

Polarized Antiproton Experiments

Update

Roma, 31 gennaio, 2008

Depolarization Measurements

- Goal
 - Depolarization measurement of a polarized proton beam through interaction with a co-propagating electron beam
- Motivation
 - Investigation of possible electromagnetic contribution to the polarization of a stored beam
 - Walcher et al.: Polarization of a stored antiproton beam with a polarized positron beam at low relative energy

A surprising method for polarising antiprotons.

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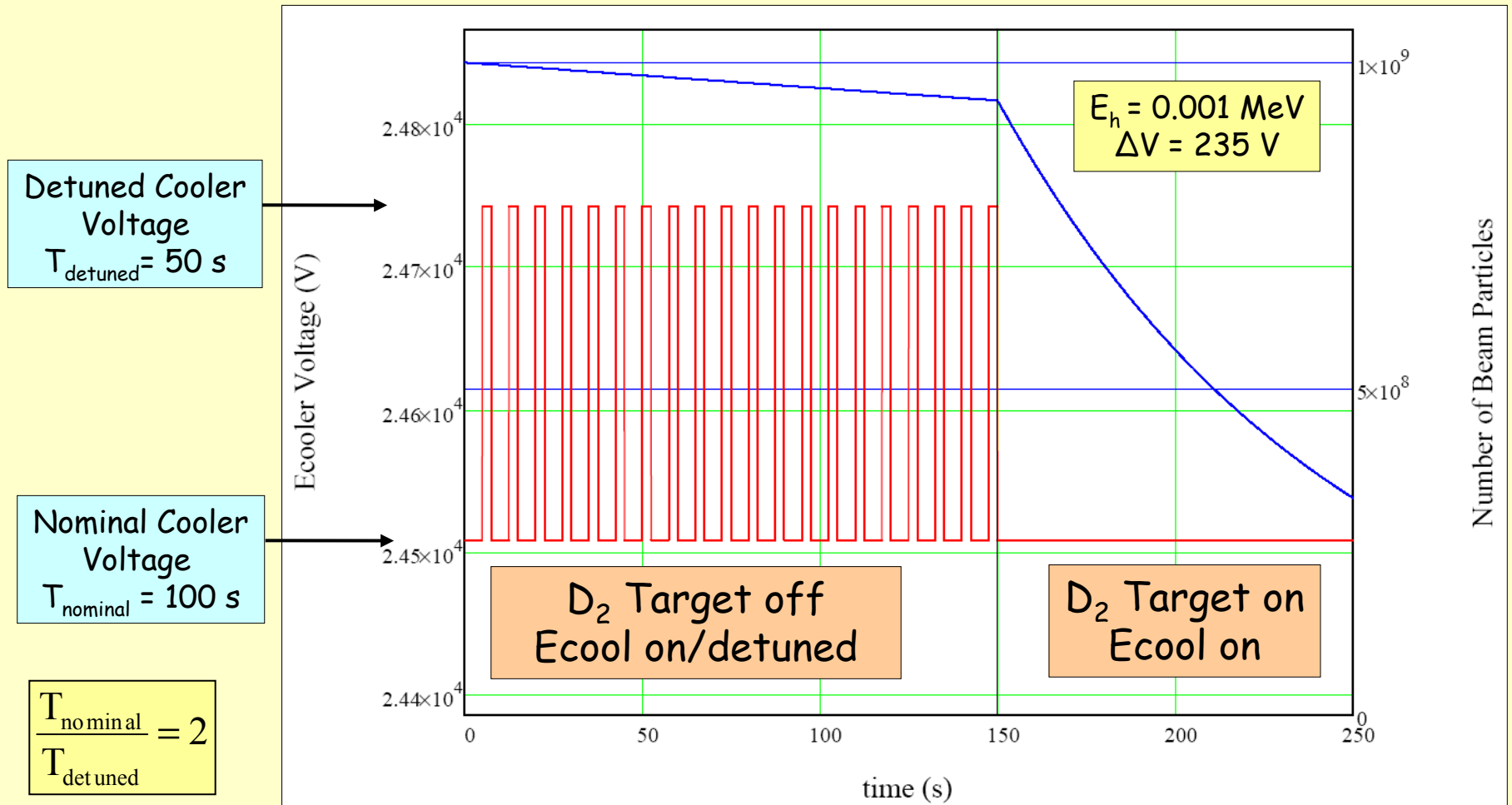
Received: date / Revised version: date

Abstract. We propose a method for polarising antiprotons in a storage ring by means of a polarised positron beam moving parallel to the antiprotons. If the relative velocity is adjusted to $v/c \approx 0.002$ the cross section for spin-flip is as large as about $2 \cdot 10^{13}$ barn as shown by new QED-calculations of the triple spin-cross sections. Two possibilities for providing a positron source with sufficient flux density are presented. A polarised positron beam with a polarisation of 0.70 and a flux density of approximately $1.5 \cdot 10^{10}/(\text{mm}^2 \text{ s})$ appears to be feasible by means of a radioactive ^{11}C dc-source. A more involved proposal is the production of polarised positrons by pair production with circularly polarised photons. It yields a polarisation of 0.76 and requires the injection into a small storage ring. Such polariser sources can be used at low (100 MeV) as well as at high (1 GeV) energy storage rings providing a time of about one hour for polarisation build-up of about 10^{10} antiprotons to a polarisation of about 0.18. A comparison with other proposals show a gain in the figure-of-merit by a factor of about ten.

PACS. 13.88.+e Polarisation in interactions and scattering – 29.20.Dh Storage rings – 29.25.Bx Electron sources – 29.27.Hj Polarised beams

arXiv:0706.3765v3 [physics.acc-ph] 14Nov 2007

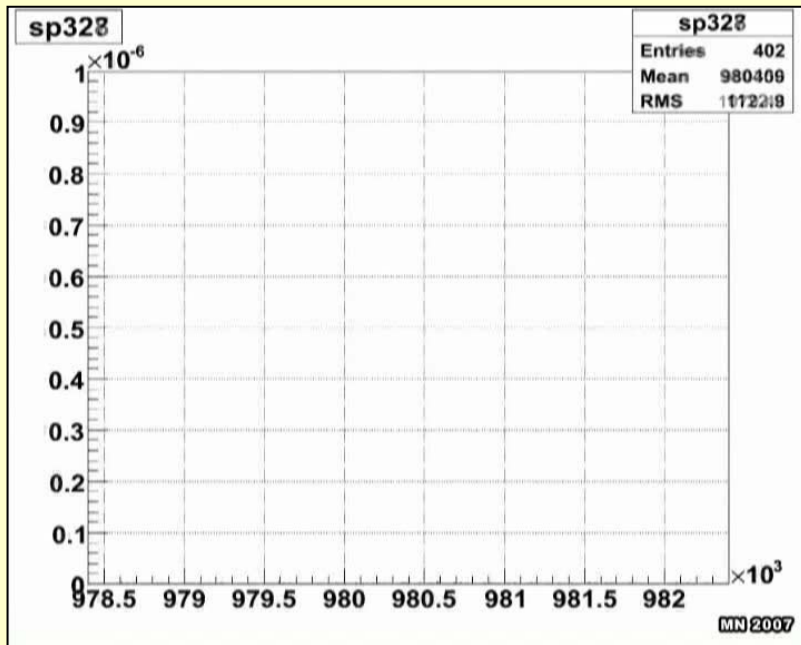
Principle of the Depolarization Measurement using co-moving electrons of the e-cooler



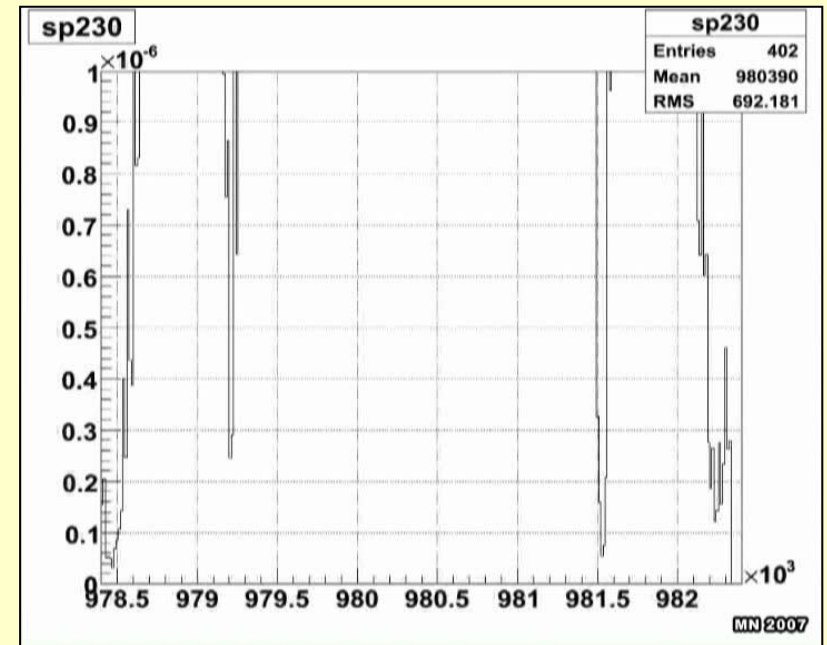
$$\frac{T_{\text{nominal}}}{T_{\text{detuned}}} = 2$$

Machine Test for Depolarization Measurements (Nov. 2007)

Switch off ecooler



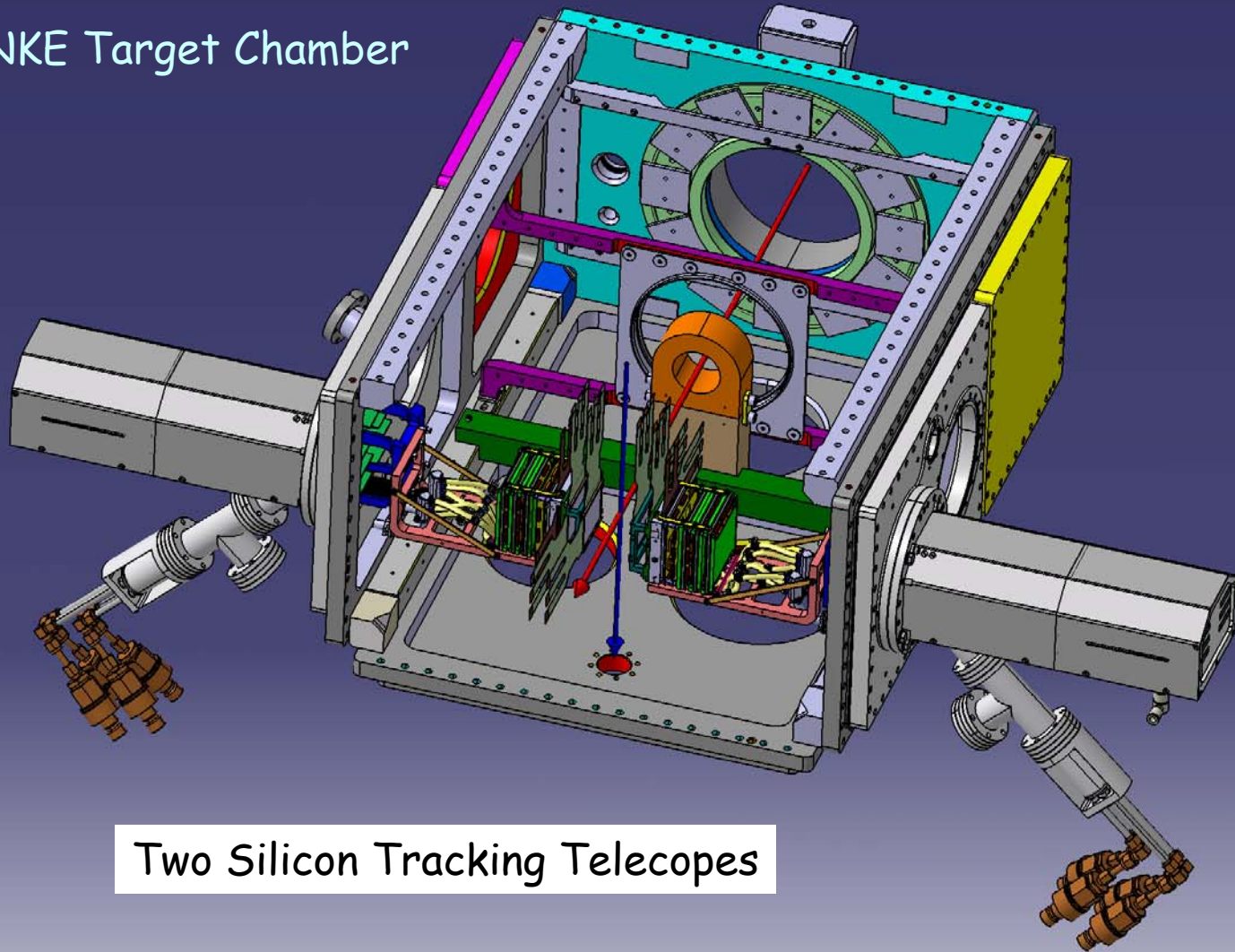
Detuned ecooler $\Delta U=150$ V



→ Machine-wise, experiment is feasible

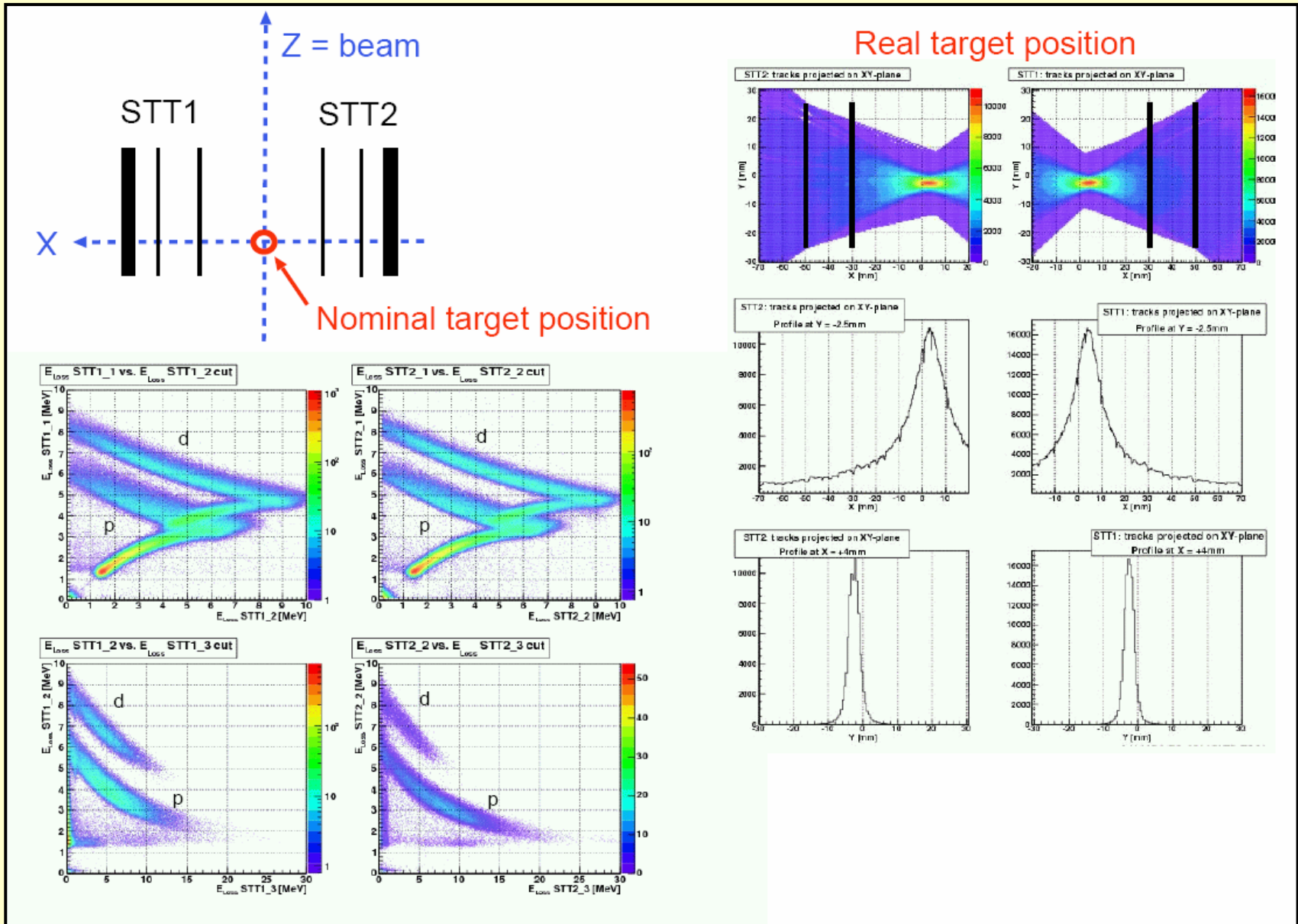
New Low Energy Polarimeter for COSY (Nov. 2007)

ANKE Target Chamber



Two Silicon Tracking Telescopes

Performance of New Low Energy Polarimeter (Nov. 2007)

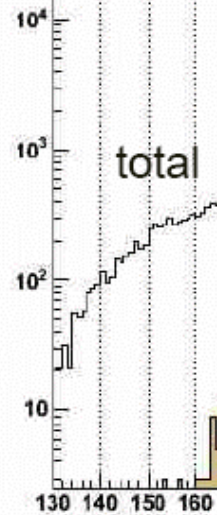
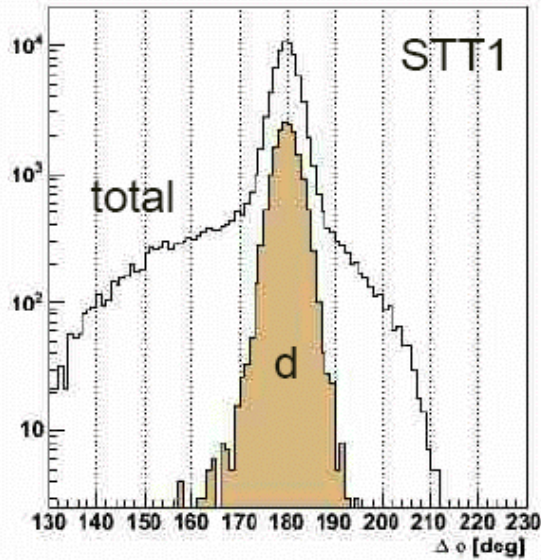


Polarimetry 45 MeV

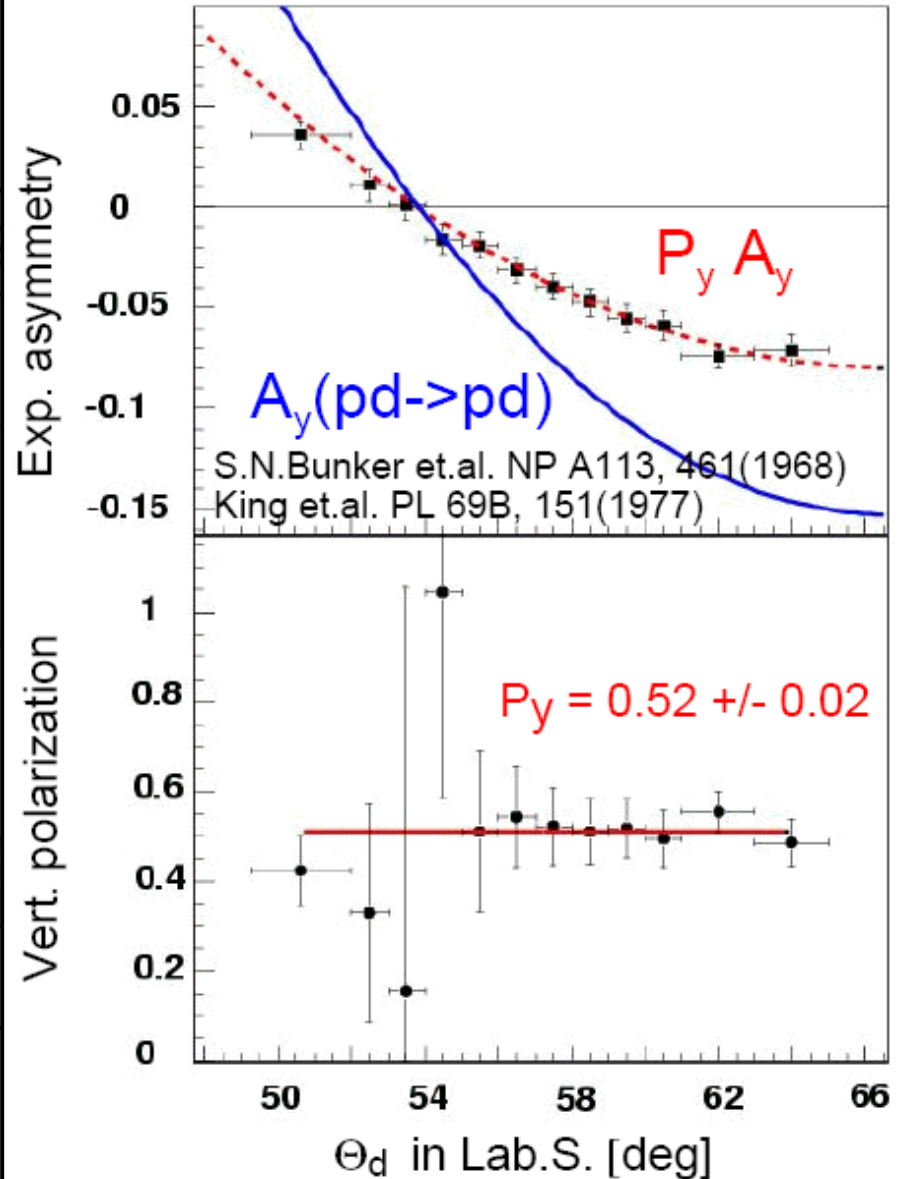
pd elastic scattering

$\Delta\phi$ between tracks in STT1 and STT2

FWHM $\sim 6.4^\circ$ = small-angle scattering

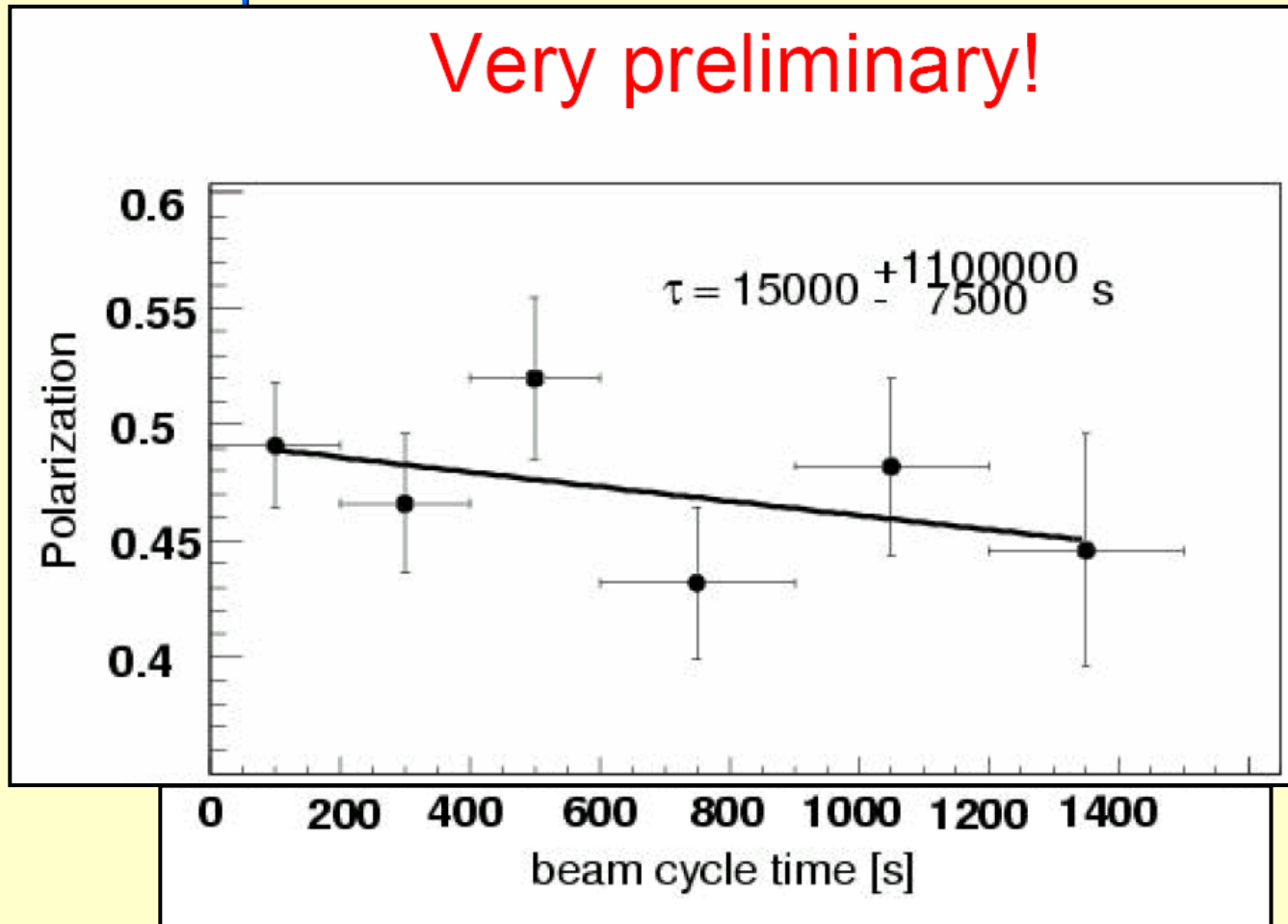


Beam polarization
(deuterons selected)



First Measurement of Polarization Lifetime at $T_p = 45$ MeV (Nov. 2007)

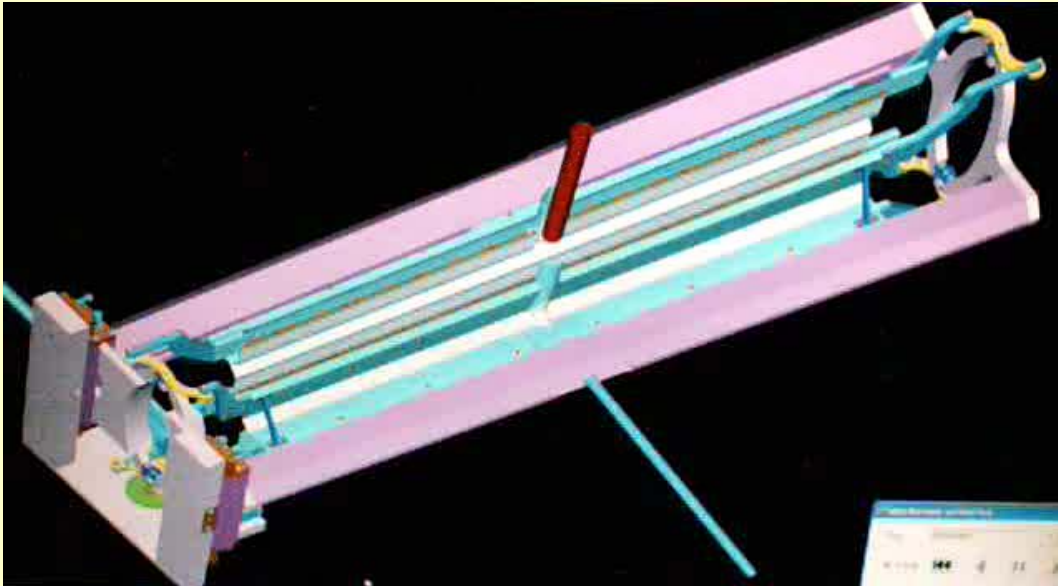
Very preliminary!



Experimental determination of the depolarizing ep cross ~ March 2008

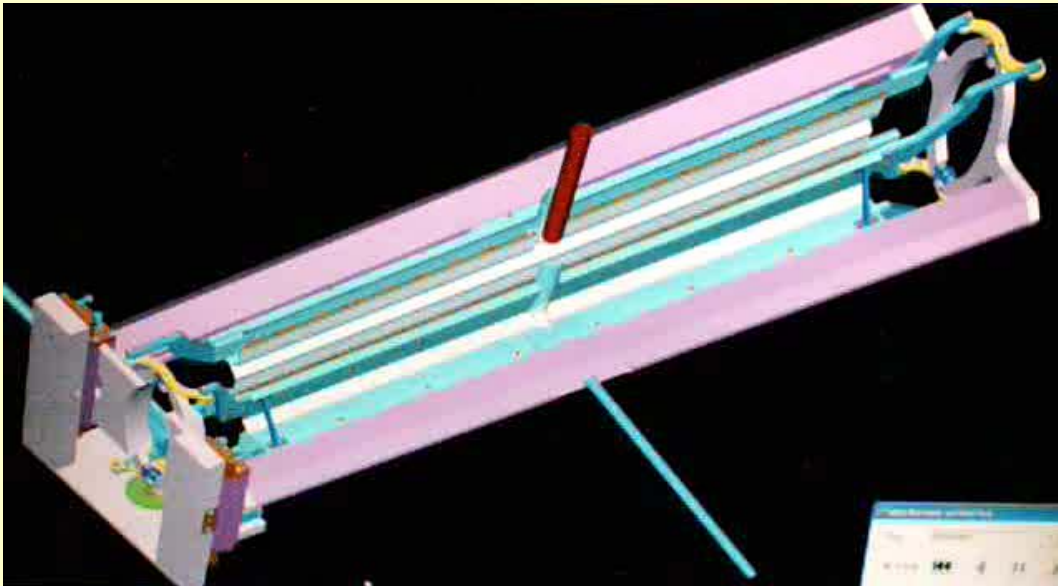
Parallel developments in Ferrara

- FERRARA mechanical workshop (ing. Vito Carassiti)
 - Designed of openable cell prototype (for AD experiment) completed
 - Tests of cell prototype with ABS and BRP in summer.



Parallel developments in Ferrara

- FERRARA mechanical workshop (ing. Vito Carassiti)
 - Designed of openable cell prototype completed
 - Cell prototype ready for tests in april



- FERRARA electronic workshop (ing. Angelo Cotta Ramusino)
 - Design and construction of a programmable FPGA trigger board completed
 - Successfull commissioning in Jülich in January '08
 - Will be used in February beam time

2008 - Schedule

- February Depolarization measurement
- March-May Data analysis
- Autumn Full proposal for *COSY* and *AD*

2008 - Events

- Ferrara, March, 17

Discussion: "A polarized target for PANDA?"

- Ferrara, May, 28-31

Transversity 2008 Workshop in Ferrara

<http://www.fe.infn.it/transversity2008/>

Transversity 2008

Second Workshop on
Transverse Polarisation Phenomena in Hard Processes

Ferrara - May 28-31, 2008



Transverse spin effects are one of the presently most debated issues in Hadron Physics. The present Workshop is organized in the frame of a Ministry-funded inter-university Research Project of National Interest (PRIN) specifically dedicated to this aspect and follows the one held in Como in 2005. The members of the project have planned this Workshop to gather together theorists and experimentalists engaged in investigating the nature of transverse spin in hadron physics, with the aim of exchanging up-to-date theoretical and experimental ideas and news on the subject.

Local organising committee

Vincenzo Barone (Alessandria)
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Giuseppe Ciullo (Ferrara)
Marco Contalbrigo (Ferrara)
Delia Hasch (Frascati)
Paolo Lenisa (Ferrara, Chair)
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International advisory committee

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Phone: Paola Fabbri (+39) 0532 974280

2008 - Events

- Ferrara, March, 17 Discussion: "A polarized target for PANDA?"
- Ferrara, May, 28-31 "Transversity 2008" Workshop in Ferrara
<http://www.fe.infn.it/transversity2008/>
- Bad Honnef (Bonn) June 23-25 Heraeus Seminar on "Polarized Antiprotons"
<http://www.fe.infn.it/heraeus/>