

The HERA polarimeters — status and plans

- LPOL status
- TPOL status and plans
- LPOL cavity status and plans
- Summary

LPOL status

- Reminder: LPOL operates in multi-photon mode. Polarisation is given by energy asymmetry

$$P = \frac{1}{A} \frac{\langle E \rangle_L - \langle E \rangle_R}{\langle E \rangle_L + \langle E \rangle_R}$$

The analyzing power A is determined by the calorimeter response (linearity, cut-off), determined from test-beam measurements.

Two calorimeters with different A exist for systematic tests.

- Ongoing work: systematic checks with SW calorimeter (secondary calorimeter). Check wavelength-shifters for radiation damage from synchrotron radiation.
- LPOL/TPOL comparisons as a function of LPOL operational parameters: no hint for systematic effects found

TPOL status

- Reminder: TPOL operates in single-photon mode. Measure double-differential cross-section as a function of the asymmetry η and E . $\eta = \frac{U-D}{U+D}$ is the energy asymmetry along the vertical direction. The online polarisation is given by

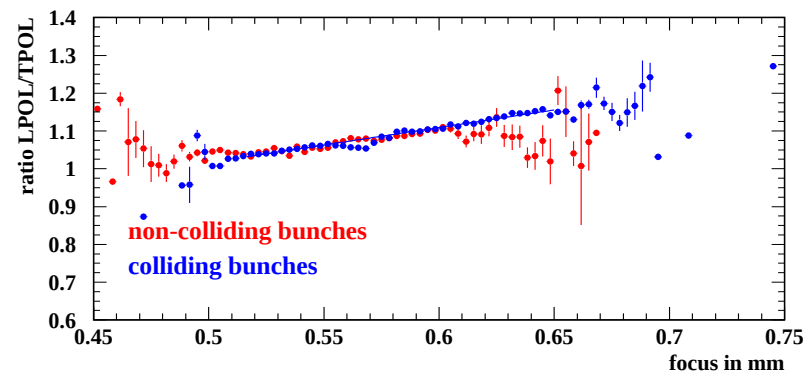
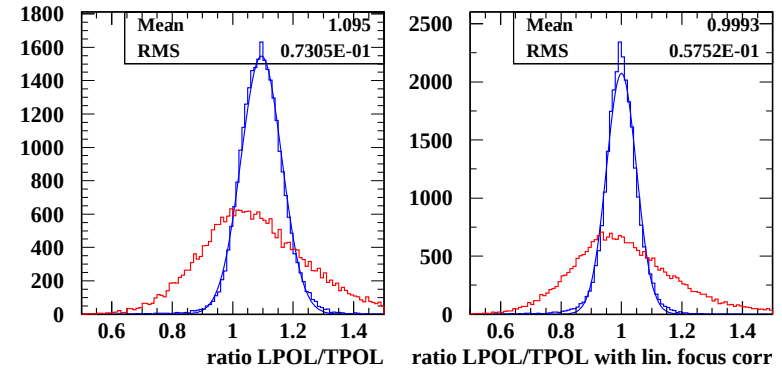
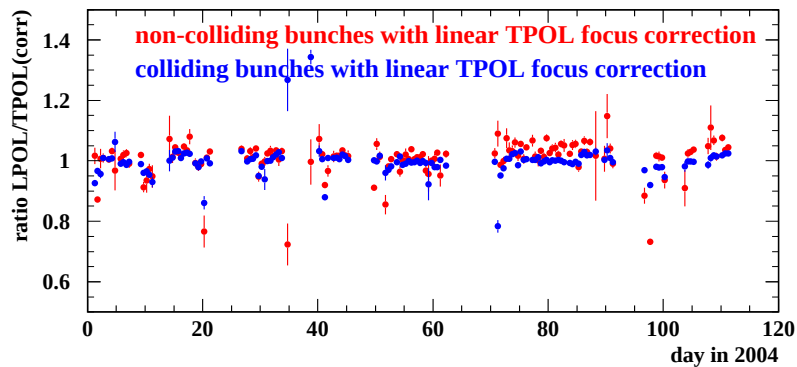
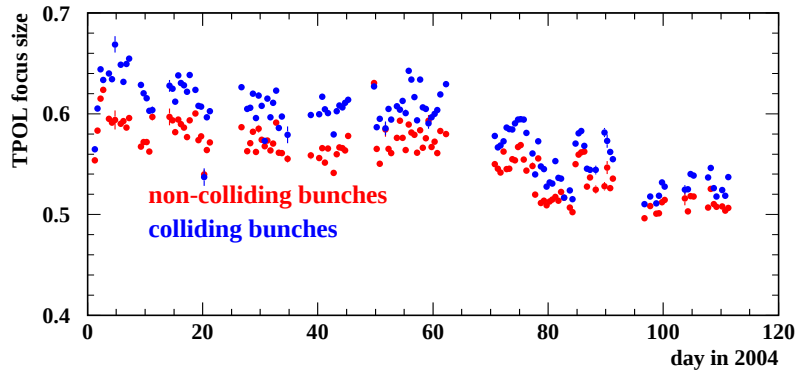
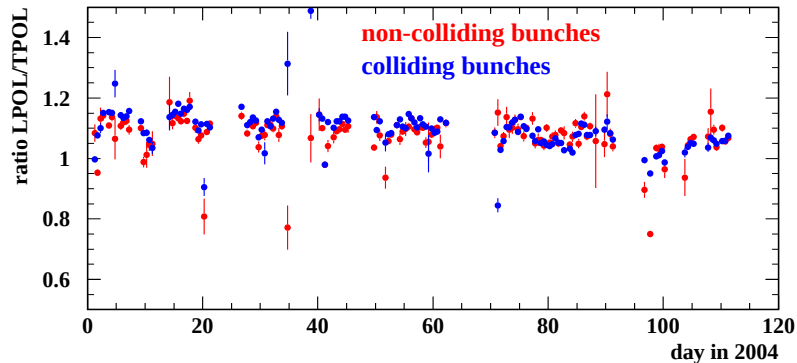
$$P = \frac{1}{A}\eta$$

The analyzing power A is a fixed value for the online analysis.

However, A depends on:

- the calorimeter response function (η and η -resolution as a function of the Compton photon energy and position)
- the HERA beam parameters (vertical emittance, beam ellipsis tilt times horizontal emittance)
- Calibration for HERA I: de-polarize beam, then determine A from polarisation rise-time
- HERA II: beam parameters less stable than at HERA I

TPOL/LPOL and TPOL Compton beam size



- Study LPOL/TPOL and beam size
- Clear evidence for a correlation
- Simple correction seems possible
- LPOL/TPOL mismatch is connected to e^+ beam parameters

TPOL plans

- Offline analysis of TPOL data (multi-parameter fit, silicon and fiber detector)
- Re-activate beam depolarizer, do rise-time calibration to get absolute TPOL calibration
- If necessary, request rise-time calibration with all spin-rotators off
- Studies with **controlled** change of beam parameters (beam ellipsis tilt or vertical emittance blow-up) might help to understand systematic effects.

LPOL cavity

- Reminder: designed to measure single-differential cross-section, get polarisation from multi-parameter fit with high precision
- Electronics suffered from synchrotron radiation (HERMES transverse target magnet)
- Now everything repaired. Need two access days to install electronics, lead shielding, and align laser
- Hope to see first Compton photons after re-installation and get alternative LPOL measurement

Summary: polarimeter plans affecting HERA operation

- Activate depolarizer as soon as possible:
need several fills with stable beam (stable and high polarisation) in order to find resonance frequency. Polarisation will drop to zero, once the frequency is found.
- Take several rise-time curves with both polarimeter operational:
again, requires stable beam conditions and high (initial) polarisation for several fills.
Polarisation for experiments will be compromised.
- LPOL cavity installation: need two long access days (morning and afternoon)
- LPOL beam steering: once everything is installed, dedicated beam steering is required.