

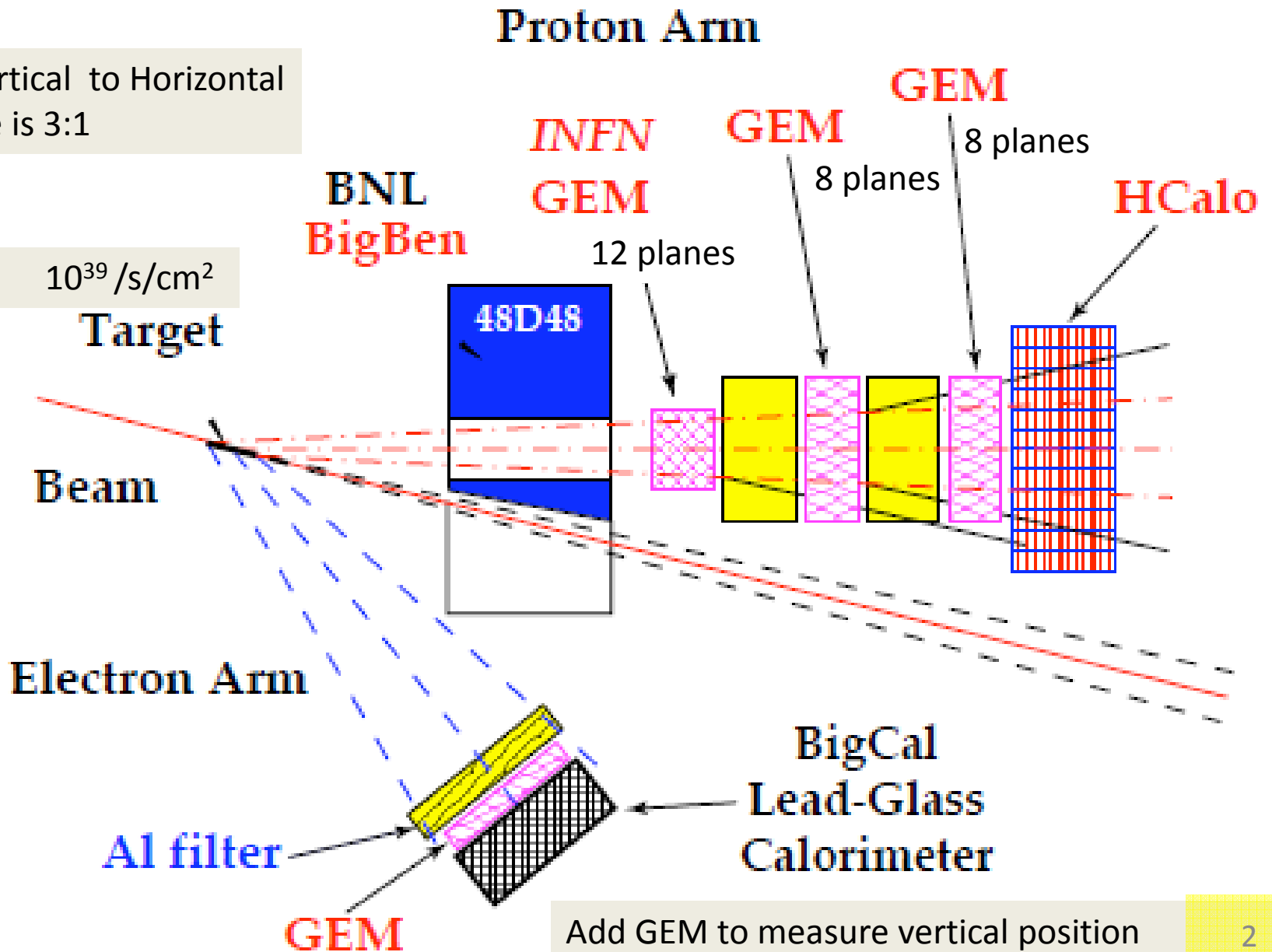
# Status of GEp5 experiment

Mark Jones  
for the GEp5 Collaboration

# Experiment Setup

Ratio of Vertical to Horizontal acceptance is 3:1

40cm LH2  $10^{39}$  /s/cm<sup>2</sup>  
Target



Add GEM to measure vertical position  
Improve track matching

# PAC35 on GEp5

**PR12-07-109:** The PAC recommends the beam time be reduced from 60 to 45 days by only measuring the ratio  $G_E/G_M$  up to a maximum value of  $Q^2=12 \text{ GeV}^2$ . Different models can already be discriminated at this lower  $Q^2$  value and the trend in the behaviour of the ratio  $G_E/G_M$  can be established before reaching  $Q^2=14.5 \text{ GeV}^2$ .

- Grade A-
- Change in kinematics

$Q^2$	$\theta_E$ (deg)	$P_e$ (GeV)	Bigcal Distance (m)	$\Theta_p$ (deg)	$P_p$ (GeV)	JAC
14.5	39	3.27	3.5	12.0	8.61	2.7
12.0	29	4.60	5.5	17.4	7.27	1.65

- Reduction in angular spread, need detailed layout

# PAC35 on GEp5

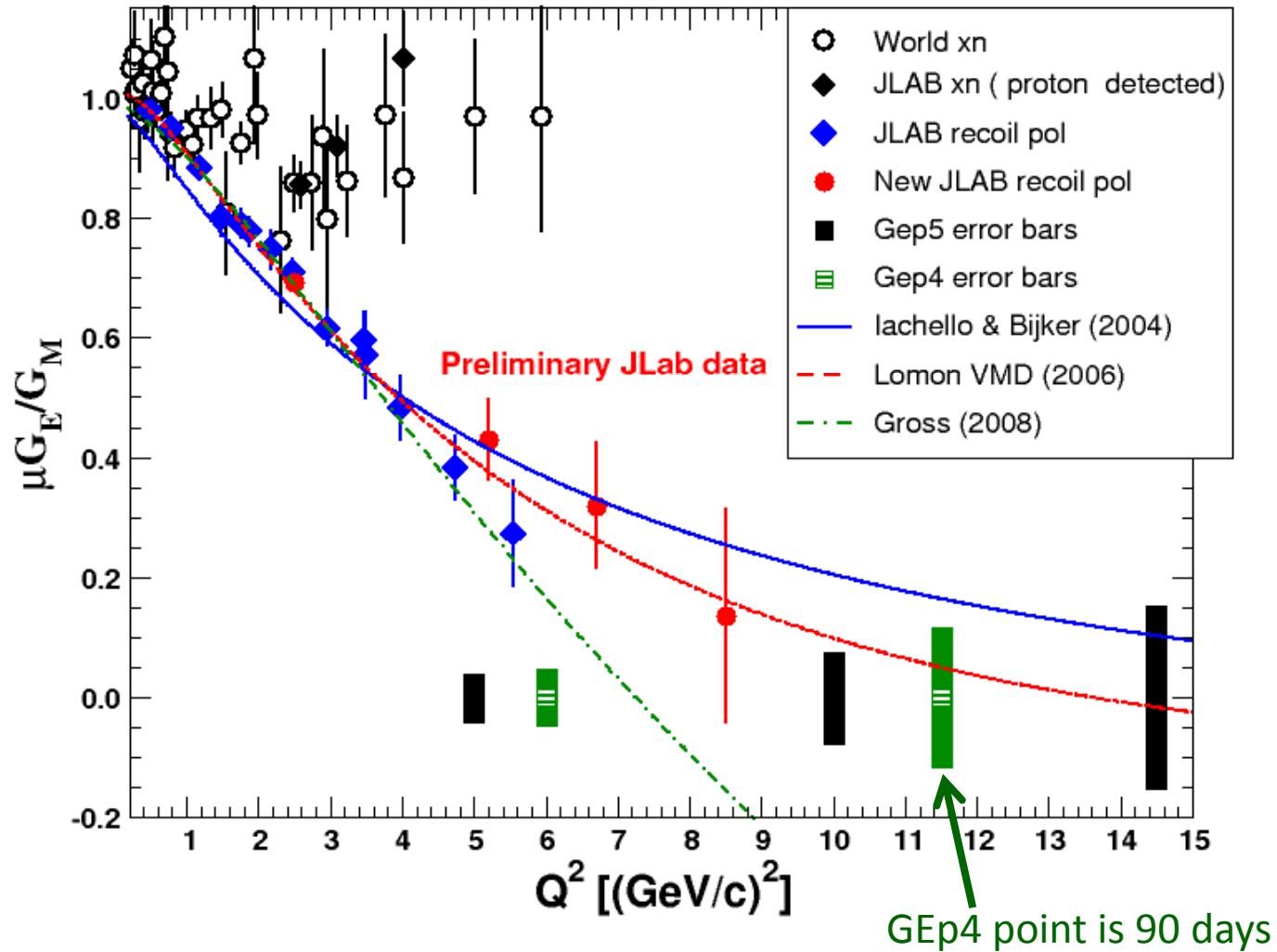
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		Rates (kHz/cm2) at various GEM locations			
particle		Front Tracker	Second Tracker	Third Tracker	BigCal Tracker
$Q^2=14.5$	$\gamma$	437	7	1	34
	charged	119	352	124	96
$Q^2=12.0$	$\gamma$	266	3.3	0.3	39
	Charged	82	110	24	105

- Reduction in background rates on proton side.
- Rates about the same on electron side

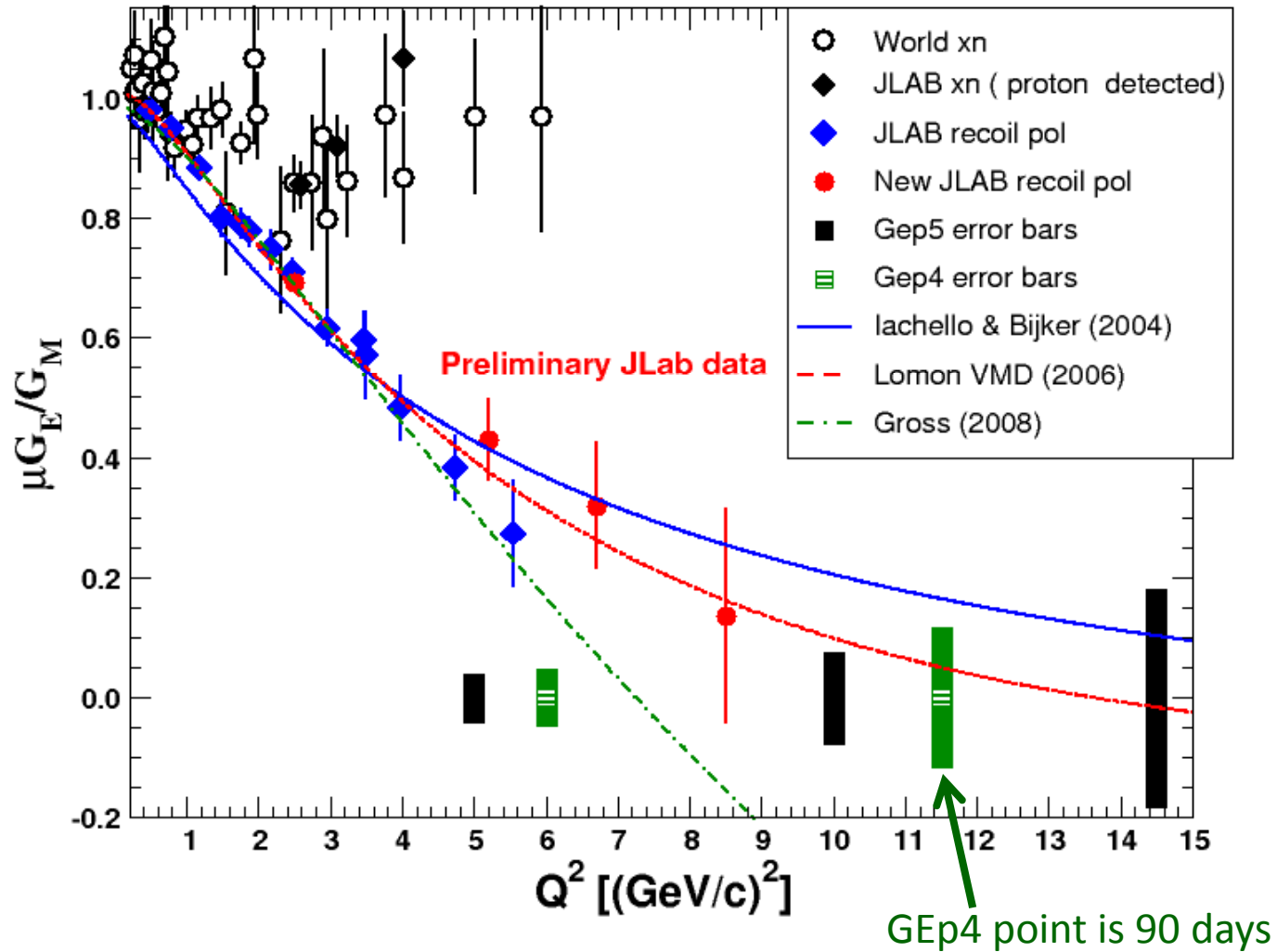
# Projected Error bars for GEp5

Original  $Q^2 = 14.5 \text{ GeV}^2$  in 45 days  $\Delta R=0.135$



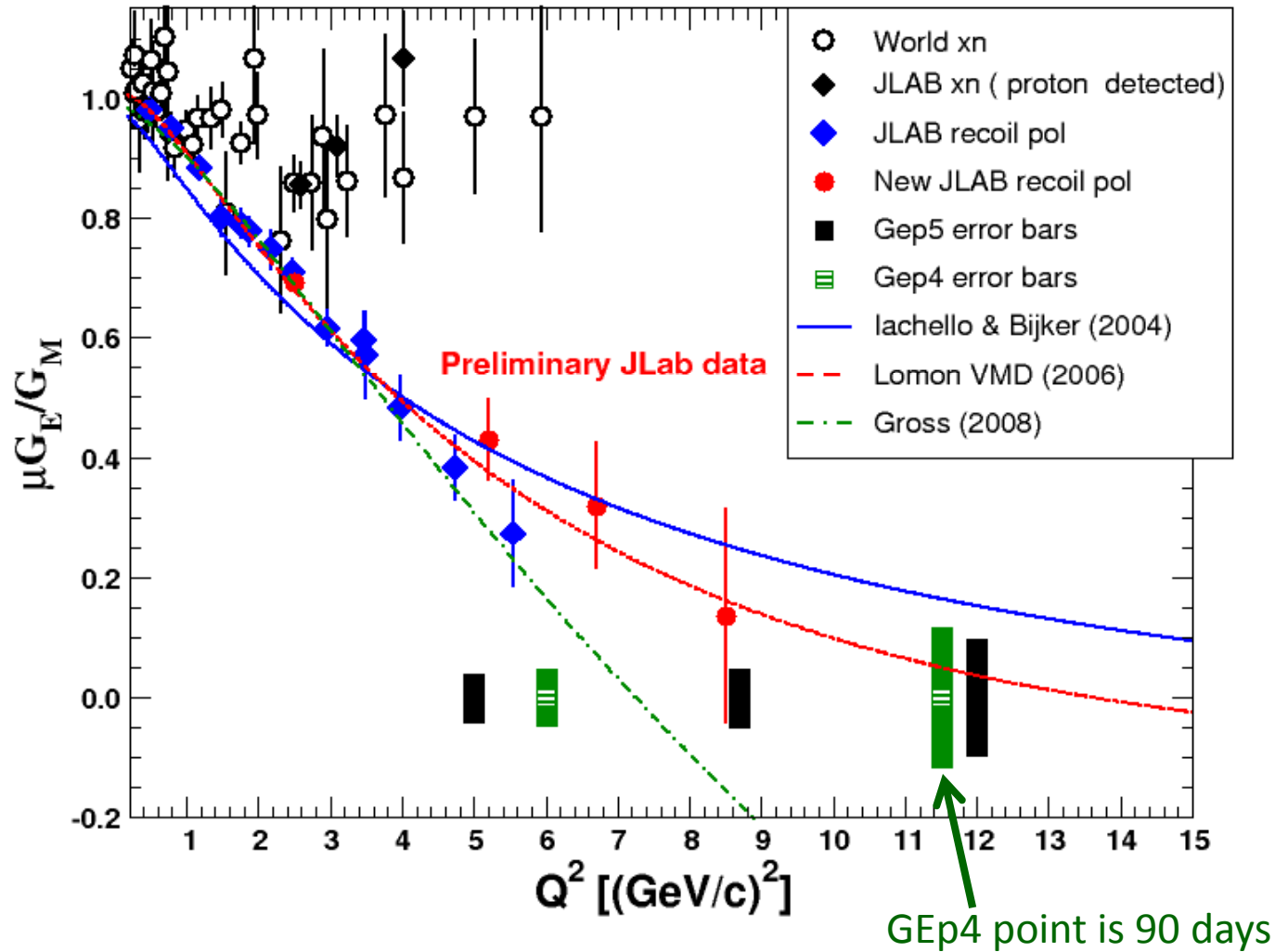
# Projected Error bars for GEp5

$Q^2 = 14.5 \text{ GeV}^2$  in 30 days gives  $\Delta R=0.165$



# Projected Error bars for GEp5

Reducing to  $Q^2 = 12 \text{ GeV}^2$  in 30 days gives  $\Delta R=0.08$



# Technical Review on GEp5

## Recommendations:

- Noise performance studies of the chamber with UV strip orientation, and therefore varying strip lengths, and an analysis of its impact on resolution and efficiency are of a great importance before the start of mass production. Special tests to estimate S/B performance should be also foreseen for the ST and TT chambers, where four strips are connected into a single readout channel (longer effective strip length mean higher capacitance, i.e. more noise).
- In view of the high background levels ( $\sim 500 \text{ kHz/cm}^2$ ) in the GEp(5) spectrometer, the Committee recommends that the 3-sample readout method of the APV25 be adopted as the default solution for all trackers (FT, ST, TT). This will increase the bandwidth requirement and data rates from tracking stations to the DAQ which, however, seems to be consistent with the plans for the Hall A DAQ upgrade.

## Response:

- When is it possible to do the noise performance studies?
- Do we agree to the 3-sample readout? Need to clearly defined data size.



# Technical Review on GEp5

*“A reduction of the occupancy is absolutely mandatory, e.g. by splitting the strips, by reducing the preamplifier and shaping time constants of the APV, and/or by decreasing the background rate by going back to the original scattering angle of 14°. “*

## **Recommendation:**

- The Committee strongly recommends that the response of a GEM detector to low-energy photons should be measured using a prototype detector and electronics. The results should be compared to the GEANT modeling to confirm that the background levels in the Monte Carlo simulation are realistic. The expected level of occupancy in the GEM detectors, using an APV time window of 250 ns and an average number of strips in cluster per MIP particle  $\sim 3.5$ , seems to be exceedingly high.

## **Response:**

- Need to firm up plans for a test with beam. This fall?
- Work on improved MC has begun by INFN-Rome. Tracking discussed in talk by O. Hansen

# Technical Review on GEp5

## Recommendations

Provide calculations of the energy and spatial resolution with the 20 cm Al absorber taking into account the average radiation damage. Evaluate the impact of the resolutions on the general performance including tracking and trigger rate. Clarify the impact of the expected energy resolution not meeting the requirement on page 107. Provide evidence or arguments that a 5 fold increase in the UV light intensity will increase the rate of curing by a factor of about 5.

## Response:

- CDR states that we need  $10\%/\sqrt{E}$ . Sergey gives talk about calculations of energy and position. Need to include estimates of radiation damage.
- Can we monitor gain stability?
- For UV curing, do we need to do tests to prove that the planned 5x increase in UV light intensity will increase curing rate by 5x?

# Measurement of analyzing power for the reaction $\vec{p} - \text{CH}_2$ at polarized proton momentum of 7.5 GeV/c (ALPOM2 proposal)

V.P. Balandin, A.E. Baskakov, S.N. Basilev, Yu.P. Bushuev,  
O.P. Gavrishchuk, V.V. Glagolev, M.G. Kadykov, D.A. Kirillov,  
Yu.T. Kiryushin, E.V. Kostyukhov, N.A. Kuzmin, P.K. Manyakov,  
S.A. Movchan, J. Mušinsky, N.M. Piskunov, A.A. Povtoreiko,  
P.A. Rukoyatkin, A.V. Shutov, N.A. Shutova, I.M. Sitnik, V.M.  
Slepnev, I.V. Slepnev, S.Ya. Sychkov, S.E. Vasiliev, A.V. Vishnevsky,  
A.I. Yukaev

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C.F. Perdrisat, L. Pentchev and M. Meziane

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G. Martinska, J. Urban

*Slovak Republic*

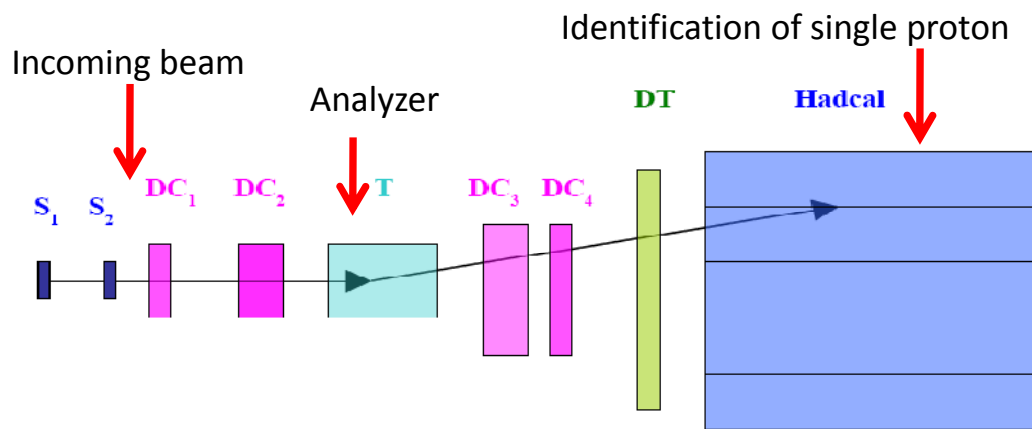
E. Tomasi-Gustafsson

**France**

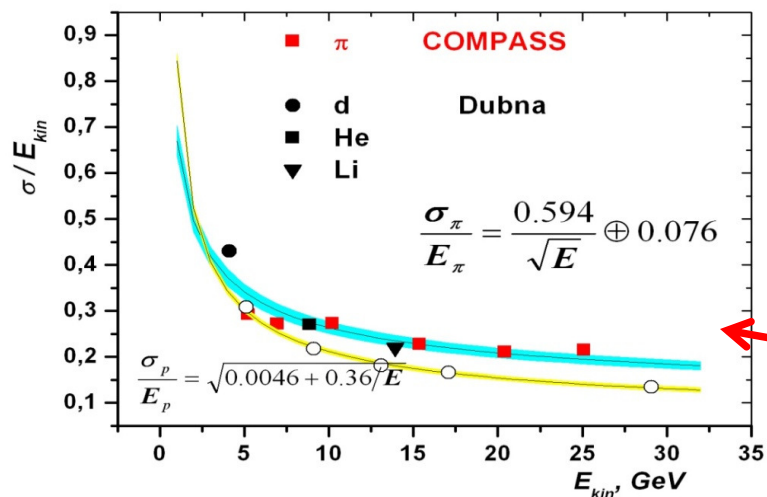
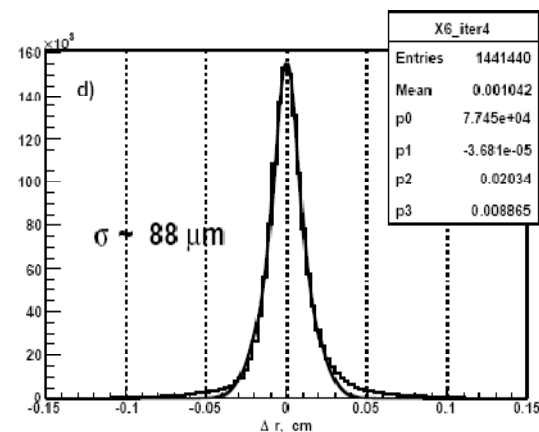
Approved 2009, to run 2010-2012

# Details of Dubna FPP test

Polarized protons up to 7.5 GeV/c, from breakup of polarized deuterons produced in (former Indiana) CIPIOS polarized source, and accelerated to 12 GeV/c in NUCLOTRON. Fermi momentum in deuteron provide protons with ~same polarization as deuteron, up to momentum 25% larger than half deuteron momentum (established at SATURNE).



Drift chamber, Fall 2009



Use 25 COMPASS hadron calorimeter bars refurbished in Protvino. Select proton track for polarimetry, provide high level trigger in SBS .

Dubna test in Spring 2009, compared to COMPASS data.

# Spokesperson's commitments

- NSU (V. Punjabi & M. Khandaker)
  - Requested funding for joint Hall A post-doc. (maybe summer)
  - Secured lab space for electronics work
  - Planning equipment needs
- INFN (E. Cisbani)
  - GEM ( see newsletter for activities)
  - Monte Carlo
- W&M (C. Perdrisat)
  - Funded post-doc, L. Pentchev, who is now in Hall D. **Major hole to fill!**
  - Proposal approved to test FPP at Dubna (2010-2012)
  - Assemble the BigCal GEM
- CNU ( E. Brash)
  - Master and undergrads for projects

# Activities for GEp5

## ➤ GEMs

- MC simulation and tracking study.
- Need to have test of GEMs in setup similar to experiment.
- Noise performance tests for UV GEMs and “4 strip” GEMs

## ➤ BigCal

- Layout of calorimeter blocks and changes to HV/LV boards
- Tests of high intensity UV curing.
- Design of gain stability monitor.
- Setup MOU with Protvino group?

## ➤ Trigger

- 1 $\mu$ s delay for 148 “groups of 32” before coincidence trigger
- Layout of single arm trigger