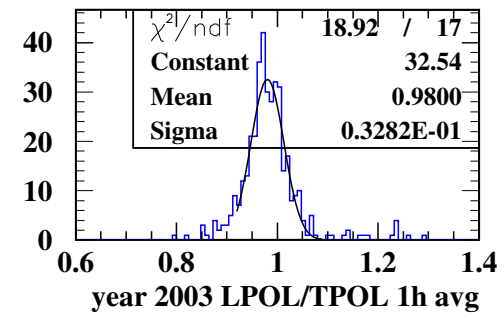
Polarimeter analysis: status

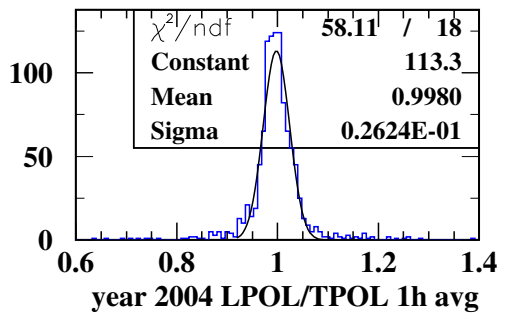
- Present understanding of Polarimeter systematics

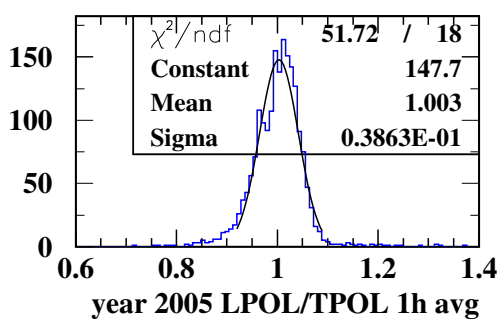
  as summarized in a polarimeter note (July 12, 2007)

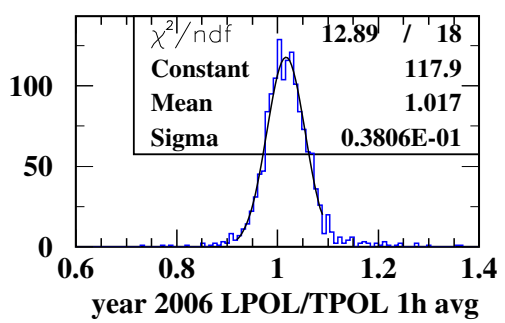
- Ongoing activities
  - Polarimeter meeting once per two weeks
  - Global survey of LPOL/TPOL ratio started (O. Eyser)
  - Risetime calibration: calculations by the machine group (D. Barber,M. Vogt)
  - TPOL: Monte Carlo tuning (R. Ciesielski), offline fit (S. Schmitt)
  - LPOL: systematic studies of all analysis steps (HERMES)
  - LPOL cavity: analysis (N. Coppola, C. Pascaud)

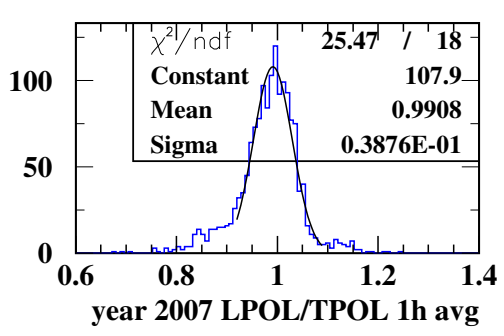
Present understanding of Polarimeter systematics











Comparison of TPOL and LPOL:
Width of LPOL/TPOL=1 $\pm$ 0.04
does not match quadratic sum of
known time-dependent systematics from
LPOL (1.1%) and TPOL (2.4%)
$\rightarrow$ systematic error from unknown source 3%

Recommendations by the POL2000 group

Use weighted mean of both polarimeters where possible to minimize systematic error (procedure described in the writeup).

Resulting errors $\frac{\Delta P}{P}$: TPOL only: 4.2% LPOL only: 3.6% LPOL,TPOL avg: 3.4%

Question to the Collaboration: what precision really is required in the end?

Known LPOL and TPOL systematics

TPOL error source	$\frac{\Delta P}{P}$(%)
Electronic noise	< 0.1
Calorimeter calibration	< 0.1
Background subtraction	< 0.1
Light polarisation	0.1
Focus correction	1.0
Compton beam centering	0.4
Interaction region	0.3
Interaction point	2.1
Absolute scale	1.7
Total HERA II error	2.9

LPOL error source	$\frac{\Delta P}{P}$(%)
Analyzing power	1.2
– response function	(0.9)
– single to multi photon extrapolation	(0.8)
Long term stability	0.5
Gain mismatch	0.3
Laser light polarisation	0.2
Pockels cell misalignment	0.4
Electron/Laser beam interaction region	0.8
Total HERA I error	1.6
Extra uncertainty for new calorimeter	≤ 1.2
Total HERA II error	2.0

Ongoing activities

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Summary

- Present Polarimeter error: $\frac{\Delta p}{P} = 3.4\%$ if both polarimeters are averaged properly
- Systematic error is dominated by 3% from unknown error source (deduced from LPOL/TPOL comparison)
- Question to the collaborations: how precise do we have to be?
- Ongoing activities:
  - Global survey of LPOL/TPOL ratio → hunt for the unknown error source
  - Risetime calibration with improved machine calculations → improve TPOL calibration
  - TPOL offline analysis: improve and re-evaluate systematic errors
  - LPOL analysis: double crosss-check all analysis steps, nothing found yet
  - LPOL cavity: independent cross-check of both TPOL and LPOL polarimeters