

# **Status of HERA Polarisation**

- Reanalysis of TPOL data**
- Reanalysis of the LPOL data**
- LPOL Cavity**

Blanka Sobloher, Riccardo Fabbri, Ties Behnke

PRC meeting, DESY, 29.4.2011

**TPOL**

# Status of TPOL Re-analysis

---

- Analysis method has been frozen early in 2011 (as requested by PRC)

Since then:

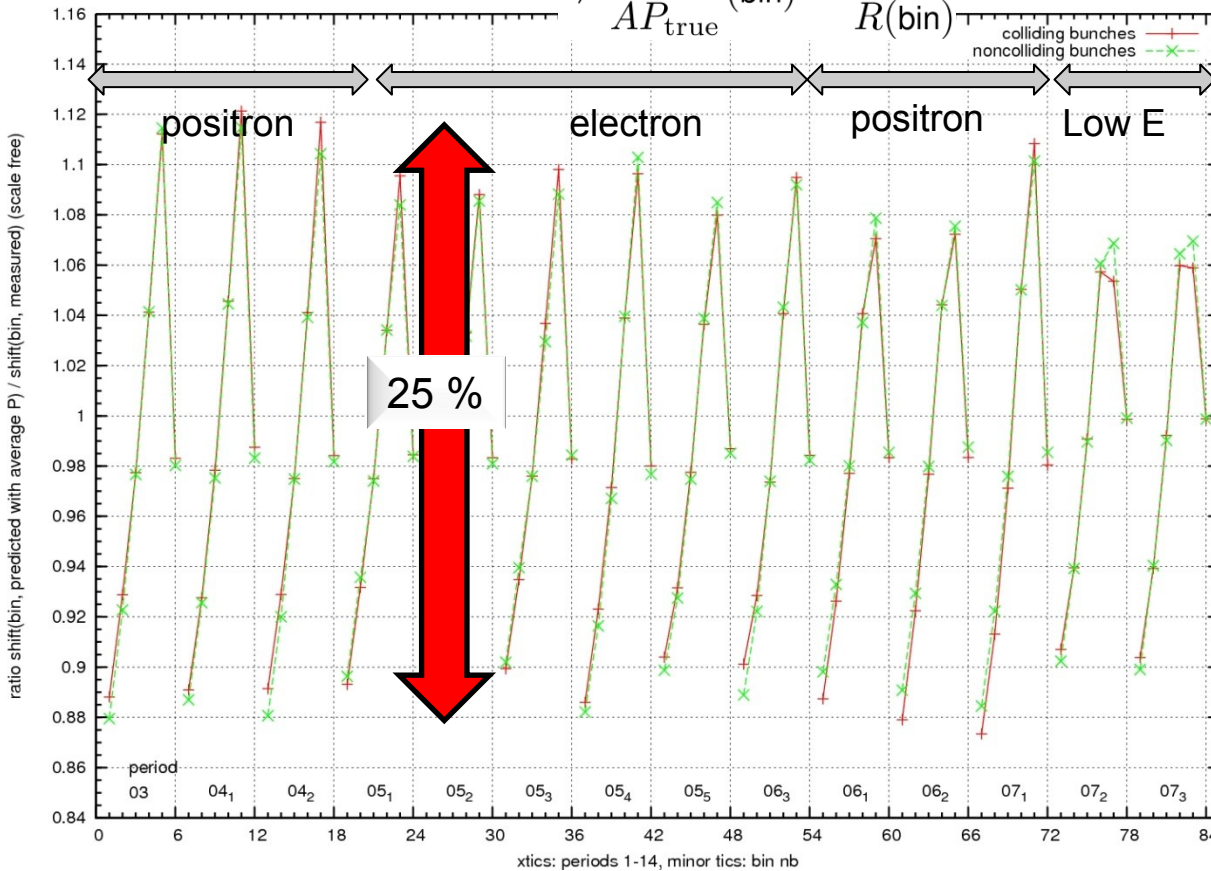
- Re-tuning of the Monte Carlo predictions (CPU intensive)
  - Re-calibration of the system
  - Re-tune of the algorithms
- Re-processing of all HERA II data finished
- Re-analysis of the HERA rise-time data
- Re-analysis of the TPOL Silicon detector data
  
- Complete set of results for HERAII exists
  
- Systematic error study:
  - TPOL internal systematic errors finished

# Analysing Data for all of HERA II running

- Given an absolute polarization scale, the ratio can be calculated into a ratio of MC Analysing Power to ,true' Analysing Power:

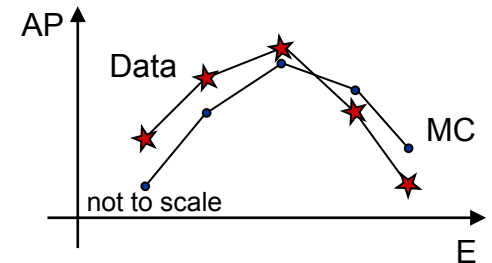
$$R(\text{bin}) = \frac{\text{shift in data}(\text{bin})}{AP_{\text{MC}}(\text{bin}) \cdot P} = \frac{AP_{\text{true}}(\text{bin}) \cdot P_{\text{true}}}{AP_{\text{MC}}(\text{bin}) \cdot P_{\text{true}} \cdot \text{scale}}$$

$$\Rightarrow \frac{AP_{\text{MC}}}{AP_{\text{true}}}(\text{bin}) = \frac{\text{scale}}{R(\text{bin})}$$



Similar behaviour for all HERAII periods

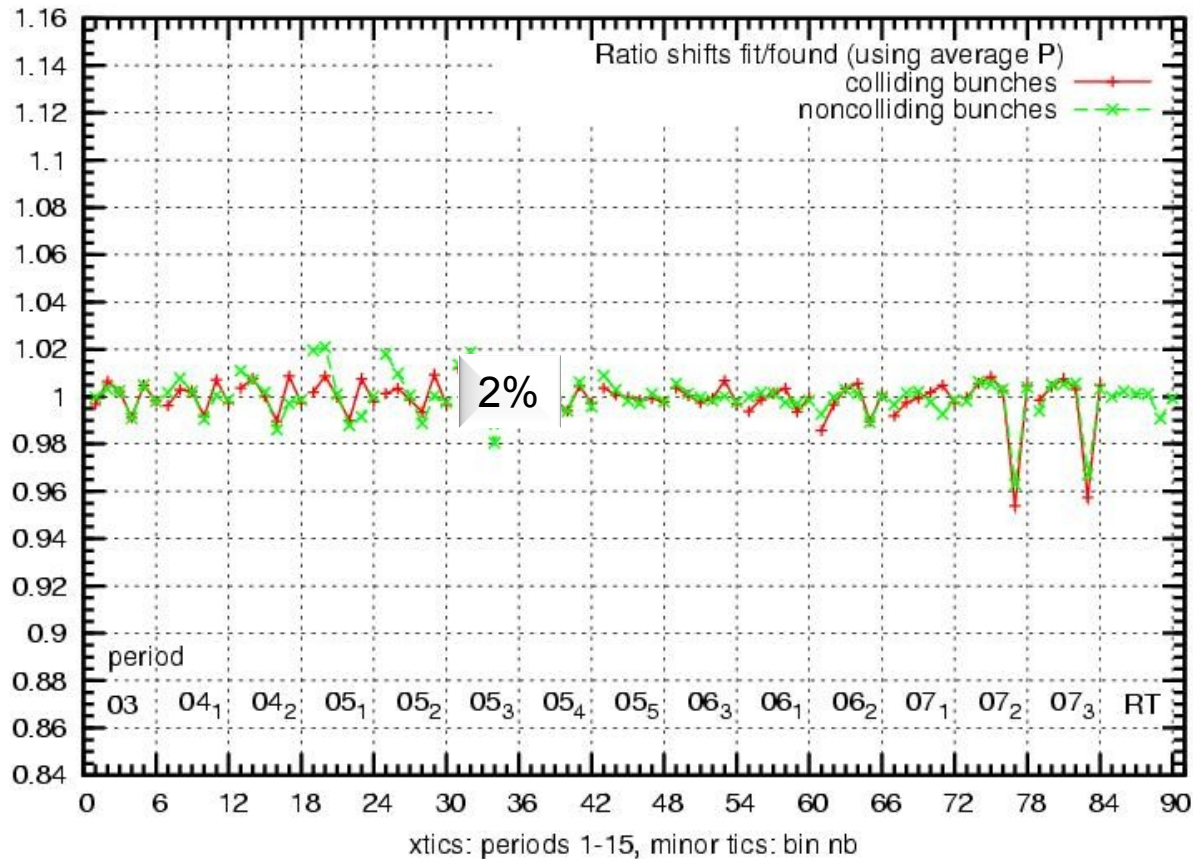
Dependence is rather stable



Status of last fall

# Re-analysed HERA-II Data

Preliminary, final run still not finished



Significant reduced dependence

Stable behaviour,

exception: very last periods

- Energy calibration at Compton edge
- Pedestal treatment
- overall alignment constant Silicon - Calorimeter

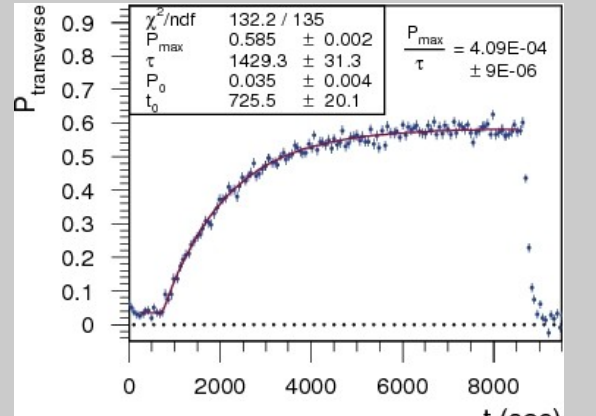
Status April 2011

# Risetime Analysis

Risetime calibration  
in 2007:

Define scale independent  
of other measurements

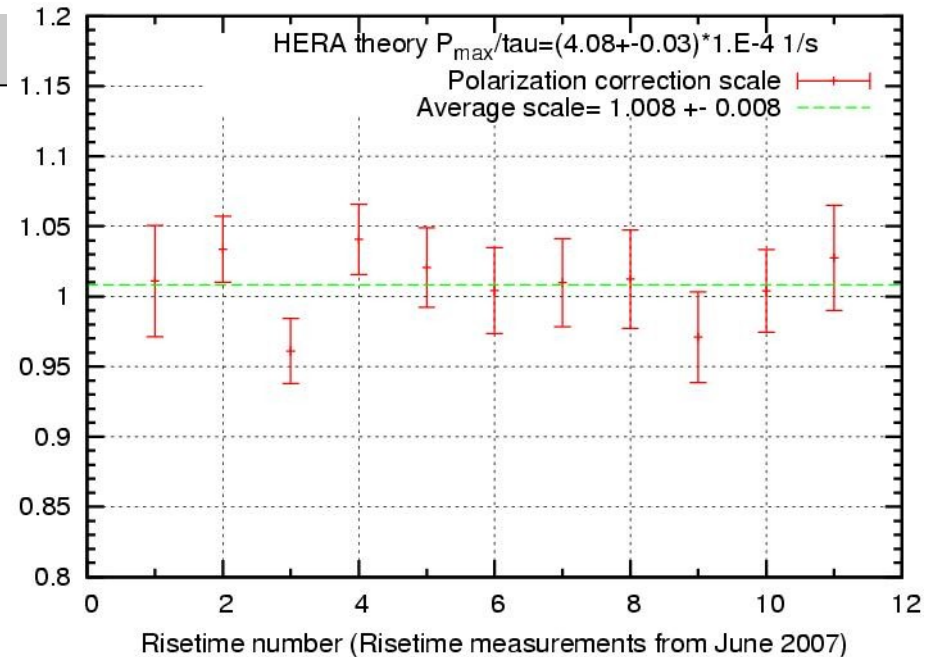
Precision around 2-3%



Risetime method used to  
confirm / cross check the  
TPOL scale.

Comparison of 2007 risetime curves with  
measured polarisation after all corrections

Scale =  $1.008 \pm 0.008$



# Systematic Errors (preliminary)

Error	Size	Comment
Background subtraction	0.001	
Electronic noise	<0.001	Small, not final
Linear light polarisation	0.001	
Table/ Calo centering	0.002	
Calo Gain calibration	0.005	
HERA / laser IP		
Laser beam	0.002	
HERA emittance	<0.001	Small
HERA energy		Small
HERA optics	0.006	
Method		
IP distance	0.005	Estimate
Focus correction	0.007	Estimate
Intrinsic method	0.005	
Detector Model		
Energy resolution	0.004	
Correlations	0.010	
Calo linearity	0.002	
Eta-y from Silicon		Small, under study

Preliminary final intrinsic TPOL error

1.8%

**LPOL**



# LPOL status

---

- Re-analysis of systematic errors (nearly) finished  
(wait for confirmation of two errors: analysis done, final number needs to be evaluated)
- Since Jan 2011: zero manpower for LPOL work

# Updated list of systematic errors

---

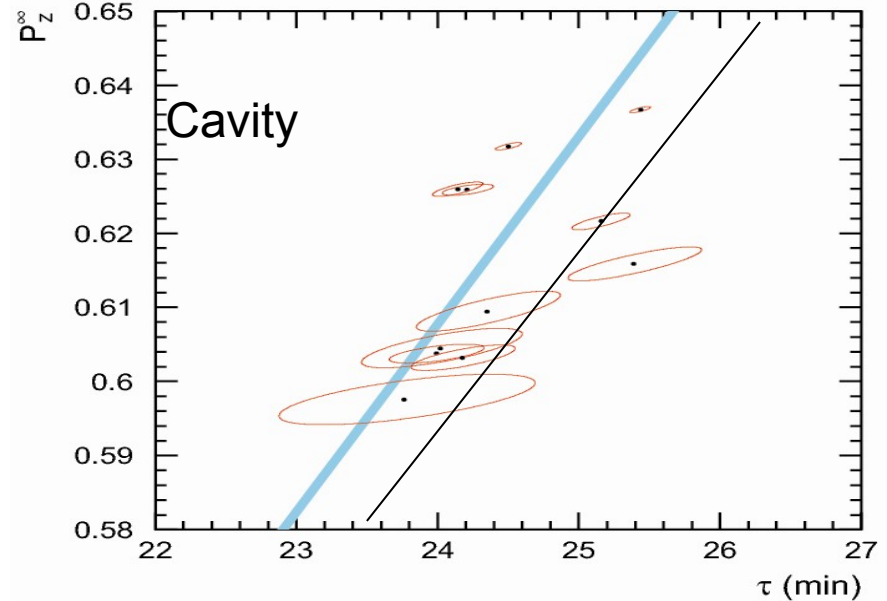
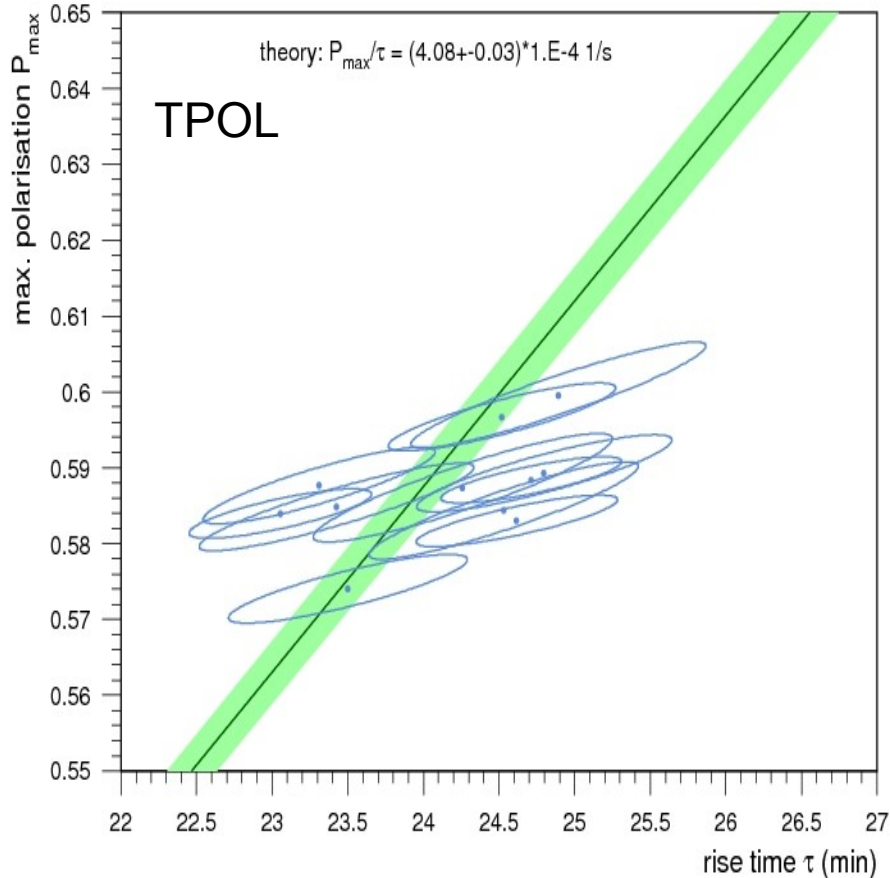
Sources	Released values	Current analysis
Analyzing power (A.P.)	1.2%	1.2%
– response function	0.9%	NA
– single to multi photon extrapolation	0.8%	0.3%
A.P. Long term stability	0.5%	0.4%
Extra uncertainty on calo scale	1.2%	1.5%
Gain mismatch	0.3%	0.3%
Pockels cell misalignment	0.4%	0.5%
IP interaction	0.8%	on going
Laser light polarization	0.2%	on going

Confirm the previous list of systematic errors

# Cavity LPOL

# Risetime Comparison

Comparison TPOL (new analysis) and cavity with rise time calibration

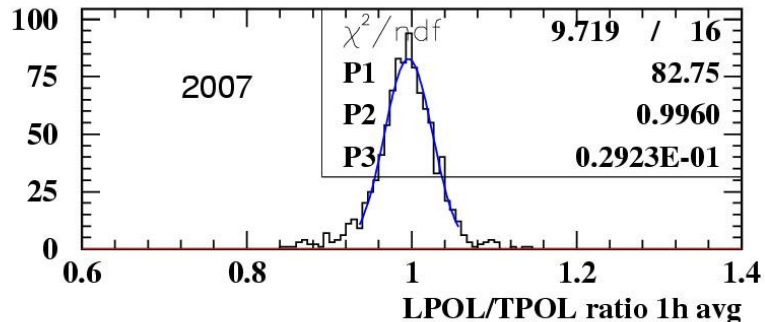
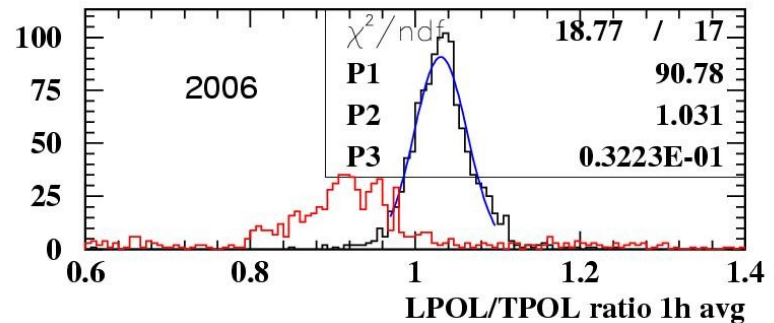
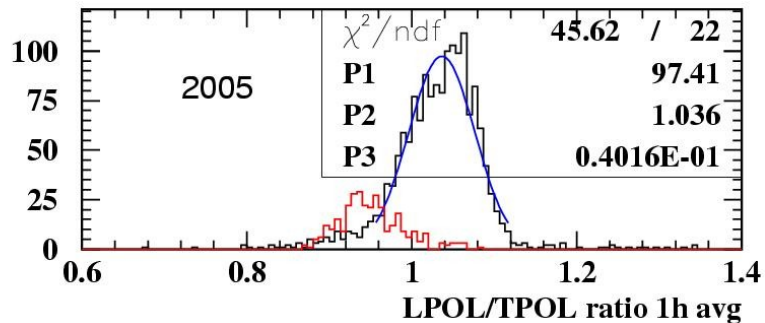
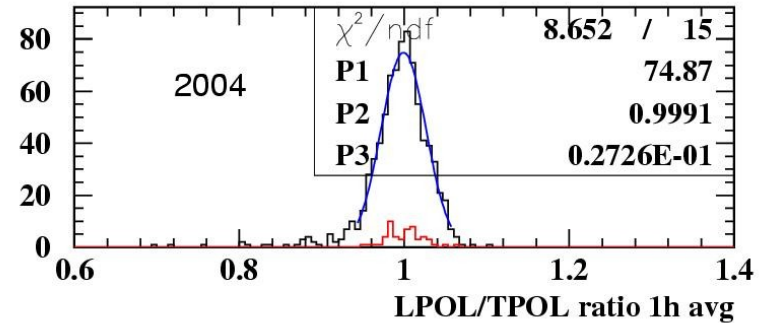
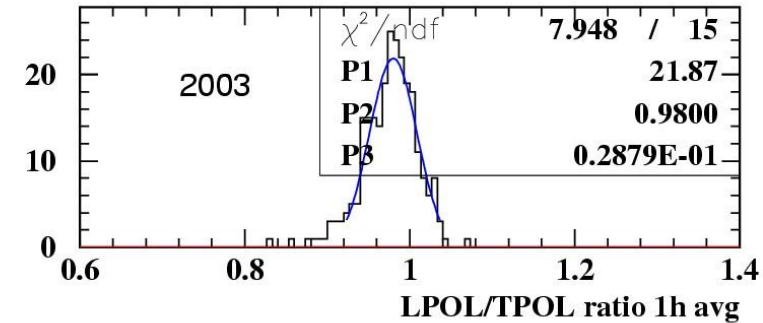


Note: Cavity uses different theory in publication than current status.

Generally decent agreement cavity – TPOL data and rise-time, within uncertainties  
Cavity and TPOL show very similar tendency.

**LPOL TPOL**  
**Ratio**

# LPOL TPOL Ratio (preliminary)



Overall: about the same as old analysis  
still a more careful investigation is needed

(technical problems accessing the right  
LPOL data)

# Future Steps

---

- Re-establish the link between TPOL (LPOL) and experiments to communicate the results (ongoing, expect to be done early May)
- Confirm our current set of LPOL data: condition for final study of LPOL/TPOL ratio
- Finalise the total systematic errors (from study of LPOL/ TPOL ratio)