



Summary Remarks

CGSWHP'06



Trip to Dmanissi on September 2, 2006



G. Khubua (UoT) C. Wilkin (LU)

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E. Steffens (UoE)

M. Nioradze (HEPITU)

A. Kacharava (UoE & T)

Meeting with Rector TSU on September 4, 2006

CGSWHP'06: „Spin in Hadron Physics“

Caucasian-German School and Workshop in Hadron Physics

An Overview

- Ongoing **physics** program at **COSY**:
 - Overview talks, specialised reports
- **Antiproton physics** at the (to be built) **FAIR**:
 - Introductory talks on physics, technical aspects
 - Preparatory work at COSY
 - **PAX Collaboration Mtg.**
- **ISTC-projects**:
 - Status and progress reports
- **Miscellaneous**:
 - Lectures and reports on special issues

SPIN PHYSICS AT COSY

- NN, NNN, YN Interaction

- Effects of the Nuclear Medium

- Non Strange and Strange Meson Production

- Fundamental Symmetries and Symmetry Breaking

SPIN IN HADRON PHYSICS

<http://www.fz-juelich.de/ikp/cgswhp>

SPIN PHYSICS WITH POLARIZED ANTIPROTONS AT FAIR

- Spin Physics with Polarized Antiproton - Transversity

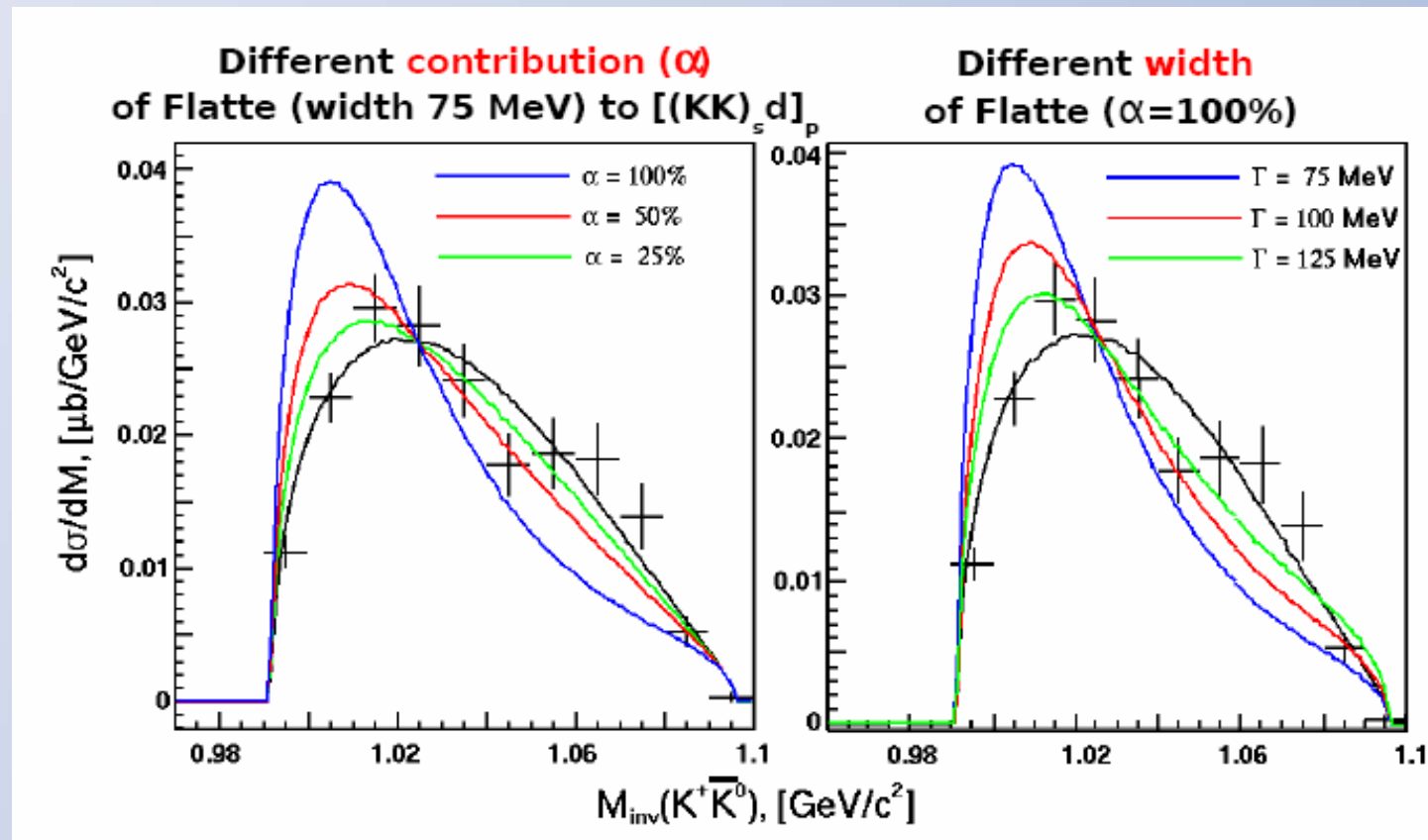
- Nuclear and Hadron Physics with Spin Polarized Protons

- Quark Spectroscopy - PANDA Experiment

(1) New Results

Alexey Dzyuba: $K\bar{K}$ production in NN-collisions

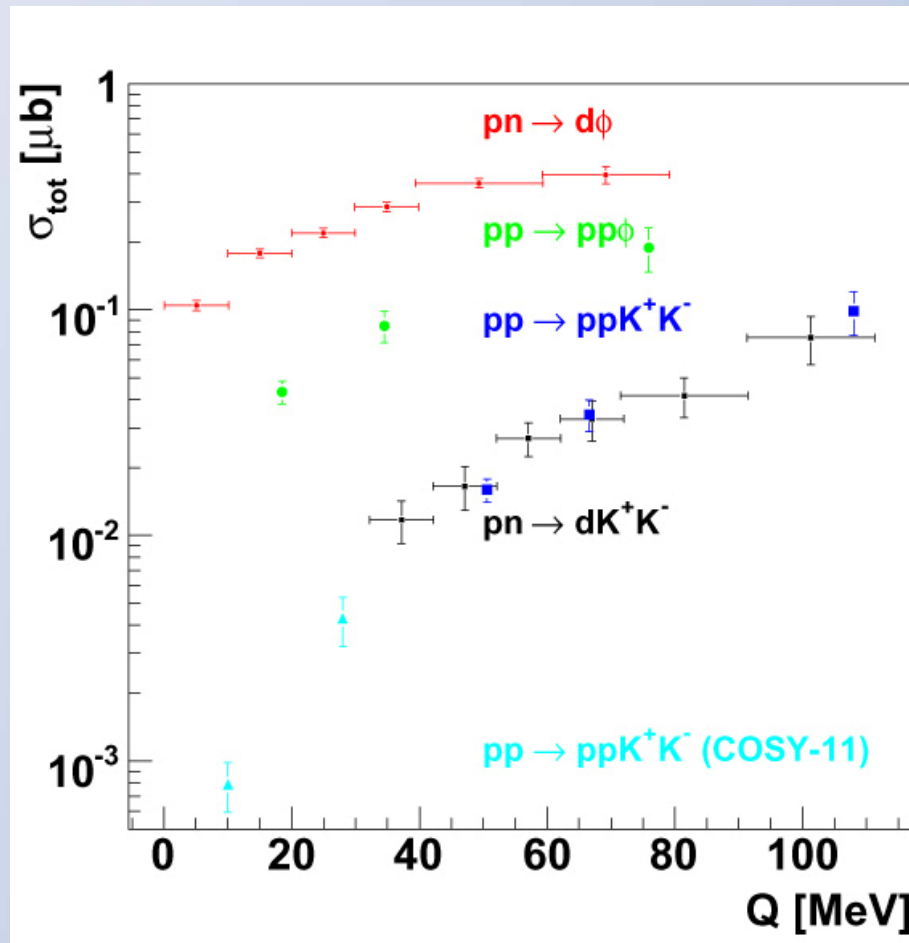
- ANKE Experiment: $p p \rightarrow d K^+ \bar{K}^0$ ($a_0(980)$)



→ No evidence for a_0 -contribution !?

Irakli Keshelashvili: K^+K^- production in NN-collisions

- ANKE and COSY-11 Experiments:



- resonant (ϕ) production

$$pn \text{ (2B)} > pp \text{ (3B)}$$

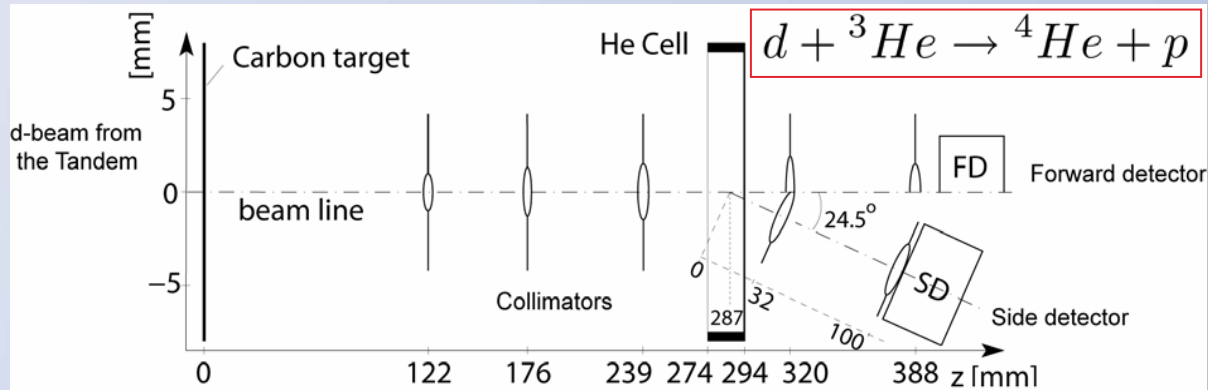
w/ ω -production: OZI -
enhancement $\sim \times 7$

- direct K^+K^- production

$$pn \text{ (3B)} \sim pp \text{ (4B)}$$

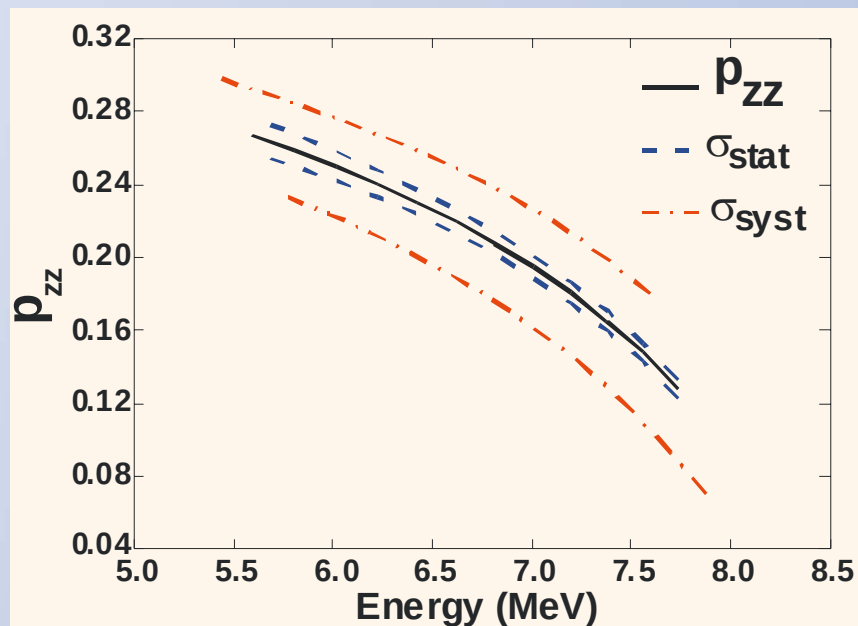
Anatoli Rouba: Deuteron Spin Dichroism

- Experiment at Cologne-University Tandem Accelerator Facility:



Asymmetry

→ P_{zz}

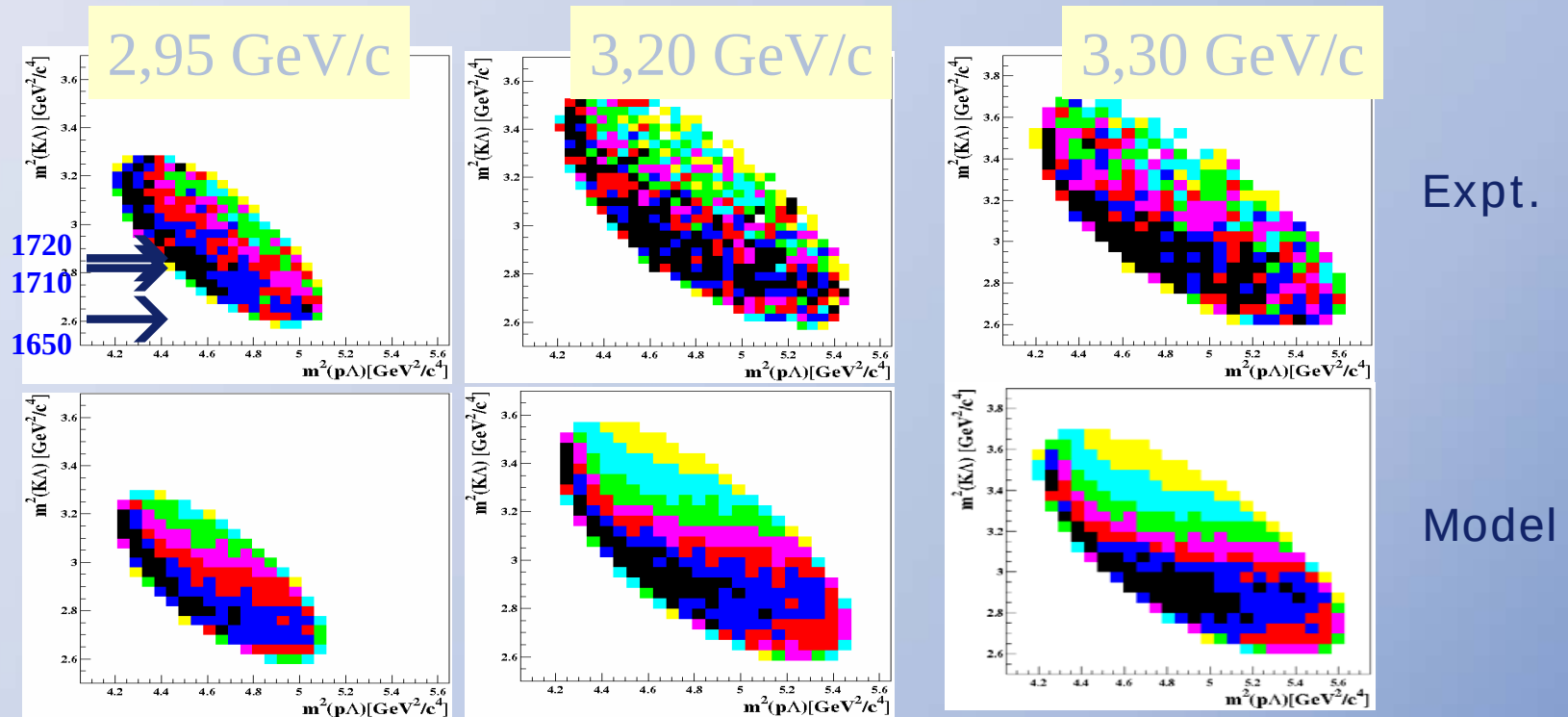


- First observation of particle (deuteron) spin dichroism

(2) Ongoing Analyses

Wolfgang Schröder: Strangeness Production

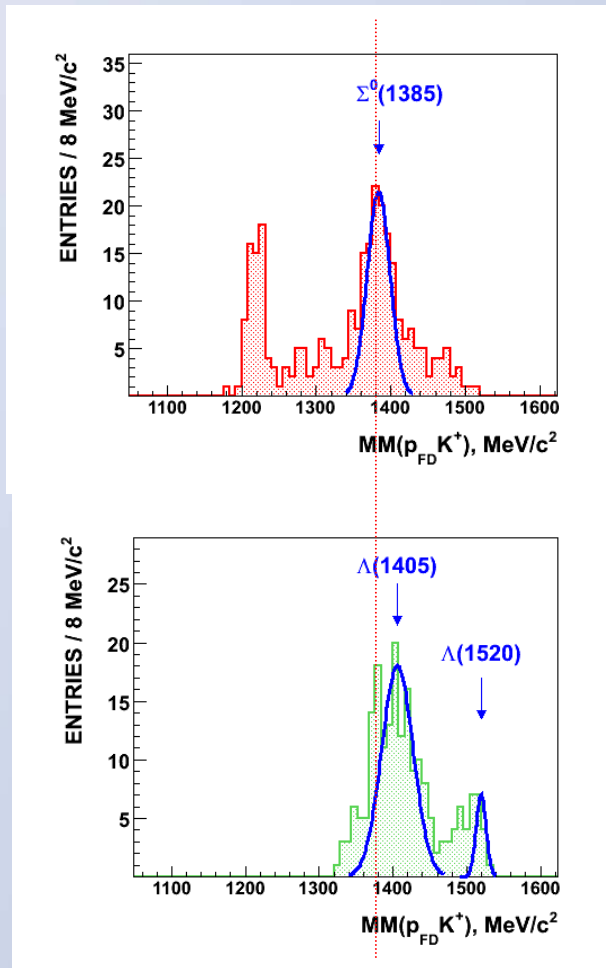
- Experimental Program at COSY-TOF :



→ Strengths of resonances: $N^*(1650)$ and $N^*(1710/1720)$

Iza Zychor: Heavy Hyperon Production

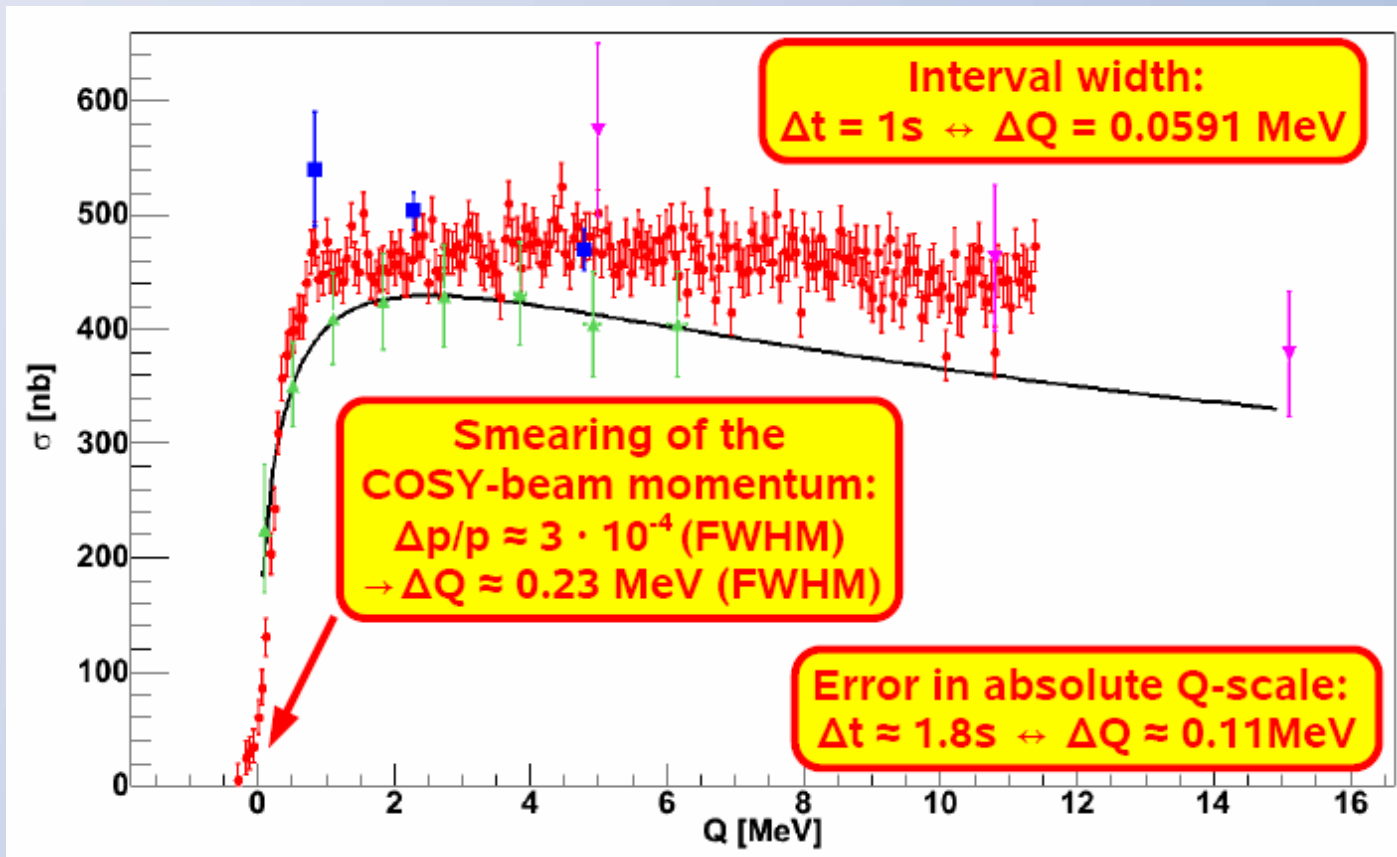
- Experimental Program at ANKE: $p p \rightarrow K^+ p p \pi^- X$



- Heavy hyperons can be identified and discriminated
example: $\Sigma(1385)$ and $\Lambda(1405)$
- New state $\Upsilon^{0*}(1480)$
current data $\rightarrow$ no decision whether Λ or Σ
 $\rightarrow$ further measurements (WASA)

Timo Mersmann: ^3He η scattering length

- ANKE measurement: $dp \rightarrow ^3\text{He} \eta$

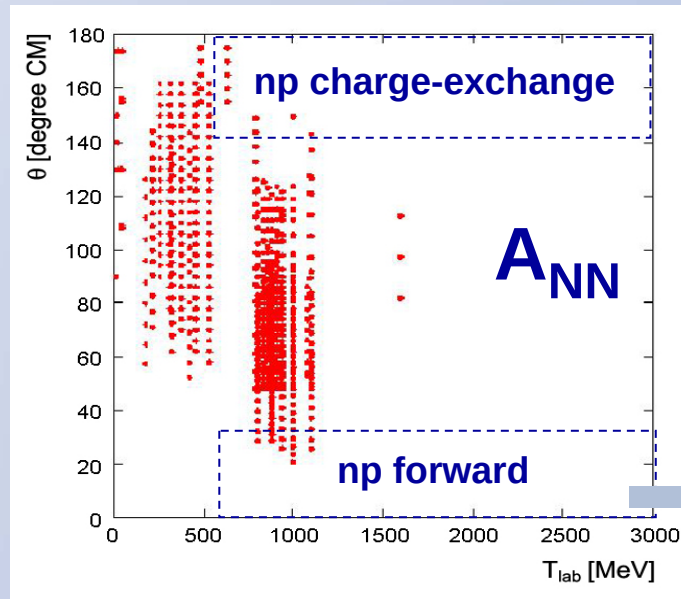


→ How to understand the energy dependence (full range) ?

(3) Plans for New Experiments

Colin Wilkin: Spin Physics inside the COSY Ring

- Experimental Program for ANKE: (accepted by COSY-PAC)



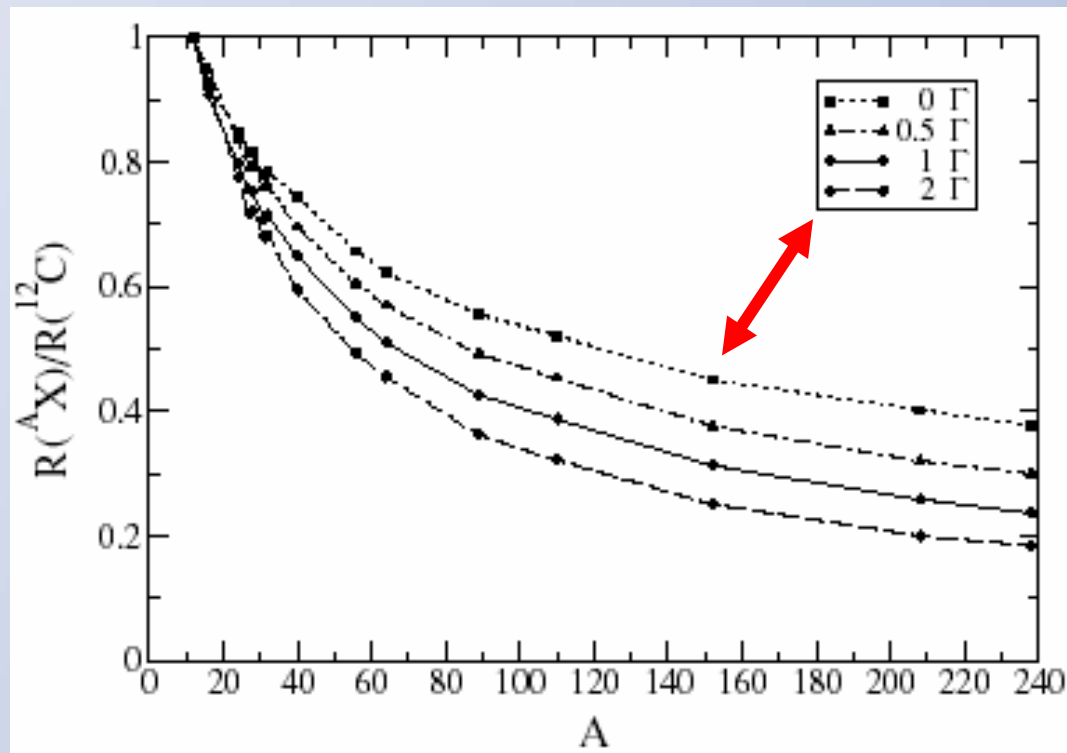
- *Proton-neutron reactions at small momentum transfers.*
- *Proton-deuteron reactions at high transfers.*
- *Non-strange meson production.*
- *Production of strange mesons and baryons.*

→ Double polarization experiments: pol. beam and target

Yuri Kiselev: Meson production in medium

- Experiment for ANKE: $p A \rightarrow \phi X$ and $K^+ K^- X$

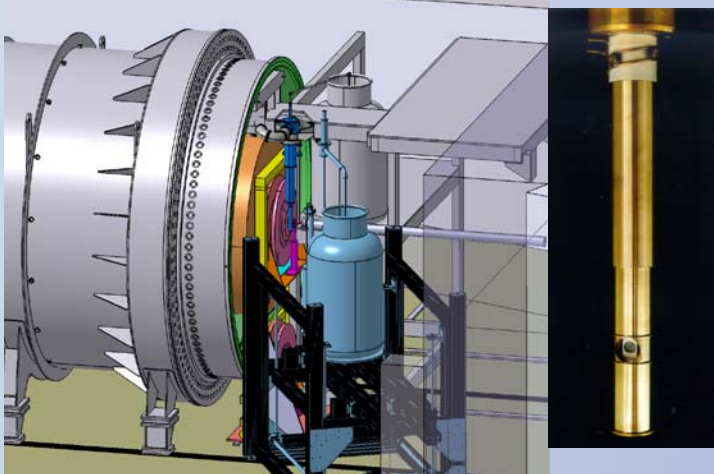
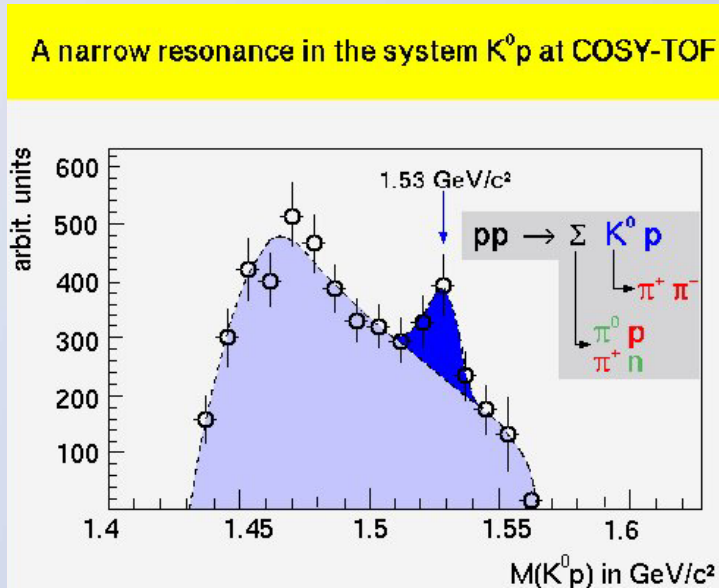
(accepted by COSY-PAC)



- some model-expectation for A-dependence

Wolfgang Schröder: Strangeness Production

- Pentaquark at COSY-TOF :



- If the pentaquark $\theta(1540)$ would exist – almost no one still believes it does! – then ...
- TOF would be the ideal place to determine its **parity** in a **model-independent** way !
(need polarized target)

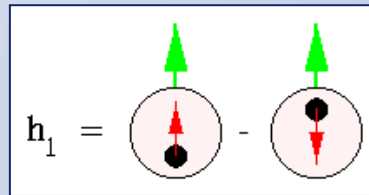
**(4) New Projects:
The PAX Enterprise**

Mauro Anselmino: PAX Physics

- Physics with polarized antiprotons:

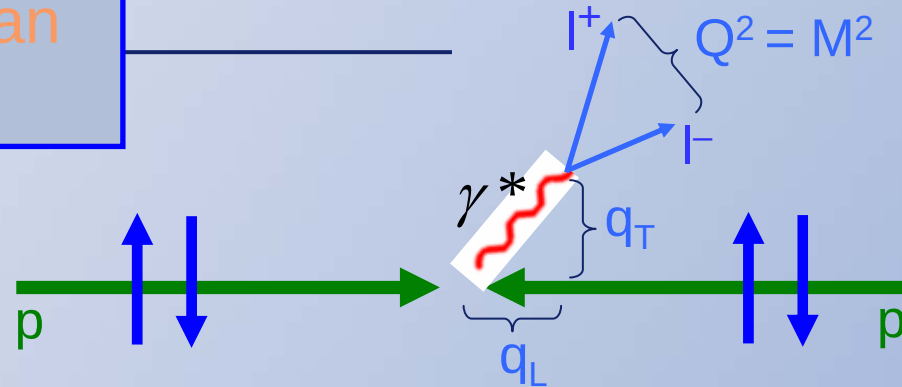
“**Transversity**”

$$(h_1 = \delta q = \Delta_T q)$$



– the missing piece
of nucleon structure

h_1 in Drell-Yan
processes



→ Unique opportunity in **polarized p p_{bar} collisions** (FAIR)

Paolo Lenisa: Polarizing Antiprotons

→ Most important issue for PAX (“all” emphasis must be put in)



A Budker-Juelich consensus on storage rings:

Polarized atomic & free electrons wouldn't polarize antiprotons.

Expect Spin-flip $\ll$ blue Electron-to-Proton spin transfer

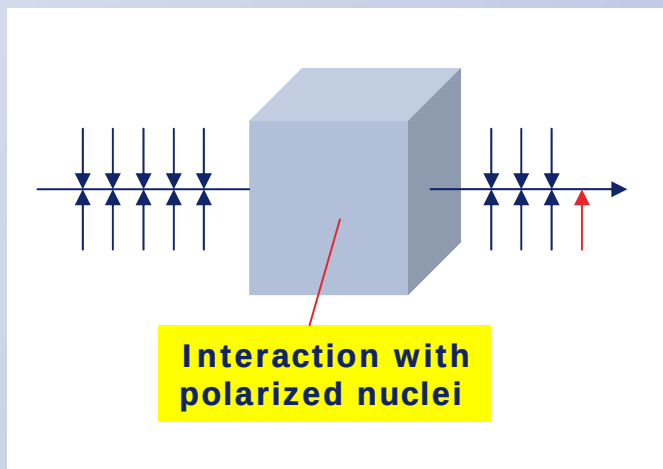


~~Walcher: loss-free filtering in a polarized electron “cooler”.~~

~~Strong enhancement of an spin-exchange at special relative velocities.~~

~~Sizable filtering if spin-flip is equated to spin-exchange.~~

• Spin Filtering:

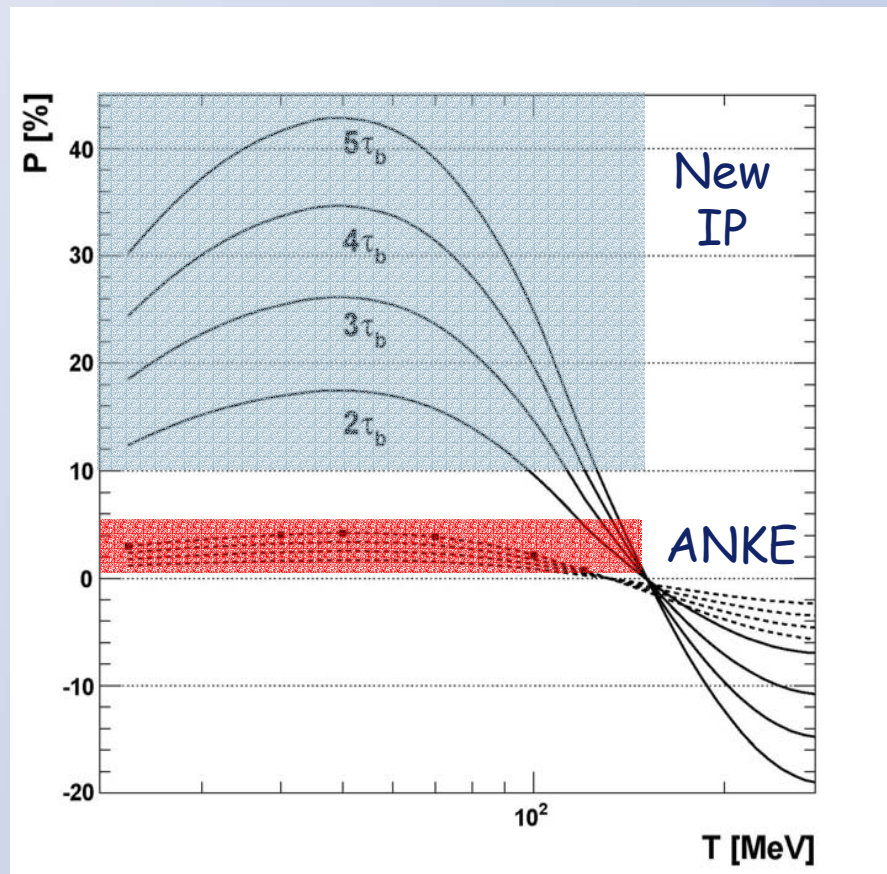


- Spin-dependent scattering of particles out of the accelerator acceptance

- It works ! (FILTEX), but how ?

Paolo Lenisa: Test Measurements at COSY

- Comparison of ANKE-TP and dedicated IP:



- Need for a **new target point** in a low- β section of COSY

Frank Rathmann: Time schedule(s), financing and all that

- Priority list: (Note: **PAX** at HESR is **2nd generation** project)

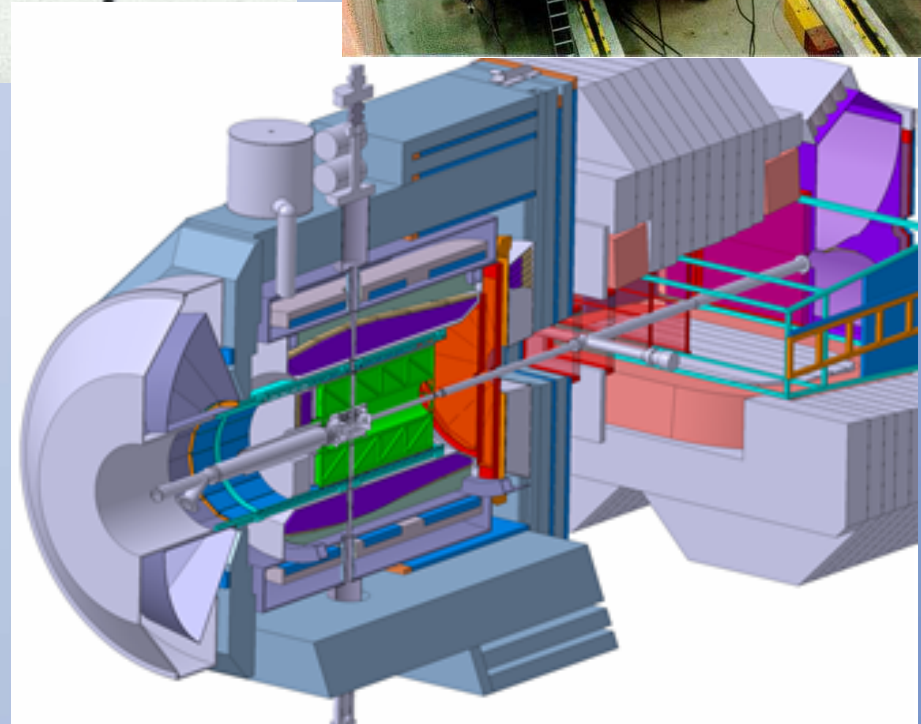
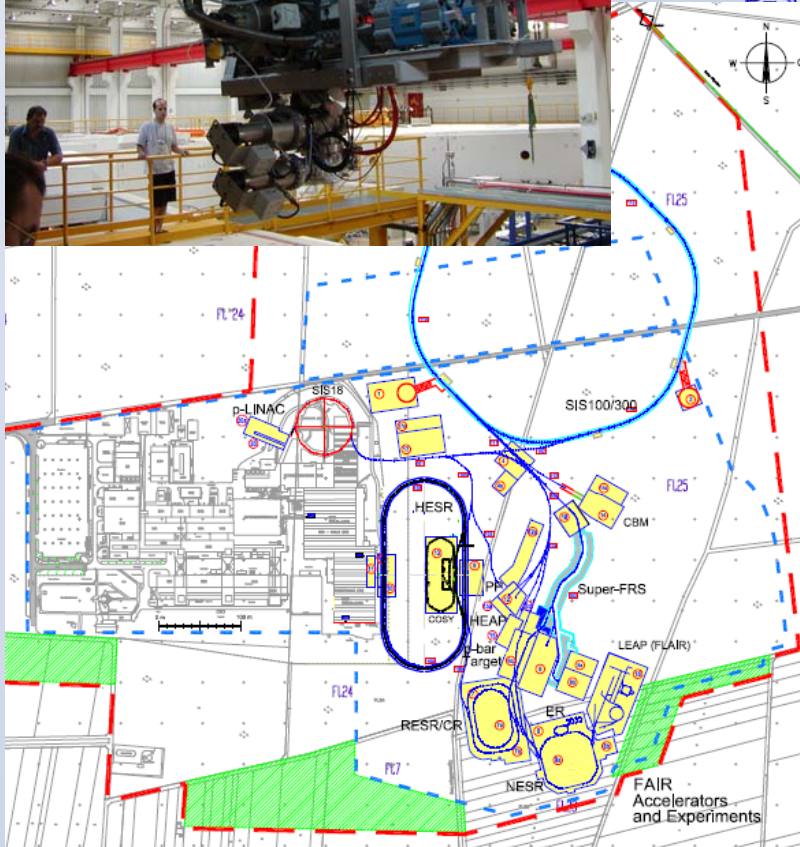
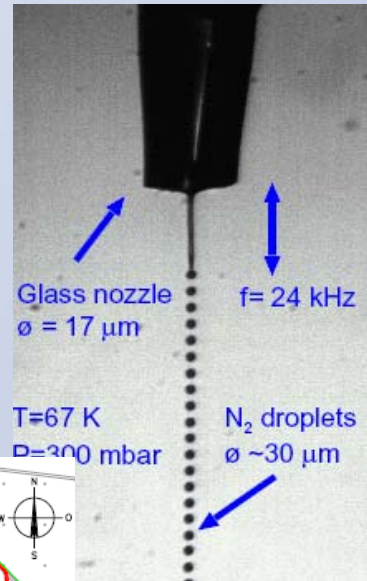
1. Spin-filtering w/ protons – polarize efficiently
2. FP7 Design studies – first money !
3. Spin-filtering w/ anti-protons – the crucial step
4. PAX at GSI (APR, CSR, detector, DAQ, collider)

(Note: do not discuss asymmetric and symmetric collider as two (subsequent) options !)

→ **Exciting - but a lot (!!)** of work

(5) Summary

Apologies for not going into any detail for many other interesting issues:



CGSWHP'06: Spin in Hadron Physics

It really was fun (again) !



CGSWHP'06: Spin in Hadron Physics

It really was fun (again) !

Thanks to Andro and all of his team:
(Irakli, David, Archil, Manana, ...)

- didi gmadloba -

CGSWHP'06: Spin in Hadron Physics

We are looking forward to CGSWHP #3 !

Closing of CGSWHP'06

May all of you have a safe trip
back to wherever you are heading !
Thank you very much & Bye-bye

