POL2000 group: Status Report

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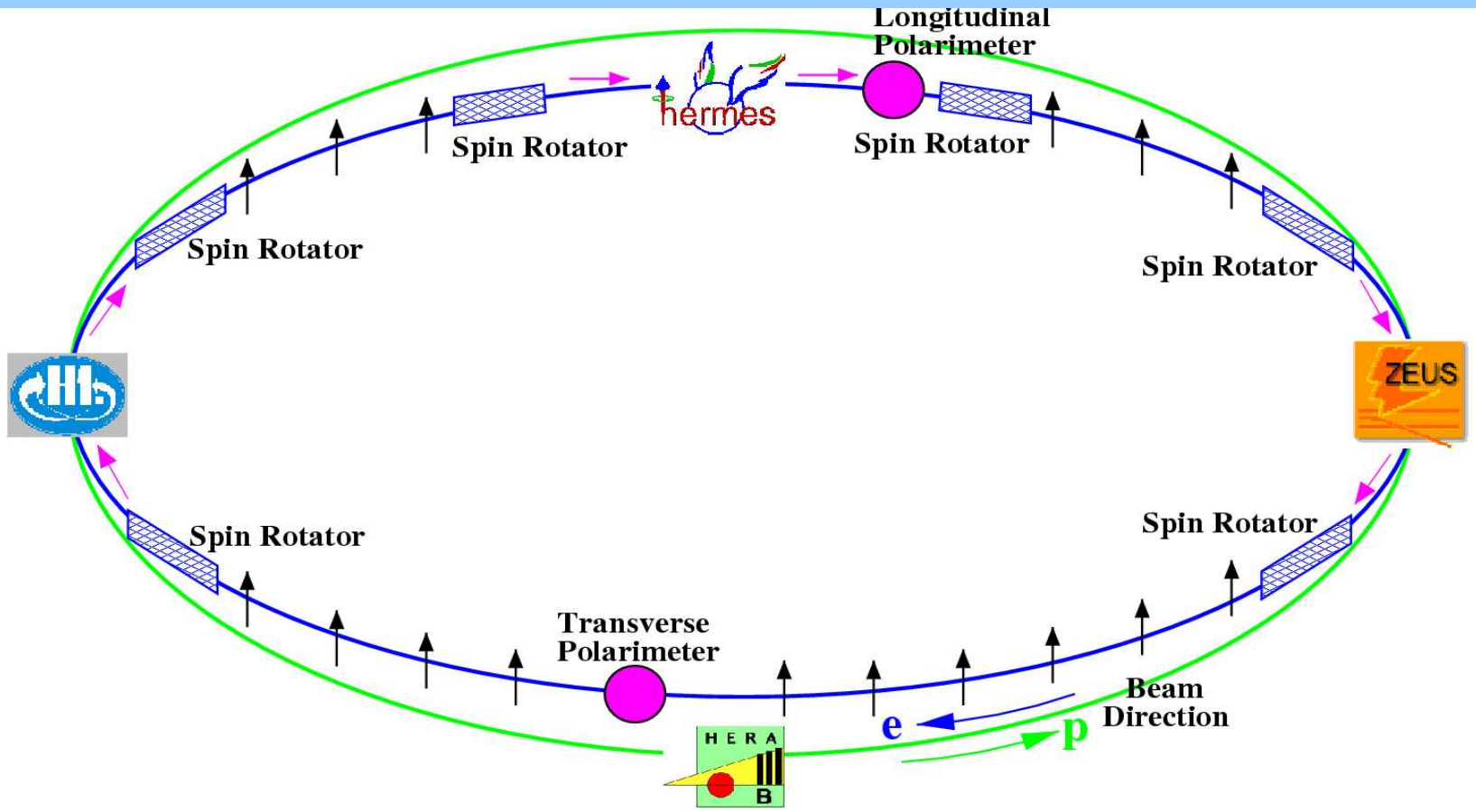
27/5/04
PRC Open Session

On behalf of POL2000 group:
DESY, H1, HERMES, ZEUS

- Introduction
- Physics Motivation
- TPOL Studies
- LPOL vs. Synchrotron
- Conclusions

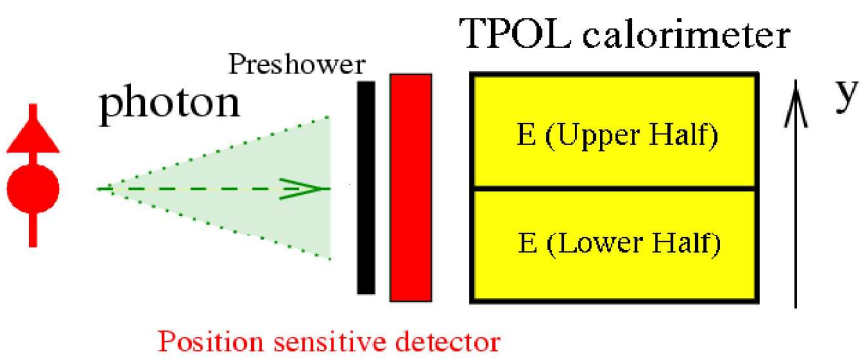
Polarisation at HERA II

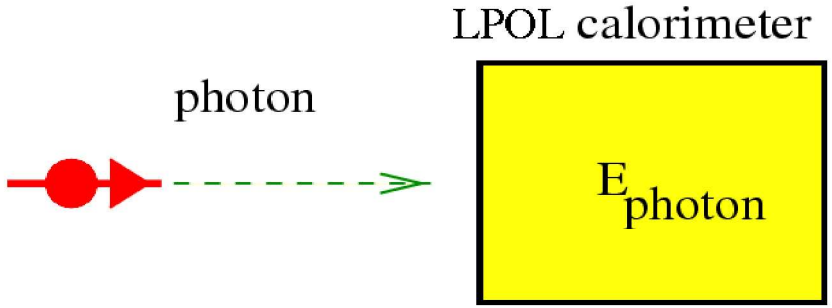


- **LPOL**: measure longitudinal polarization between HERMES' spin rotators
- **TPOL**: measure transverse polarisation far from spin rotators

TPOL and LPOL

Compton scatter laser light off pol. electron beam





- Measure vertical asymmetry of compton photons η(y):

$$\eta = (E_{upper} - E_{lower})/(E_{upper} + E_{lower})$$

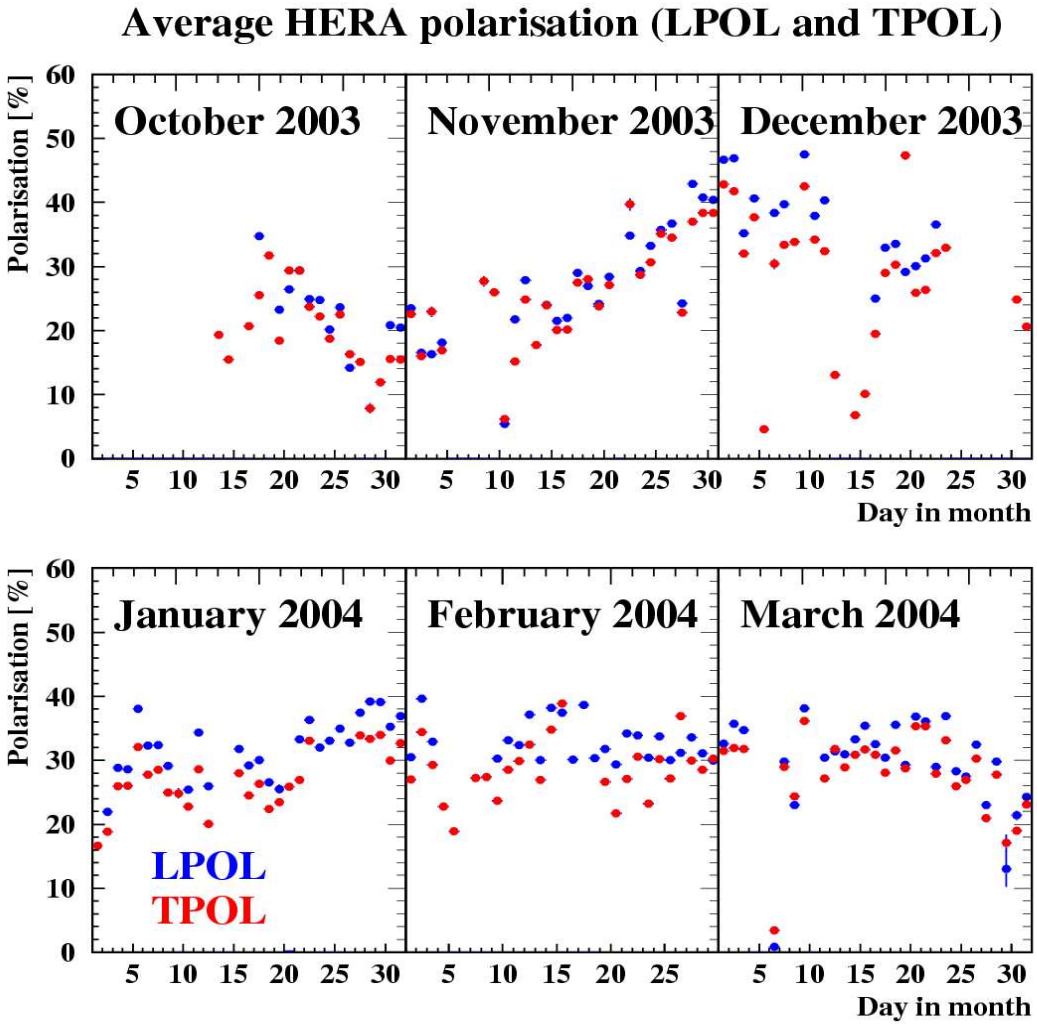
- Continuous laser (1−2 compton γ's in 200 bunch crossings)
- In−situ measurement of η(y) from Si strip and scintillating fibre

- Measure energy dependence of compton photons
- Pulsed laser (high power, low rate)
- Measure multi−γ spectrum

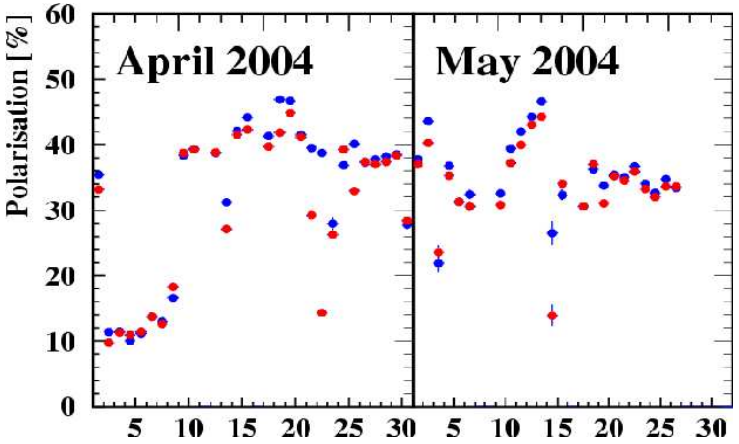
⇒ New 1W laser + Fabry−Perot cavity

- Measure 'Few−γ' spectrum

Polarisation Measurements



- Continuous, reliable operation
- However, discrepancy between LPOL and TPOL
  - Time depedent
  - Ratio discrepancy
    ~ 5−15%



Polarised Charged Current

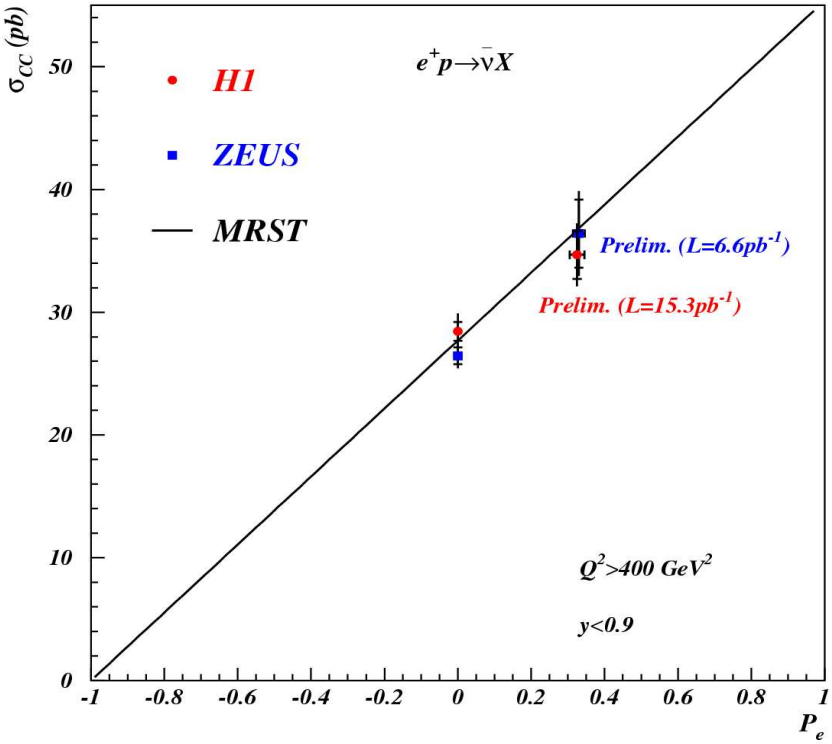
- First pol. CC measurements presented at spring conferences
- 2000 pol. (HERMES) error

$$\frac{\Delta P^{2000}_{LPOL}}{P_{LPOL}} = 1.9\,\% \qquad \frac{\Delta P^{2000}_{TPOL}}{P_{TPOL}} = 3.4\,\%$$

- 2004 (conservative) pol. error

$$\frac{\Delta P^{2004}_{LPOL}}{P_{LPOL}} = 5\,\% \qquad \frac{\Delta P^{2004}_{TPOL}}{P_{TPOL}} = 10\,\%$$

- LPOL measurement used in preference

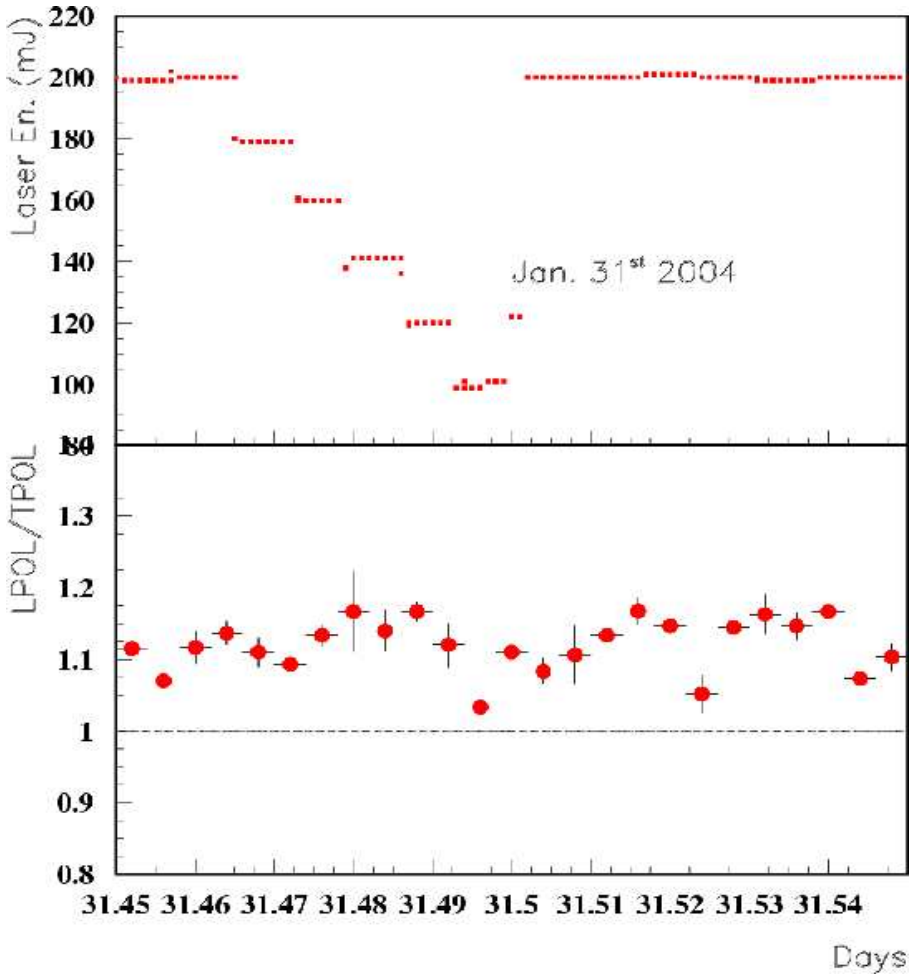


- H1: σ^P_{CC} = 34.67 pb ±5.6%(stat.) ± 4.8% (sys.)
- ZEUS: σ^P_{CC} = 38.1 ± 2.9(stat.) ± 0.8(sys.) ± 0.2(lumi.) ± 0.8(pol.) pb

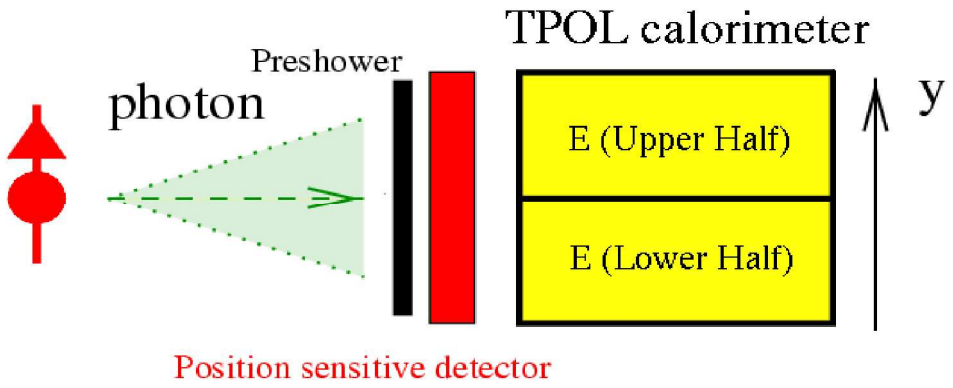
⇒ Aim to minimise pol. error

LPOL Systematic Studies

- Study existing LPOL
- Possible systematics investigated (Winter 2003−Spring 2004) including:
  - Laser energy (figure)
  - Position of Compton cone in calorimeter
  - Laser noise correction
  - False asymmetry
- No dependence of polarisation measurement observed
- LPOL appears consistent with 2000 performance (~2% sys. error)



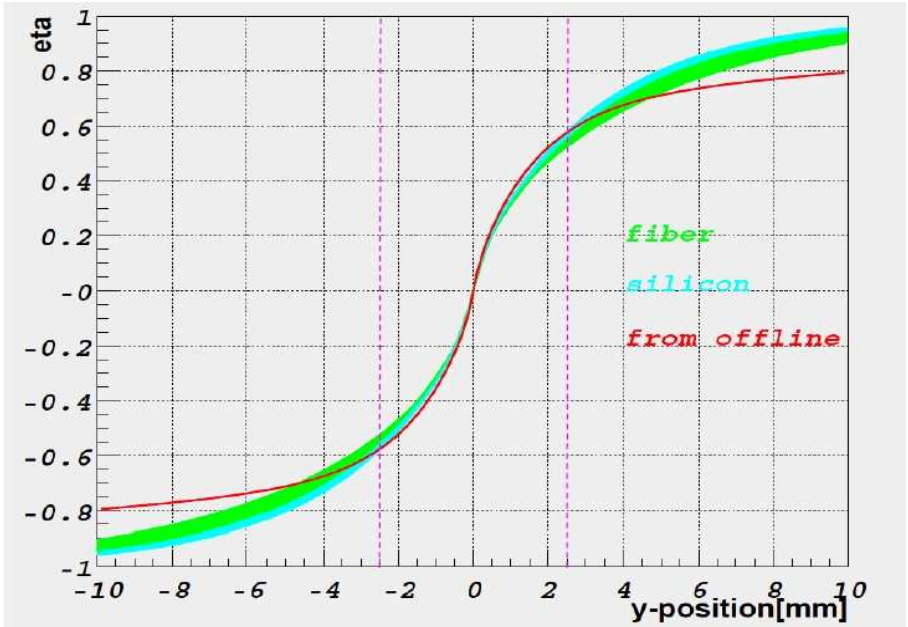
TPOL Analysis: η−y



- Components running successfully
- Examining offline analysis:
  - compare measurements of η+y

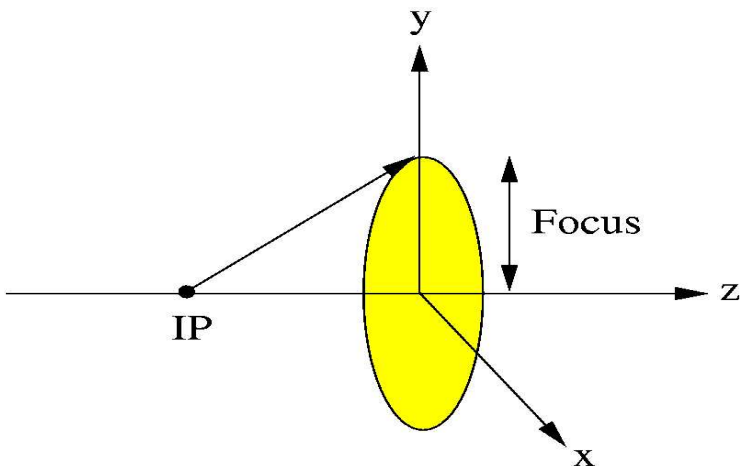
$$\eta = (E_{upper} - E_{lower})/(E_{upper} + E_{lower})$$

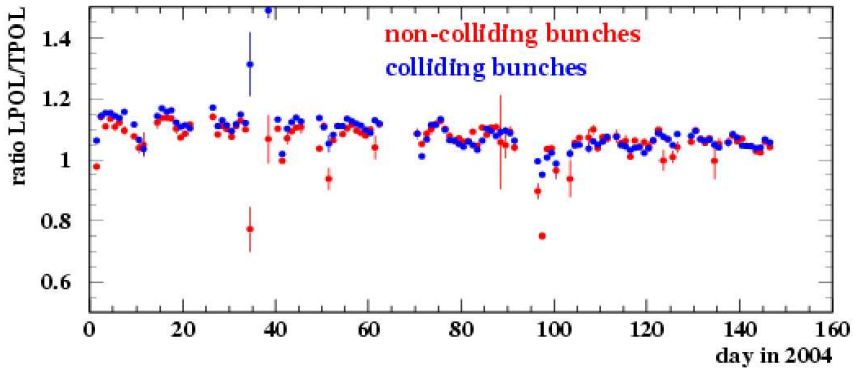
  - use both Si and fibre position detectors

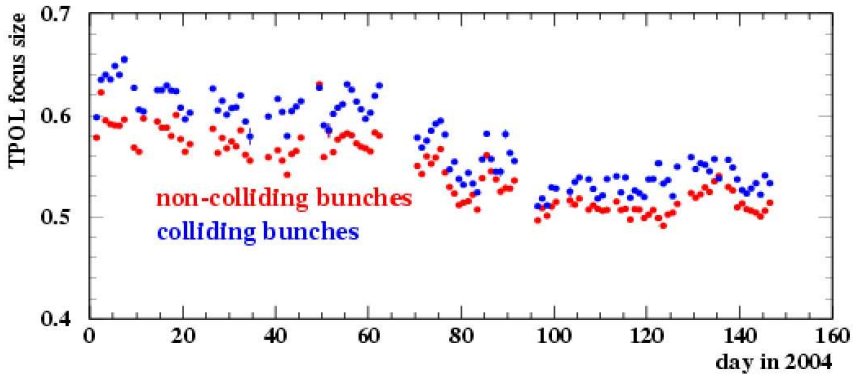


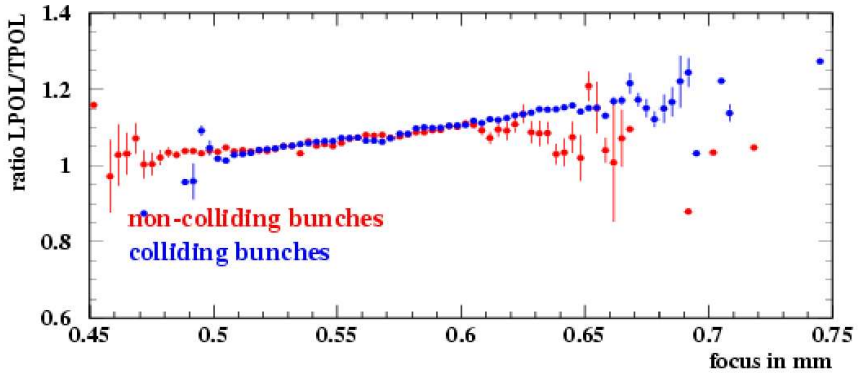
TPOL Analysis: systematics

- Studies into systematic errors ongoing:
  - Hints of correlations (eg. focus of Compton cone)



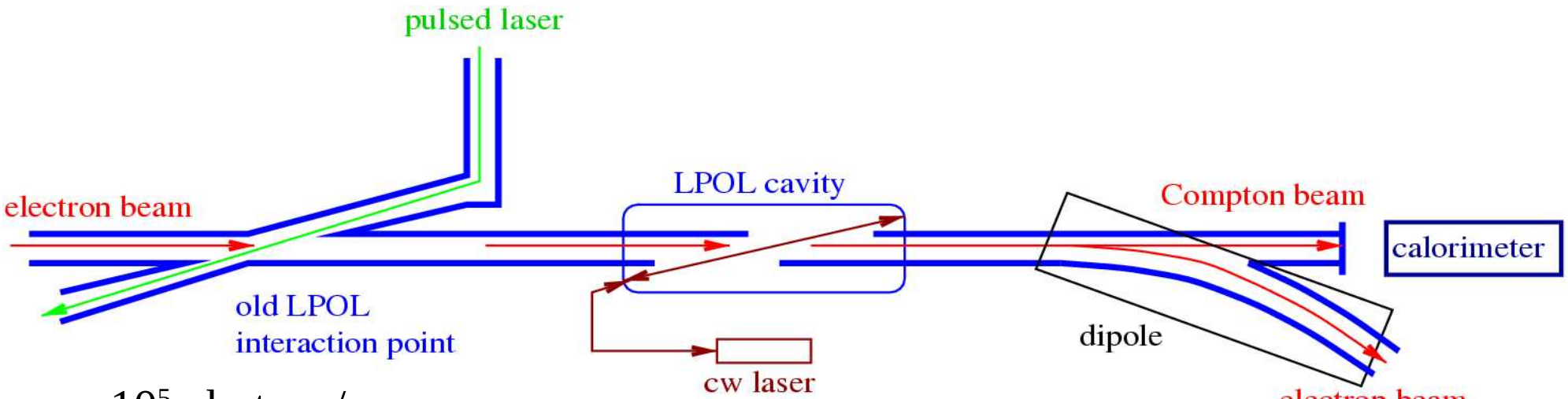






Status of the Cavity LPOL

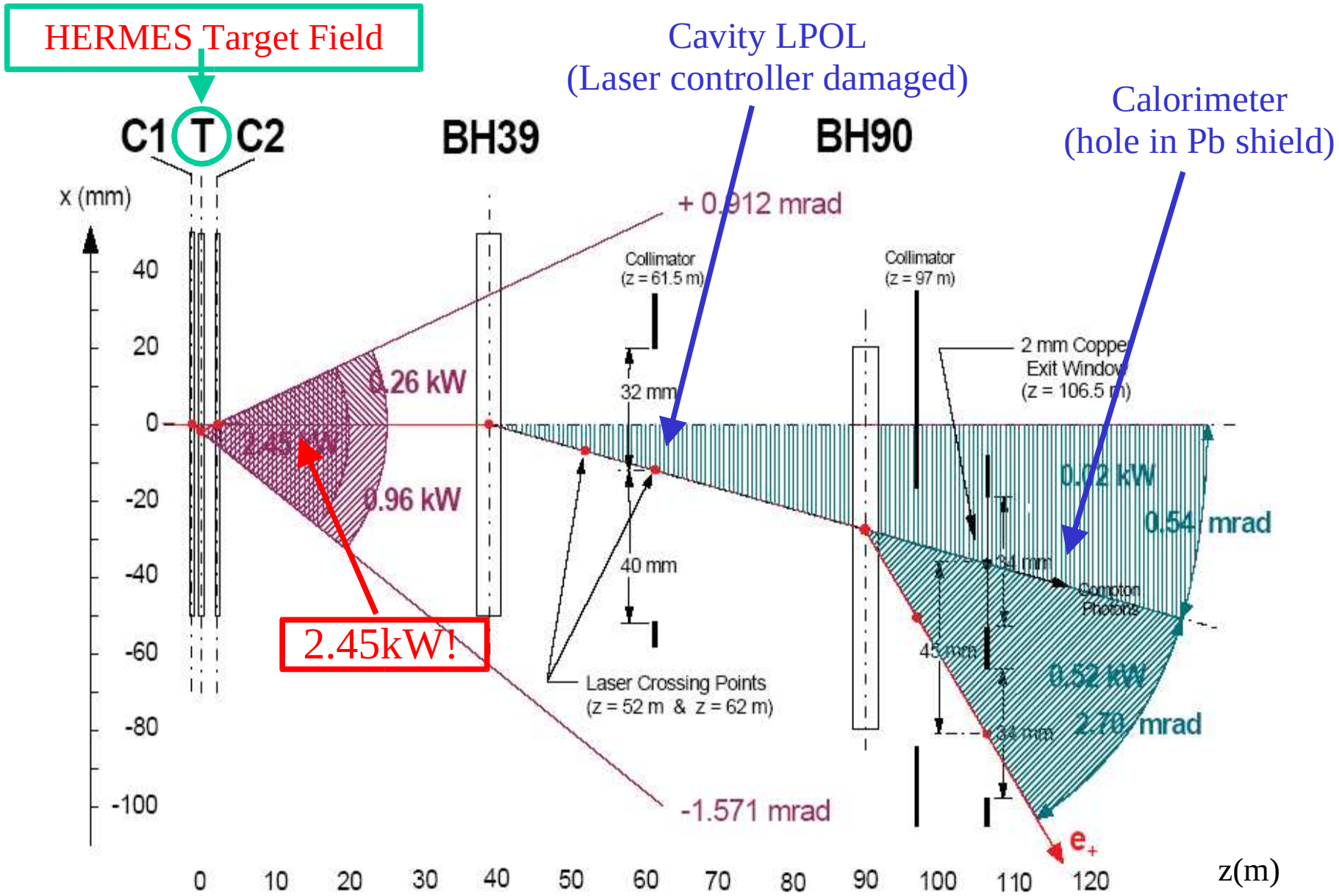
- Allows fast and precise polarisation measurement
- Cavity installation in spring/summer 2003
  - LPOL cavity DAQ system working fine
- New calorimeter
  - Calorimeter design updated (crystal calo. not radiation hard enough)
  - New calorimeter (quartz fibres) installation by end of 2004



10^5 photons/s

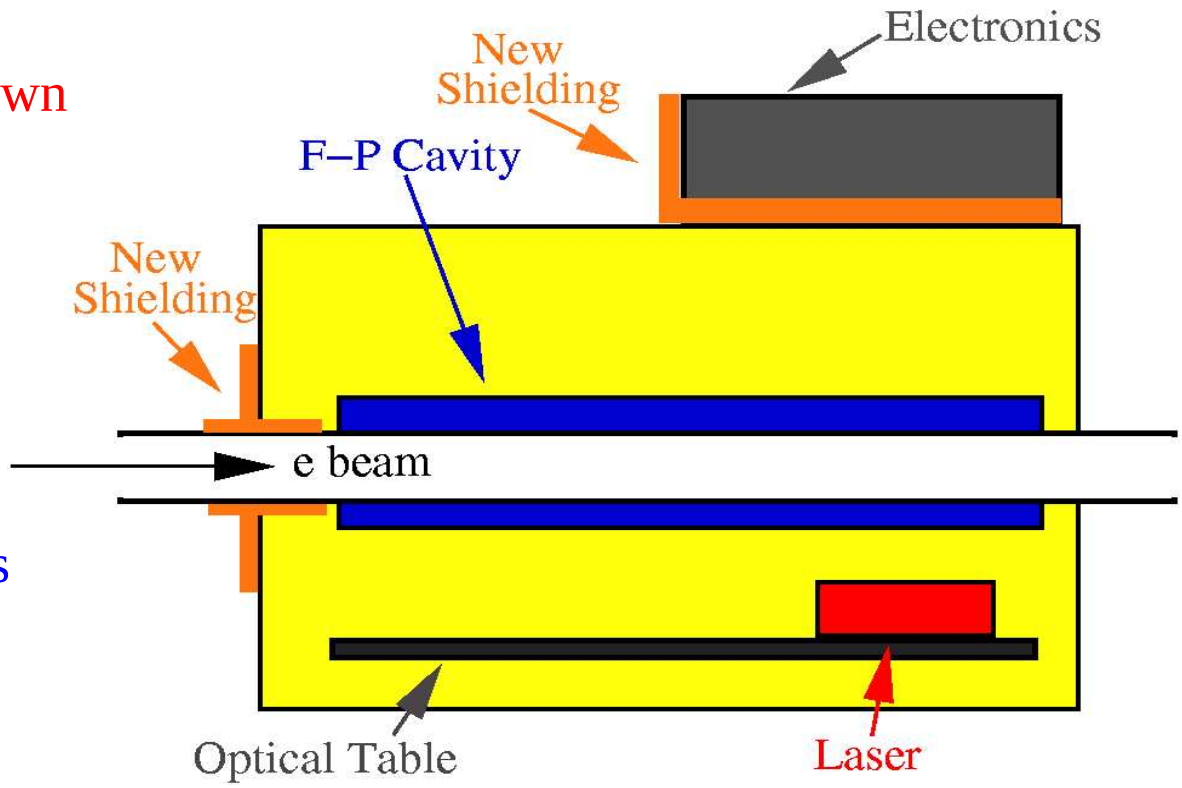
10^7 photons/s

Synchrotron Radiation Problem



Actions Taken Against Radiation

- New absorber being designed (cooled Cu, OR 53m)
  - Installation after shut down
- Improved lead shielding
- Radiation monitoring
  - dosimeters
  - PM's
- Reinstall electronics after results of dosimeter analysis



Conclusions

- Continuous, reliable measurements from both polarimeters
  - First measurements of polarised CC sent to spring conferences with conservative polarisation error (5%)
- LPOL appears consistent with 2000 performance ⇒ ~2% error
- TPOL offline analysis ongoing
- LPOL cavity installed + DAQ working
- Updated LPOL calorimeter design ⇒ Installation by end of 2004
- LPOL cavity electronics suffered from intense synchrotron radiation
  - New shielding in place
  - Constant monitoring of radiation doses
  - Reinstall electronics and continue commisioning
  - New absorber in progress