

# Description of the LPOL Data Reorganization

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## 1 Introduction

In order to re-analyse the beam polarization values, measured by the LPOL polarimeter, the raw ADC data have been saved from the original FZ (ADAMO) format to HBOOK files. In the new files, additional relevant variables were included. This new common format should allow, in principle, a more flexible analysis of a sizably enlarged set of variables. In addition, the analysis can be performed using a framework (HBOOK libraries) common to all the HERA experiments, no more bounded to ADAMO software (although very flexible) not shared by the all experiments.

This note shows how to run the new LPOL analysis code on the raw data and the additional data stored in HBOOK files, and describes the output variables which are saved, at per-minute basis, in separate HBOOK files.

## 2 How the New Lponl Program Works

The raw ADC data have been saved from the original FZ (ADAMO) files to new HBOOK files, one file per HERMES run. In addition to the LPOL raw data, also variables from different source files, relevant for a correlation analysis, were saved, Fig. 1. These extra variables were dumped when their corresponding subdetectors communicated to the HERMES DAQ a change of their values during the accumulation of the LPOL raw data. They concern the proton bunches current, laser beam variables (e.g., rate and flash lamp voltage), the HERA lepton beam position and slope in the interaction region with the laser, the calorimeter position, the PMTs high voltage values, the orientation (in arbitrary units) of the mirrors in the laser transport line, the voltage value applied to the Pockels Cell (providing circularly polarized laser beam), online TPOL polarimeter variables (e.g., table position and rates), online LPOL variables, and the HERMES target status.

Each set of data was saved in a separated ntuple, not synchronized with the timestamp of the LPOL raw data. The generated HBOOK files are stored in the machine h1repro7 in the directory /x03/data/lpol/RAW/2006, or other similar directories, according to the data taking year. These data are accessible by the analysers in the POL2000 group.

The official LPOL analysis code **lponl** was modified accordingly to calculate the beam polarization out of raw ADC data now stored in HBOOK files, and synchronize the additional variables for, possibly, an extensive correlation analysis. It is located in the directory h1repro7:/x03/data/lpol/ANALYSIS\_CODE, and a compiled version is available in the directory /x03/data/lpol/ANALYSIS. The source code is written in FORTRAN, allowing for easy debugging and possible implementations.

The code should be run with the following arguments,

$$./lponl - polcut - boff 12 - c 20000 - fz < file list > , \quad (1)$$

where **-polcut** sets the polarization  $P$  to zero whenever  $\delta P > P/2$ , **-boff XX**

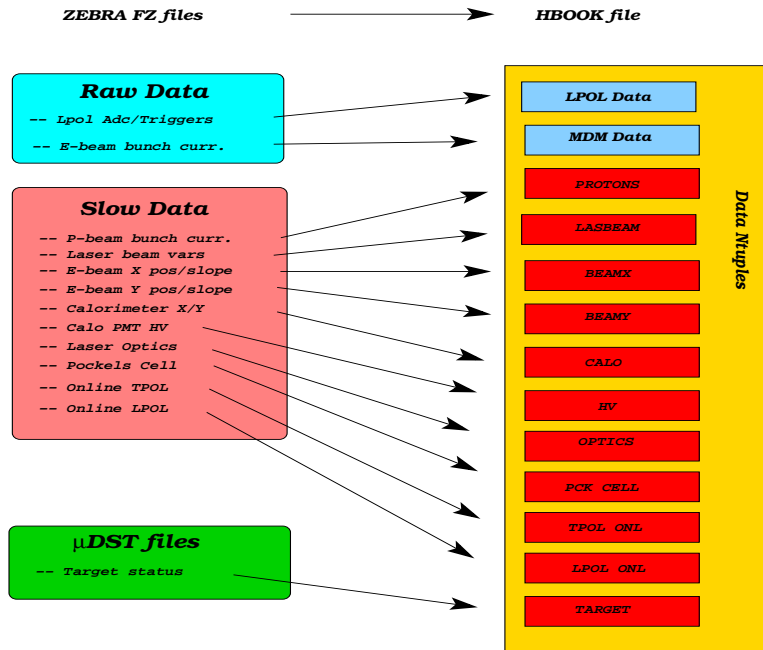


Figure 1: Data from different sources were merged together into common HBOOK files, one file per HERMES run.

considers the numbering shift needed to correctly identify a bunch, due to the required time necessary to fire the laser after a trigger condition is fulfilled. This correction in the bunch numbering is needed in the analysis to know whether the signal collected in the calorimeter is associated to either an empty or filled bunch. The argument **-c 20000** instructs the program to perform a calibration (pedestal and noise evaluation) each 20000 events, roughly each two minutes. The list of HBOOK files is provided by the argument **-fz <file list>**, where the ascii file **<file list>** contains the path (a string of maximum 80 characters) to the files to process, one line per file. When providing no command line argument the program dumps an online help on the screen and quits.

The calculated beam polarization values are dumped, per-minute basis, in separate HBOOK files (e.g., `offline_lpol001.hbook`), generated in the current working directory, a new file each 5000 measurements. The additional variables are also saved, in separate blocks of variables in a common nutple, thus allowing for a correlation analysis. The synchronization of the externally included variables is done saving their last value registered by the HERMES DAQ before the polarization measurement timestamp.

Each block of variables is described in the next sections of the note.

### 3 The Offline Beam Polarization Variables Block

The beam polarization and its statistical uncertainty are calculated using the official analysis code `lponl`, which was modified to calculate the polarization using also methods different from the official one. All results are dumped into the output HBOOK file synchronized with the calculation of the nominal polarization value. This way, the effect of the several corrections applied to the raw data can be, possibly, more efficiently investigated.

- **LpolPol (LpoldPol)**  
LPOL polarization (and statistical uncertainty) measurement calculated using the default (official) method [2]. The beam polarisation is calculated as a weighted mean of the single bunch polarization, using the bunch current values as weights. Events with trigger 3 are used for the jitter correction. The pedestal is calculated using for the same event the signal in the 96 ns delayed ADC line, which arrives in the ADC module out of gate, therefore allowing for for events with empty lepton bunches. The correction for using a different ADC line is performed linearly fitting the ADC correlation between the delayed and undelayed line for laser\_off events.
- **LpolPol35 (LpoldPol35)**  
Beam polarization (and statistical uncertainty) calculated following the standard method, except using trigger 35 instead of 3 for the jitter correction,
- **LpolPol\_SJW (LpoldPol\_SJW)**  
Beam polarization (and statistical uncertainty) calculated following the standard method, except that for each laser\_on-filled\_bunch trigger (3 or 35) the signal is corrected using the jitter correction calculated for the corresponding trigger,
- **LpolPol\_NoJW (LpoldPol\_NoJW )**  
Beam polarization (and statistical uncertainty) calculated following the standard method, except that signals are not corrected for timing jitter of the laser firing,
- **LpolPol\_NoCW (LpoldPol\_NoCW)**  
Beam polarization (and statistical uncertainty) calculated following the standard method, except that the beam polarization is calculated without weighting the single bunch polarization value,
- **LpolPol\_ADC (LpoldPol\_ADC)**  
Beam polarization (and statistical uncertainty) calculated following the standard method, except that bunch polarization values are weighted using the corresponding signal ADC values instead of the bunch current,
- **LpolPol\_No96 (LpoldPol\_No96)**  
Beam polarization (and statistical uncertainty) calculated following the

standard method, except that for the calculation of pedestals no correction is performed on the signal ADC values in the 96 ns delayed line.

- **LpolPol\_NoLC (LpoldPol\_NoLC)**  
Beam polarization (and statistical uncertainty) calculated following the standard method, except that the correction for laser high frequency noise is not performed.
- **LpolPol\_NoDel (LpoldPol\_NoDel)**  
Beam polarization (and statistical uncertainty) calculated following the standard method, except calculating the pedestal using laser\_off-filled\_bunch events.
- **LpolPol\_Mean**  
The beam polarization (and statistical uncertainty) is calculated using only the ADC information on the undelayed ADC signal line. For each signal trigger the mean ADC values is calculated separately for the raw and pedestal signals, considering laser\_on-filled\_bunch and laser\_off-filled\_bunch events, respectively. The Compton signal is extracted after pedestal subtraction to the raw mean ADC signal,  $\langle ADC_{raw} \rangle - \langle ADC_{ped} \rangle$ .

## 4 The Offline Laser Jitter Fit Variables Block

The LPOL laser has a non uniform profile which shows up in the Compton signal due to the electronic jitter of  $\pm 1.5$  ns. The jitter-dependence of the luminosity per event delivered in the calorimeter, Fig. 2 was extracted by measuring the timing of the laser firing with a PIN diode in the laser hut.

Thus, the Compton photon signal (showing the laser beam profile) has to be corrected for jitter effects to calculate the proper beam polarization. This is achieved by fitting, every minute, the time dependence of the signal with the beam profile function

$$l(\Delta t) = N \cdot \exp\left(-\frac{\tau^2}{[x_5 + \sigma(1 + a \tan(2\tau \cdot x_4)/\pi)]^2}\right), \quad (2)$$

with  $\tau = \Delta t/t_{max} - 1$ , and  $x_4$  and  $x_5$  being skewness parameters of the distribution. The five parameters  $N, \sigma, t_{max}, x_4$ , and  $x_5$  are extracted from the fit, and the ADC signal is corrected applying, for each time bin  $\Delta t$ , the correction factor  $1/l(\Delta t)$  to the measured ADCs. In order to minimize the effects of the correction to the ADC values, and to optimize the photon-lepton collisions, the difference of the maximum signal timing ( $t_{max}$ ) and the mean statistics timing  $t_{mean}$  was used to calculate the laser **trigger delay offset** which was needed to anticipate or delay the laser firing trigger if necessary.

- **LpolDelayOffset (LpolDelayOffset35)**  
Laser trigger delay offset calculated using the default trigger 3 (35).

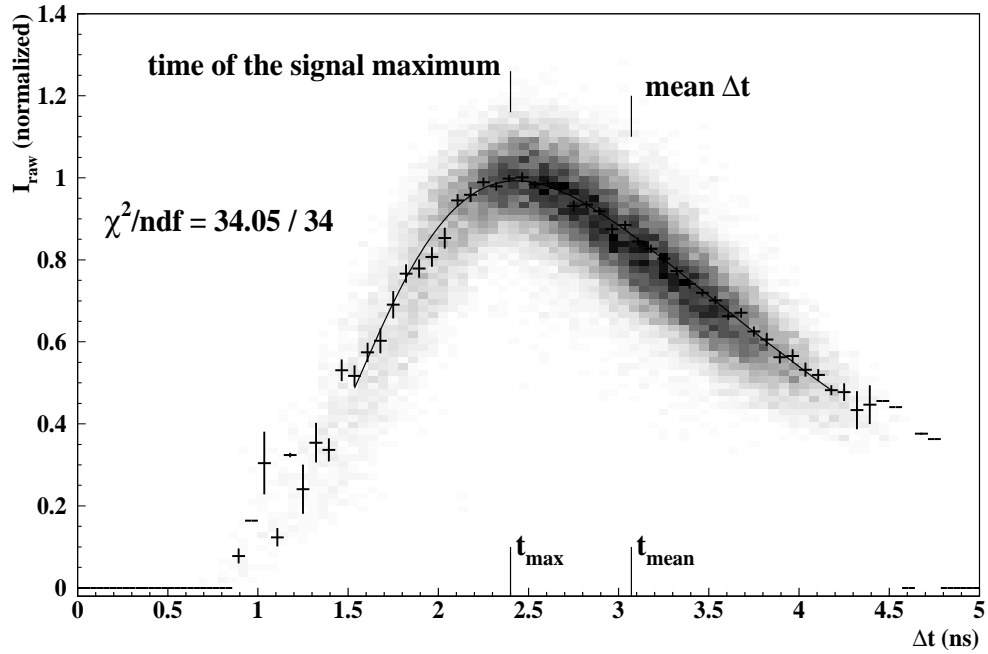


Figure 2: Example of the jitter dependence of the Compton photons signal.

- **LpolChi2Fit (LpolChi2Fit35)**  
Fit  $\chi^2$  using the trigger 3 (35) events.
- **LpolFitParNorm (LpolFitdParNorm)**  
Height  $N$  (and uncertainty) of the ADC profile using function trigger 3 events.
- **LpolFitParPos (LpolFitdParPos)**  
Timing  $t_{max}$  (and uncertainty) of maximum of the ADC profile function using trigger 3 events.
- **LpolFitParWid (LpolFitdParWid)**  
Width  $\sigma$  (and uncertainty) of the ADC profile function using trigger 3 events.
- **LpolFitParSkew (LpolFitdParSkew)**  
Skewness  $x_4$  (and uncertainty) of the ADC profile function using trigger 3 events.
- **LpolFitParLwid (LpolFitdParLwid)**  
Skewness  $x_5$  (and uncertainty) of the ADC profile function using trigger 3 events.
- **LpolFitParNorm35 (LpolFitdParNorm35)**  
Height  $N$  (and uncertainty) of the ADC profile function using trigger 35 events.

- **LpolFitParPos35 (LpolFitdParPos35)**  
Timing  $t_{max}$  (and uncertainty) of maximum of the ADC profile function using trigger 35 events.
- **LpolFitParWid35 (LpolFitdParWid35)**  
Width  $\sigma$  (and uncertainty) of the ADC profile function using trigger 35 events.
- **LpolFitParSkew35 (LpolFitdParSkew35)**  
Skewness  $x_4$  (and uncertainty) of the ADC profile function using trigger 35 events.
- **LpolFitParLwid35 (LpolFitdParLwid35)**  
Skewness  $x_5$  (and uncertainty) of the ADC profile function using trigger 35 events.
- **LpolJitMaxSig**  
Maximum of the signal ADC profile distribution using trigger 3 events.
- **LpolJitMaxSigTime**  
Timing of the signal ADC profile distribution maximum using trigger 3 events.
- **LpolJitMaxStatTime**  
Timing of the maximum of statistics in the signal ADC profile distribution using trigger 3 events.
- **LpolJitMinTime**  
Timing of the lowest bin in the signal ADC profile distribution using trigger 3 events.
- **LpolJitMaxTime**  
Timing of the highest bin in the signal ADC profile distribution using trigger 3 events.
- **LpolJitMaxSig35**  
Maximum of the signal ADC profile distribution using trigger 35 events.
- **LpolJitMaxSigTime35**  
Timing of the signal ADC profile distribution maximum using trigger 35 events.
- **LpolJitMaxStatTime35**  
Timing of the maximum of statistics in the signal ADC profile distribution using trigger 35 events.
- **LpolJitMinTime35**  
Timing of the lowest bin in the signal ADC profile distribution using trigger 35 events.

- **LpolJitMaxTime35**  
Timing of the highest bin in the signal ADC profile distribution using trigger 35 events.

## 5 The Offline ADC Variables Block

To monitor any change in time, the pedestal and the laser high frequency noise are reported in this variables block for the delayed and the undelayed PMTs lines. In the analysis, pedestals are measured from the undelayed line, and the corrected for using ADC channels different from the signal ones. This correction is performed using the slope and offset parameters obtained via a linear fit to the pedestal ADC correlation between delayed and undelayed lines, separately for each PMT line [2].

- **AdcMPMT1p, AdcMPMT2p, AdcMPMT3p, AdcMPMT4p**  
Mean pedestal ADC in lines 1, 2, 3, and 4. Pedestals are calculated using laser\_off events with the Pockels Cell configured to circularly polarize the laser (trigger 2 and 34).
- **AdcSMPMT1p, AdcSMPMT2p, AdcSMPMT3p, AdcSMPMT4p**  
Error on the mean for pedestal ADCs in lines 1, 2, 3, and 4.
- **AdcMPMT1p\_96, AdcMPMT2p\_96, AdcMPMT3p\_96, and AdcMPMT4p\_96**  
Mean pedestal ADC in the 96 ns delayed lines 1, 2, 3, and 4.
- **AdcSMPMT1p\_96, AdcSMPMT2p\_96, AdcSMPMT3p\_96, and AdcSMPMT4p\_96**  
Error on the mean for pedestal ADCs in the 96 ns delayed lines 1, 2, 3, and 4.
- **AdcMPMT1l, AdcMPMT2l, AdcMPMT3l, and AdcMPMT4l**  
Mean laser high frequency noise ADC, calculated using laser\_on-empty\_bunch events in the lines 1, 2, 3, and 4.
- **AdcSMPMT1l, AdcSMPMT2l, AdcSMPMT3l, and AdcSMPMT4l**  
Error on the mean for the laser high frequency noise ADC in the lines 1, 2, 3, and 4.
- **AdcMPMT1l\_96, AdcMPMT2l\_96, AdcMPMT3l\_96, and AdcMPMT4l\_96**  
Mean laser high frequency noise ADC in the 96 ns delayed lines 1, 2, 3, and 4.
- **AdcSMPMT1l\_96m, AdcSMPMT2l\_96m, AdcSMPMT3l\_96m, and AdcSMPMT4l\_96m**  
Error on the mean for the laser high frequency noise ADC in the 96 ns delayed lines 1, 2, 3, and 4.



- **AdcPMT1\_s, AdcPMT2\_s, AdcPMT3\_s, and AdcPMT4\_s**  
Slope of the linear fit to the pedestal ADC correlation between delayed and undelayed lines 1, 2, 3, and 4 for .
- **AdcPMT1\_o, AdcPMT2\_o, AdcPMT3\_o, and AdcPMT4\_o**  
Offset of the linear fit to the pedestal ADC correlation between delayed and undelayed lines 1, 2, 3, and 4.

## 6 The Offline Compton Photons Variables Block

Variables related to the Compton photons impinging into the calorimeter are calculate per-minute basis and presented in this variable block. These values are calculated for the same data used for the beam polarization measurement.

- **LpolMeanX (LpolMeanY)**  
 $x$  ( $y$ ) coordinate of the reconstructed Compton centroid in the calorimeter combining signal events with trigger 3 and 35.
- **LpolMeanX3 (LpolMeanY3)**  
 $x$  ( $y$ ) coordinate of the reconstructed Compton centroid in the calorimeter using only events with signal trigger 3.
- **LpolMeanX35 (LpolMeanY35)**  
 $x$  ( $y$ ) coordinate of the reconstructed Compton centroid in the calorimeter using only events with signal trigger 35.
- **LpolNormCalo**  
Luminosity normalised to the beam current.
- **LpolMCaloSum**  
Luminosity calculated as the mean ADC sum per signal event, where the sum runs over the four calorimeter PMTs. The mean is calculated separately for the two signal triggers 3 and 35, and their arithmetic mean is presented as luminosity value.
- **LpolEnReso**  
Energy resolution.
- **LpolNormCaloNoJC**  
Luminosity normalised to the current without performing the jitter correction on ADC signal.
- **LpolMCaloSumNoJC**  
Luminosity calculated without performing the jitter correction on ADC signal.
- **LpolEnResoNoJC**  
Energy resolution calculated without performing the jitter correction on ADC signal.

## 7 The Proton Beam Variables Block

The current of the proton beam bunches is retrieved from slow files, as received by the HERA machine group BKR. The values presented here correspond to the last current measurement performed before the beam polarization measurement. The corresponding timestamps are reported in the variable block table **TIMING**.

- **ProtonsBunches**  
Dummy variable for the number of proton bunches (always 220) saved in the table for convenience reasons.
- **ProtonBunchCurrent**  
Current of the 220 proton bunches.

## 8 The Laser System Variables Block

Whenever a parameter in the laser setting was changed (or whenever it was required), as the firing rate, the information of the laser configuration was retrieved, and saved in the HERMES DAQ.

- **LpolLaserRate**  
Laser firing rate (in Hz).
- **LpolLaserInDelay**  
Laser trigger delay offset (in ns).
- **LpolLaserTrigger**
  
- **LpolLaserNrOfShots**  
Laser number of shots since the replacement of the flash lamp.
- **LpolLaserAngle**  
Orientation of the rotatable half-wave plate. The plate rotated the orientation of the linear polarization, thus acting as an optical attenuator in combination with a subsequent Glan-Thompson prism, which filtered the vertical component, and directed the horizontal component into a beam dump.
- **LpolLaserZeroAngle**  
Zero angle of the rotatable half-wave plate.
- **LpolLaserStatus**  
Hardware status of the laser system.
- **LpolLaserLampVoltage**  
Voltage value of the flash lamp (used to amplify the seed laser).

## 9 The Lepton Beam Variables Block

Periodically the information on the position and slope of the HERA lepton beam in the interaction point with the laser is read via beam position monitors at HERA tunnel locations OR46 and OR52, 46 m and 52 m downstream the HERMES detector, respectively.

- **LpolBeamPosX**  
*x* position (mm) of the lepton beam.
- **LpolBeamSlopeX**  
*x* slope of the lepton beam.
- **LpolBeamPosY**  
*y* position (mm) of the lepton beam.
- **LpolBeamSlopeY**  
*y* slope of the lepton beam.

## 10 The Calorimeter Variables Block

The position in *x* and *y* of the calorimeter (in the HERA coordinate system), is set via two stepper motors, one device per coordinate.

- **LpolCaloX**  
*x* coordinate (mm) of the calorimeter.
- **LpolCaloY**  
*y* coordinate (mm) of the calorimeter.
- **LpolCaloStatusX**  
Hardware status of the stepper motor (and its controller) responsible for the calorimeter movement along the *x* coordinate.
- **LpolCaloStatusY**  
Hardware status of the stepper motor (and its controller) responsible for the calorimeter movement along the *y* coordinate.

## 11 The PMTs Voltage Variables Block

The high voltage to the PMTs of both the crystal and the sandwich calorimeter was set and monitor by a CAEN crate.

- **LpolHvCR1**  
High voltage value (Volt) applied to the photomultiplier Nr.1, top left while watching at the incoming Compton photons.

- **LpolHvCR2**  
High voltage value (Volt) applied to the photomultiplier Nr.2, top right while watching at the incoming Compton photons.
- **LpolHvCR3**  
High voltage value (Volt) applied to the photomultiplier Nr.3, bottom left while watching at the incoming Compton photons.
- **LpolHvCR4**  
High voltage value (Volt) applied to the photomultiplier Nr.4, bottom right while watching at the incoming Compton photons.
- **LpolHvSW**  
High voltage value (Volt) applied to the photomultiplier of the sandwich calorimeter.

## 12 The Laser Transport Line Variables Block

The laser is transported in a vacuum pipe to the interaction region, and then to the analyser box AB2 (to measure its circular polarization) via eight mirrors, Fig. 3, which could be rotated in two perpendicular directions (called  $x$  and  $y$  for convenience) via stepper motors.

- **OpticsChannels**  
Dummy variable for the number of proton bunches (always 8) saved in the table for convenience reasons.
- **OpticsMirrorX**  
Orientation in  $x$  of the eight mirrors.
- **OpticsMirrorY**  
Orientation in  $y$  of the eight mirrors.
- **OpticsMirrorStatus**  
Hardware status of the eight mirrors.

## 13 The Pockels Cell Variables Block

The vertically polarized laser beam, surviving the Glam-Thompson filter, is circularly polarized by a Pockels Cell, to which is applied either a positive or negative high voltage, according to the helicity required.

- **LpolPcHvPos**  
Positive High voltage value (Volt) applied to the Pockels Cell.
- **LpolPcHvNeg**  
Negative High voltage value (Volt) applied to the Pockels Cell.
- **LpolPcStatus**  
Hardware status of the Pockels Cell.

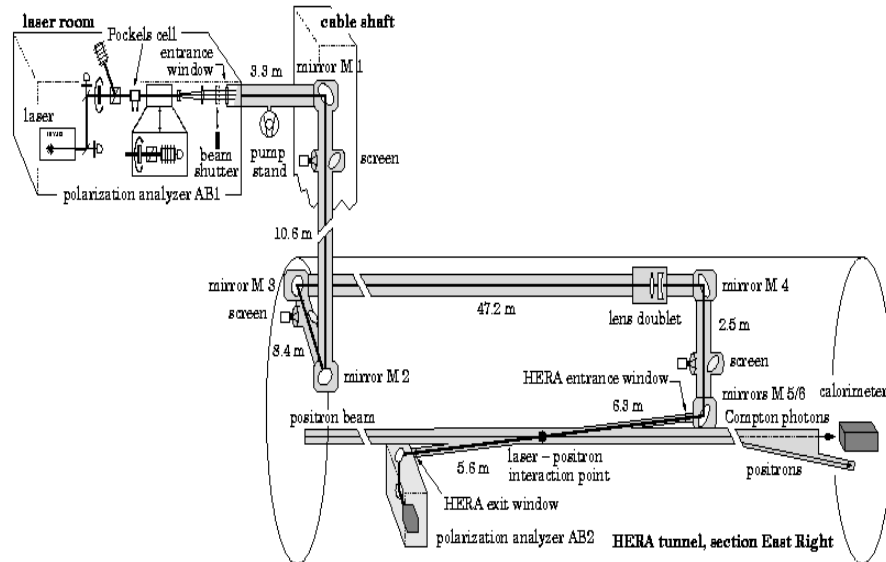


Figure 3: Drawing of the laser transport line. The laser is driven to the interaction point via mirror 1 to 6. Mirrors 7 and 8 drive in sequence the laser to the analyzer box AB2.

## 14 The Online TPOL Variables Block

During data acquisition, some online TPOL-related variables are saved in the HERMES DAQ, and available in this table.

- **OnlineTpol**  
Online beam polarization value measured per-minute basis.
- **OnlineDTpol**  
Statistical uncertainty of the polarization measurement.
- **OnlineTpolLumi**  
Compton photons luminosity.
- **OnlineTpolLinLight**  
Linear light component to the TPOL laser.
- **OnlineTpolFocus**  
Compton photons focus at the TPOL calorimeter.

- **OnlineTpolTabPos**  
*y* position of the TPOL calorimeter.
- **OnlineTpolVacuum**  
Pressure value in the laser pipe.
- **OnlineTpolRateOnL**  
Acquisition signal rate for the firing laser left-handed polarized.
- **OnlineTpolRateOnR**  
Acquisition signal rate for the laser right-handed polarized.
- **OnlineTpolRateOffL**  
Acquisition signal rate with the non-firing laser right-handed polarized.
- **OnlineTpolRateOffR**  
Acquisition signal rate with the non-firing laser right-handed polarized.

## 15 The Online LPOL Variables Block

During data acquisition, some online LPOL-related variables are saved in the HERMES DAQ, and available in this table.

- **OnlineLpol**  
Online beam polarization value measured per-minute basis.
- **OnlineDLpol**  
Statistical uncertainty of the polarization measurement.
- **OnlineLpolCaloNorm**  
Online luminosity normalized to the beam current.
- **OnlineLpolReso**  
Online energy resolution (in percent).
- **OnlineLpolLumi**  
Online luminosity.
- **OnlineLpolFracOvfl**  
Fraction of ADC overflows.
- **OnlineSlowEtaX**  
Online  $\eta_x$  coordinate for the Compton photons cone.
- **OnlineSlowEtaY**  
Online  $\eta_y$  coordinate for the Compton photons cone.
- **OnlineLpolDelOff**  
Online laser trigger delay offset.

- **OnlineLpolStatus**

Online data quality status, which can have the following values:

- 100: OK, pol.measurement in progress.
- 110: OK, sandwich prototype operation.
- 201: pol.calculation: bad  $\chi^2$  in fitting the ADC profile (for more than five measurements in row).
- 301: energy resolution bad (larger than 30%).
- 501: Compton photon cone position bad ( $ABS(\langle x \rangle) > 5 \parallel ABS(\langle y \rangle) > 5 \text{ mm}$ ).
- 552: too many ADC overflows.
- 601: calorimeter signal low (luminosity value lower than 300 ADC).
- 702: no updates from HERA.
- 802: no calorimeter signal (luminosity value lower than 50 ADC).
- 902: laser off? (no heraclock signal!).
- 1000: LPOL is calibrating.
- 1100: LPOL waiting for ramped beam.
- 1300: cannot read from DSP: DAQ down?

## 16 The HERMES Target Variables Block

The status of the HERMES target density and of the recoil detector magnet status can be accessed in the variable `LpolRunType`.

- **LpolRunType**

- 0 → unpolarized gas (5 - 10 times ABS density) and recoil magnet on.
- 1 → unpolarized gas (5 - 10 times ABS density) recoil magnet off.
- 16 → unpolarised high density gas (80 times ABS density) and recoil magnet on.

## 17 The Timing Variables Block

- **LpolTimeStart**

Unix time of the first Compton event included in the per-minute basis LPOL beam polarization offline measurement timestamp.

- **LpolTimeStamp**

Unix timestamp of the per-minute basis LPOL beam polarization offline measurement timestamp.

- **LpolRun**

HERMES run during the beam polarization measurement.

- **LpolProtonTime**  
Unix time for the latest proton beam current online measurement, before the LPOL offline measurement timestamp.
- **LpolLaserTime**  
Unix time for the latest online access to the laser system information, before the LPOL offline measurement timestamp.
- **LpolBeamTimeX**  
Unix time for the latest online access to the  $x$  coordinate of the lepton beam, before the LPOL offline measurement timestamp.
- **LpolBeamTimeY**  
Unix time for the latest online access to the  $y$  coordinate of the lepton beam, before the LPOL offline measurement timestamp.
- **LpolCaloTime**  
Unix time for the latest online access to the calorimeter coordinates, before the LPOL offline measurement timestamp.
- **LpolHvTime**  
Unix time for the latest online access to the CAEN HV module to retrieve or set the high voltage of the calorimeter photomultiplier, before the LPOL offline measurement timestamp.
- **LpolOpticsTime**  
Unix time for the latest online access to the laser mirror controllers, to retrieve or set the mirror orientation values, before the LPOL offline measurement timestamp.
- **LpolPcTime**  
Unix time for the latest online access to the HV module to retrieve or set the high voltage of the Pockels Cell, before the LPOL offline measurement timestamp.
- **OnlineTpolTime**  
Unix time for the latest online access to the TPOL online measurements during data taking, before the LPOL offline measurement timestamp.
- **OnlineLpolTime**  
Unix time for the latest online access to the LPOL online measurements during data taking, before the LPOL offline measurement timestamp.
- **LpolTargetTime** Unix time for the latest online access to the HERMES target status, before the LPOL offline measurement timestamp.



## 18 Examples of Offline Analysis

## 19 Conclusions

Additional documentation of the LPOL polarimeter concept and description can be found in the directory `h1repro7:/x03/data/lpol/DOCU`, and in [1]- [2].

## References

- [1] M. Beckmann et al., The Longitudinal Polarimeter at HERA, NIM A **479** (2002) 334-348.
- [2] F. M. Menden, Determination of the Gluon Polarization in the Nucleon, PhD Thesis 2001, DESY-THESIS-2001-060.