ZEUS Luminosity Upgrade Group *7 May 2001*

DESY

Preliminary Results from the 6m-Tagger Beam Test

- From 17 April to 28 May (In progress !!)
- Photographs of the Tagger
- LED Calibration
- Calibration Procedure (pC/GeV)
  - Signal spectra
  - Energy resolution
  - Position resolution
  - Fiducial-volume definition

J. A. Crittenden

DESY

Introducing the Tagger (I)

1890 holes

Introducing the Tagger (II)

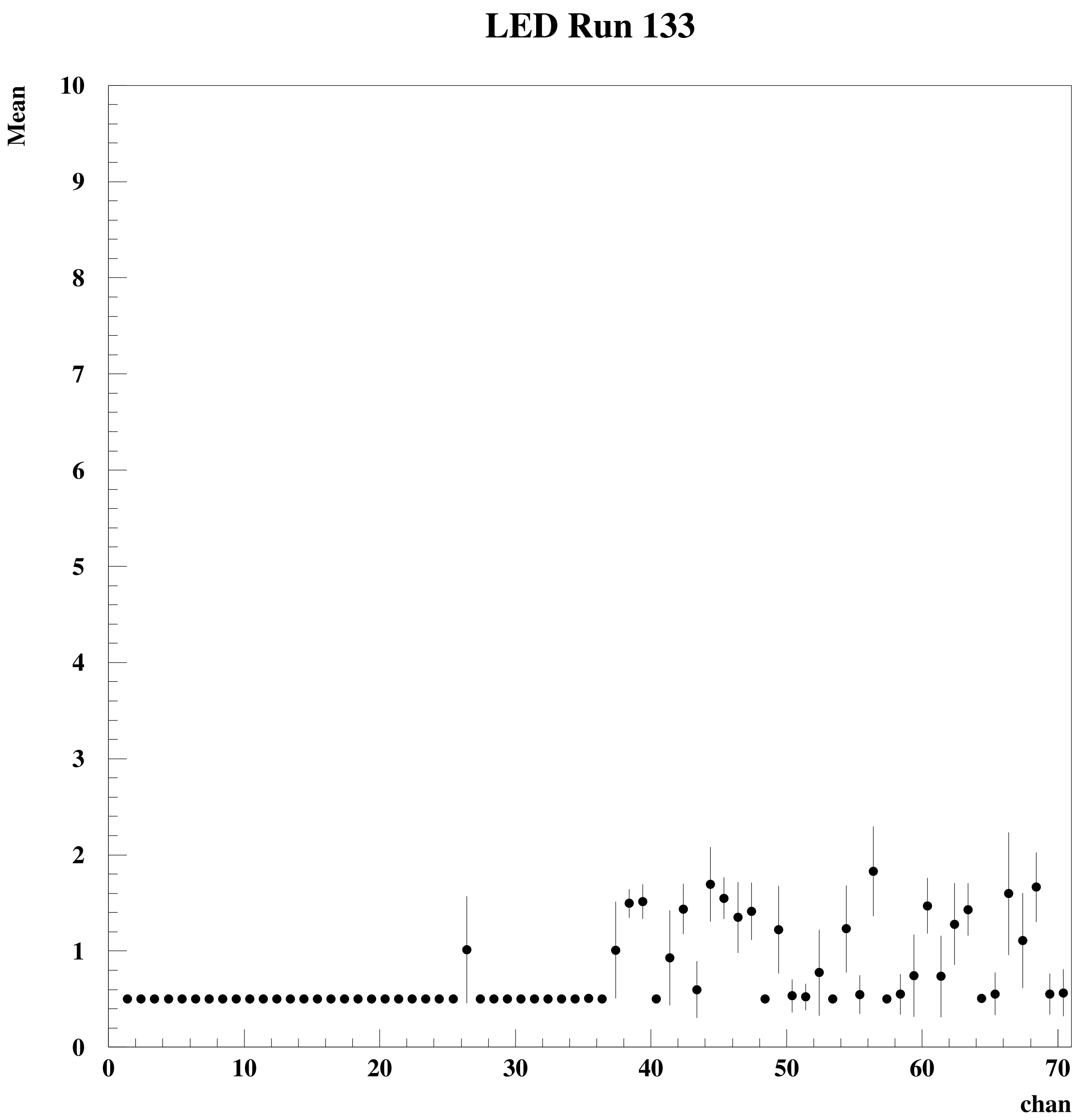
1890 fibers

Introducing the Tagger (III)

$14 \times 5 = 70$ **channels**

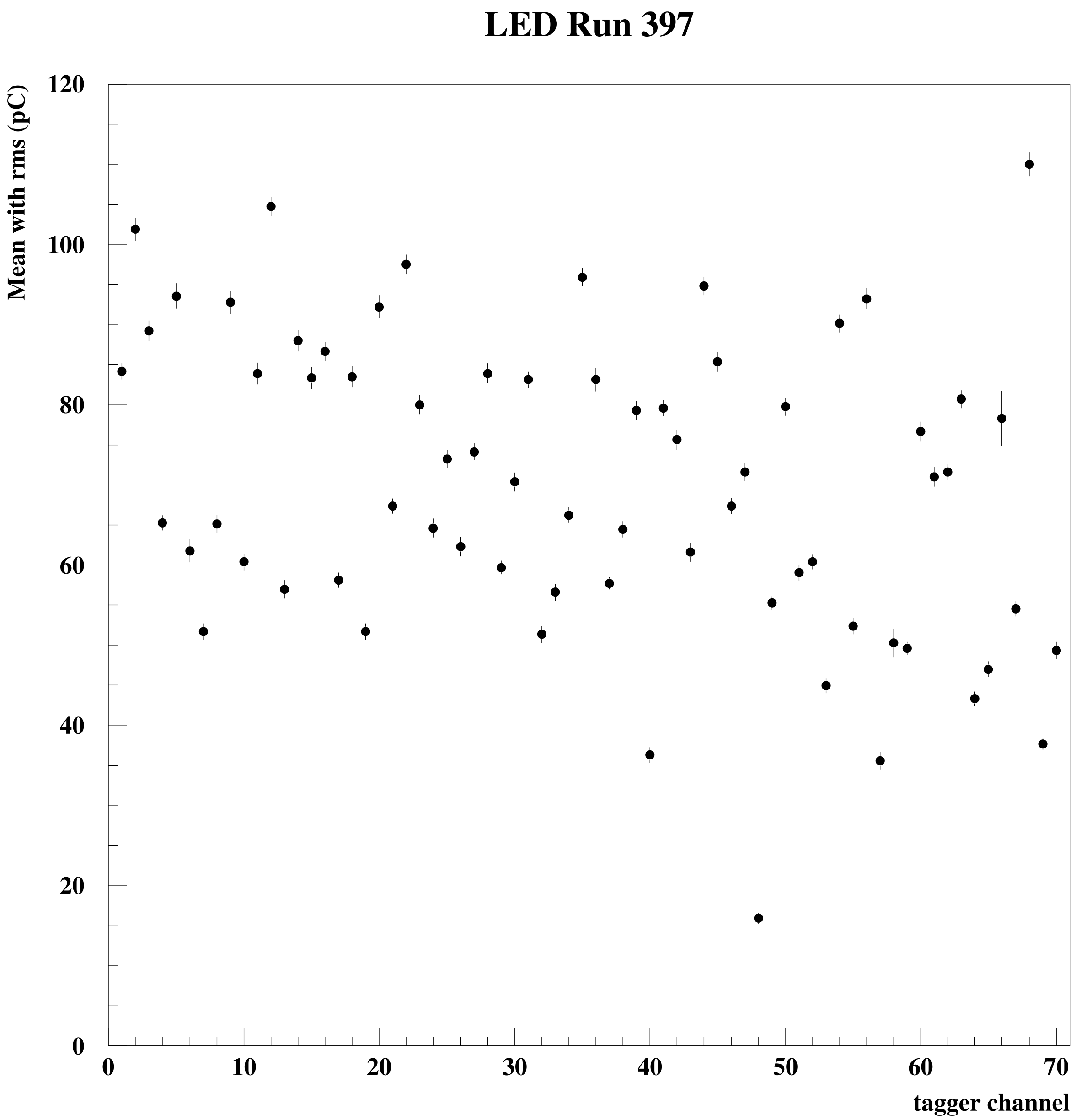
LED Calibration (I)

Initial attempt ...



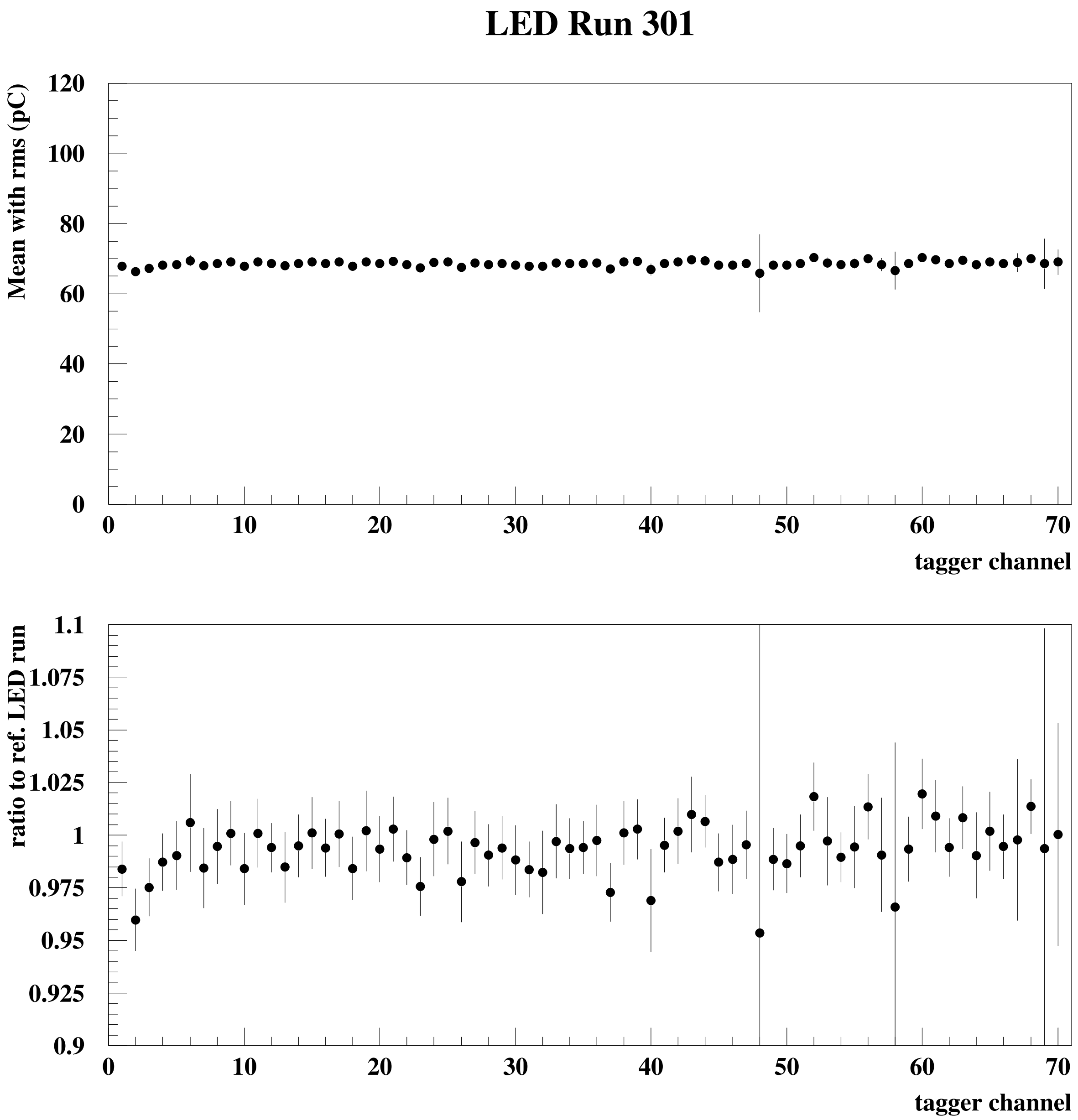
Not enough light!

LED Calibration (II)



System much improved after May 2

LED Calibration (III)



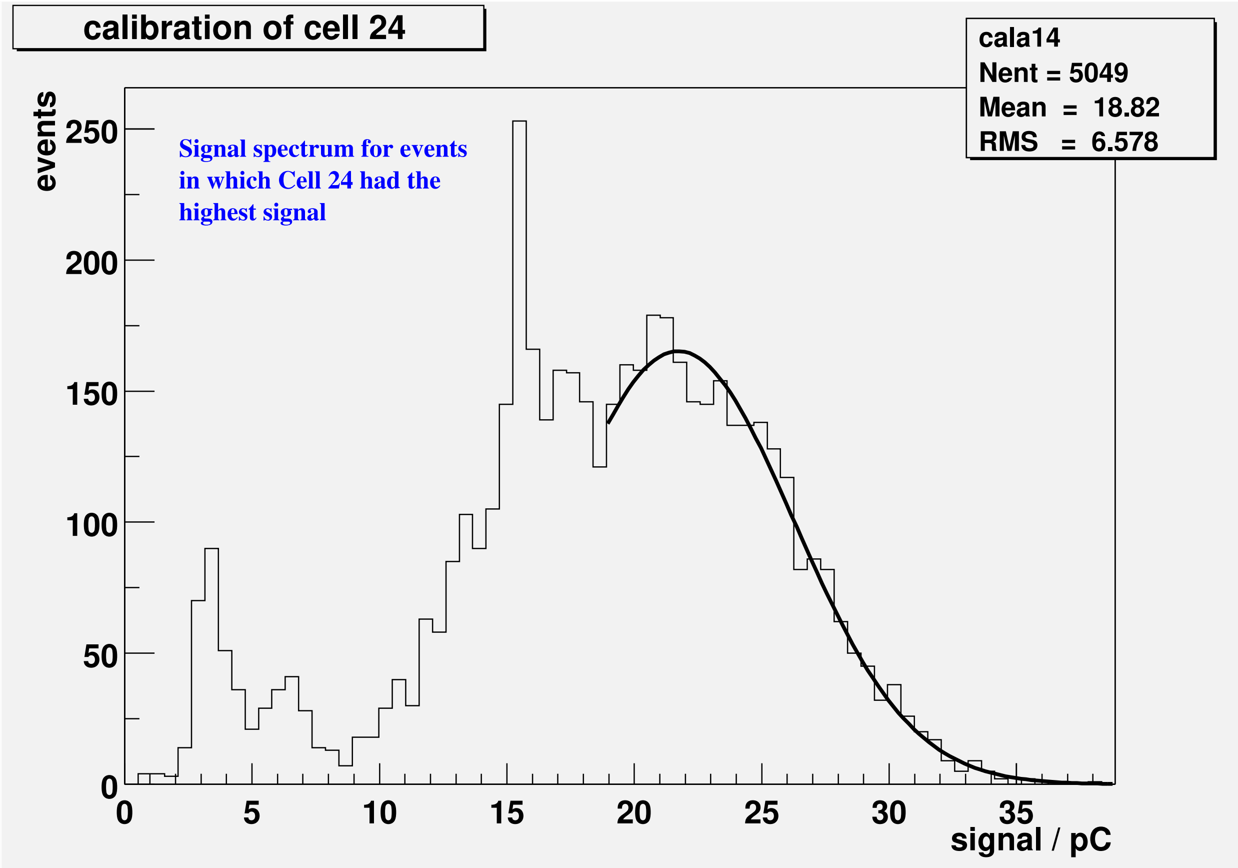
LED monitor of gain stability

Absolute Calibration

Calibration Algorithm

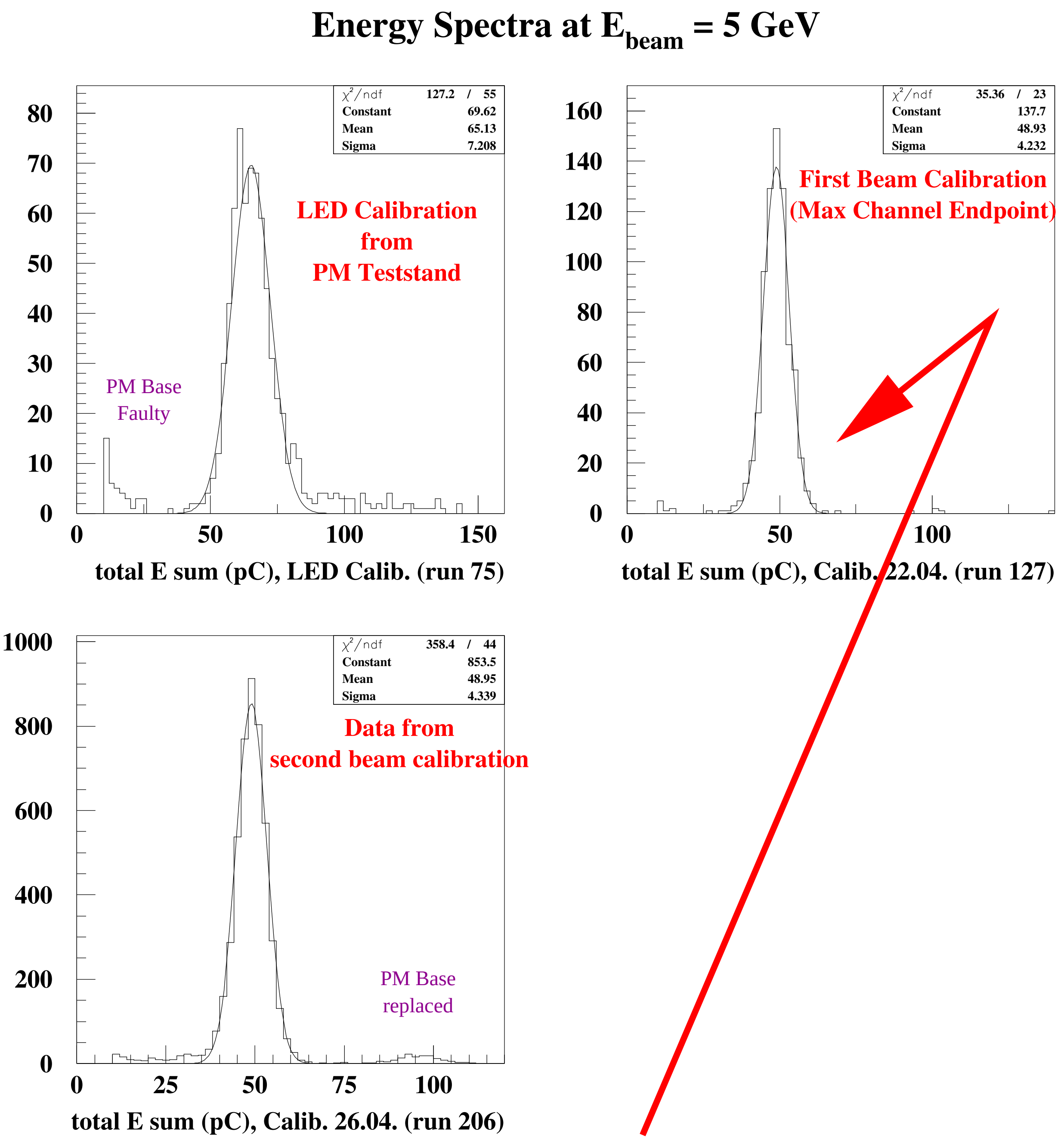
Maximum-Channel Endpoint Method

Based on an smooth distribution of monoenergetic electrons



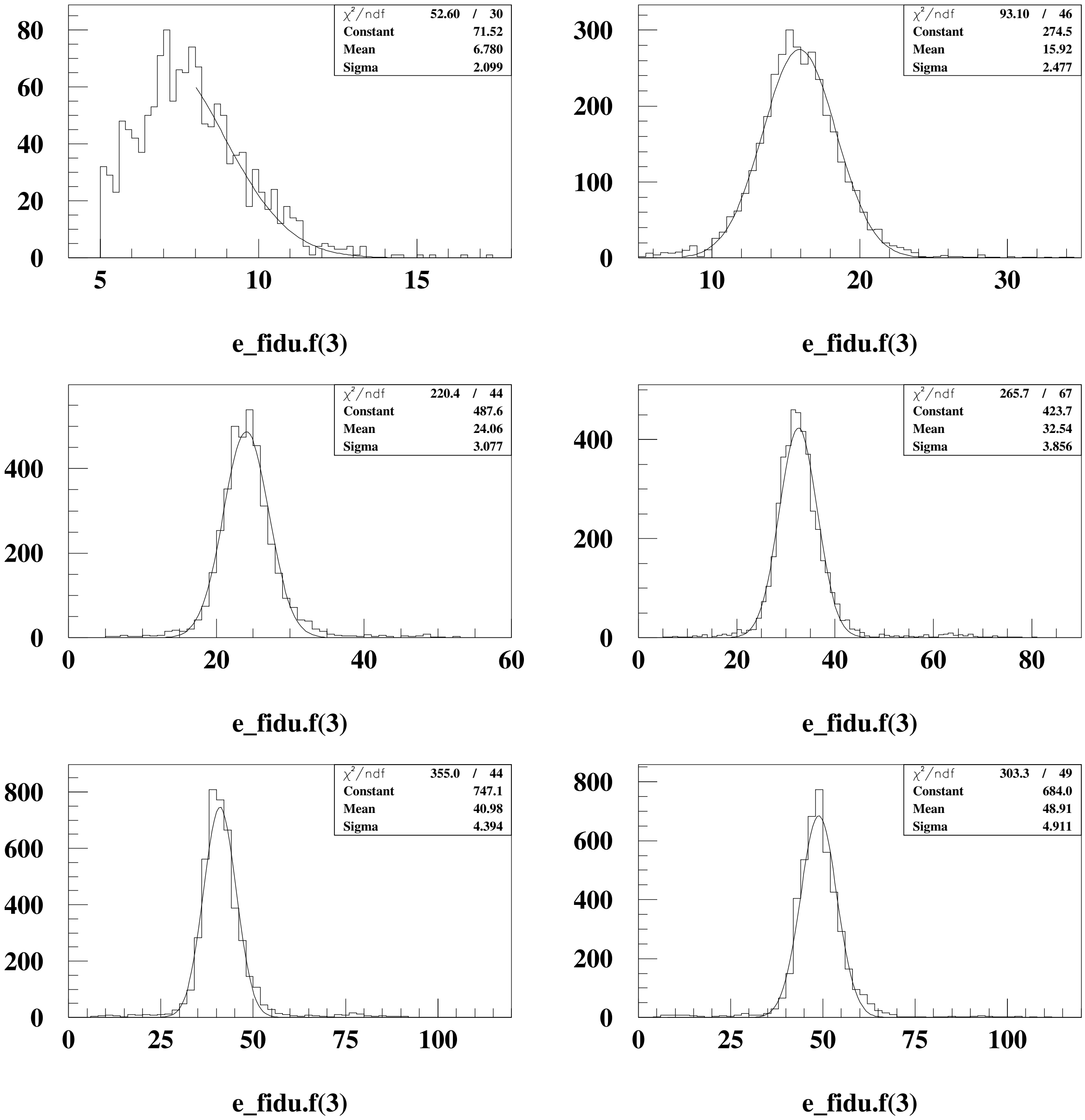
Requires ≈400k events ⇒ ≈6 hours

Signal Spectra for 5 GeV

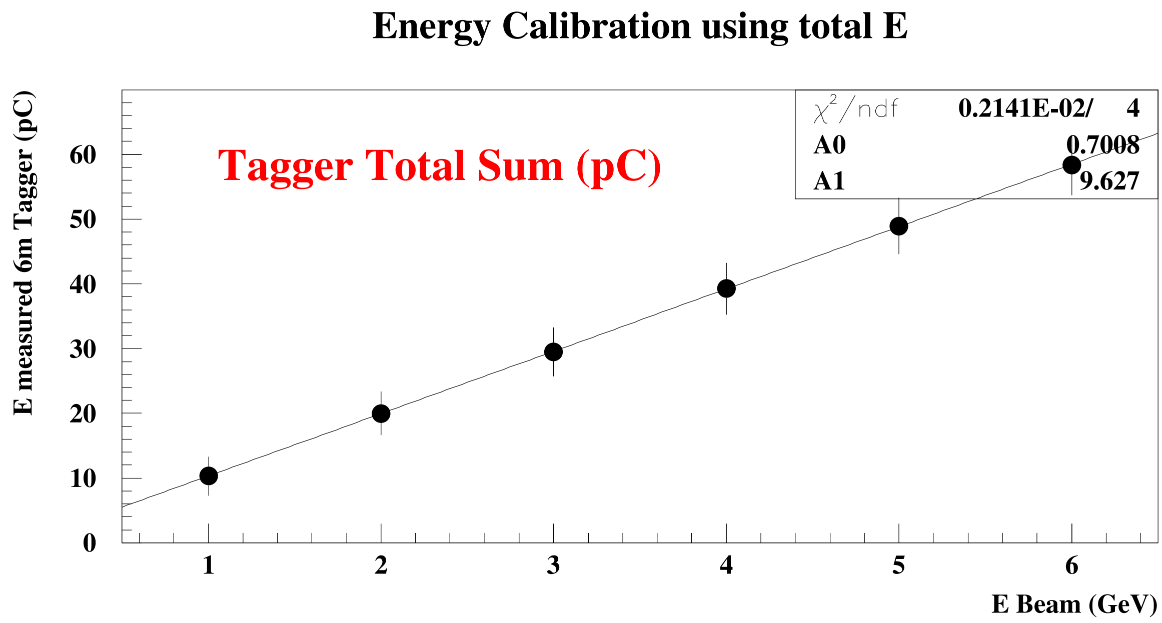


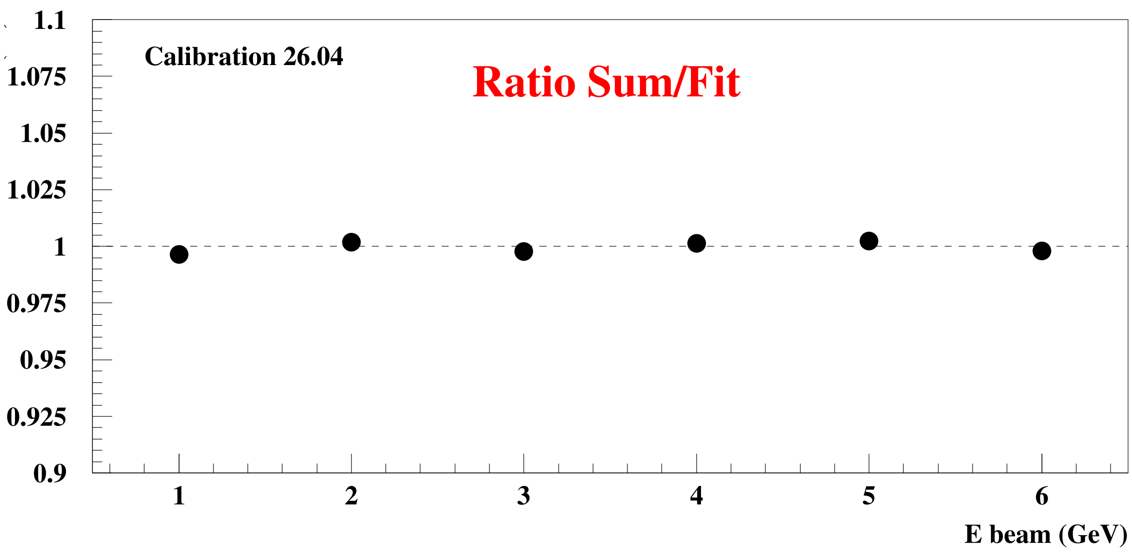
Very clean !!

Signal Spectra for 1–6 GeV



Linearity 1–6 GeV





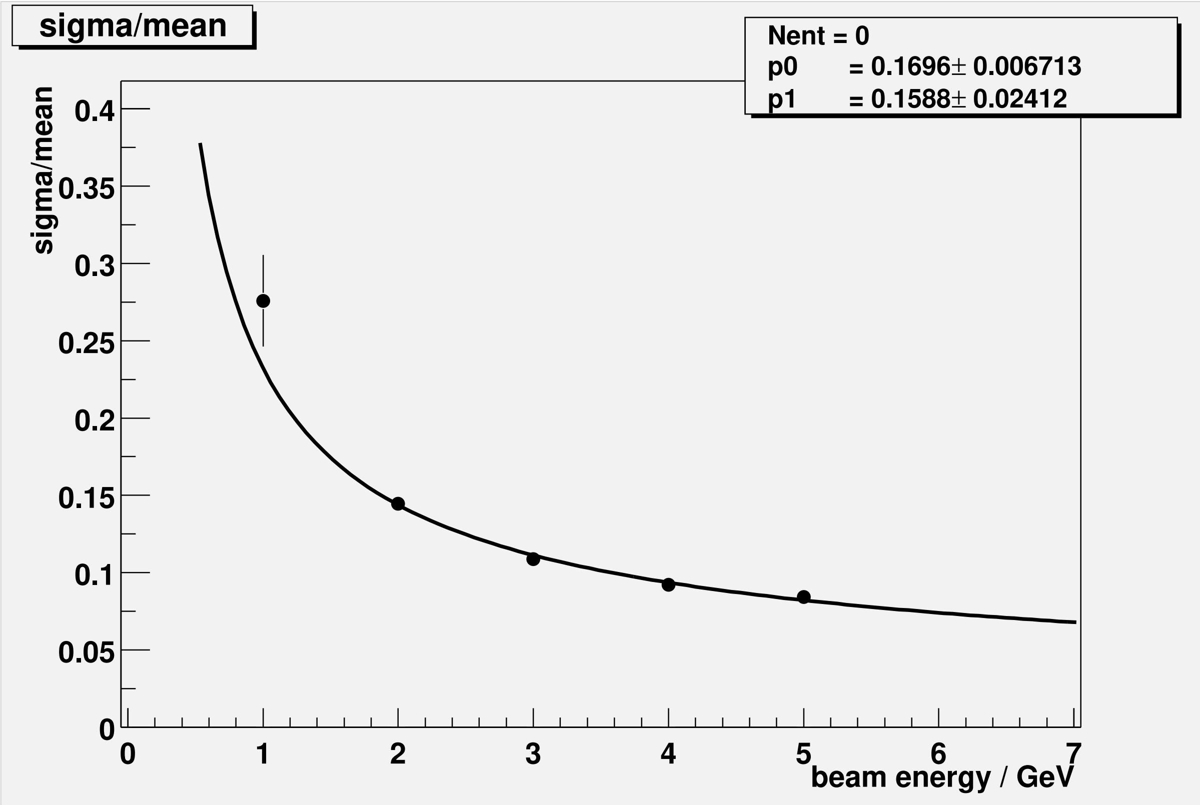
Linearity better than 1%

Absolute scale: 9.6 pC/ GeV

$\Rightarrow$ *Saturation (400 pC) at* $\approx$*40 GeV*

$\Rightarrow$ *LSB: 10* MeV

Energy Resolution

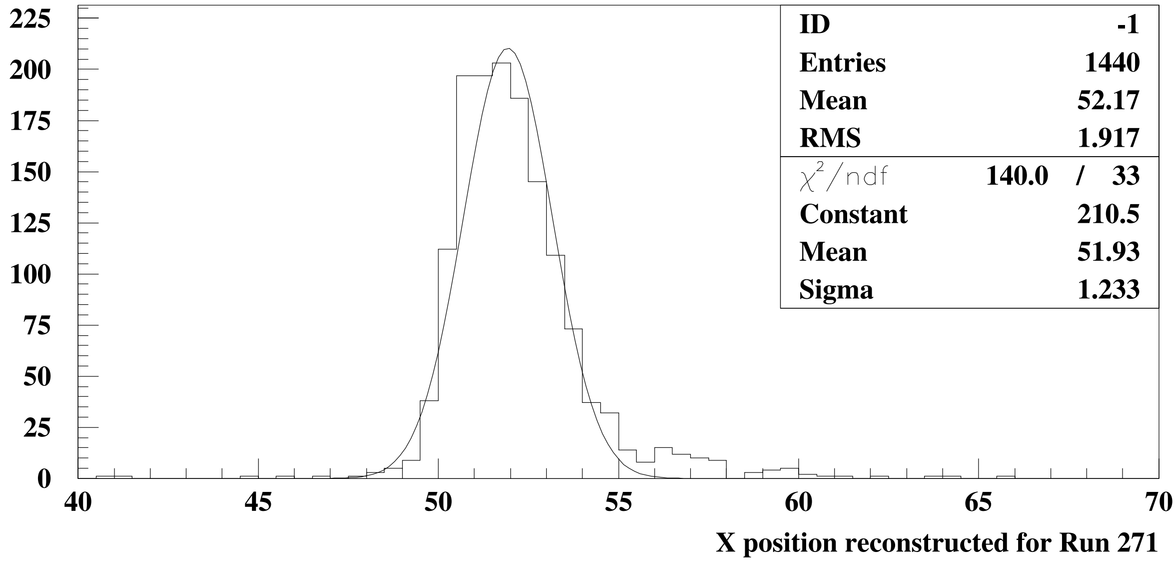


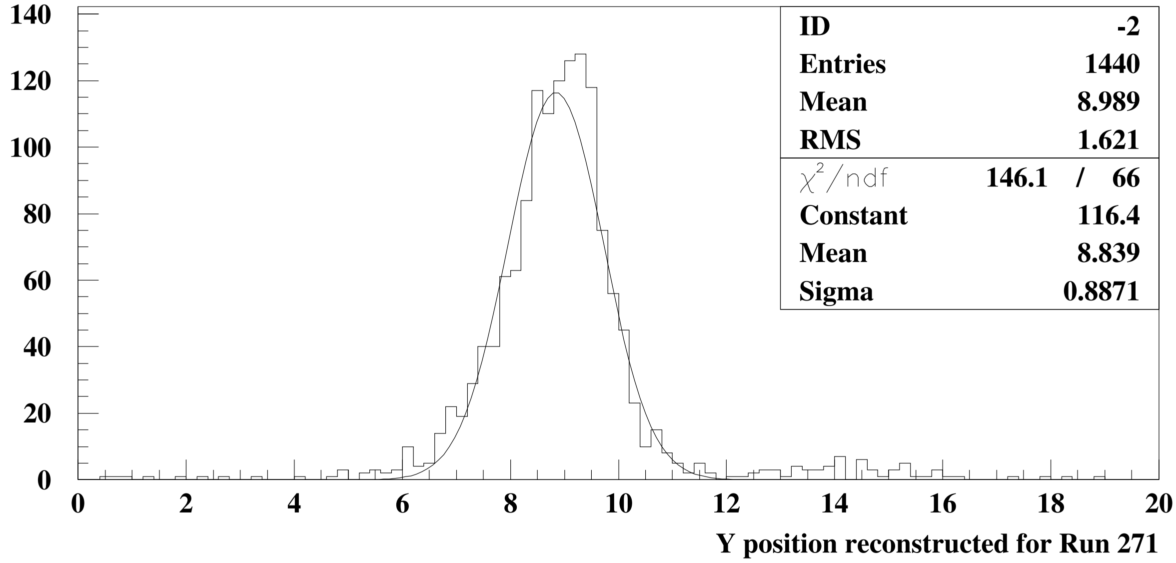
$17\%/\sqrt{E}$ observed on first attempt

(More recent scan looked even better)

Position Resolution

Position Reconstruction: energy weighted sum over all cells

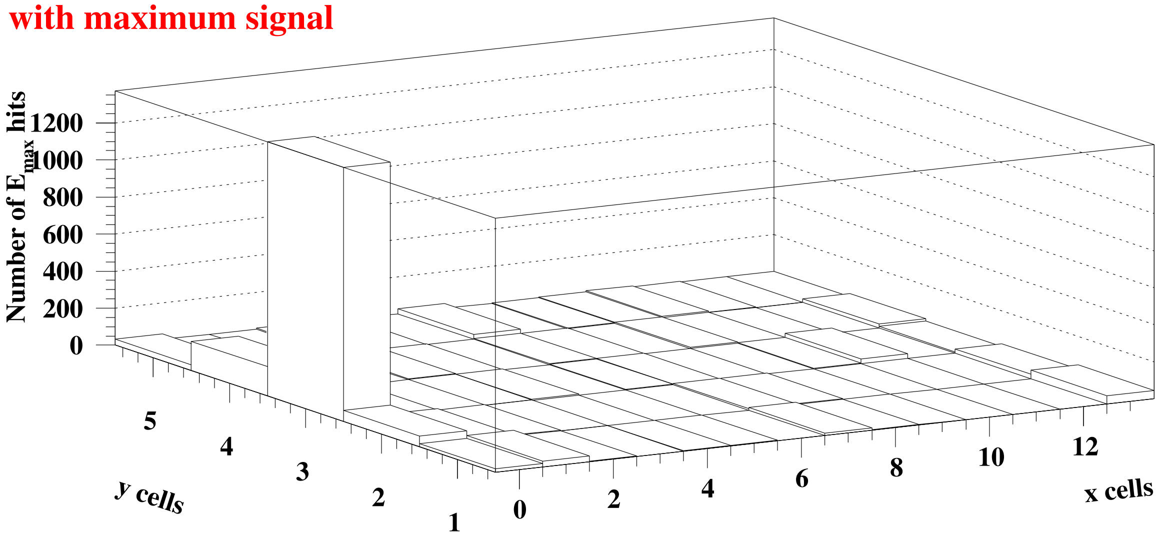


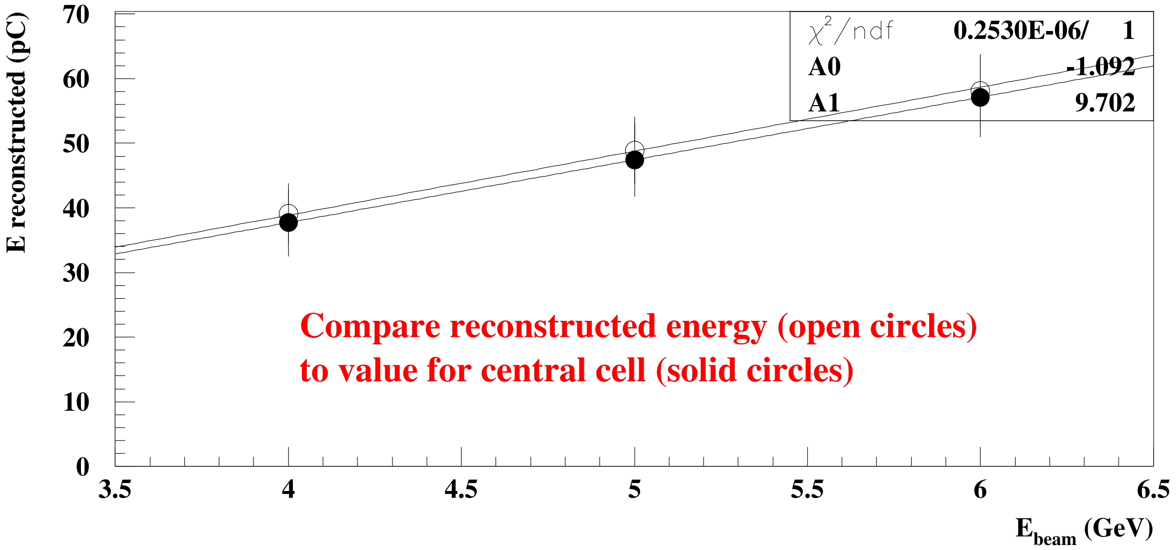


Resolution $\approx$ 1 mm in X and Y

Fiducial Volume Definition (I)

Position beam such that edge cell has many events with maximum signal

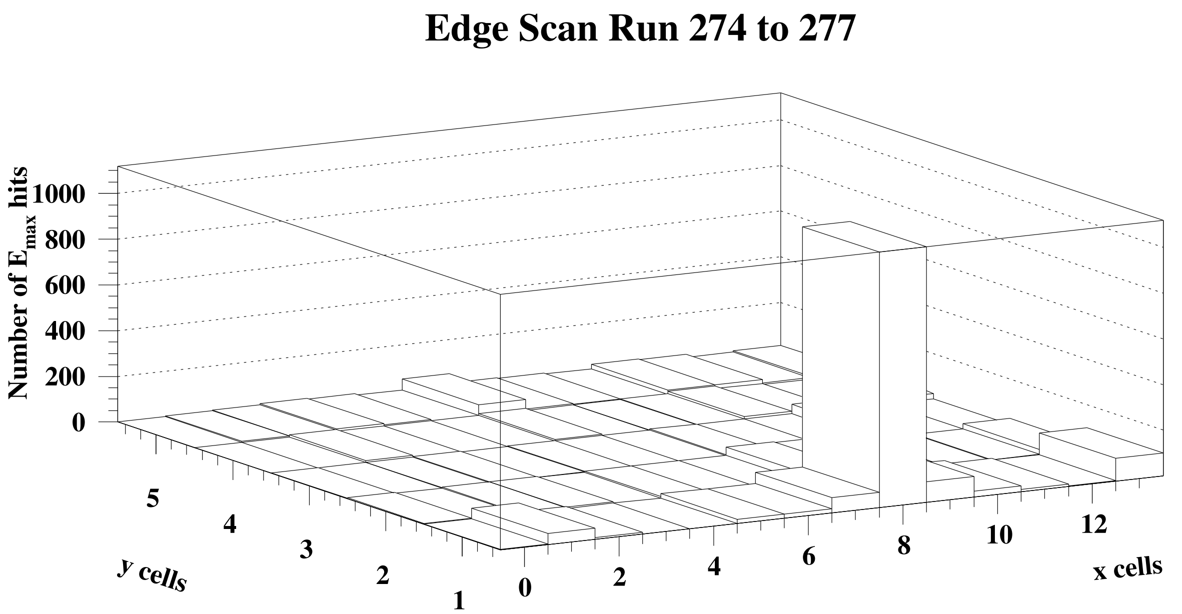


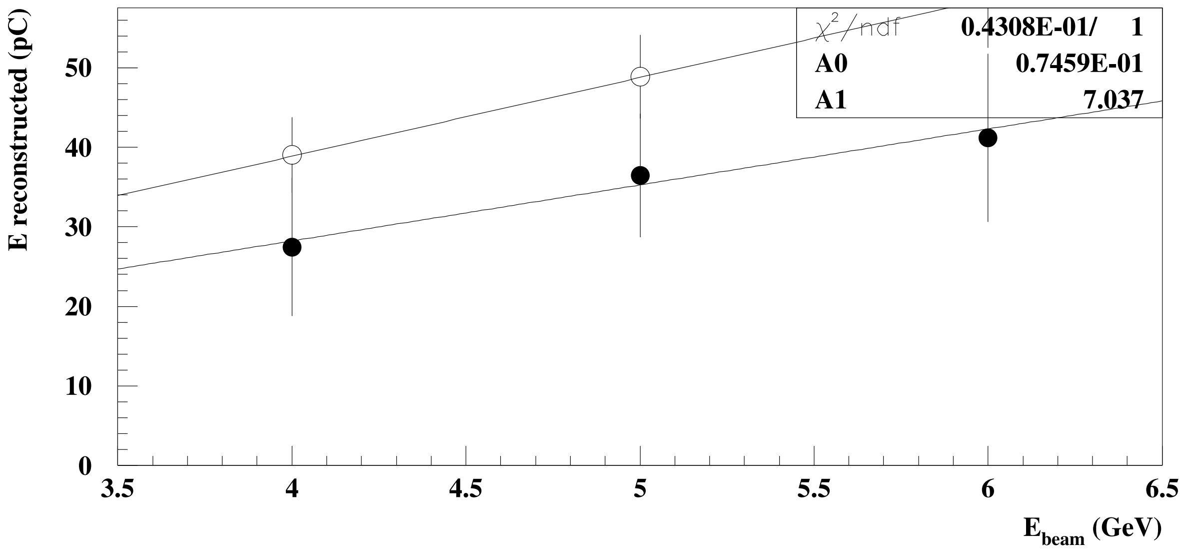


Edge cell (X) signal nearly complete even when maximum

(energy-independent)

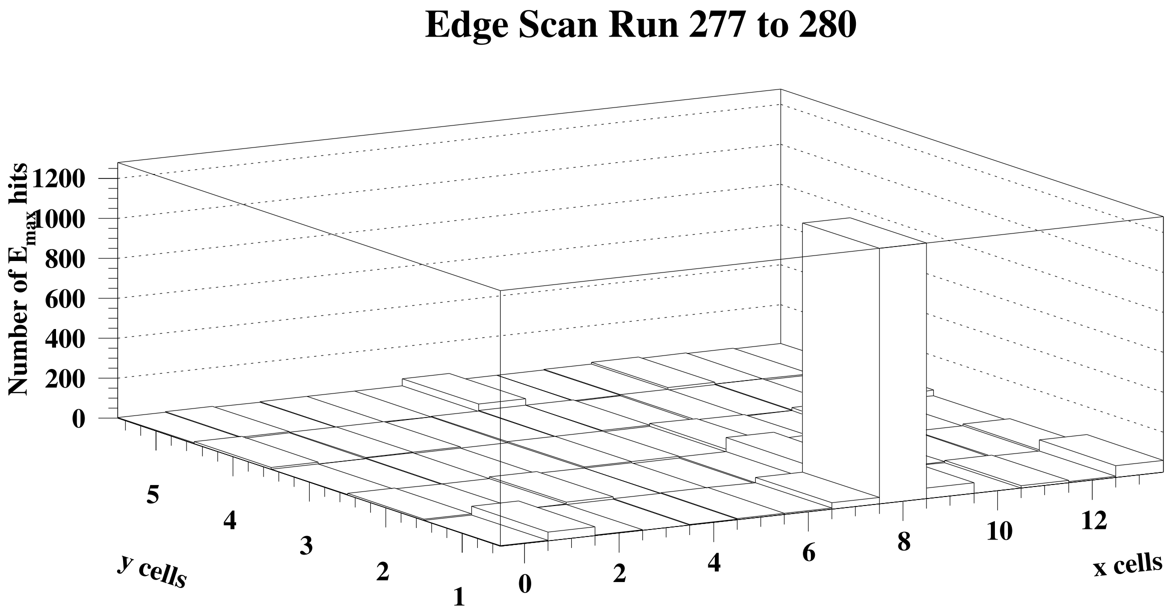
Fiducial Volume Definition (II)

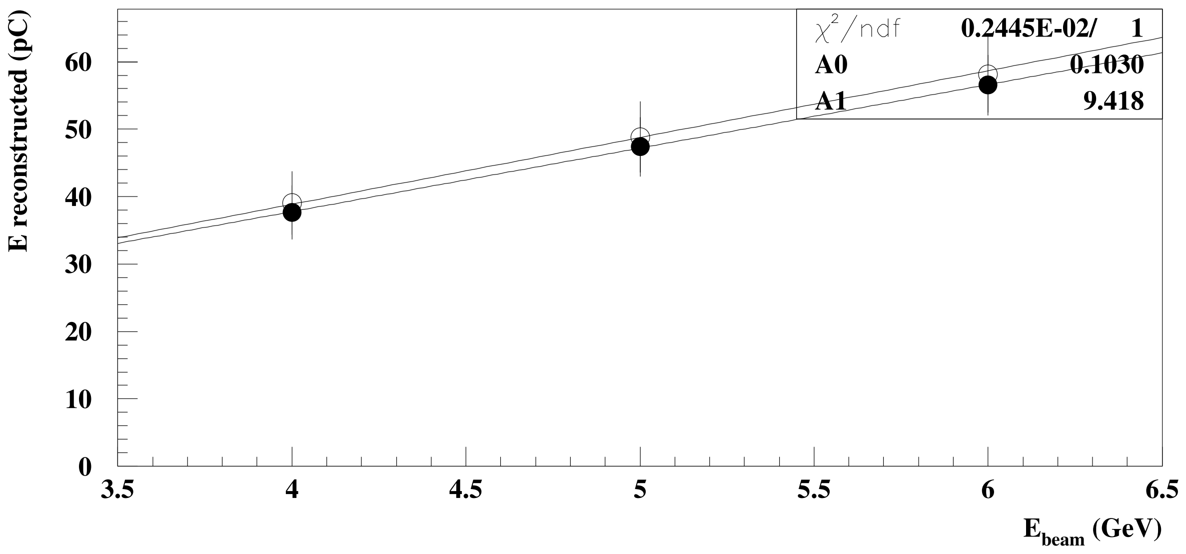




Edge cell (Y) shows leakage ...

Fiducial Volume Definition (III)





... which decreases rapidly with distance from edge

Summary and Outlook

☞ The 6m-tagger has been built and it works

☞ Preliminary results from the DESY II beam test:

- A fast calibration method has been developed, simulated and tested:

  "Maximum-Channel Endpoint"

  Accuracy is 1-2%

  This algorithm is a candidate for a kinematic-peak calibration method *in situ* (≈400k events required if smoothly distributed)

- Energy resolution is <10% at 4–6 GeV, in agreement with simulation
- Position resolution is ≈ 1 mm in X and Y
- Fiducial volume can be defined to within a few mm of edges

☞ Next Steps

- Full calibrations at various beam energies and PM gains underway
- ^{60}Co scans to be done
  (New readout system under development)
- Dependence on angle of incidence (currently fixed at 5°), gate-width study, etc, to be done
- 6m-dummy for radiation-damage monitoring in ZEUS to be built and installed in ZEUS at the end of May