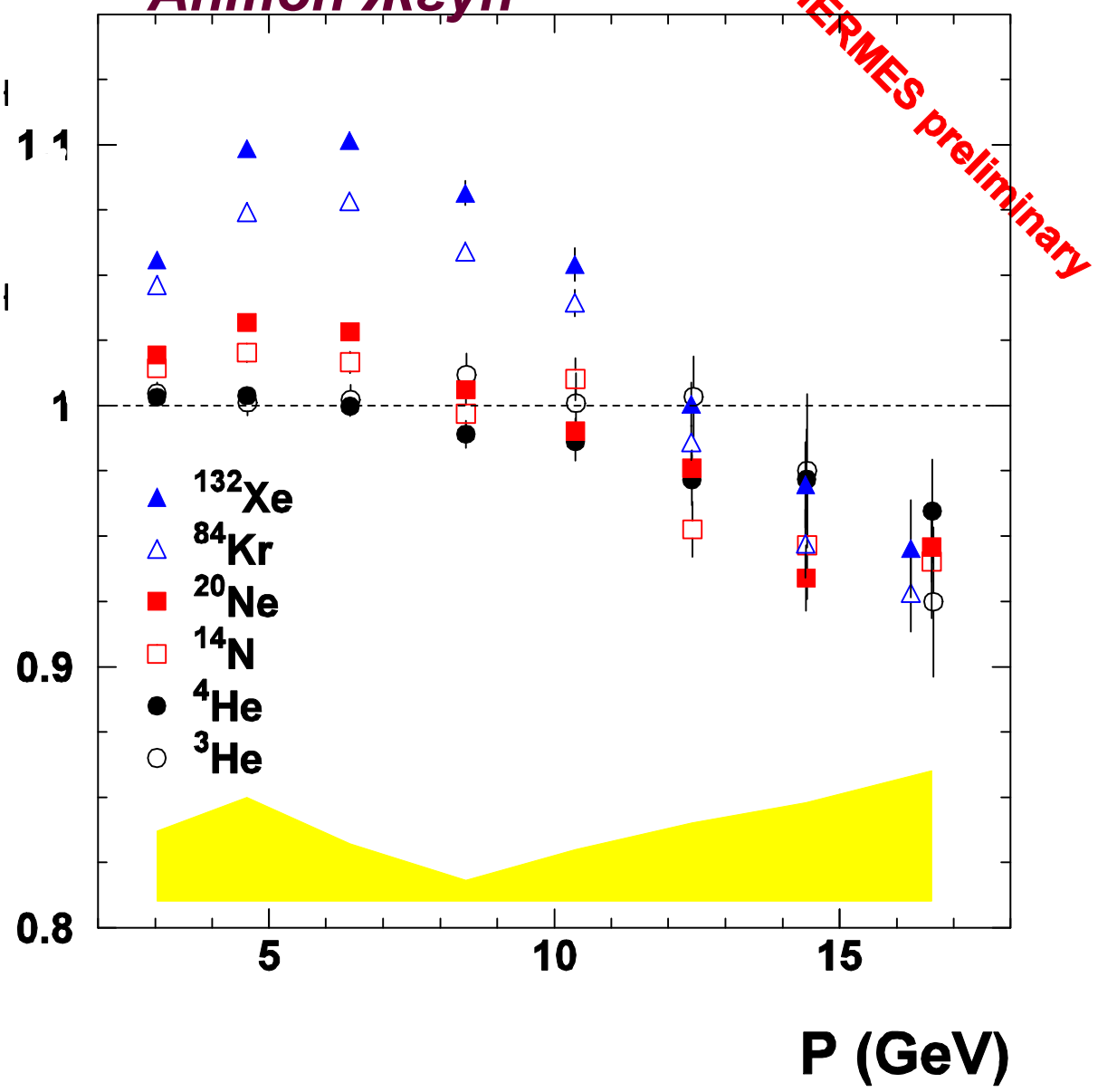
В Вихров	***RD installation, SiFi***
Г Гаврилов	***gas system, TRD***
А Изотов	***Slow Control, DAQ***
А Киселёв	***Data production***
Ю Нарышкин	***LW SD***
Д Веретенников	***Mag.Ch.***

PNPI analysis topics at HERMES

С. Манаенков	Vector meson production SMDE
Ю. Нарышкин	Hyperon production at HERMES
А. Жгун	Phi_gamma, P_T
П. Кравченко	DSA, Δq final analysis
Ю. Санжиев	DSA of Ks s-quark polarization
Д.Веретенников	KLL DLL in photoproduction

Quark P_T distributions and hadronization (released).

Антон Жгун



Contributions to PT:

quark motion in nucleon

fragmentation

rescattering in nuclear medium

Conclusion:

Swelled nucleons?

How does Λ-hyperon spin structure look like?

$$\Lambda\uparrow = (ud)_0 \cdot s\uparrow$$ naive Constituent Quark Model

or

$$\Lambda\uparrow = (ud)_0 \cdot s\uparrow + (ud)_{11}\uparrow \cdot s\downarrow + \ldots.$$ Spin Crisis

In CQM ***P(u,d)=0*** ***P(s)=1***

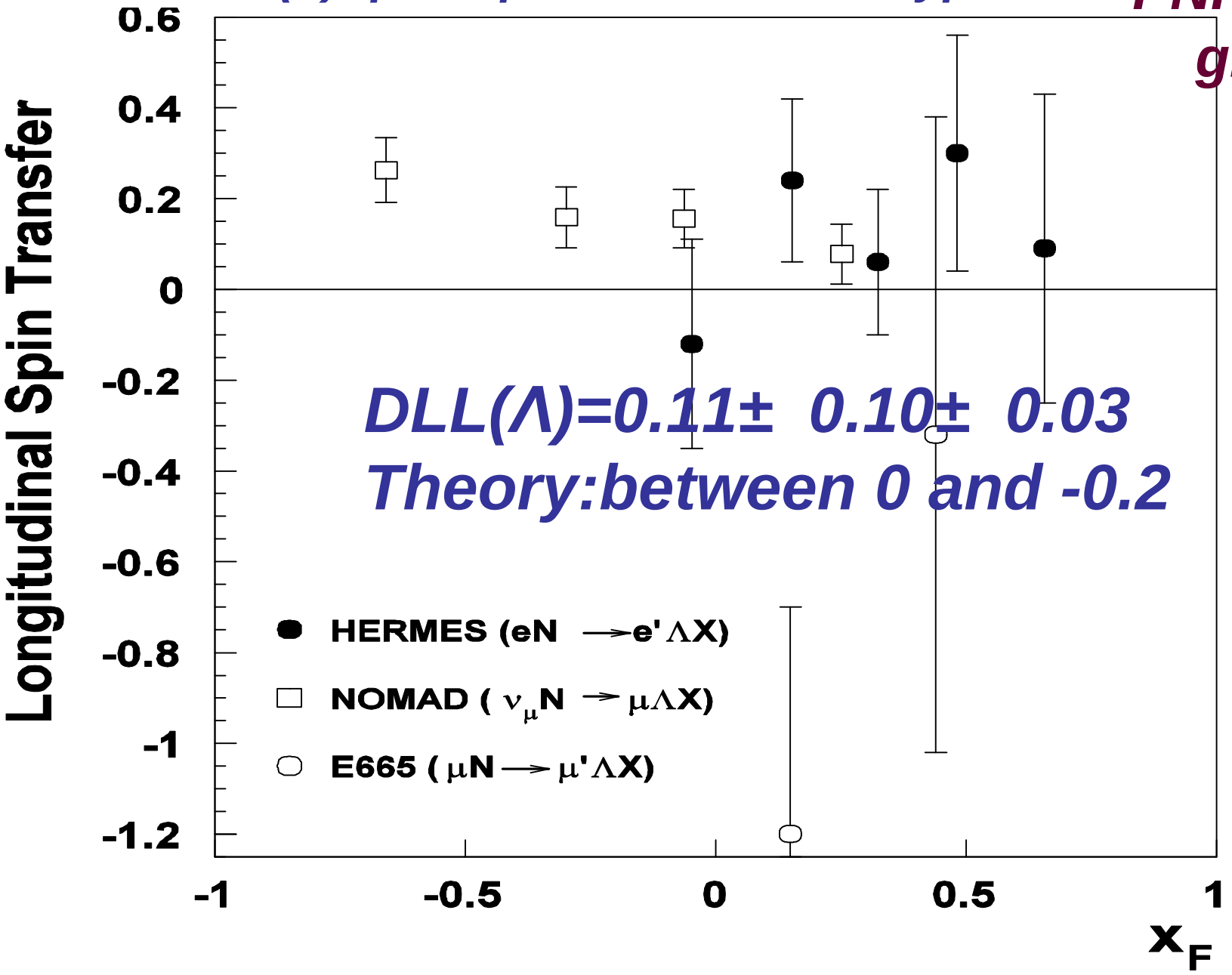
In Spin Crisis ***P(u,d) from 0 to -0.2*** ***P(s)~0.6***

R.L.Jaffe: to measure spin transfer $\vec{u}$ to $\vec{\Lambda}$

Spin-transfer in DIS, published in PRD 2006

u (d)-quark polarization in Λ hyperon

PNPI/China groups



DLL(Λ)=0.11± 0.10± 0.03

Theory:between 0 and -0.2

Transverse Λ polarization

$$g(E_g \approx 20\text{GeV}) + \text{P/D} \rightarrow \Lambda \Uparrow + \text{X}$$

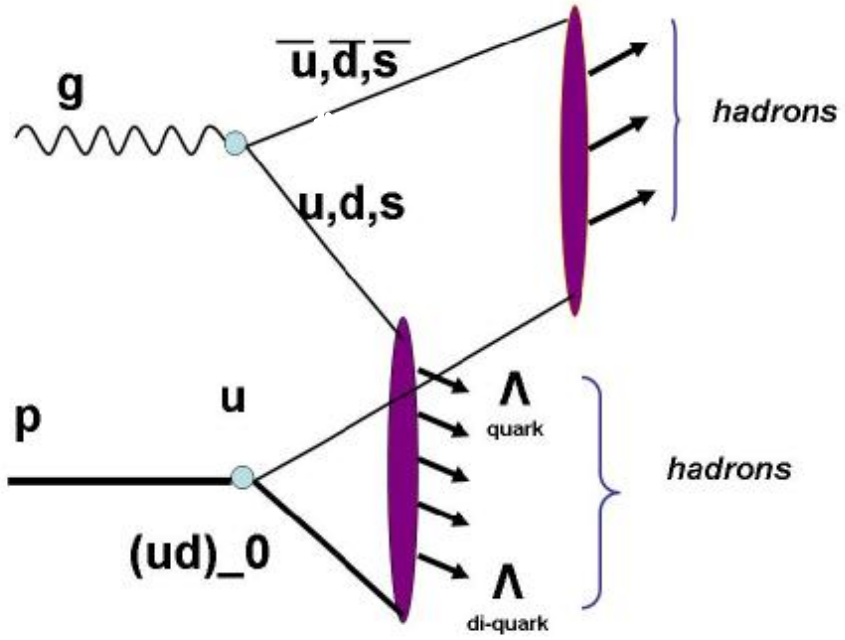
Hyperon polarization in hadron collision is well-known phenomenon: 30 years ago in Fermilab P+Be→Λ(↑)+X studied. Then

K+ P →Λ(↑)+X ,

$\sum$ +P →Λ(↑)+X , etc.

But no data in lepto/photoproduction(!)

typical PITHIA mechanism



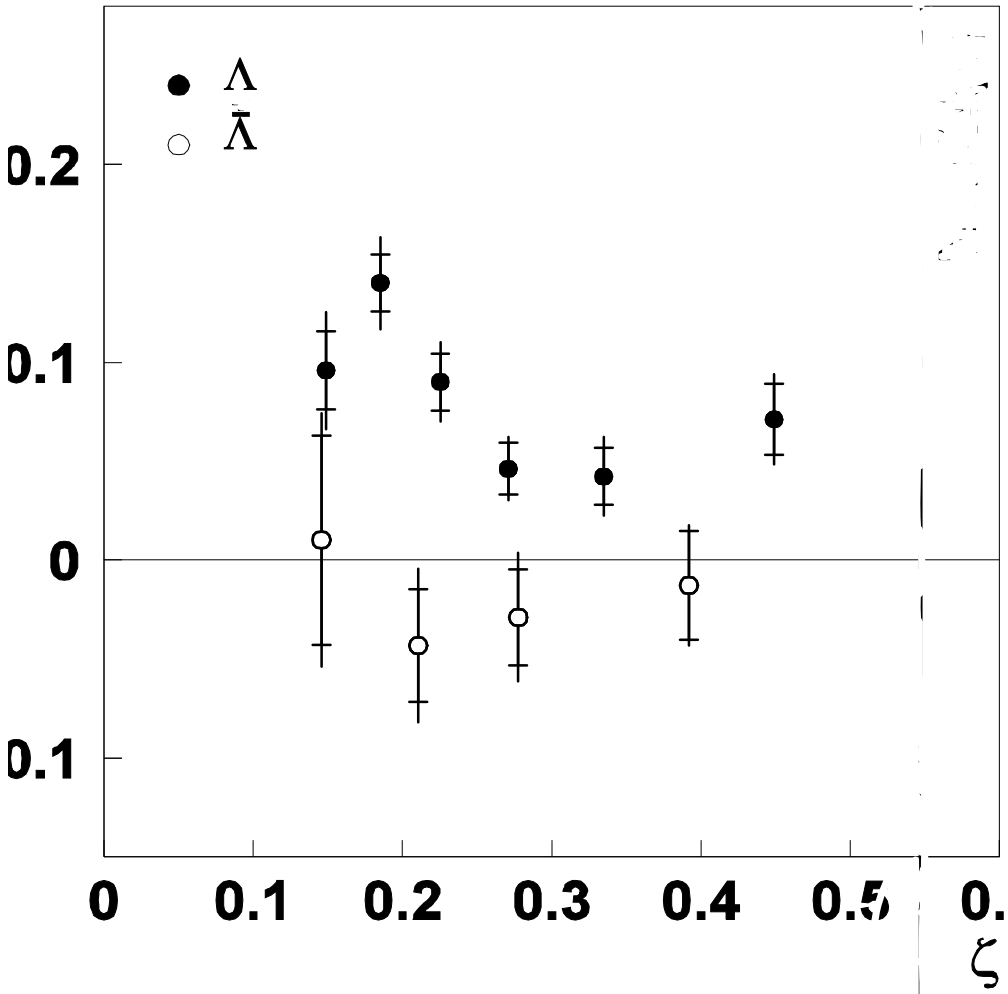
$$\Lambda \Uparrow = (ud)_0 + s \Uparrow \qquad \Lambda \Uparrow = \text{u} + (\text{ds})_{0,1} \qquad \bar{\Lambda} \Uparrow = \bar{\text{u}} + (\bar{\text{d}}\bar{\text{s}})_{0,1}$$

dominates *or* $\Lambda \Uparrow = \text{d} + (\text{us})_{0,1}$ *.....etc.*

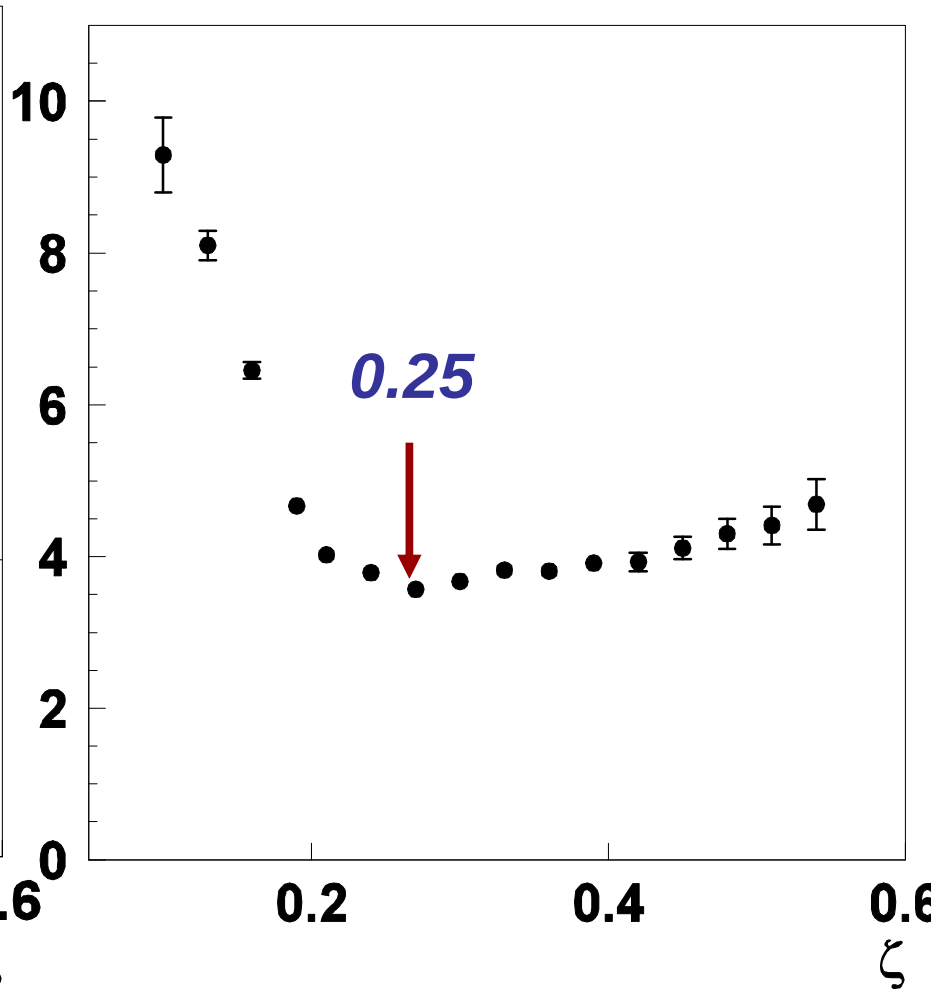
Юрий Нарышкин, С.Б. + A.Andrus, Makin

final

polarization



$\bar{\Lambda}$ to Λ yield



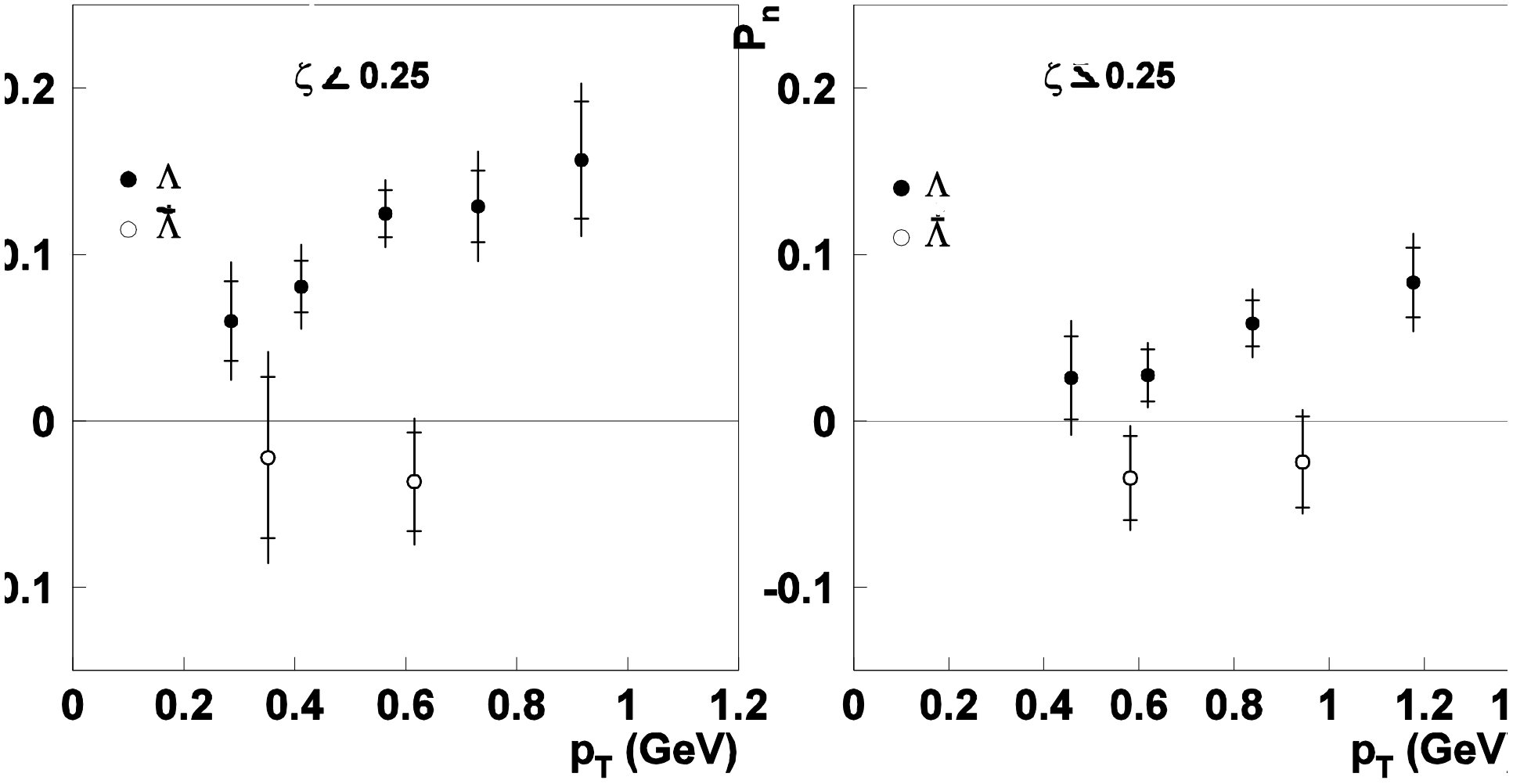
P_T dependence

$$P(\Lambda) = 0.078 \pm 0.006 \pm 0.012$$

$$P(\bar{\Lambda}) = -0.025 \pm 0.015 \pm 0.018$$

Юрий Нарышкин, С.Б. + Aaron ,N.Makins

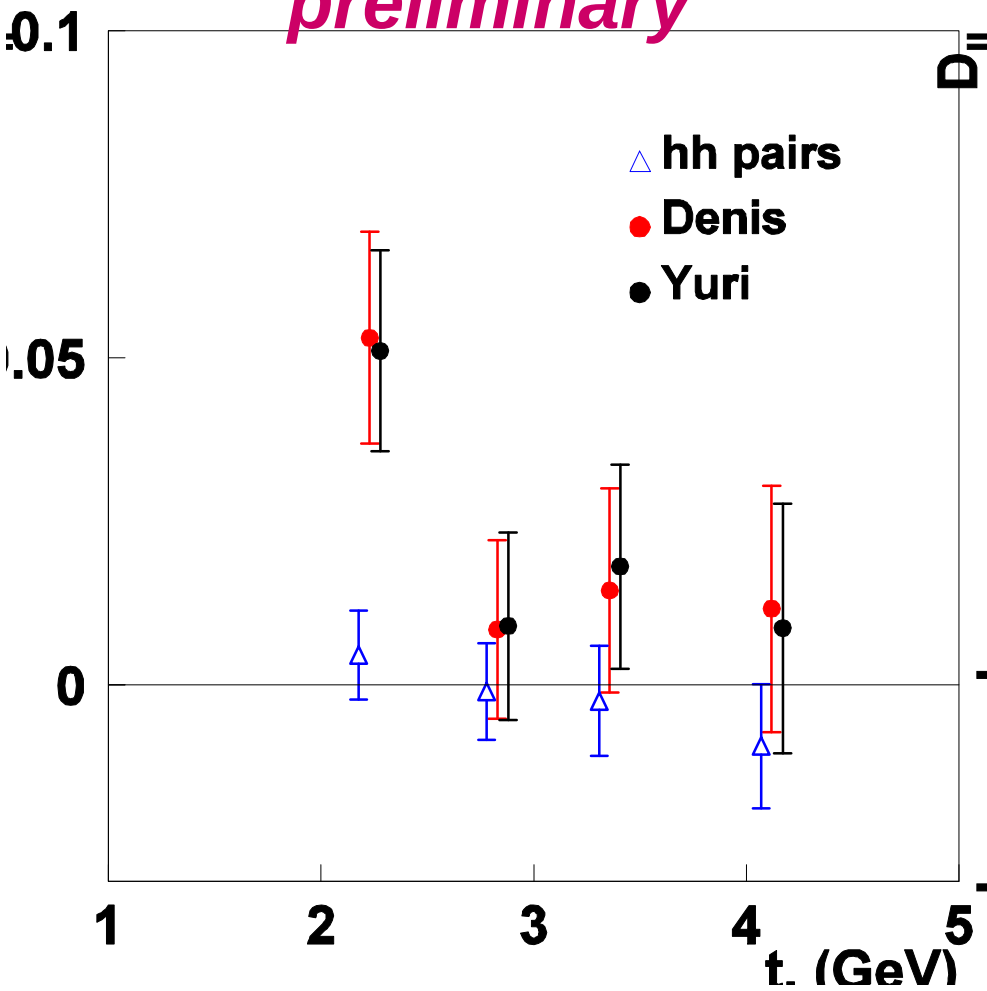
Final→PRD



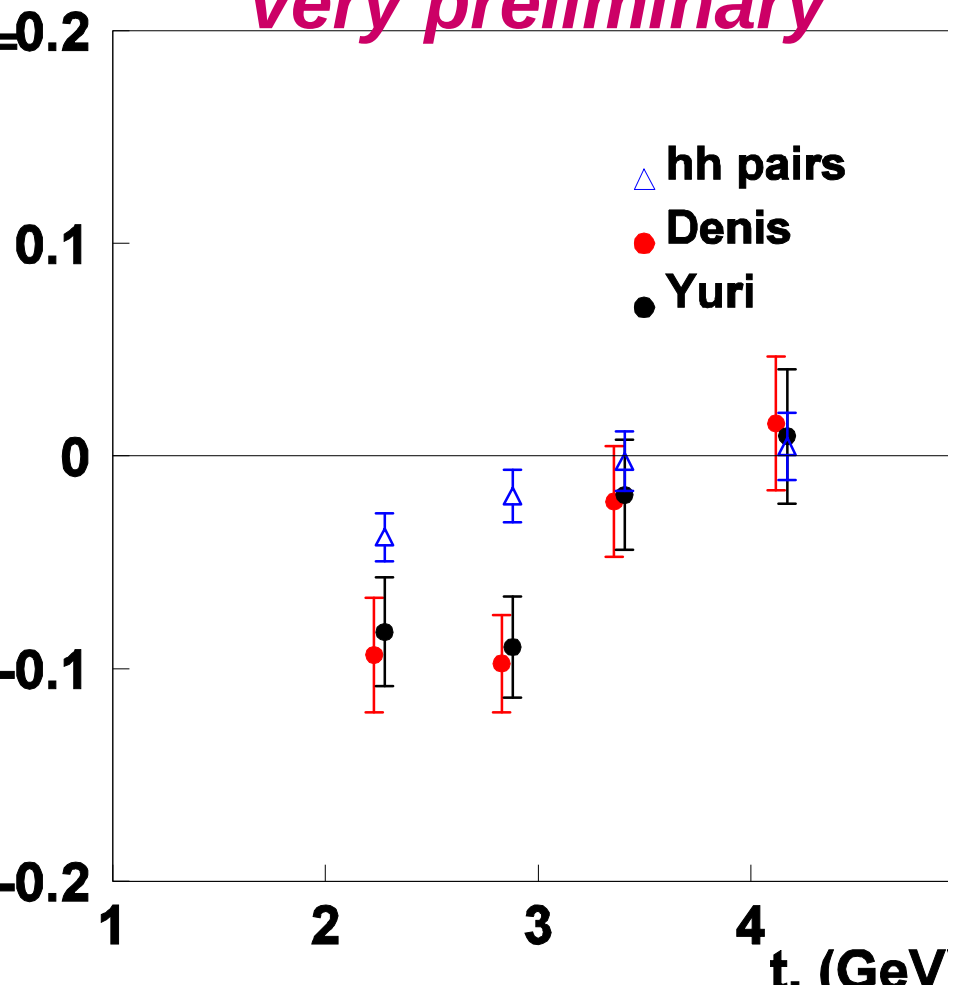
$$\vec{g}\,(E_g \approx 20\ \mathrm{GeV}) + \vec{\mathrm{P}}/\vec{\mathrm{D}} \rightarrow \vec{\Lambda} + \mathrm{X}$$

Денис Веретенников ***Diquark polarization in nucleon(!)***

KLL (from target) preliminary

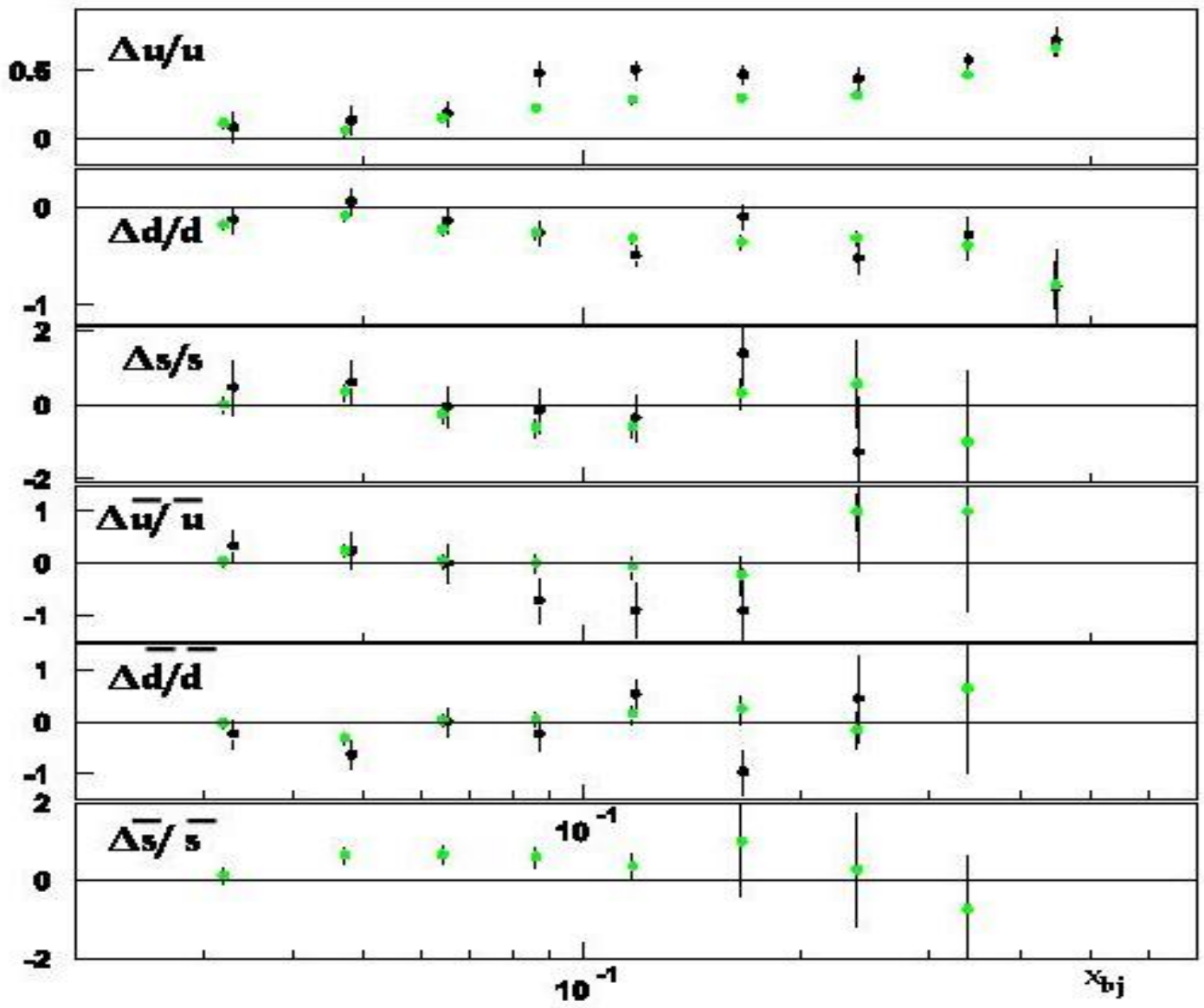


DLL (from beam) very preliminary



Quark polarization in nucleon (spin crisis)

Полина Кравченко



MC tune

New data:

K+,K-,

P,Pbar

Publications&Talks

A.Airapetian et al.,HERMES collaboration "Longitudinal spin transfer to the lambda Hyperon in Semi-inclusive Deep-inelastic Scattering"

Phys.Rev.D 74 (2006) 072004

A.Airapetian et al.,HERMES collaboration "Double-hadron leptoproduction in nuclear medium" Phys.Rev.Lett.96 (2006)162301

A.Airapetian et al.,HERMES collaboration "Precision determination of structure function g1 of proton, deuteron and neutron" Phys.Rev D (2006) (in press)

O.V.Miklukho "Polarization in quasi-elastic (p.2p) scattering from 4 He at 1 GeV" Physics of Atomic Nucleus 69,n3,2006 474

Publications&Talks

S.Belostotski "Topical aspects of hyperon physics" in 'Hadron Physics' 97-120 (2006) edition of Uni.Glasgow, Scotland, U K

Conference talks for HERMES Collaboration:

Ю. Нарышкин "Study of Lambda polarization at HERMES"
7-th International Conference on Hyperons, Charm and Beauty Hadrons; Beach 2006 Lancaster Uni, Lancaster U K

С. Манаенков "Study of Spin Density Matrix Elements in exclusive
ρ0 production at HERMES" 13 International QCD Conference"
Montpellier, France, July 2006

Финансы

- Влияние ядерной среды 800 т. р.
- Контракт (япон.) 12.5 KUSD
- Визиты росс фонд 55 KUSD
- Визиты DESY 105 KEU

Where to go?

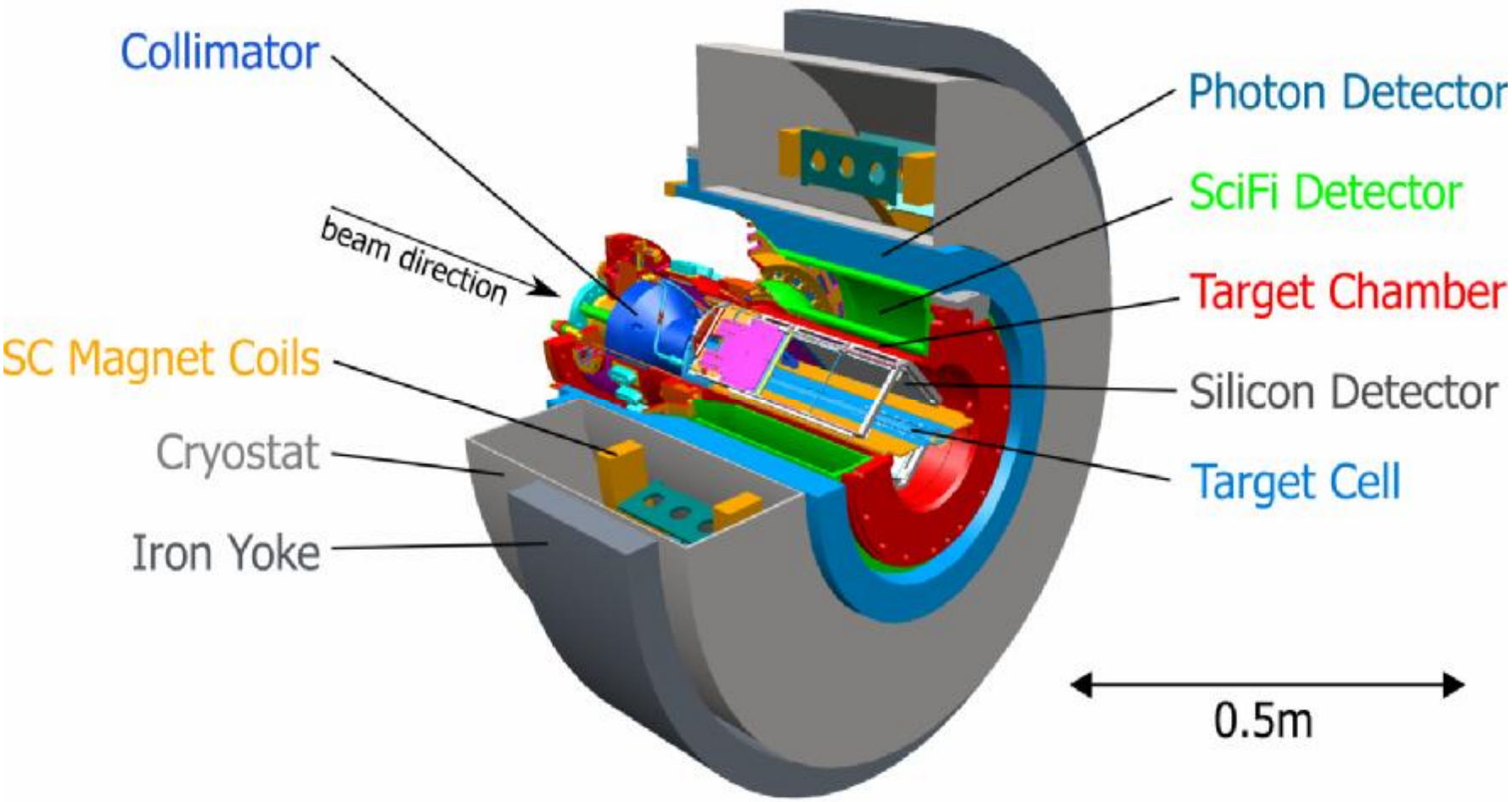
- ***Continue 2-arm spectrometer experiments;***
- ***HERMES after HERA shutdown. Finalize analysis topics;***
- ***PANDA. TOF prototyping, test station. Participation in STT, magnet design….***
- ***WASA experiment at COSY;***
- ***PAX ?***

Состав лаборатории

- С Белостоцкий зав. проф. д. ф.-м. н.
- Г Амальский н. с.
- В Вихров с. н. с. к. ф.-м. н.
- З Гадицкая ст. лаб.
- А Жгун с. н. с. к. ф.-м. н.
- А Жданов с. н. с. к. ф.-м. н.
- А Изотов с. н. с. к. ф.-м. н.
- А Киселев н. с.
- П Кравченко н. с м .н. с.
- С Манаенков с. н. с. к. ф.-м. н.
- О Миклухо с. н. с. к. ф.-м. н.
- Ю Нарышкин с. н. с. к. ф.-м. н.
- А Прокофьев с. н. с. к. ф.-м. н.
- Л Обрант инж. Прогр. 2 кат.
- Ю Санжиев н. с м. н. с.
- В Федулов слес. 6р.
- Д Веретенников стаж.
- В Плотников ст. лаб.-иссл.

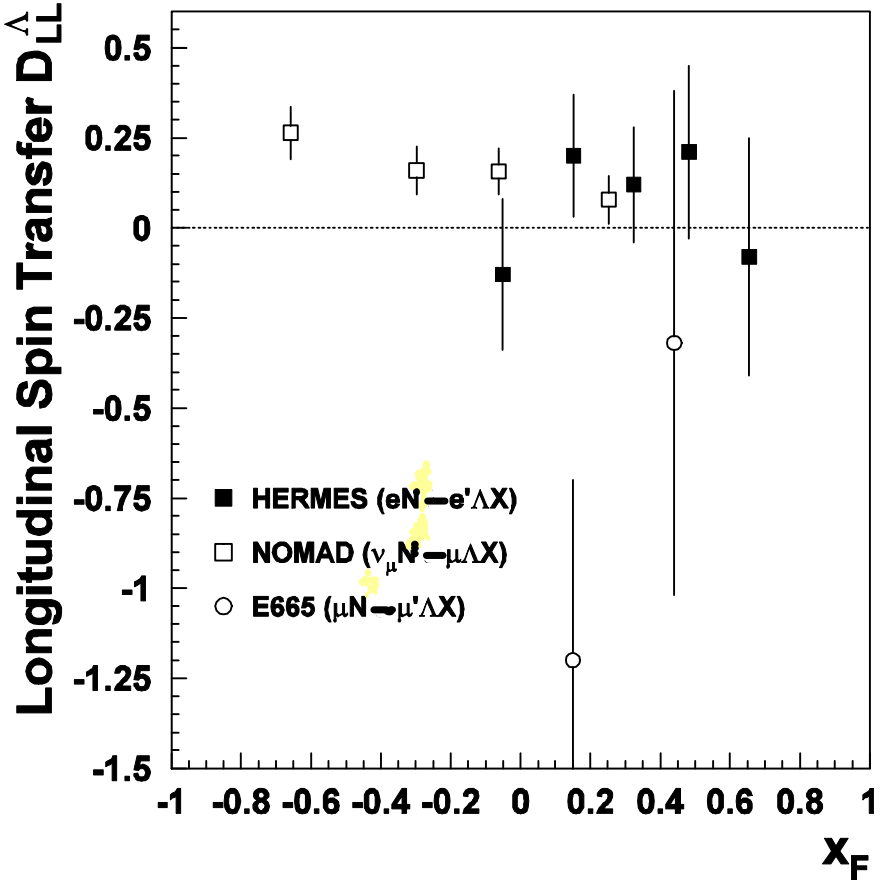

С Новым
Годом !!!

The HERMES Recoil Detector



Longitudinal Spin Transfer to the Λ Hyperon DLL

Phys.Rev.D



HERMES results, u - quark fragmentation

$$D_{LL}^{\Lambda} = 0.11 \pm 0.10(stat) \pm 0.03(syst)$$

NOMAD results, u - quark fragmentation

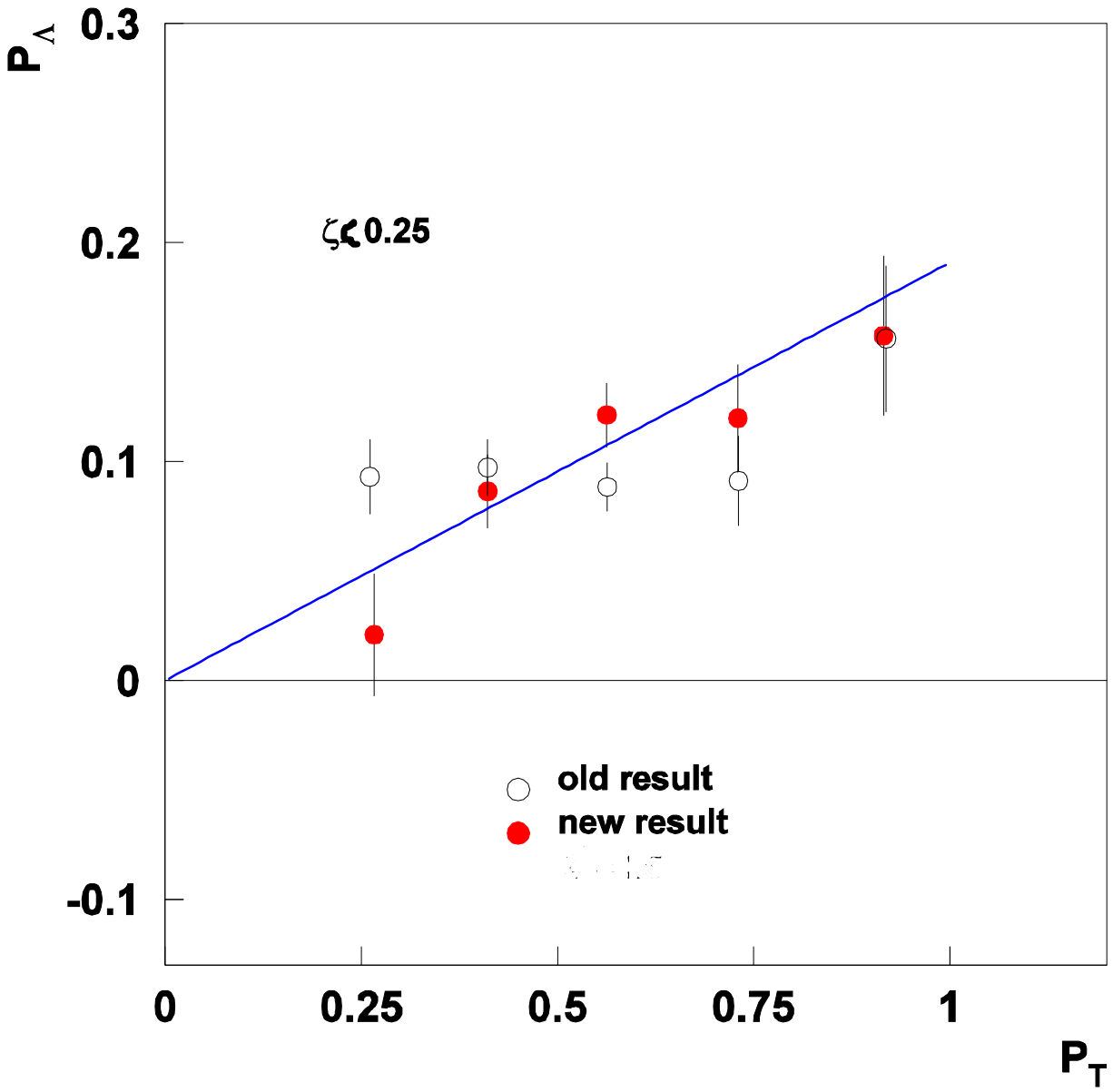
$$D_{LL}^{\Lambda} = 0.09 \pm 0.06(stat) \pm 0.03(syst)$$

ALEPH, *OPAL*, s - quark fragmentation

$$D_{LL}^{\Lambda} \approx 0.3 \quad at \quad z > 0.3$$

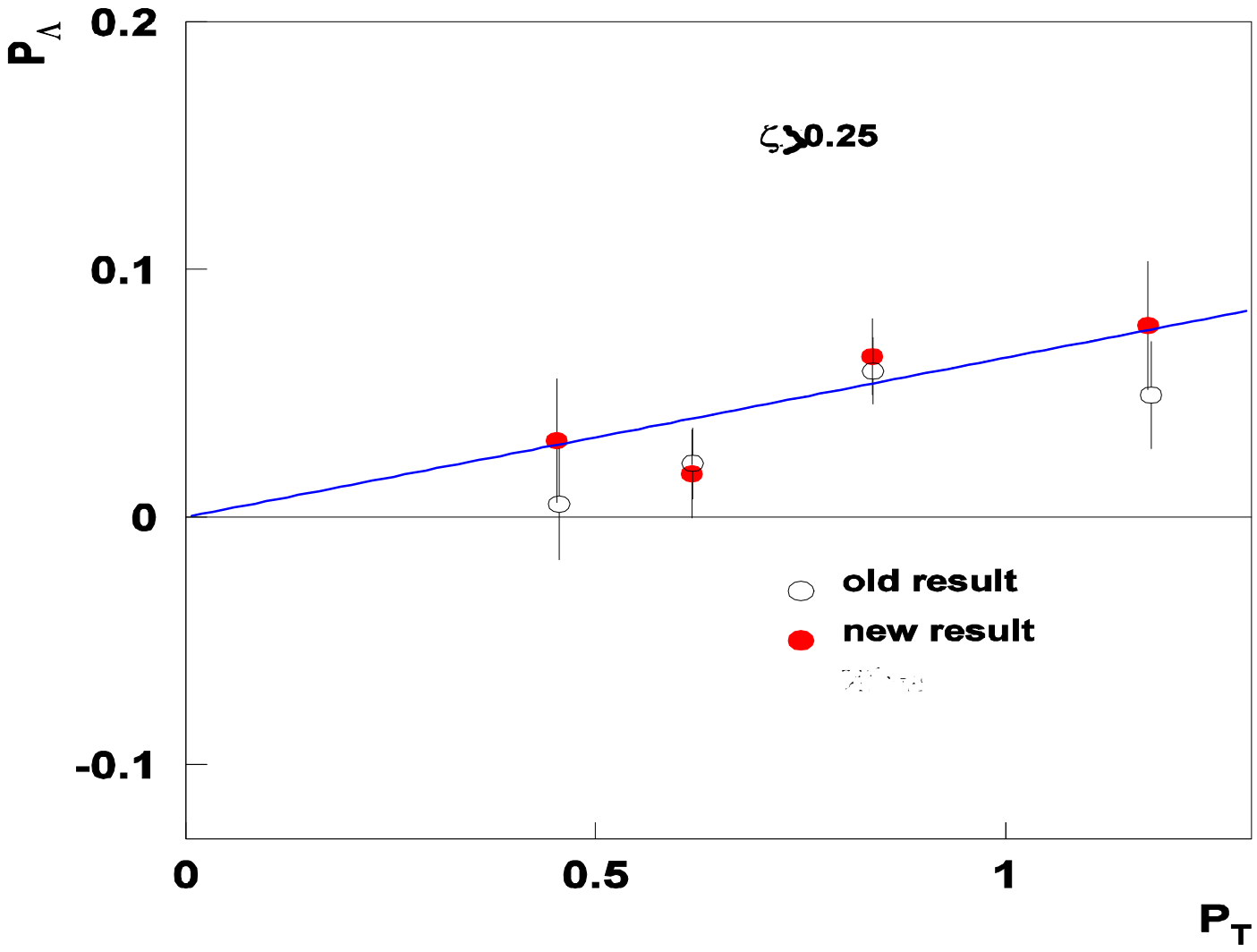
Transverse Λ polarization in photoproduction, pz/pbeam<0.25, remnant fragmentation

Юрий Н



Transverse Λ polarization in photoproduction, pz/pbeam>0.25, Y→S$\bar{S}$

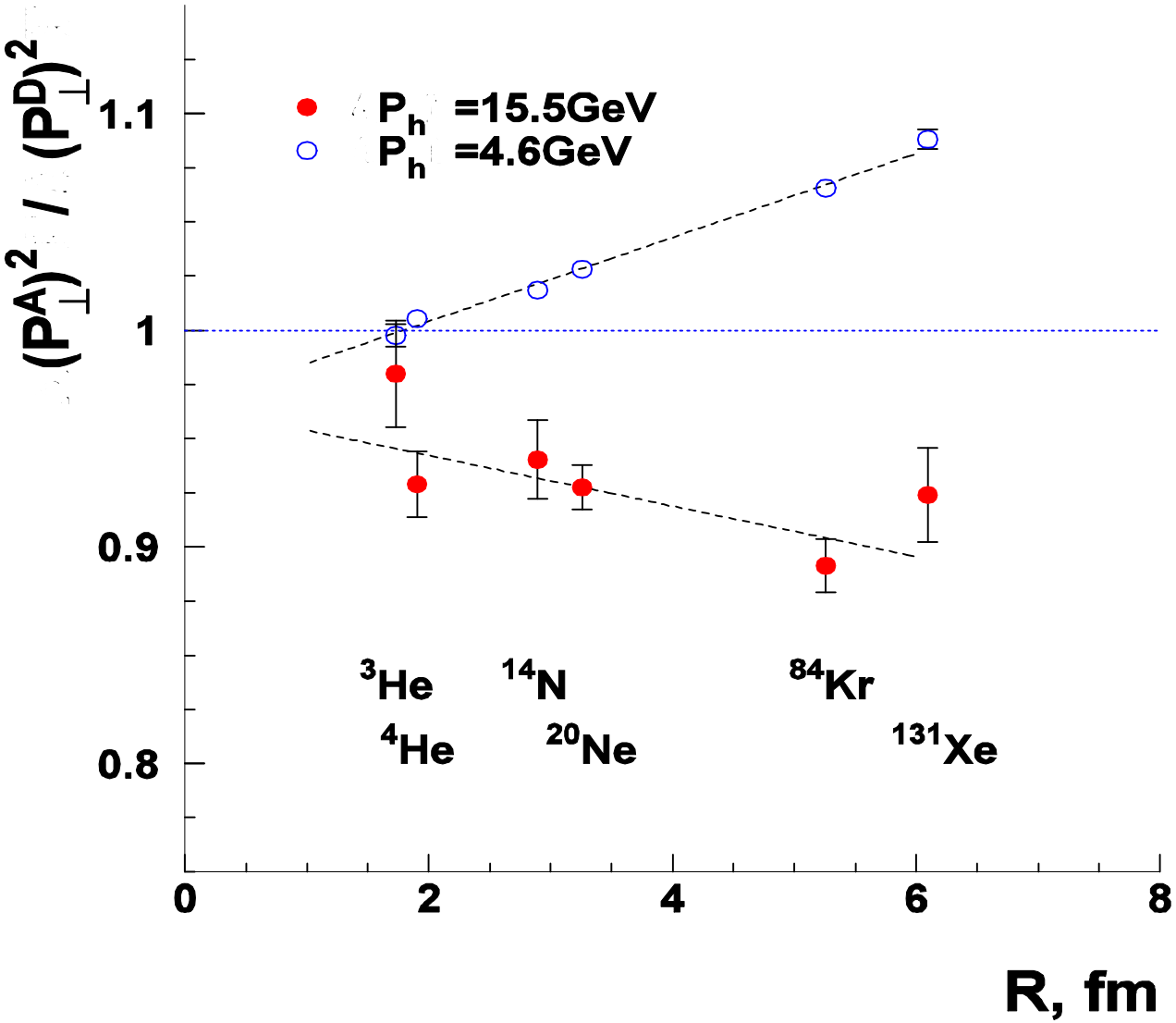
Юрий Н



Transverse motion of quarks in nuclei

Антон Ж

$$P_t^2 \propto a P_t^2(\text{int}) + b P_t^2(\textit{frag}) + g\, P_t^2(\textit{nucl.scat})$$



transverse Λ polarization

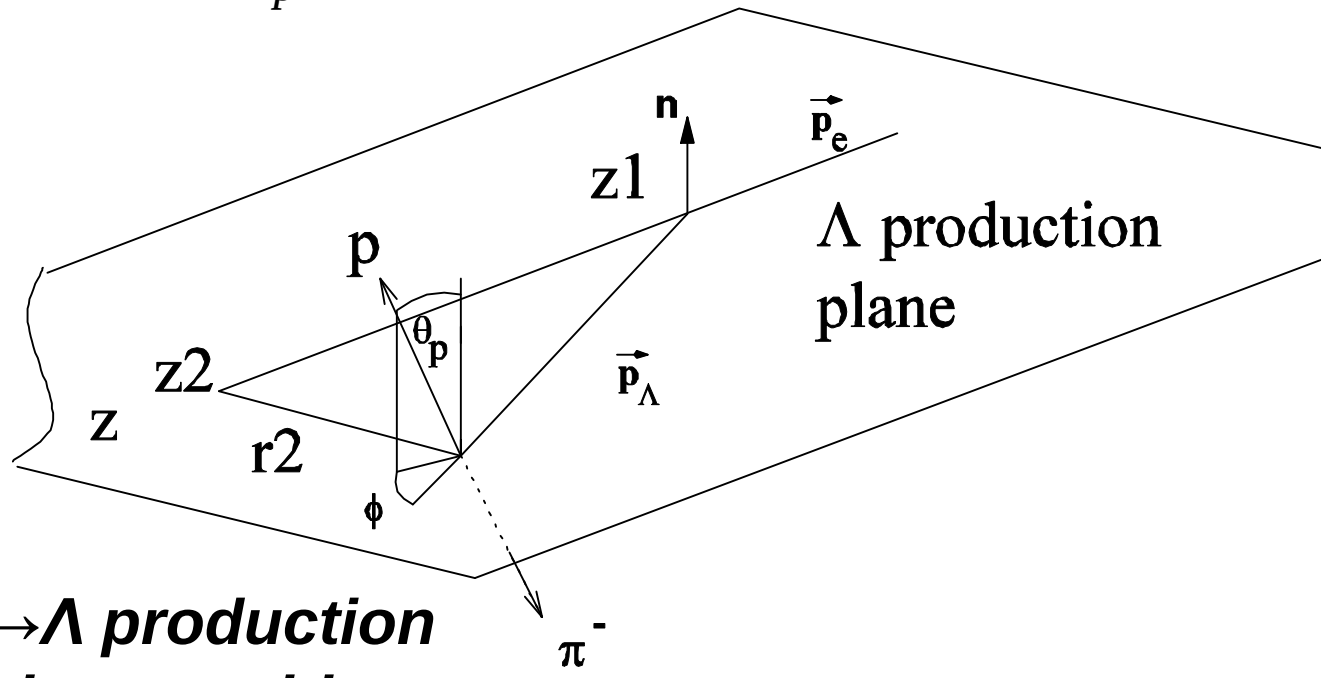
$$\vec{P}_\Lambda = P_\Lambda \cdot \vec{n}, \quad \vec{n} = \frac{\vec{p}_e \times \vec{p}_\Lambda}{|\vec{p}_e \times \vec{p}_\Lambda|}$$

Polarized Λ decay (Λ rest frame)

$$\frac{dN}{d\Omega_p} = \frac{dN_0}{d\Omega_p}(1 + a\ P_\Lambda \cos q_p)$$

$$a = 0.642 \text{ for } \Lambda$$

$$a = -0.642 \text{ for } \overline{\Lambda}$$



f →***decay plane position***

$\cos\Phi = \vec{n} \cdot \vec{n}_y$ →***Λ production plane position***

photon beam

Photon structure

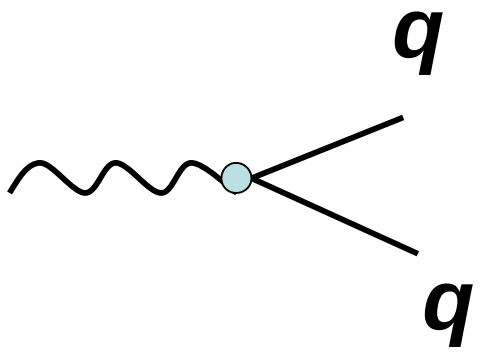
$$|g\rangle = |g_{BARE}\rangle + |VMD\rangle + |GVMD\rangle + |l^+ l^-\rangle$$

$|g_{BARE}\rangle$ **a** direct QCD like gq

$|VMD\rangle$ **a** $r^0, w, j, J/\Psi,$ $q\bar{q}$ at low p_{qT}

$|GVMD\rangle$ **a** $q\bar{q}$ at higher p_{qT} (pertub.)

Finally, for hadron-hyperon (not VM difractive /exlusive) production vertex



dominates

Влияние ядерной среды на PN амплитуду

Олег M+Noro *Published in ЯФ 2006*