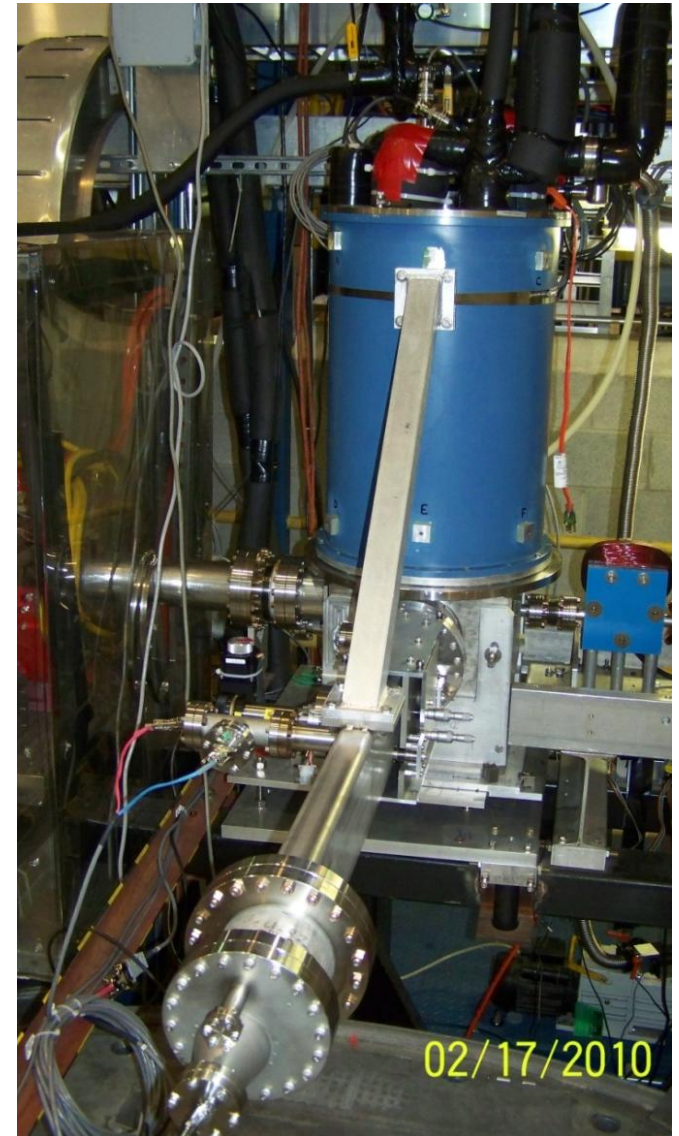


# *Møller Polarimetry for PREX (status report)*

O. Glamazdin  
Kharkov Institute of Physics and Technology  
Kharkov, Ukraine

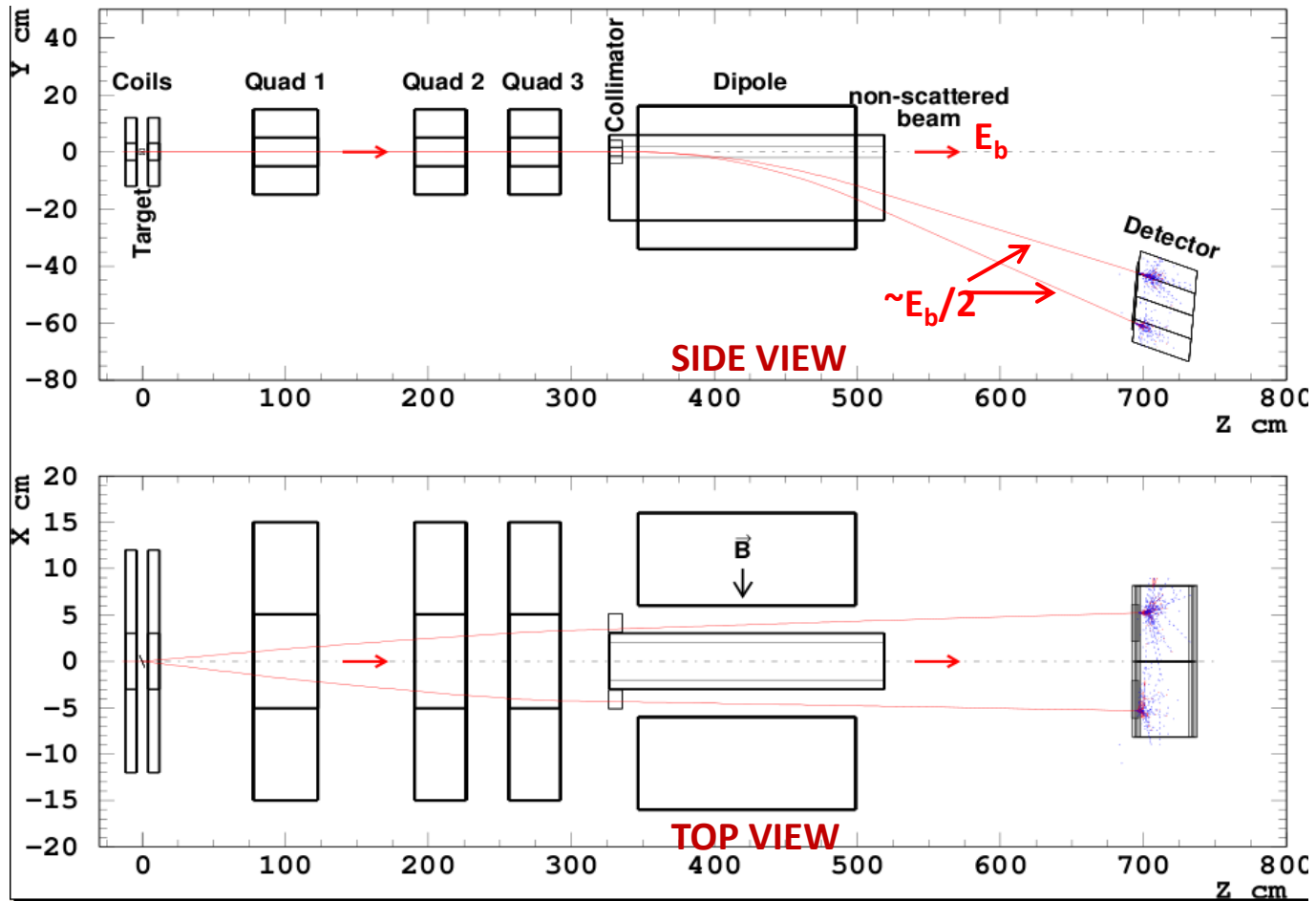
# What has been done?

1. Polarized electron target "brute force" 3T (smaller thickness, lower heating)
2. Segmented aperture detector (higher rate)
3. New fast DAQ based on FADC (higher rate, smaller dead time, more information etc.)



02/17/2010

# Møller Polarimeter Layout



$$P_{\text{beam}} = A_{\text{sym}} / A_{\text{npow}} \times P_{\text{targ}}$$

# Møller Problems in PREX

1. Magnet alignment  
(→ Acceptance → Analyzing Power)
2. Quads discrepancy  
(→ Acceptance → Analyzing Power)
3. Targets discrepancy  
(→ Target polarization)
4. Targets saturation  
(→ Target polarization)
5. Old DAQ vs. FADC

# *Møller Magnet Alignment*

PREX

March 30, 2010:

$dX = -0.3\text{mm}$   $dY = -1.1\text{mm}$   $d\text{Horiz} = -1.8\text{mrad}$   $d\text{Vert} = +4.4\text{mrad}$

April 17, 2010:

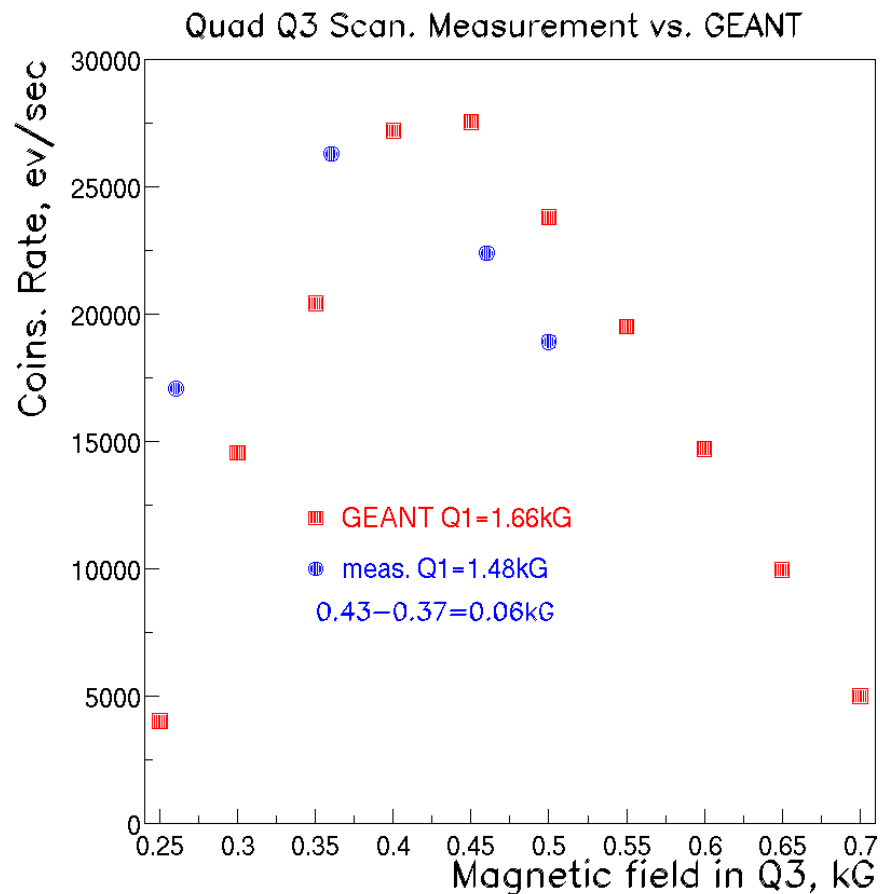
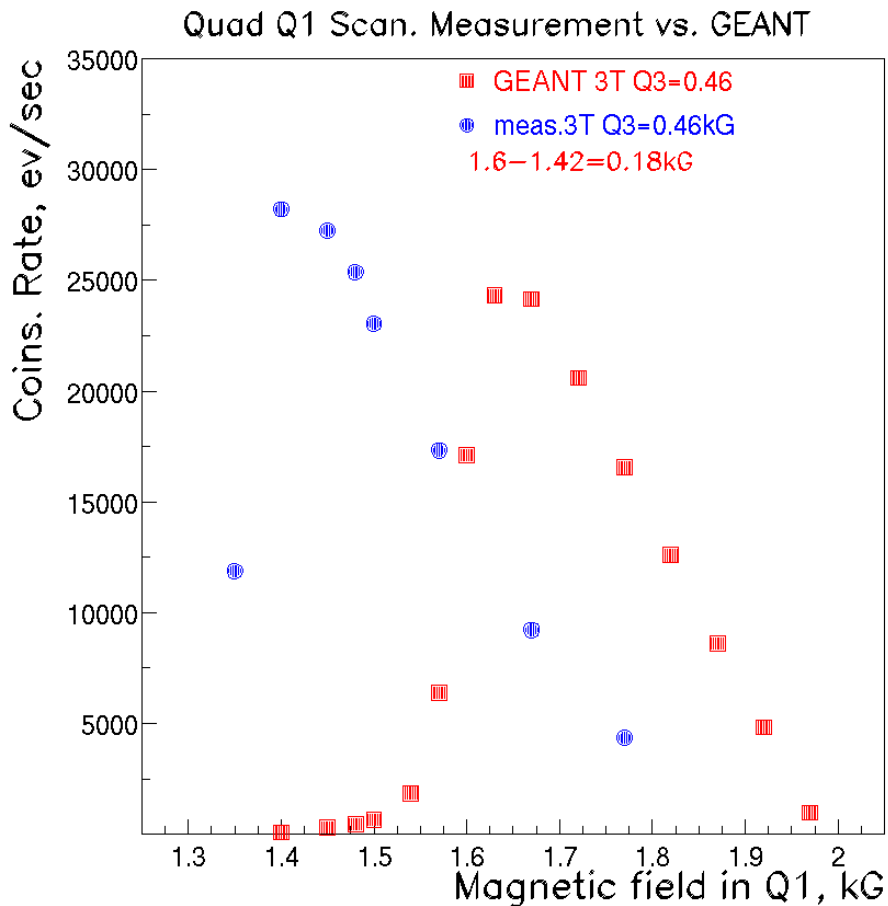
$dX = -0.2\text{mm}$   $dY = -1.7\text{mm}$   $d\text{Horiz} = -1.6\text{mrad}$   $d\text{Vert} = +6.1\text{mrad}$

DVCS

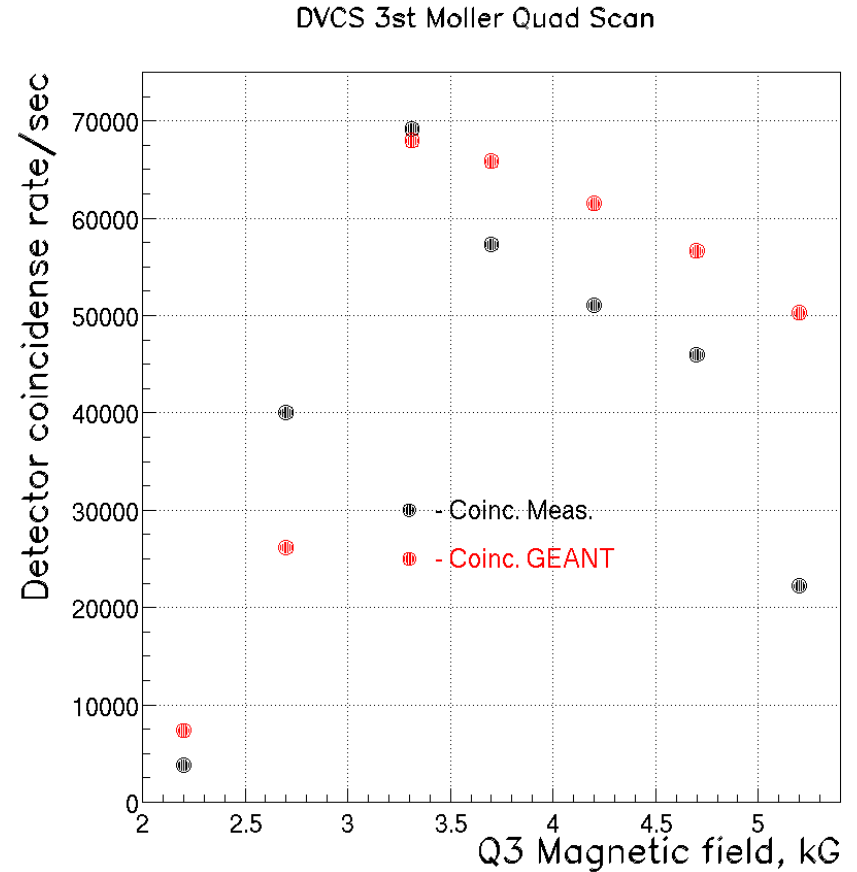
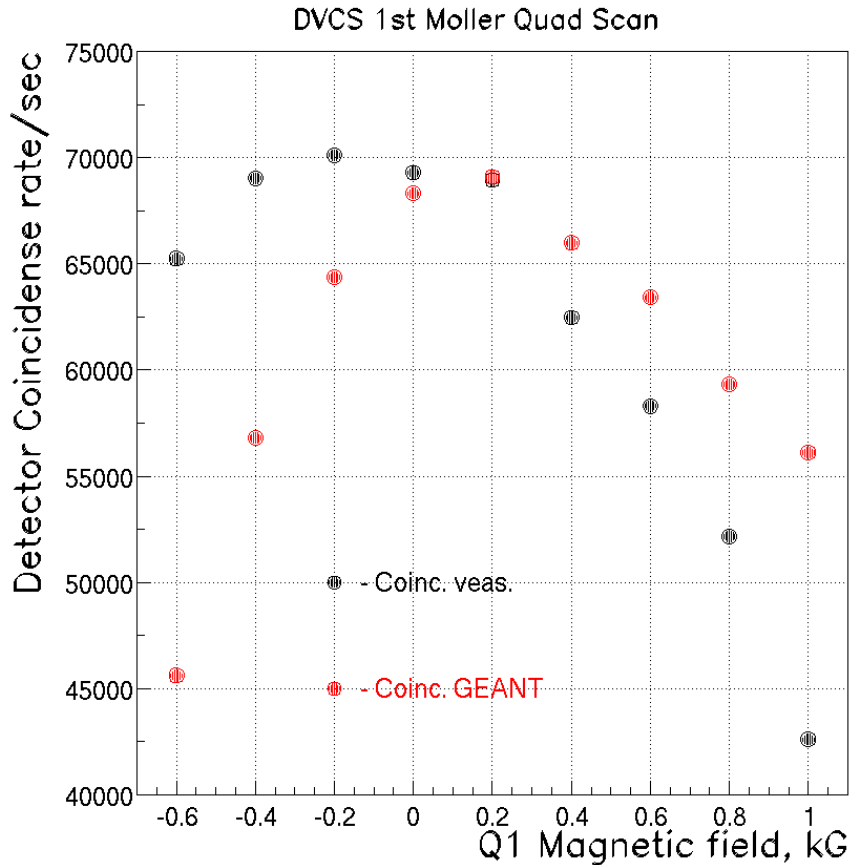
September 30, 2010:

$dX = -0.2\text{mm}$   $dY = -1.0\text{mm}$   $d\text{Horiz} = -0.2\text{mrad}$   $d\text{Vert} = +2.9\text{mrad}$

# Quads Scan PREX



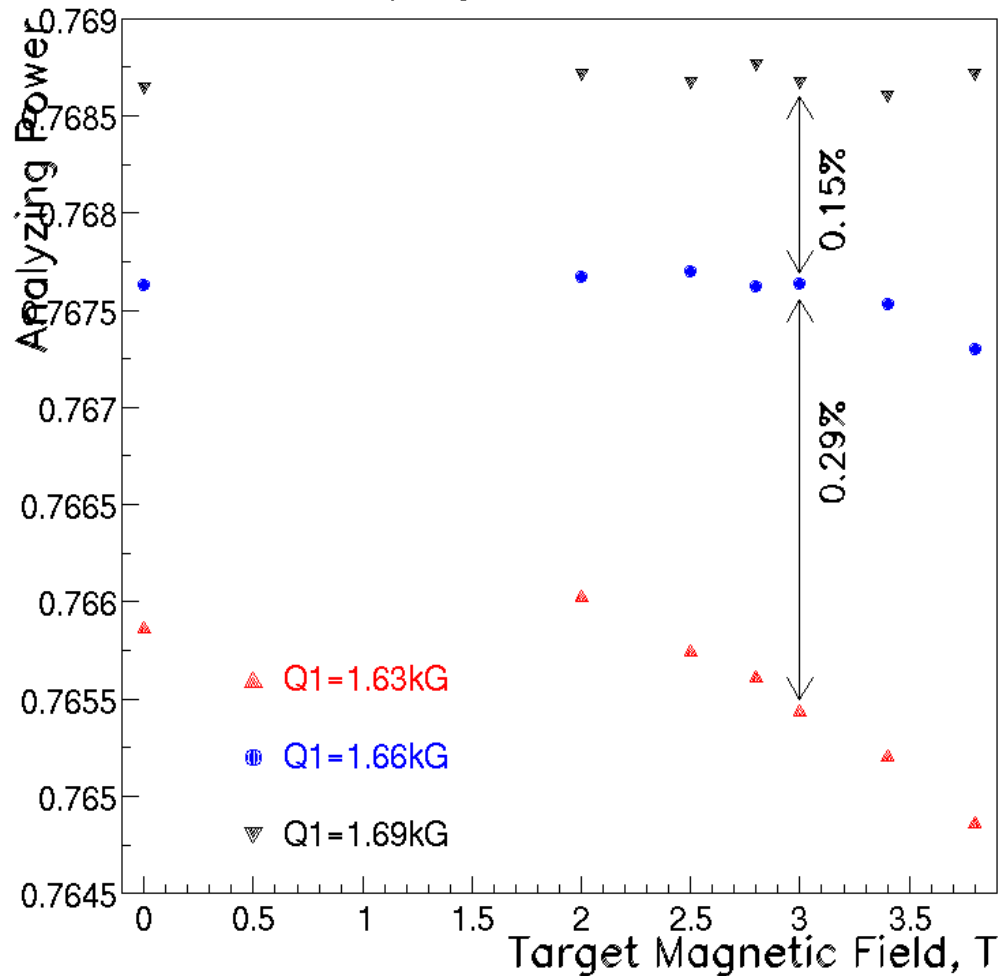
# Quads Scan DVCS



- Request quads power supply test (current output vs. current read out)
- New quads scan (3.5GeV, March 2011)

# Analyzing Power

PREX Analyzing Power vs. Saturated Field

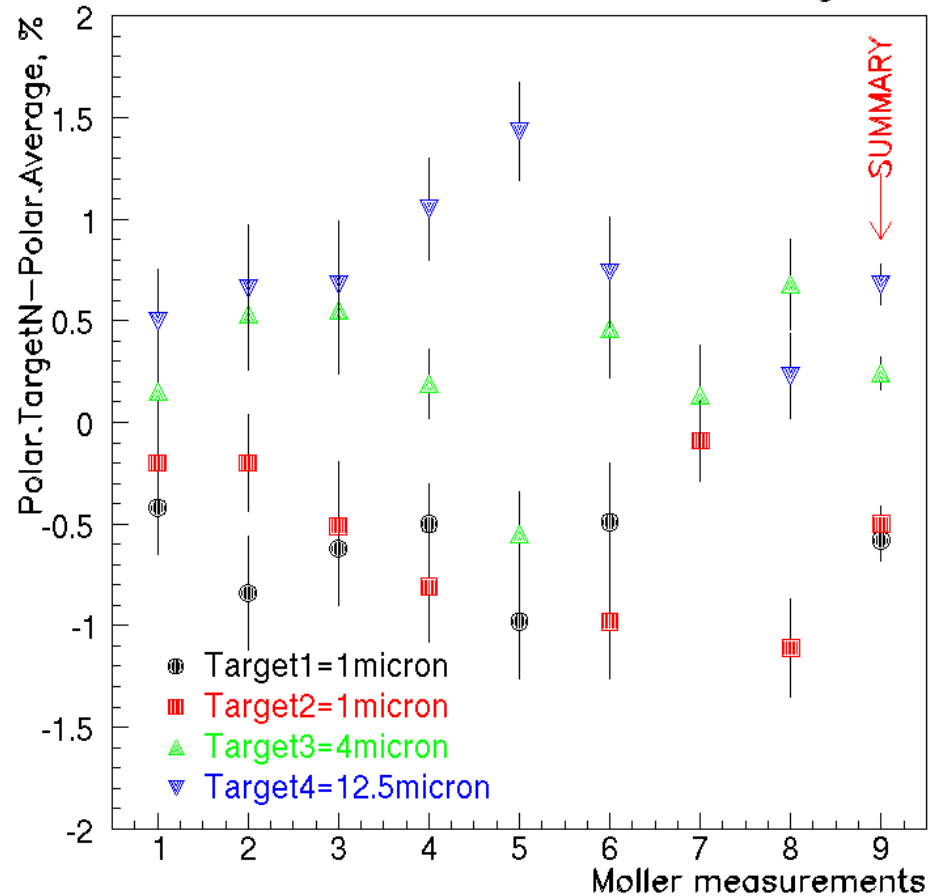


**Systematic error  $\pm 0.3\%$**

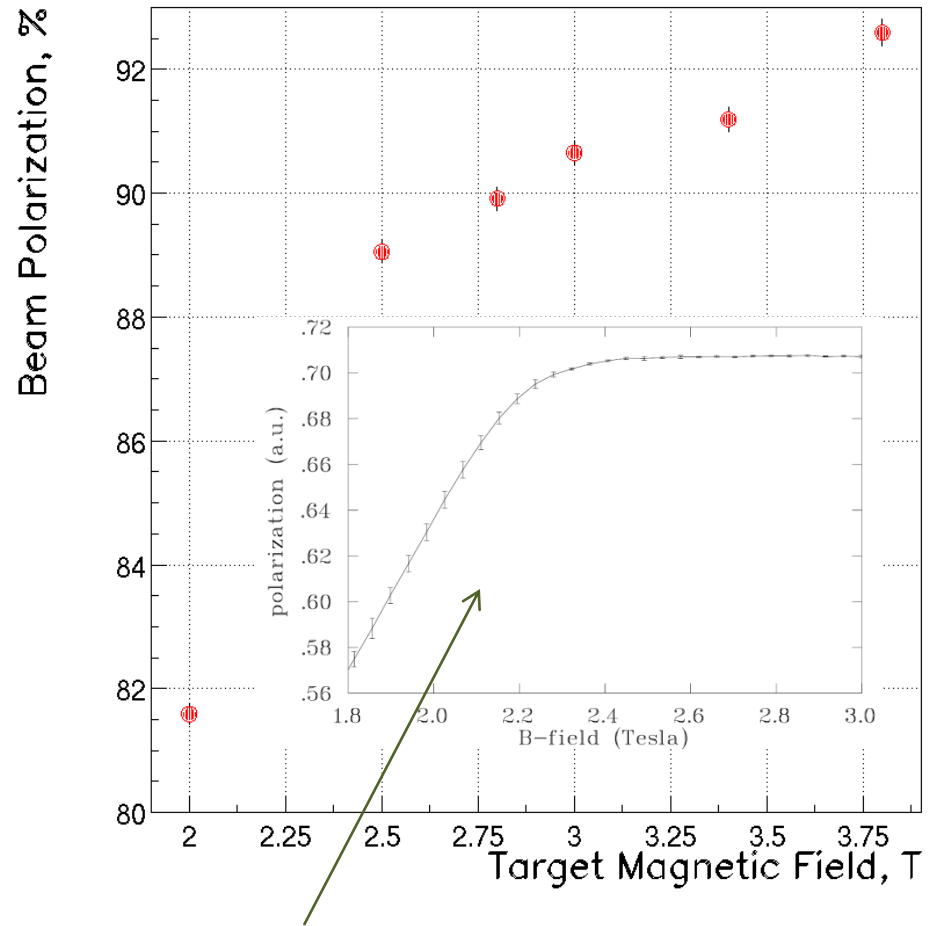


# Target Polarization

Beam Polarization vs. Moller Target



PREX Target Saturation Test



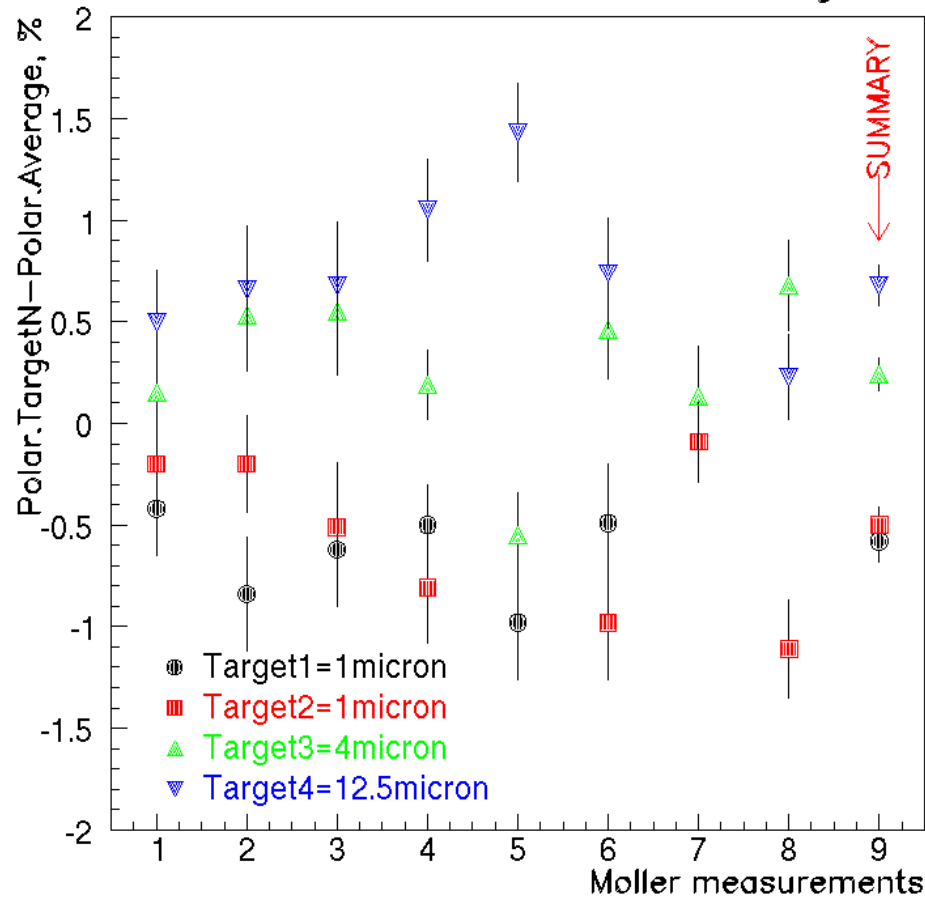
M. Loppacher "Møller Polarimetry for CEBAF Hall C" PhD thesis, Basel 1996

# Target Polarization

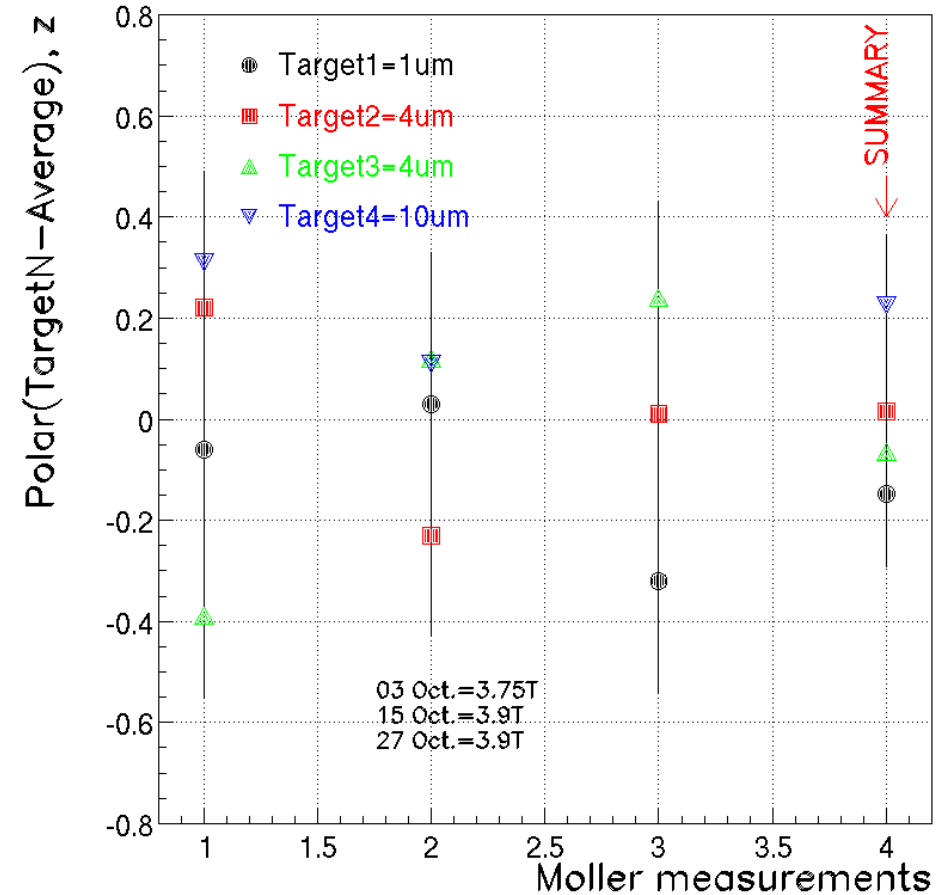
PREX (3T)

DVCS (3.75-3.9T)

Beam Polarization vs. Moller Target

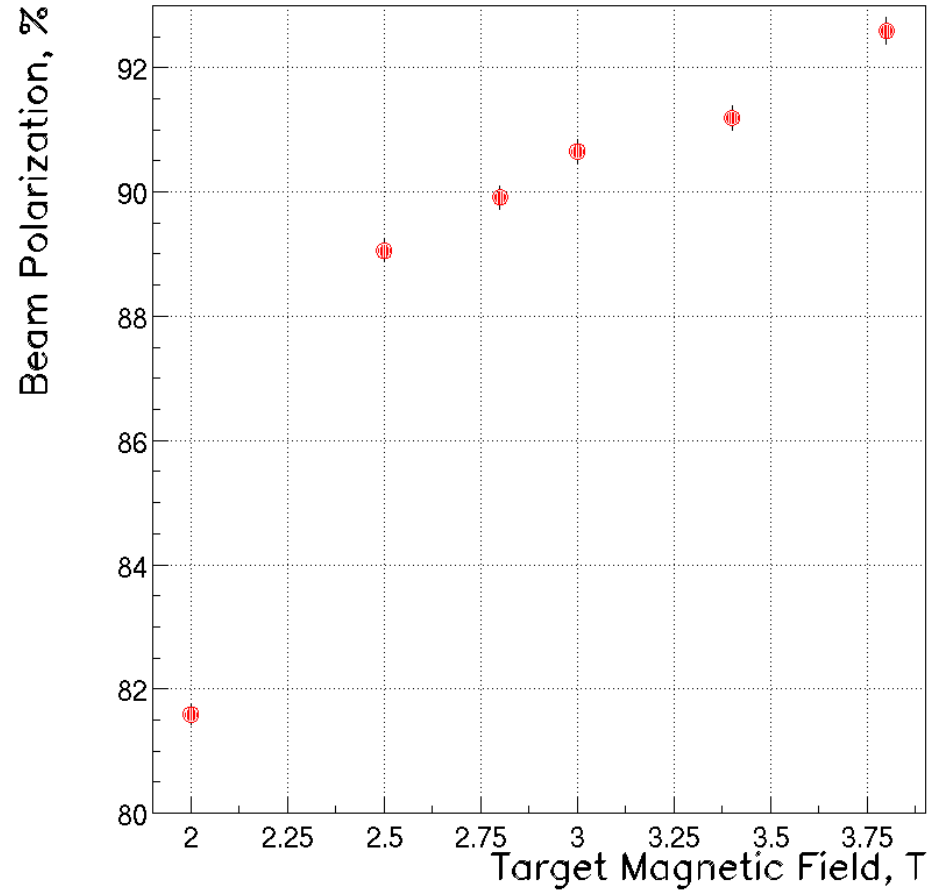


DVCS Beam Polarization vs. Moller Target

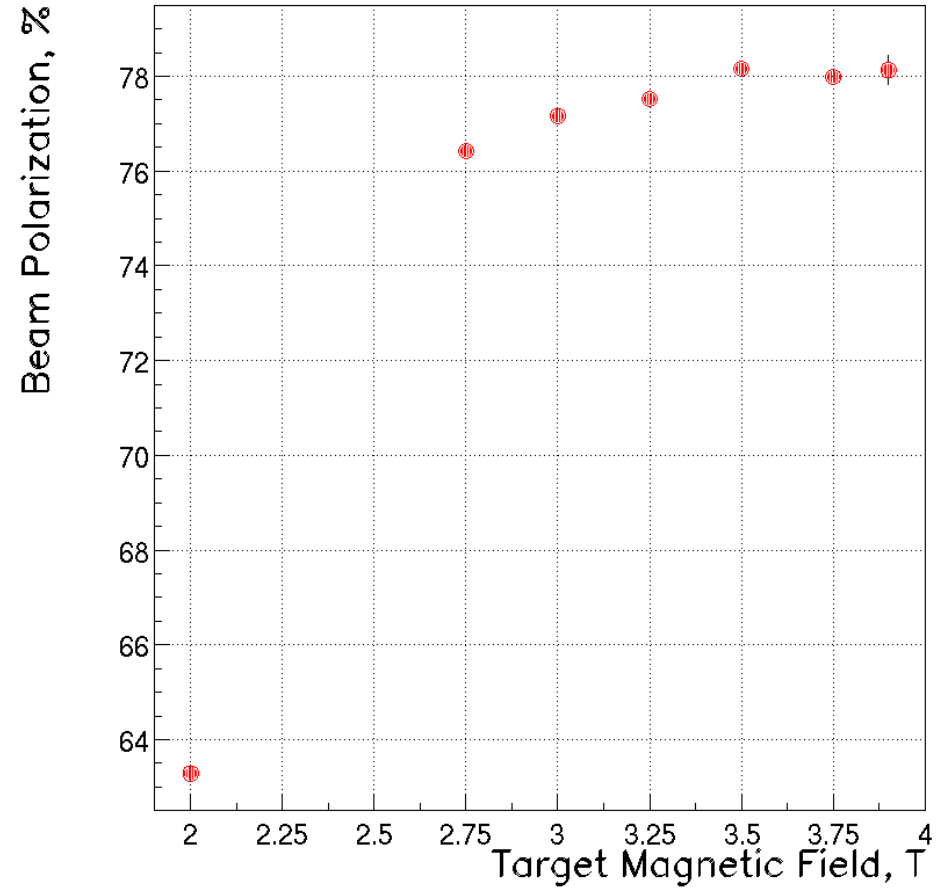


# Target Saturation

PREX Target Saturation Test

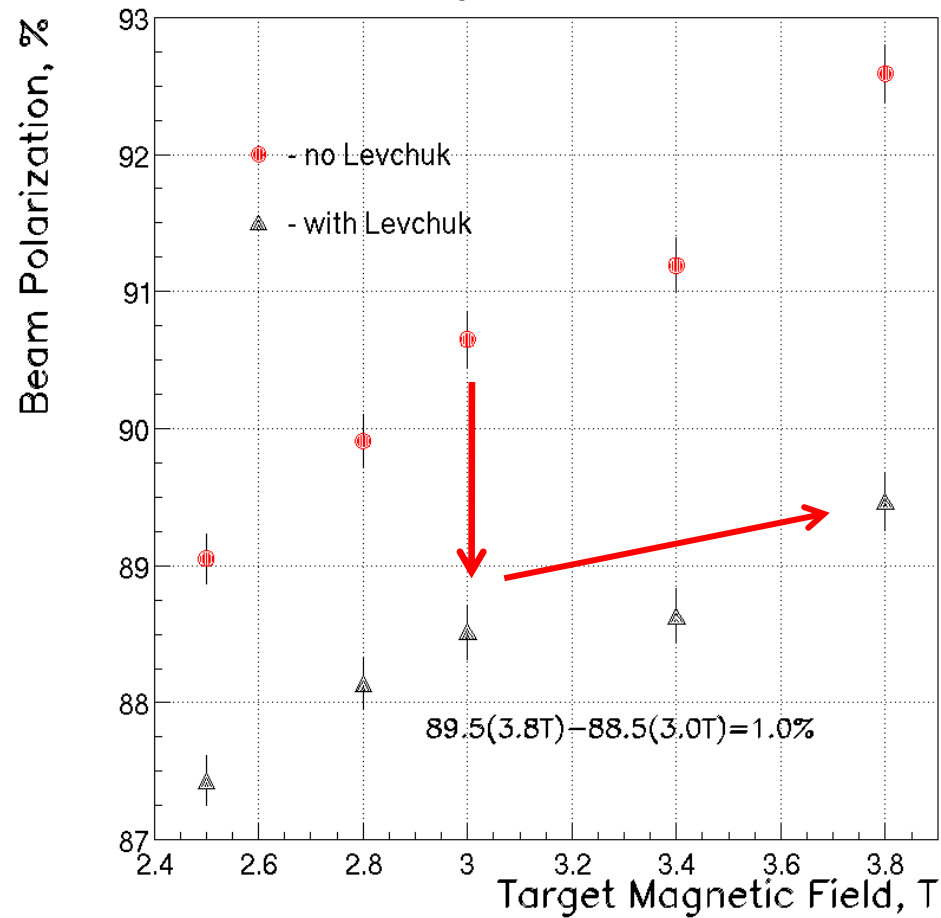


DVCS Target Saturation Test

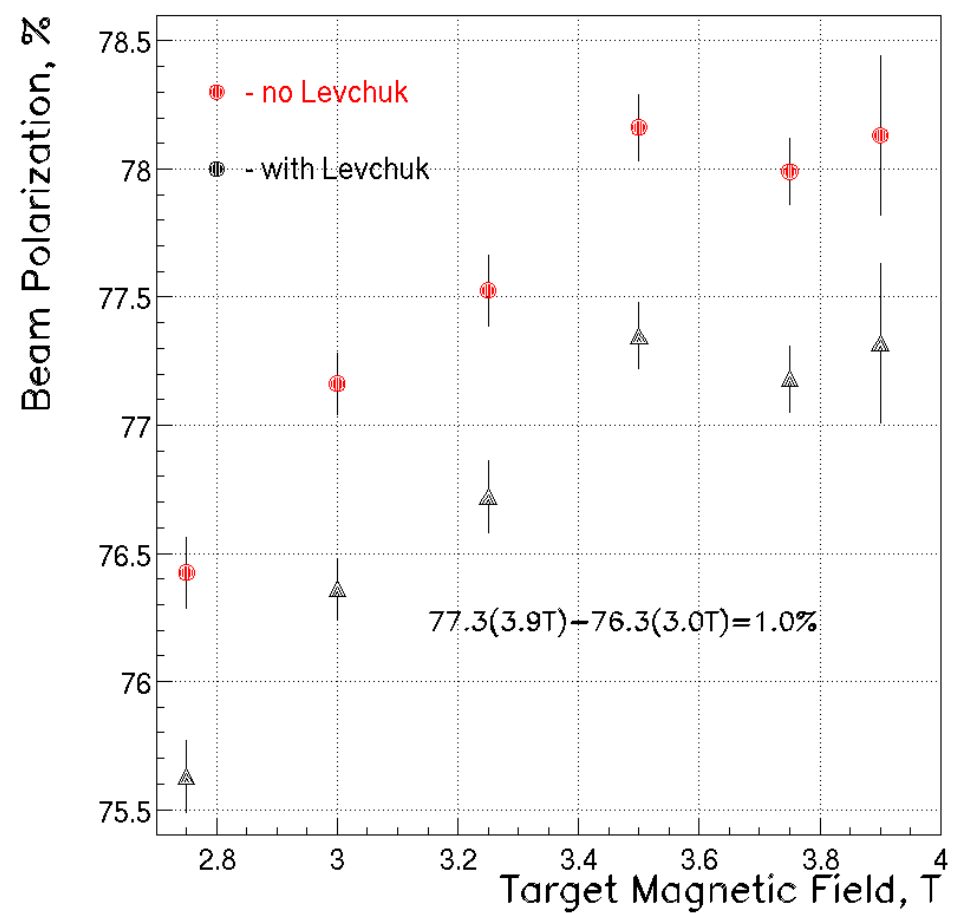


# Levchuk-effect

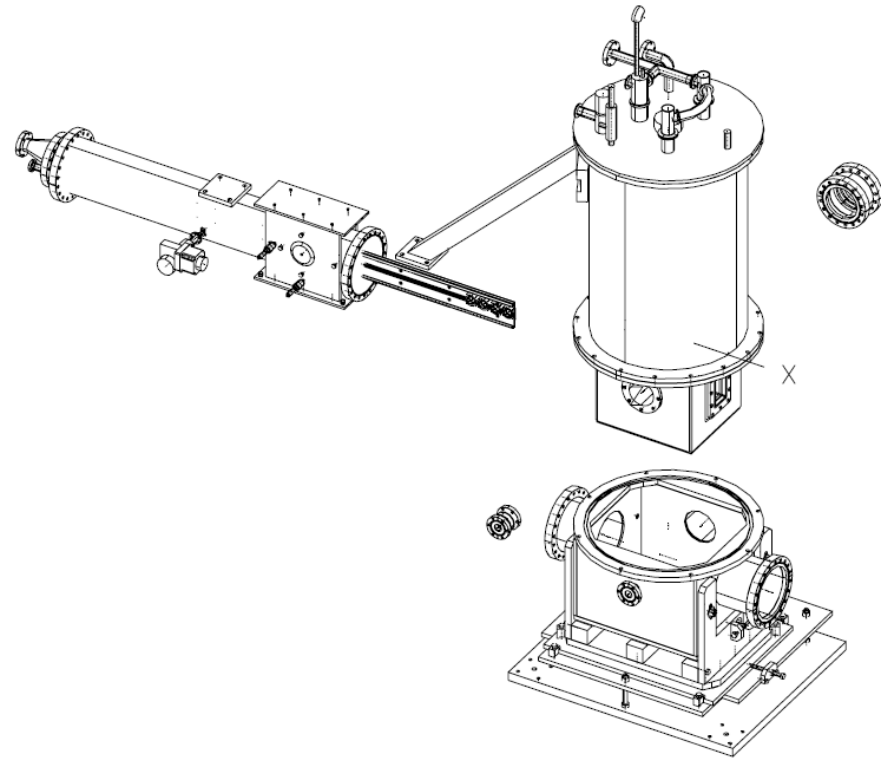
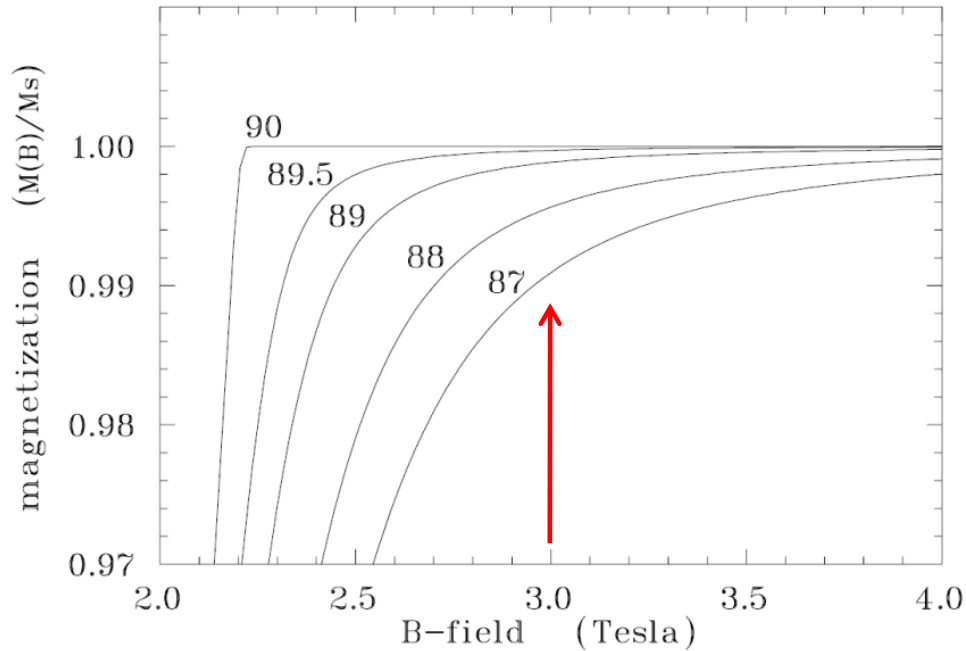
PREX Target Saturation Test



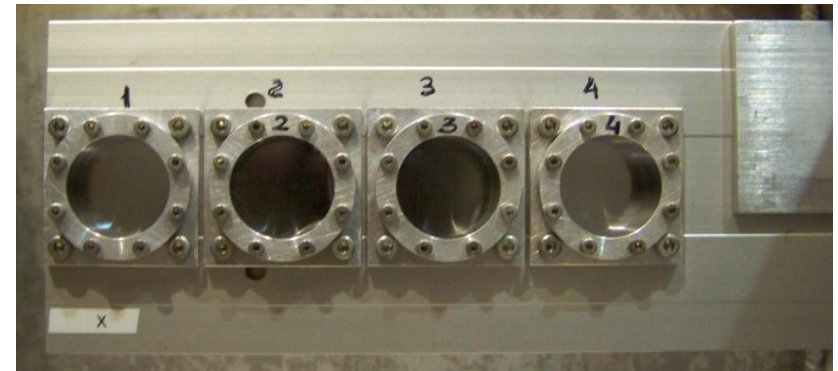
DVCS Target Saturation Test



# Target Warping+Misalignment



M. Loppacher "Møller  
Polarimetry for CEBAF Hall C"  
PhD thesis, Basel 1996



# Systematic Error for PREX

Variable	PREX(old DAQ)
<i>Iron Foil Polarization</i>	0.25%
<i>Targets Discrepancy</i>	0.5%
<i>Target Saturation</i>	0.3%
<i>Analyzing power</i>	0.3%
<i>Levchuk effect</i>	0.5%
<i>Target temperature</i>	0.02%
<i>Dead time</i>	0.3%
<i>Background</i>	0.3%
<i>Others</i>	0.5%
<b><i>Total</i></b>	<b>1.1%</b>

# High Current Measurements

## 1. EXPERT mode (pulse beam)

- 6-9 $\mu$ A beam current ;
- special dead time study is required.

## 2. Bunch suppression (499MHz)

- have to turn injector pre-buncher OFF - INVASIVE;
- specially dedicated measurement;
- special study of cavities load;
- bunch of cross-calibrations;
- can get more new questions than answers

## "Brute Force" target

- maximal CW current for Møller is 3 $\mu$ A
- fully open slit
- Hall A energy lock available

**Møller with solid target = low current method**

# SUMMARY

- 1. We understand Møller analyzing power with reasonable accuracy*
- 2. We understand target polarization with reasonable accuracy*
- 3. We have to re-analyze all Møller data for PREX with Levchuk and saturation corrections*
- 4. Møller systematic error for PREX is 1.1%*