Stefan Schmitt
H1 collaboration meeting

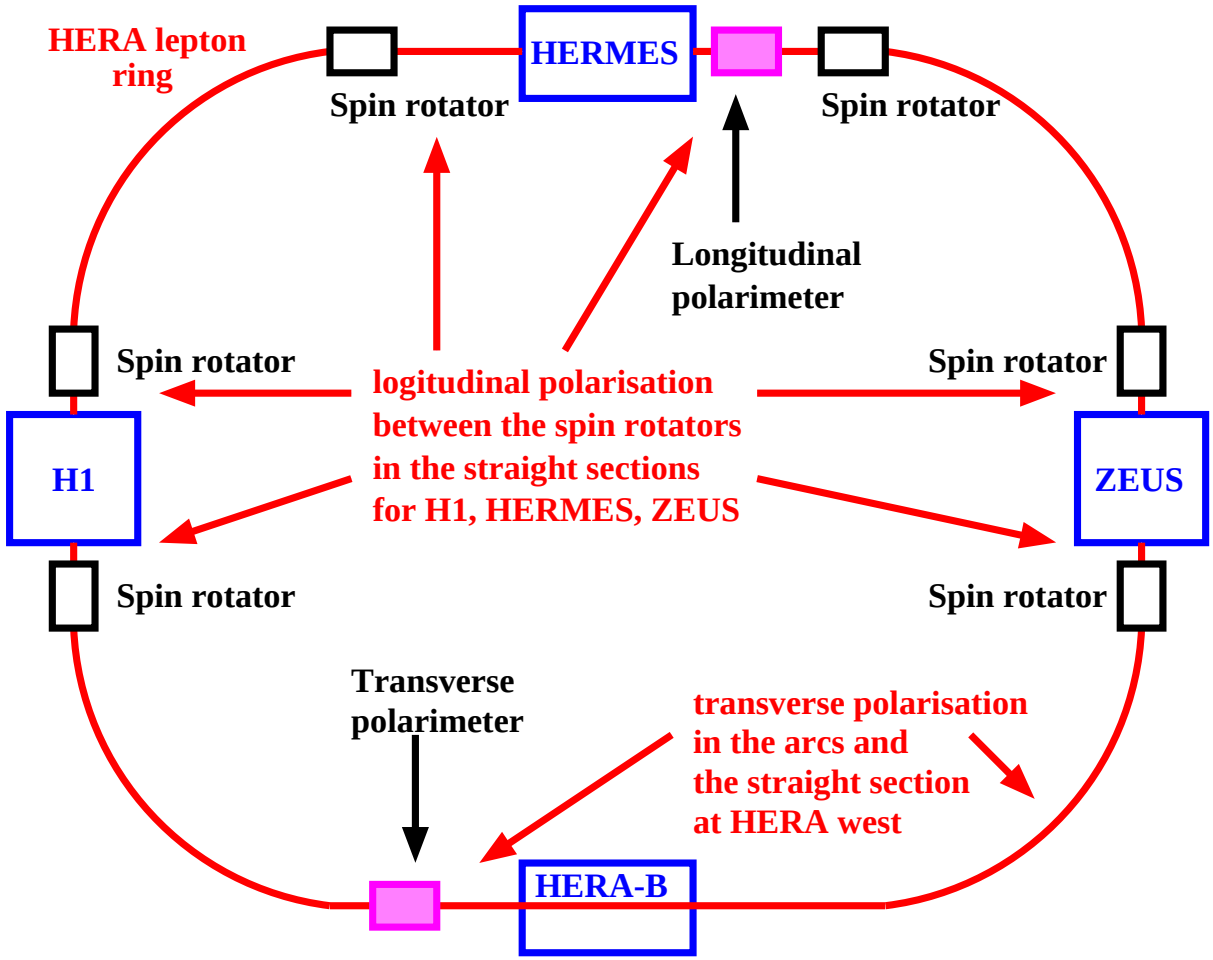
June 25, 2003

Polarimeter status

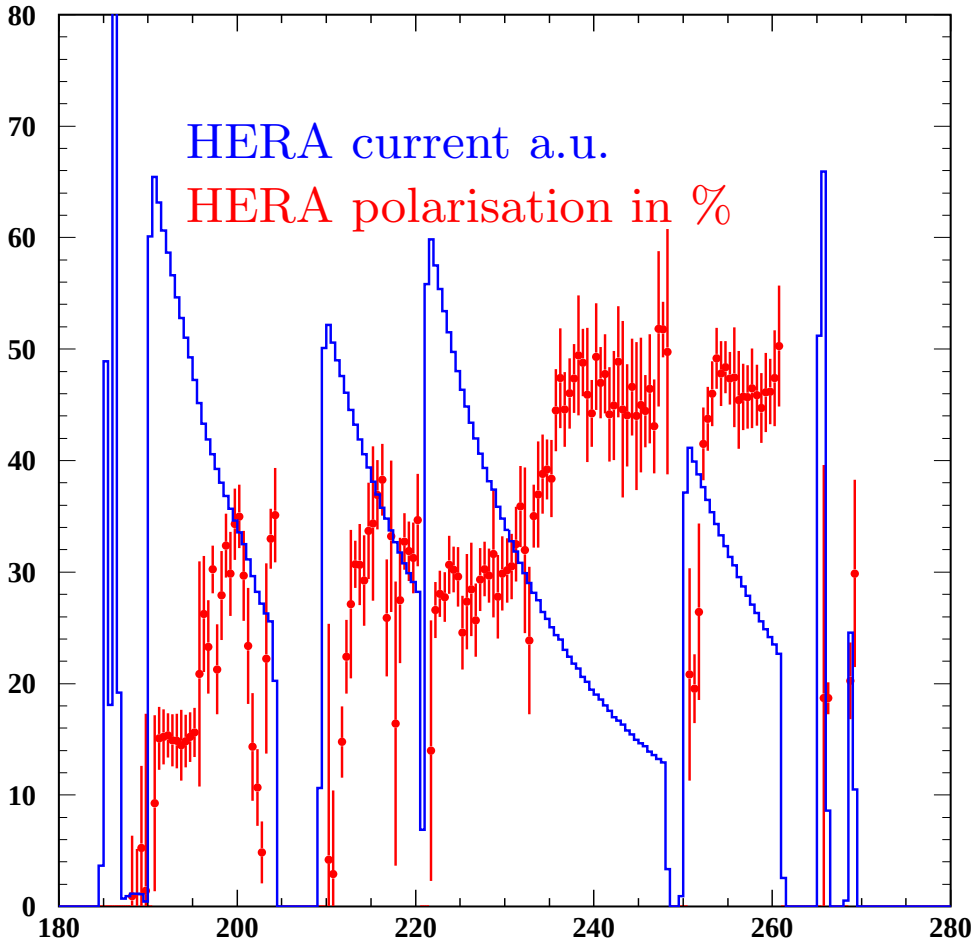
- Introduction
- Polarisation tuning: it worked!
- Polarisation: why should H1 care?
- The HERA polarimeters
  - The transverse polarimeter (TPOL)
  - The longitudinal polarimeter (LPOL)
  - The LPOL cavity

Introduction: Polarisation and polarimeters at HERA

- Built-up of polarisation in $\approx$ 30 min (Sokolov-Ternov effect)
- Transverse polarimeter (TPOL) is located near HERA-B
- Longitudinal polarimeter (LPOL) is located between HERMES spin rotator
- LPOL Fabry-Perot cavity successfully installed during shutdown

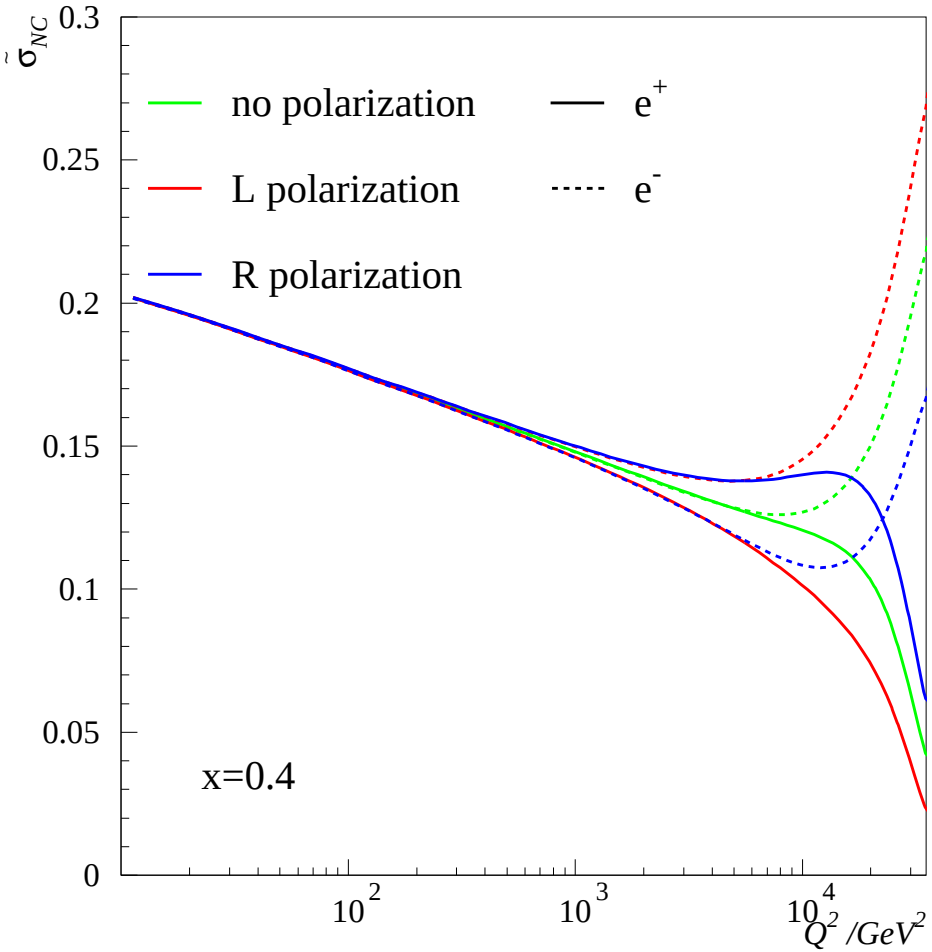


Polarisation tuning in February/March 2003



- Plot shows HERA current and polarisation from spring 2003 polarisation tuning phase ($P >$ 45% seen)
- All H1 data will be polarized after the restart

Polarisation: why bother?

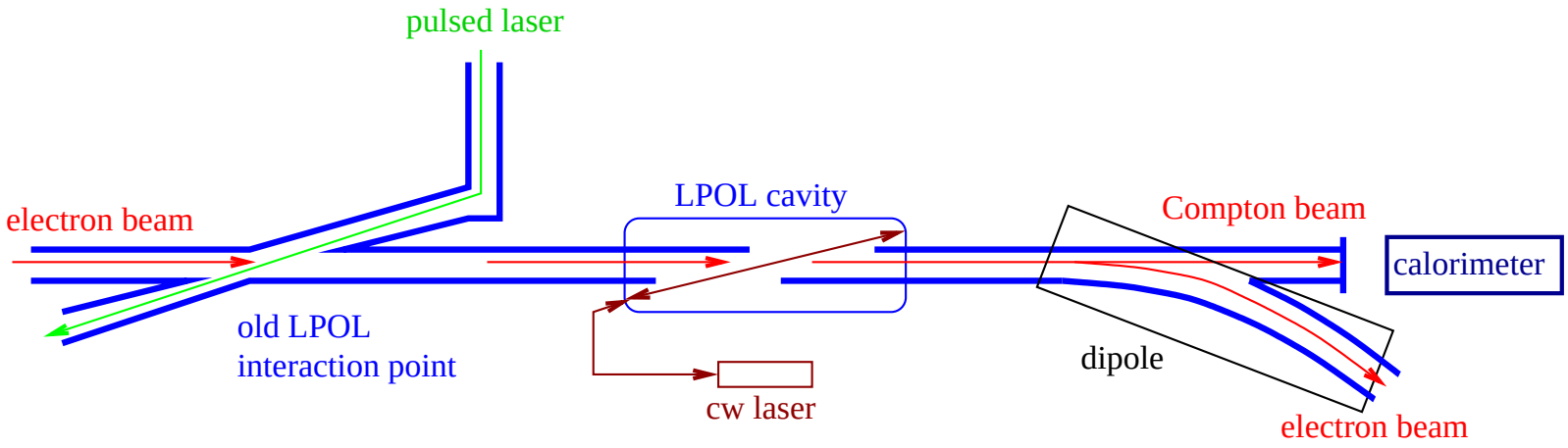


- NC and CC cross-section depends on polarisation
- All analyses at high Q^2 need to know about polarisation
- If polarisation is not known for some part of the data, it is lost for high Q^2 analyses
- **Polarimeters and luminosity system are of similar importance for many analyses**

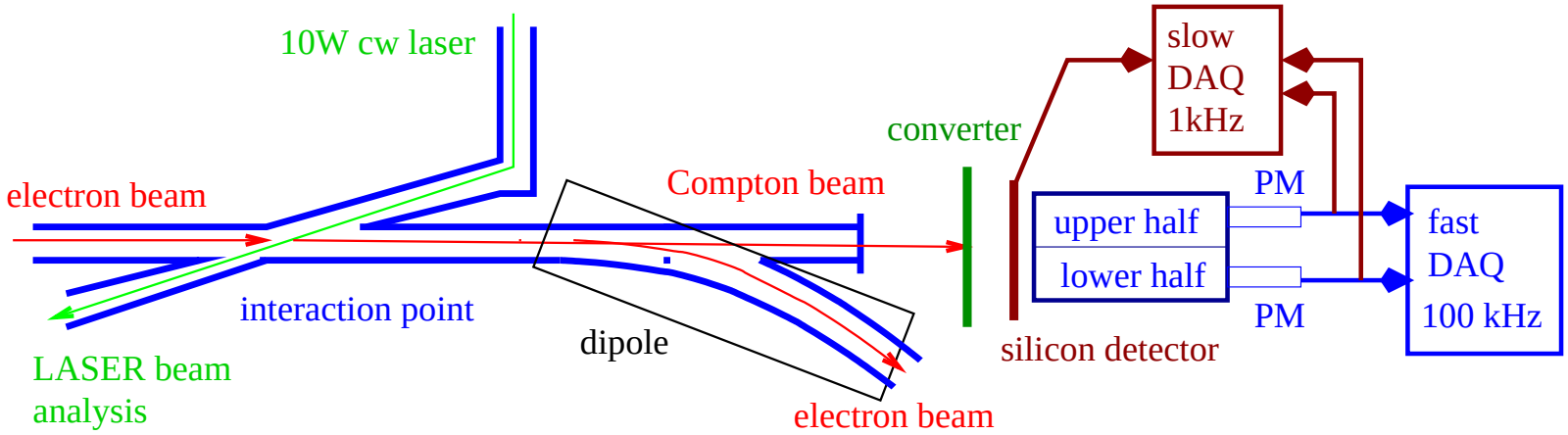
The HERA polarimeters

Two polarimeters are running in parallel (redundancy, syst. checks)

1. Near HERA-B: the transverse polarimeter (TPOL)
   $\Delta P = 1\% \oplus 3\%$ per minute, avg over all bunches
2. Near HERMES:
   (a) either the "old" logitudinal polarimeter (LPOL)
   $\Delta P = 1\% \oplus 2\%$ per minute, avg over all bunches
   (b) or the new laser cavity, built by Orsay (LPOL cavity)
   $\Delta P = 1\%$ per minute per single bunch

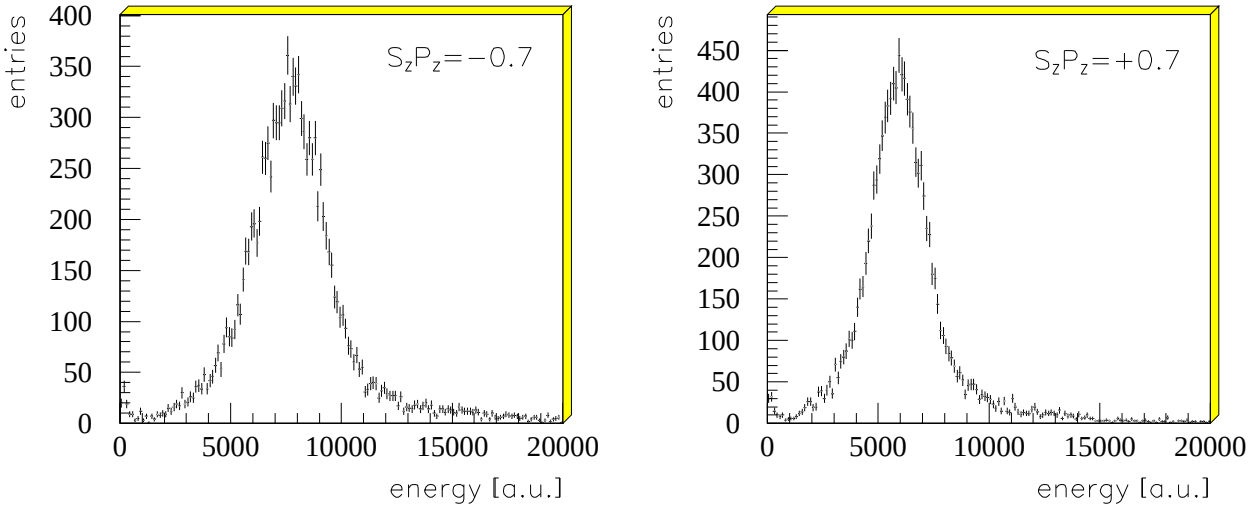


The transverse polarimeter (TPOL)



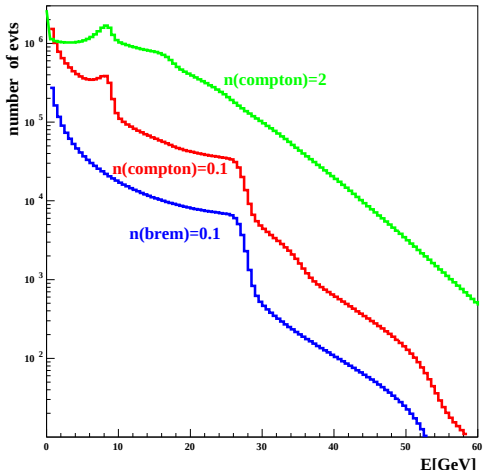
- DAQ upgrade in 2000–2001 (new H1 lumi electronics)
- Polarisation determined from energy asymmetry $\eta = \frac{U-D}{U+D}$
- Systematics limited by non-linear $\eta - y$ transf.
- Install converter and silicon detector for online-calibration 2001–2003 (two ZEUS groups: London, Tokyo)
- New offline analysis determines calibration from the calorimeter data alone (H1, Jenny Böhme)

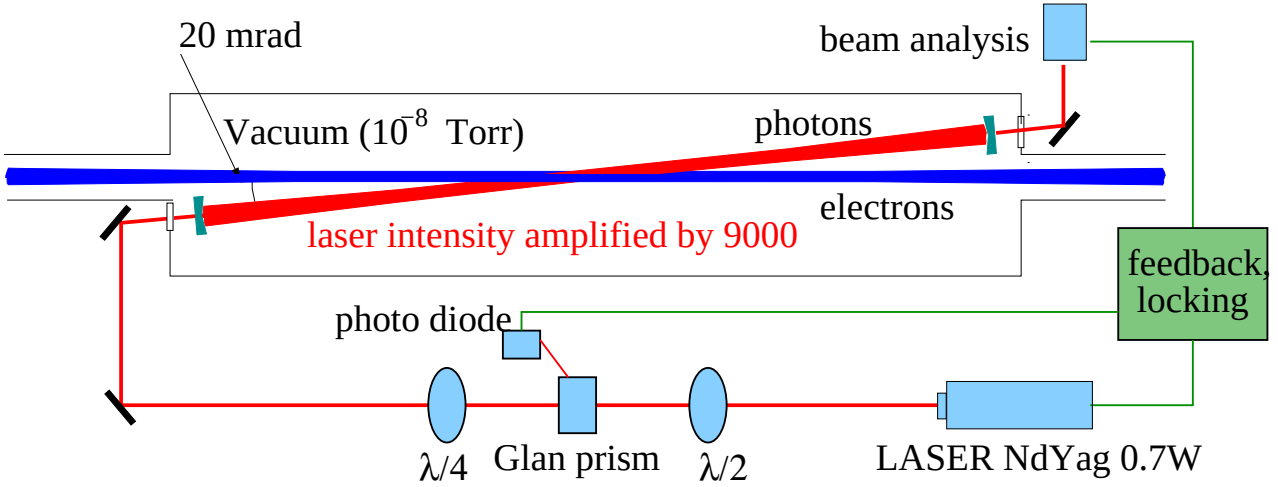
The longitudinal polarimeter (LPOL)



- Longitudinal polarisation influences $\frac{d\sigma}{dE}$
- Multi-photon mode: pulsed high-intensity LASER, energy of 1000 photons add up to $\langle E \rangle$ seen in the calorimeter
- Systematics limited by calorimeter linearity, laser timing
- HERMES takes care of operating the LPOL

The LPOL cavity





- Measure $\frac{d\sigma}{dE}$ with high precision
  statistical error negligible, good control of syst. uncertainties
- Amplify 1W Laser in a Fabry-Perot resonator (cavity) to increase probability of Compton scattering
- Read calorimeter and fill histogram at 10.4 MHz (similar to H1 lumi system)

The LPOL cavity (continued)

- Cavity was installed during 2003 shutdown
- gain factor 9000 observed → congratulations to H1 Orsay people
- Integration of DAQ system progressing
- Critical items:
  - need new radiation-hard calorimeter
  - expert coverage at DESY beyond 2003
  - HERMES resources bound to old LPOL operation
  - ZEUS resources focussing on the TPOL (+silicon det.)

Conclusions:

- Polarisation is coming now
- You need the polarimeters for Your analysis
- The polarimeters need Your support
  - join the polarimeter analysis now
  - or: join as an expert for the TPOL or the LPOL cavity
  - or: help to construct the new LPOL calorimeter

Next polarimeter meeting:
Monday, June 30, 9:00-11:00 in SR 4a — Don't miss it