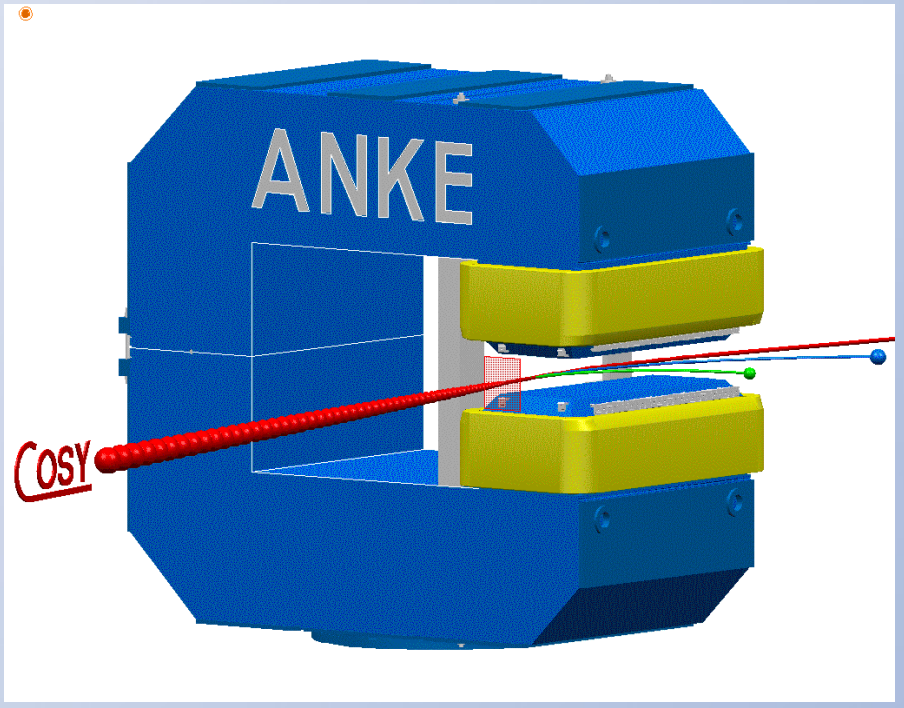
ANKE/PAX Workshop on *Spin Physics*

Workshop Summary

ANKE-PAX Collaboration Meeting
Ferrara (It) May 29 – June 1, 2007

HELMHOLTZ GEMEINSCHAFT

Forschungszentrum Jülich
in der Helmholtz-Gemeinschaft



Central ANKE Spectrometer Dipole

ANKE Physics Program

Current program: 2- and 3-body final states

- Hadronic probes, double polarization
- NN scattering, meson and hyperon production
- PIT commissioning (background from cell)
- Example for precision expt.: dp → ^{3}He X (X = π and $\pi\pi$ and η)
  ("ABC"-effect, cusp effect at η threshold, scattering length)

Future program: → double polarization, np-measurements

- Cluster target → PIT during Dec.´07 COSY shut-down

New Proposals:

- PAC34 (Nov. 07), PAC35 (I-08), …
- Long term (PoF II) → internal ANKE discussion

←→ connection w/ PAX !

Andro Kacharava: "ANKE Experiment at COSY"

Malte Mielke: "Analysis of ANKE data"

Luminosity and Polarimetry

Luminosity determination:

- Conventional method (comp. w/ known reaction) vs. Schottky method (energy loss)
- Uncertainty for Schottky < 10 %

Beam polarimetry:

- Deuteron beam: $P_z \sim 0.5$ (dp → p_{sp}d π°) and P_{zz} (dp → dp)
- Polarization export technique (P_1 → P_2 → P_1)

Target polarimetry:

- using PIT, unpolarized deuteron beam
- $Q_y \sim 0.8$

→ Ready for double polarization experiments

Irakli Keshelashvili: "Schottky-Method"

David Chiladze: "Polarimetry at ANKE"

PITs et al.

ABS:

- ANKE ABS and LSP → in use for double pol. expts.
- HERMES ABS and BRP, TGA → will be used for PAX
- SpinLab at Ferrara

News:

- First double pol. expt. w/ ANKE PIT performed in Jan.´07
- HERMES PIT set up again in lab at COSY

Future Developments:

- Move to COSY hall, set-up, design/construction necessary
- Openable cell (prototype by end of 2007)

Michelle Stancari: "Studies of beam intensity …"

Kirill Grigoryev: "PIT System at ANKE"_

Alexander Nass: "PIT for Spin Filtering Expts."_

Giuseppe Ciullo: "Openable Cell for PAX"_

New ANKE Hardware

Detectors:

- Mechanical supports for (part of) positive-side detectors
- New Drift chambers for FD´s
- Straw tubes at D2 exit window (installation summer ´07 !?)

DAQ:

- Upgrade synchronization modules (WASA-like)
- Additional hardware for “depolarization studies”

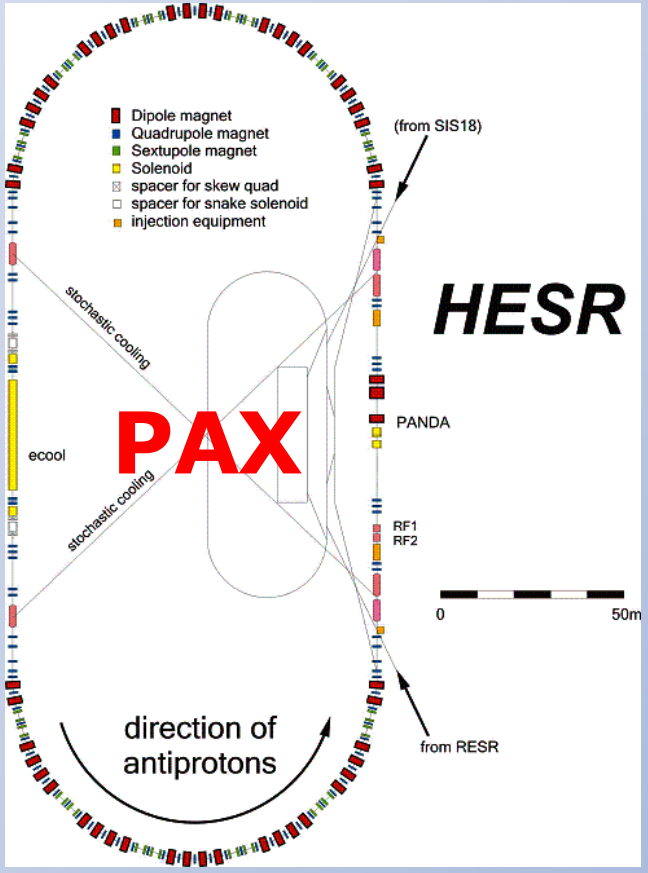
Ralf Schleichert: “ANKE … Upgrades”

Valery Serdyuk: “New ANKE … detectors“

Further Issues: dp-Breakup

Analysis method:

- Sampling method (PS grid, multidimensional interpolation, no MC))
  → application to PINTEX dp-breakup
- Application to some ANKE-data (e.g. dp → (pp)n)



Collider Upgrade Option of FAIR

Physics Case for PAX

News:

- Anselmino´s analysis of (existing) COMPASS, HERMES and BELLE-data → first estimate of ($x\,\Delta_T$) for u and d

Conclusions:

- Extract the transversity distribution of quarks in the valence region from Drell-Yan production in transversely polarized p - (anti-p)

… and:

- Extract the transversity distribution of anti-quarks in the valence region from Drell-Yan production in transversely polarized p – p
- Flavor separation by (anti p)-deuterium scattering

Alessandro Drago: “Transversity”

Polarization Production

Methods:

- Interaction with external fields (… bent crystals)
- Atomic interactions
- Scattering and reactions → "Spin Filtering"

Observations:

- need of a storage ring
- discarding unwanted spin states
- lossless methods (spin flip)
- long processing times ←→ accelerator physicists

→ understanding and control of stored polarization needed !

Hans Otto Meyer: "About Polarized Particles"

Mikhail Ukhanov: "Polarization with Bent Crystal"

Nikolai Nikolaev: "Estimations for Polarization …"

Understanding FILTEX

Conclusions:

- FILTEX: an important proof-of-principle of spin filtering
- Polarized electrons (in atoms) do not polarize (anti-) protons in a storage ring !?
- Slight disagreement between theory and experiment
- Spin filtering with nuclear antiproton-proton interaction

Next steps:

- “Meyer-Horowitz” vs. “Budker-Jülich”; check w/ p at COSY

Nikolai Nikolaev: “Interpretation of spin filtering experiments”

Micha Nekipelov: (…)

Spin Filtering at COSY and AD

General Introduction:

- Physics case → "Transversity"
- What needs to be done !

Simulations:

- Silicon telescopes (ANKE- and HERMES-version)
- Event generators → detector performance
- Same detector (w/ minor modifications) can be used for COSY and AD

Detectors:

- STTs - see below (… HERMES recoil detector)

Frank Rathmann: "Spin Filtering at COSY and AD"

Mirian Tabidze: "Simulations for Spin Filtering at COSY"

Gogi Macharashvili: "Detector for Spin Filtering"

Depolarization Measurements

Aim:

- Influence of (unpolarized) electrons on beam polarization ?

Beam times:

- June ´07 and Nov.´07, …

Detector/electronics preparations:

- 2 STTs: 1 addit. telescope must be built; online analysis

→ promise: STT will be ready (note: financial constraints !)

Dieter Oellers: "Depolarization Experiment at ANKE"

Ralf Schleichert: "Spin Filtering Studies at COSY"

Sergey Merzliakov: "Test Station for Silicon Detectors"

Angelo Cotta: "Electronics Development …"

Luca Baron: "Timing sequencer …"

Sergey Trusov: "Software Development …"

Micha Nekipelov: "Online Software …"

Accelerators etc.

Accelerator aspects:

- Low β-sections at COSY(PISA-section) …
- … and AD (openable cell, snake design, electron cooling)

Magnets:

- SC quadrupoles (high-, low gradient option)
- Technical solutions for coils, cable, …
- High-T_C SC an option? ←→ model coil

Archil Garishvili: "Accelerator Aspects for SF Expts. …"

Marco Statera: "Quadrupole Magnets"

Further Issue: PANDA

Physics case:

- Charmonium spectroscopy
- Hybrids and Glueballs
- Hadrons in nuclear matter
- Hypernuclei (single- and double)
- EM: (Time-like) formfactors, DVCS and Drell-Yan

Detector:

- Multipurpose (central solenoid + forward dipole)
- 4π, tracking, PID, em calorimeter, …

Collaboration:

- Huge international team (~ 350 scientists, 47 institutions)

Diego Bettoni: "The PANDA Experiment"

The Challenges (for PAX)

Technology:

- Does Spin Filtering work ?

Science Politics:

- PoF w/i HGF
- AD/CERN
- (When) does FAIR start ?
- Preparation of FAIR for future upgrade (building) !

People:

- **** (!!)

Money:

- Institutional (limited)

→ (at least one of the) applications to FZJ, HGF, EU must be successful !

The End

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Thanks a lot

for an informative and very nice meeting

(plus: great organization !)

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Have a save trip home … !