LUMI System Energy Calibration

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Calibration procedures

- LUMI pair spectrometer calibration
  - movable collimator
  - benefits from E calibration for LU MI measurement
- *e* tagger calibration
  - LUMI pair spectrometer $\gamma \rightarrow$ tagger *e*
- 0° γ calorimeter calibration
  - tagger *e* $\rightarrow$ calorimeter γ

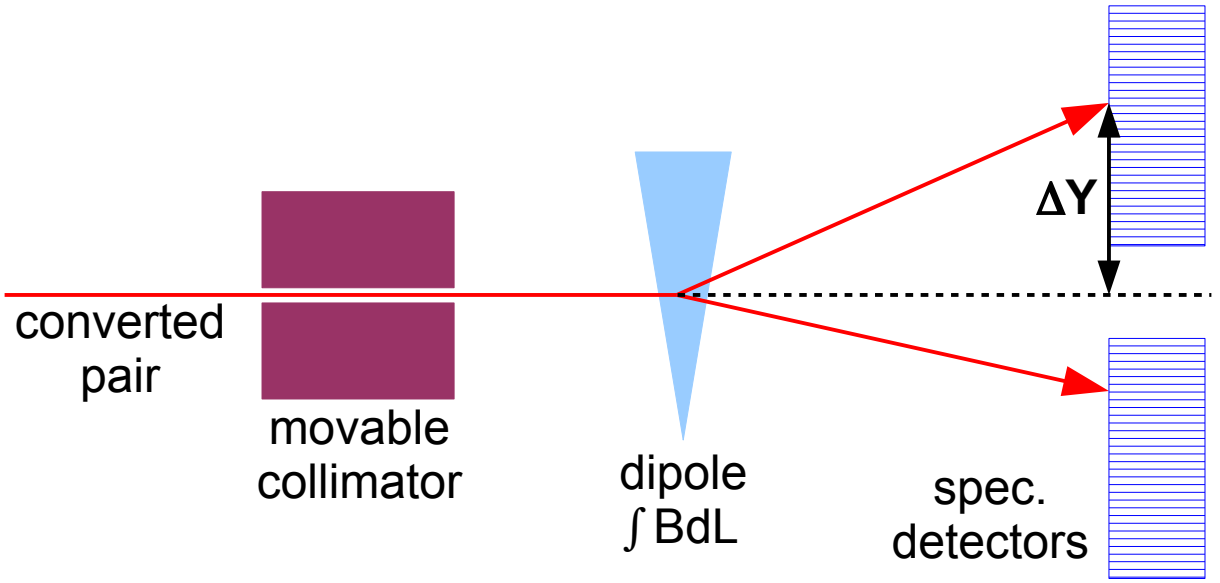
Required hardware

- movable collimator
  challenge: sync. rad. heating

Follows implementation by ZEUS @ HERA

LUMI pair spectrometer calibration

- Movable collimator: out of γ beam during physics running
  inserted in γ beam for special calib. runs
  (@ ZEUS: few min. end of HERA fills)

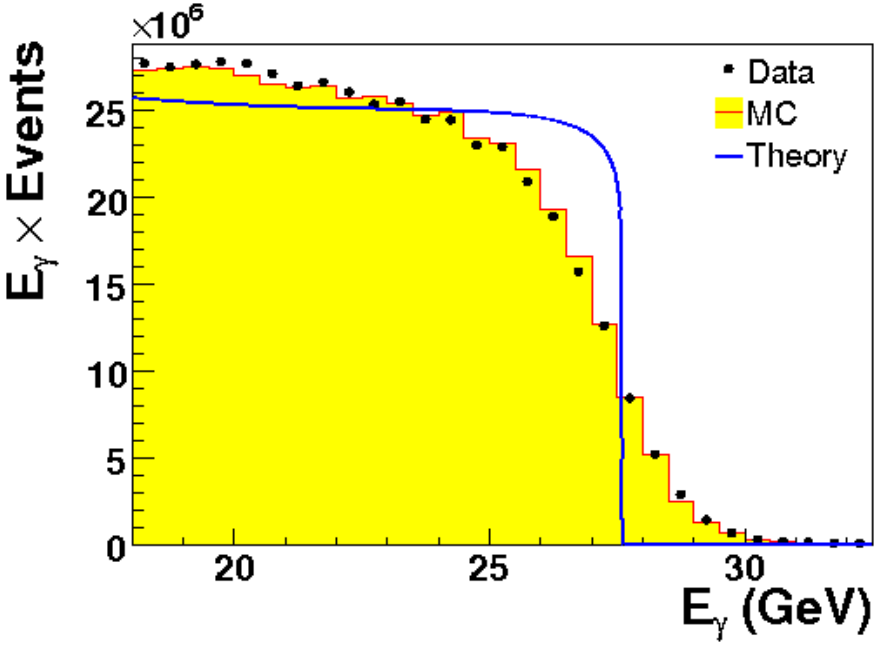


- Collimator defines $e^{\pm}$ position, direction before dipole
- Spec. detector measures $e^{\pm}$ position after dipole
  $\Rightarrow$ true magnetic spectrometer
- With dipole $\int$ BdL $\Rightarrow$ $e^{\pm}$ energy
- Calibrate spec. calorimeter channels

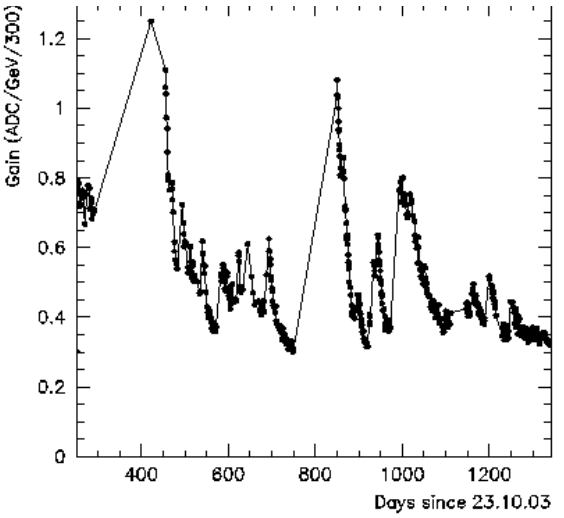
LUMI pair spectrometer calibration

- Spectrometer LUMI measurement does not need energy measurement *per se*
  - spec. acceptance (i.e. sensitive brems. cross section) defined by spec. geometry

- Simulation is need for precise acceptance determination
  - energy measurements data↔simulation verify MC
  - e.g. ZEUS spec. brems. endpoint w/ higher dipole B: ~1% agreement



- Also need some E calibration for sensible triggering, event selections
  - e.g. ZEUS spec. sync. rad. damage gain worst channel last 3 years HERA:



e tagger, 0° γ calorimeter calibration

- Need special low luminosity runs:
  ensure <<1 brems. γ per bunch ×ing,
  tagged *e* and γ from same event

- *e* tagger calibration
  - coincidence γ in spectrometer & *e* in tagger
  - know E_γ from calibrated spectrometer
  - tagger $E_e = E_{beam} - E_\gamma$

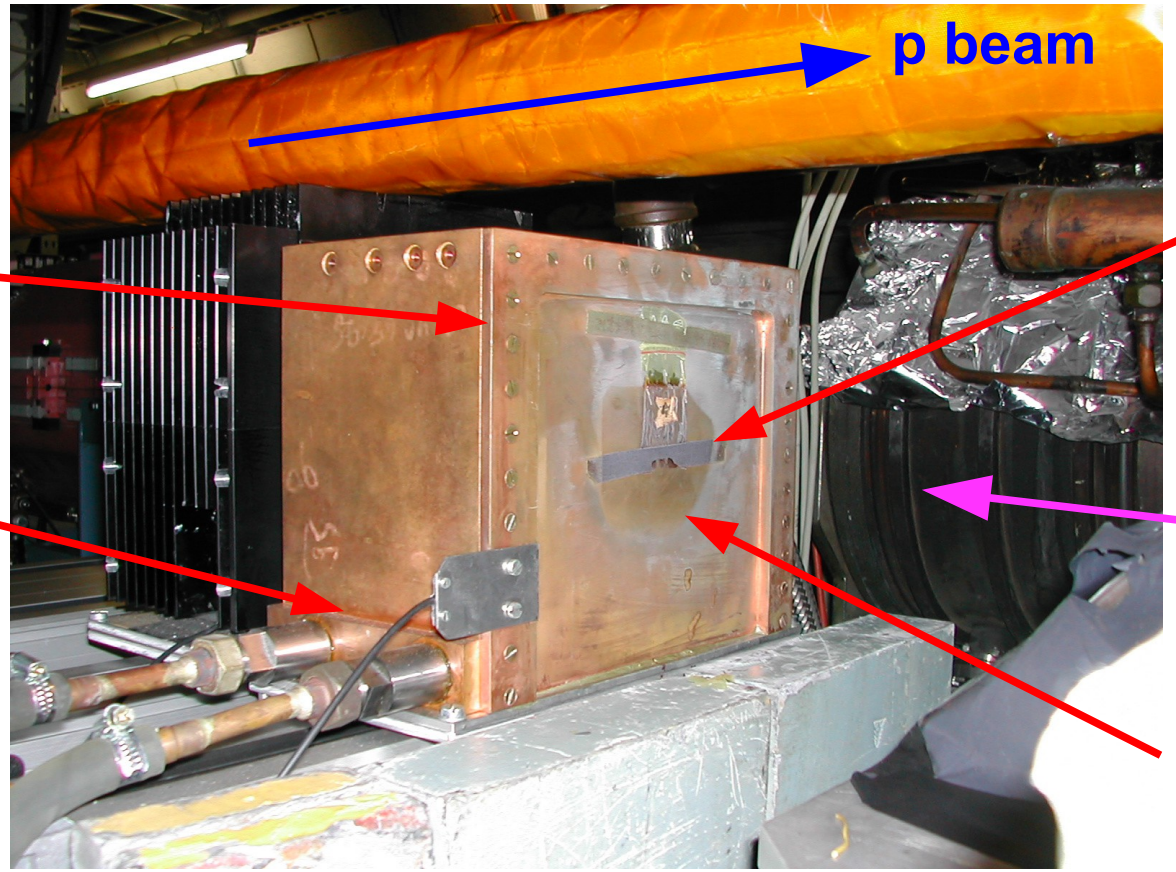
  $\Rightarrow$ calibrate *e* tagger

- 0° γ calorimeter calibration
  - *e* in tagger & γ in 0° calorimeter
  - know E_e from calibrated tagger
  - calorimeter $E_\gamma = E_{beam} - E_e$

  $\Rightarrow$ calibrate 0° γ calorimeter

Required hardware

- Need a movable collimator
- Don't have picture of ZEUS collimator, but identical structure:
  0.7 X_0 Cu+C absorber in front of 0° γ calorimeter:



- Similar design w/ water cooling (sync. rad.) may be adequate
  only in beam few minutes, not as severe as γ exit window/converter
- Should include in planning soon