CERN Testbeam Data

First Look at the comparison of MC with Data

using

the TPOL Geant3 Monte Carlo Program TPOLMC

J. Olsson Polarisation Task Force Meeting 04.03.2009

Reminder:

CERN Testbeam Data, July-August 2001

e-, e+ beams,

energies from 6 Gev to 50 Gev

Documentation:

Talks:	M. Inuzuka	17.09.2001
	F. Metlica	16.10.2001
	K. Matsuzawa	14.02.2002, 26.02.2002
	F. Corriveau	22.06.2004

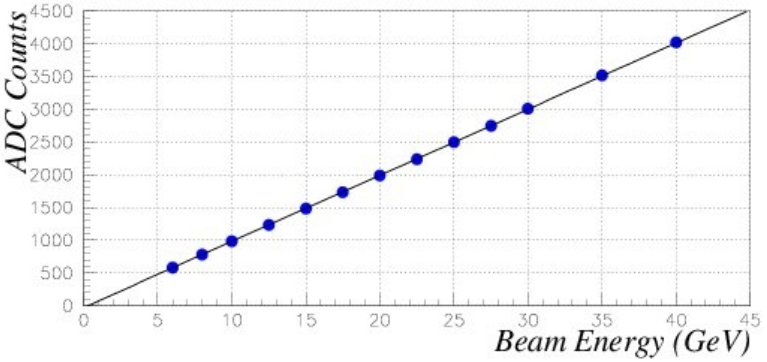
ZEUS-Note from 24.10.2002 (unnumbered)

Reminder: Results from the CERN Testbeam Data

M. Inuzuka, 17.09.2001

TPOL Calorimeter Response

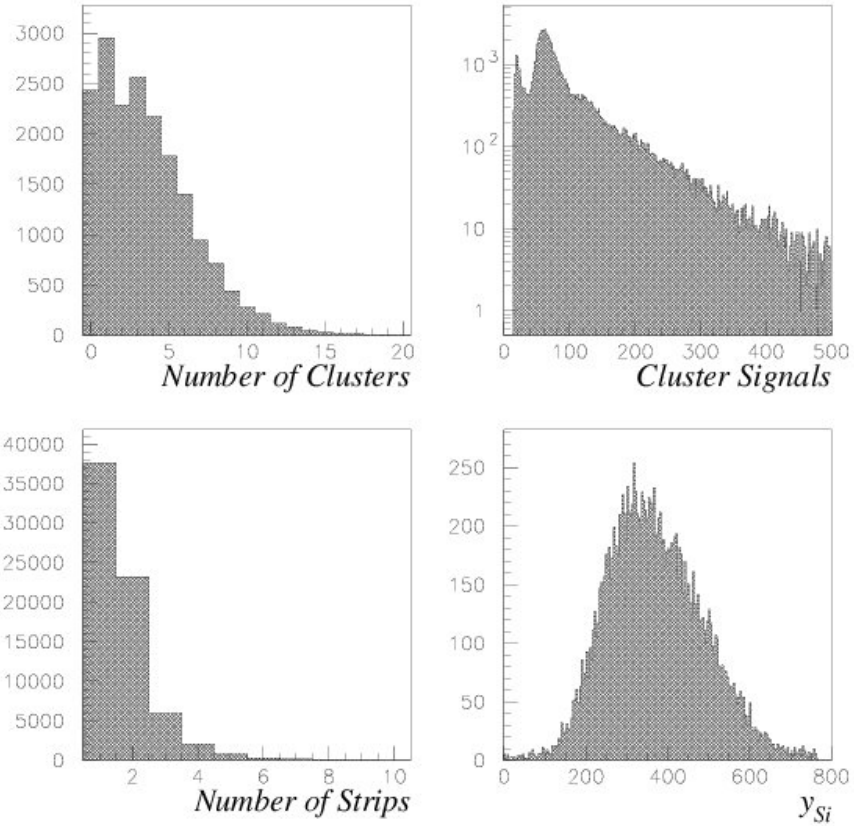
Injected 6 $\sim$ 50 GeV e^+ beams to study linearity and resolution:



- Linearity is good ($< 1\,\%$).
- Resolution:
  $\sigma/E = 0.24/\sqrt{E} \oplus 0.05$ (E in GeV)

Si Position Sensitive Detector

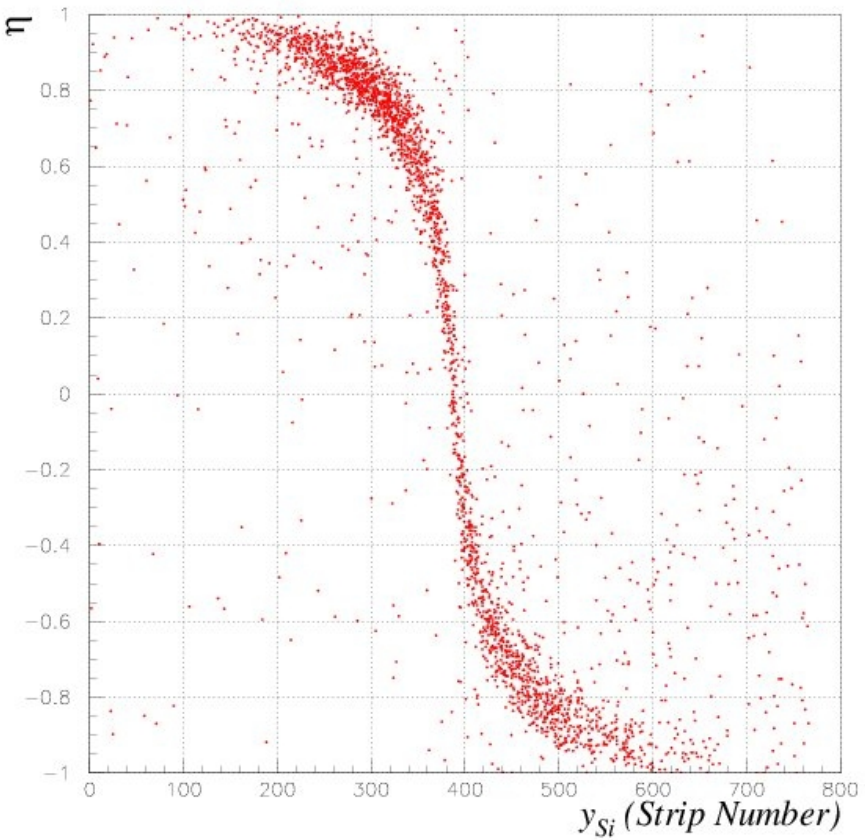
- Reconstruction method (ZEUS Note 01-019):
  - Pedestal, Common Mode subtraction
  - Clustering algorithm



Reminder: Results from the CERN Testbeam Data

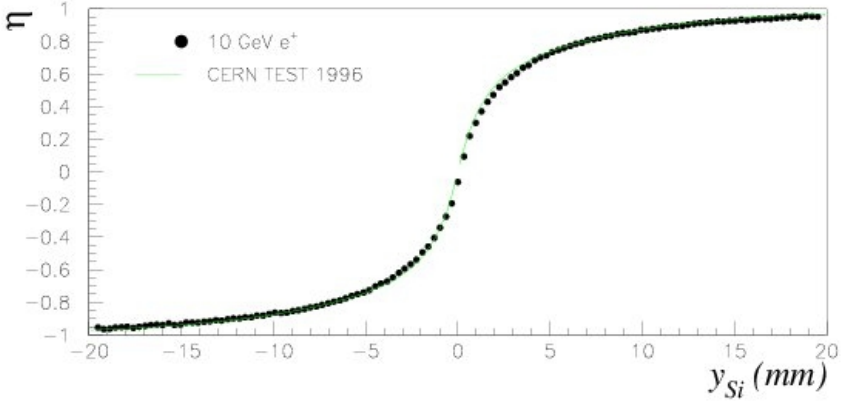
M. Inuzuka, 17.09.2001

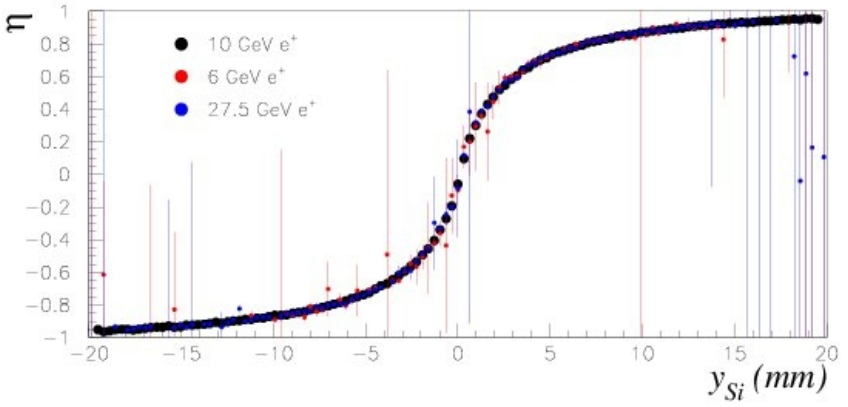
The $\eta - y$ Correlation



We observed a clear correlation between η (calorimeter) and y (Si)!

The $\eta - y$ Transformation





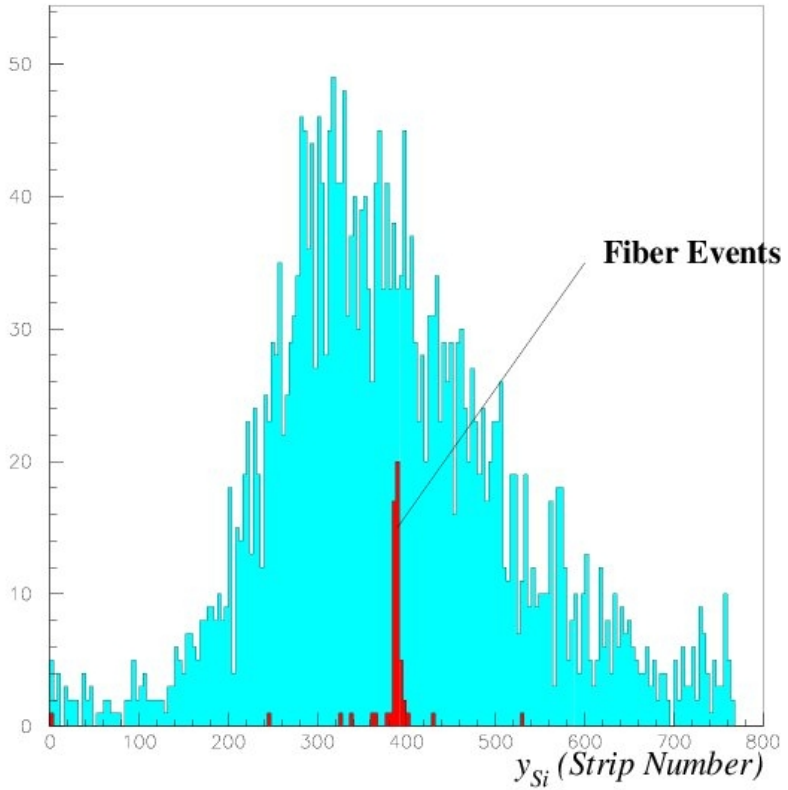
- Obtained $\eta - y$ transformation almost reproduces the old results in 1996.
- No energy dependence was observed.
- Analyses are still ongoing...

Reminder: Results from the CERN Testbeam Data

M. Inuzuka, 17.09.2001

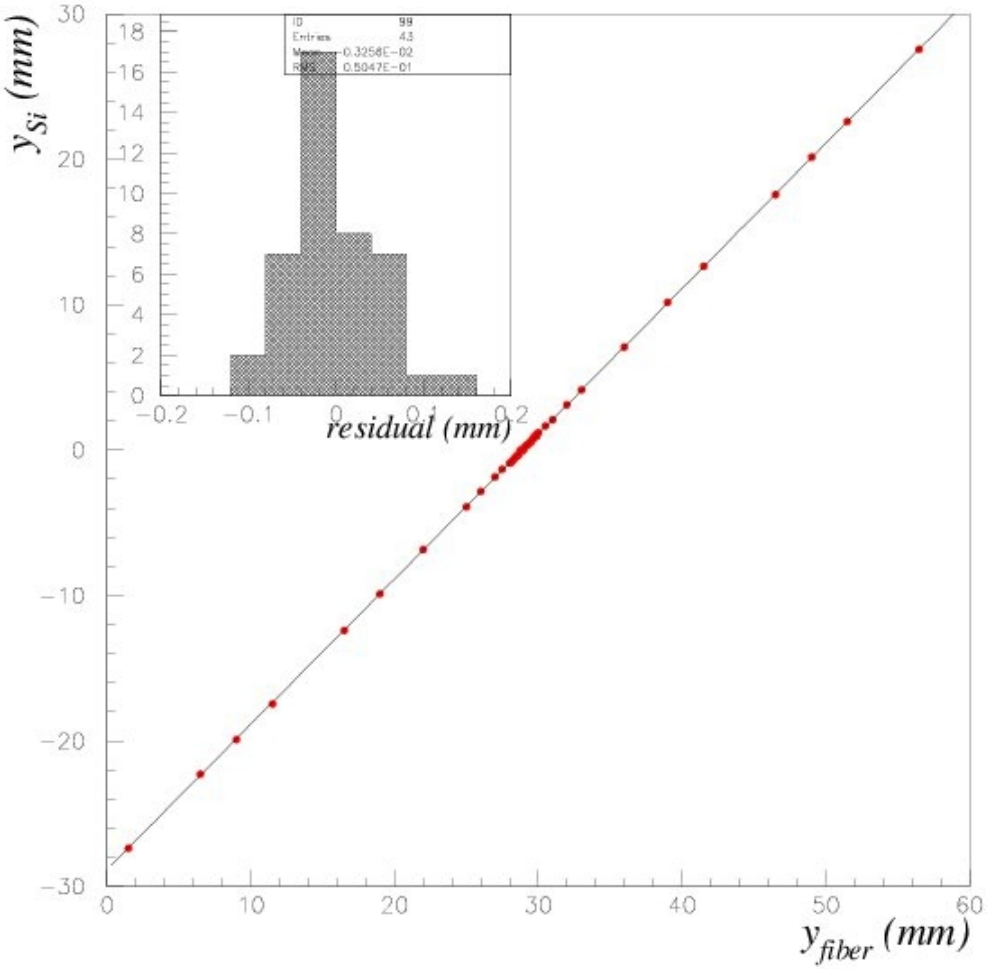
Fiber Scan

Fiber scan (typical step size: 100μm) was carried out while taking data with 10, 15 and 20 GeV e^+ beams:



- "Shadow" of the fiber was observed clearly.
- The mean positions are compared with the geometrical fiber positions. →

Linearity Calibration of Si Detector



- Precision of the fiber calibration:
  $\Longrightarrow \sim 50\mu$m

Reminder: Results from the CERN Testbeam Data

M. Inuzuka, 17.09.2001

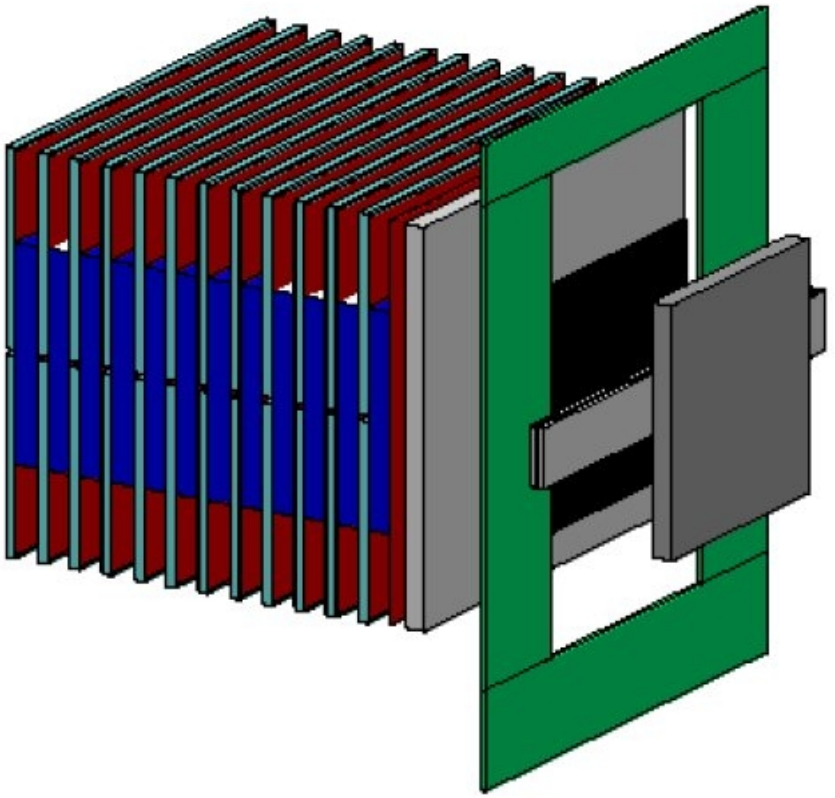
Summary

- CERN test-beam for the TPOL was carried out successfully!
- We collected nice data:
  - Linearity and resolution of the calorimeter
  - Observed a clear correlation between η (calorimeter) and y (Si).
  - Linearity calibratoin of Si using a fiber works reasonably ($\sim 50\,\mu$m).

  Data analyses are still ongoing.
- Installation in the HERA tunnel will be completed during the access in October.

Geant MC program: was the CERN testbeam data already simulated? Talk by F. Corriveau 22.06.04:

Monte Carlo

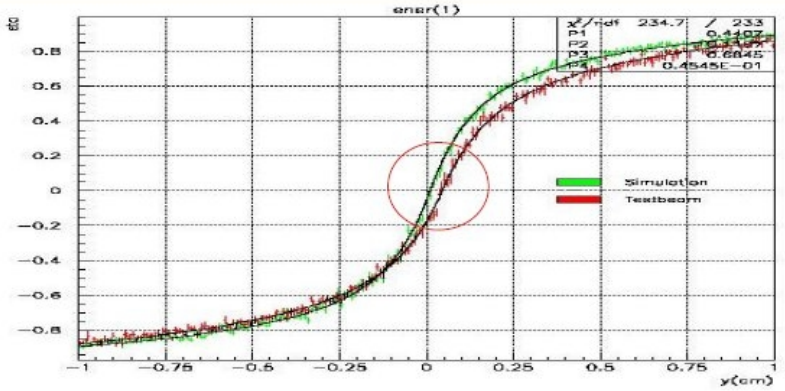


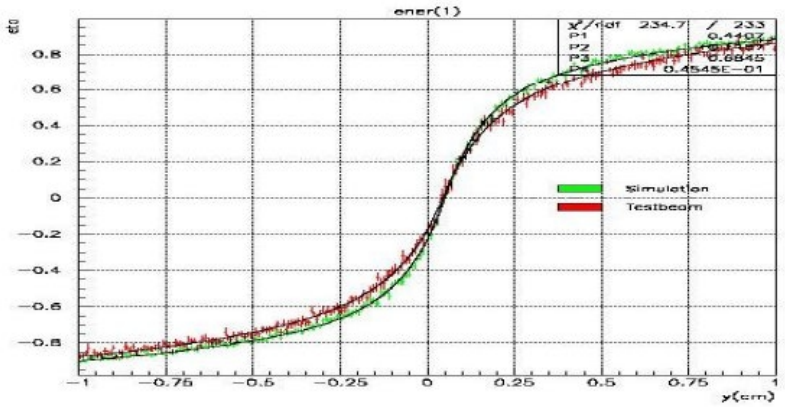
Geant3 studies: J.Sully

Goals:

- reproduce the CERN test beam data
- obtain the η-y relation (energy asymmetry)
- understand the analysing power, hence the absolute polarisation scale

Test Beams: η-y relation





Energy asymmetry η
vs vertical position y

Run Options:
Gap: 0.00 cm
Scintillator Offset: Off

Run Options:
Gap: 0.05 cm
Scintillator Offset: On

No trace of a CERN Testbeam simulation in the standard TPOLMC ....

More information in theses of Plamondon and Sully ?

(really unpublished, not available on Google !)

Note: Lessard's thesis can be found in Google

Final Report
TPOL Geant3 Simulation

Jean-Raphael Lessard, McGill University

August 31, 2005

From the reference list:

[4] M. Plamondon, *Geant Simulation of the TPOL* (Unpublished), (April 28, 2004)

[5] J. Sully, *TPOL Geant3 Simulation* (Unpublished), (August 27, 2004)

Upgraded TPOLMC, Autumn 2008:

CERN Testbeam Setup included as flag option in the "standard" TPOLMC, thus no separate program.

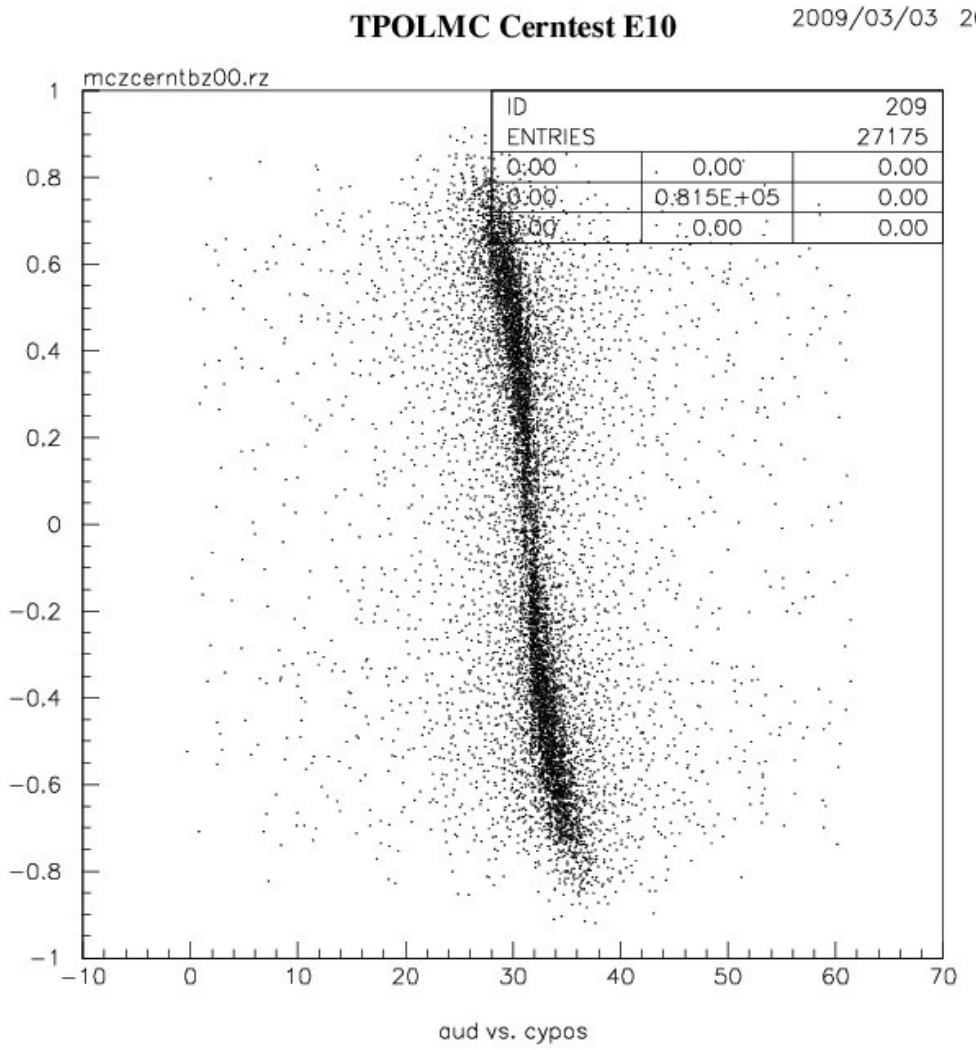
Modifications

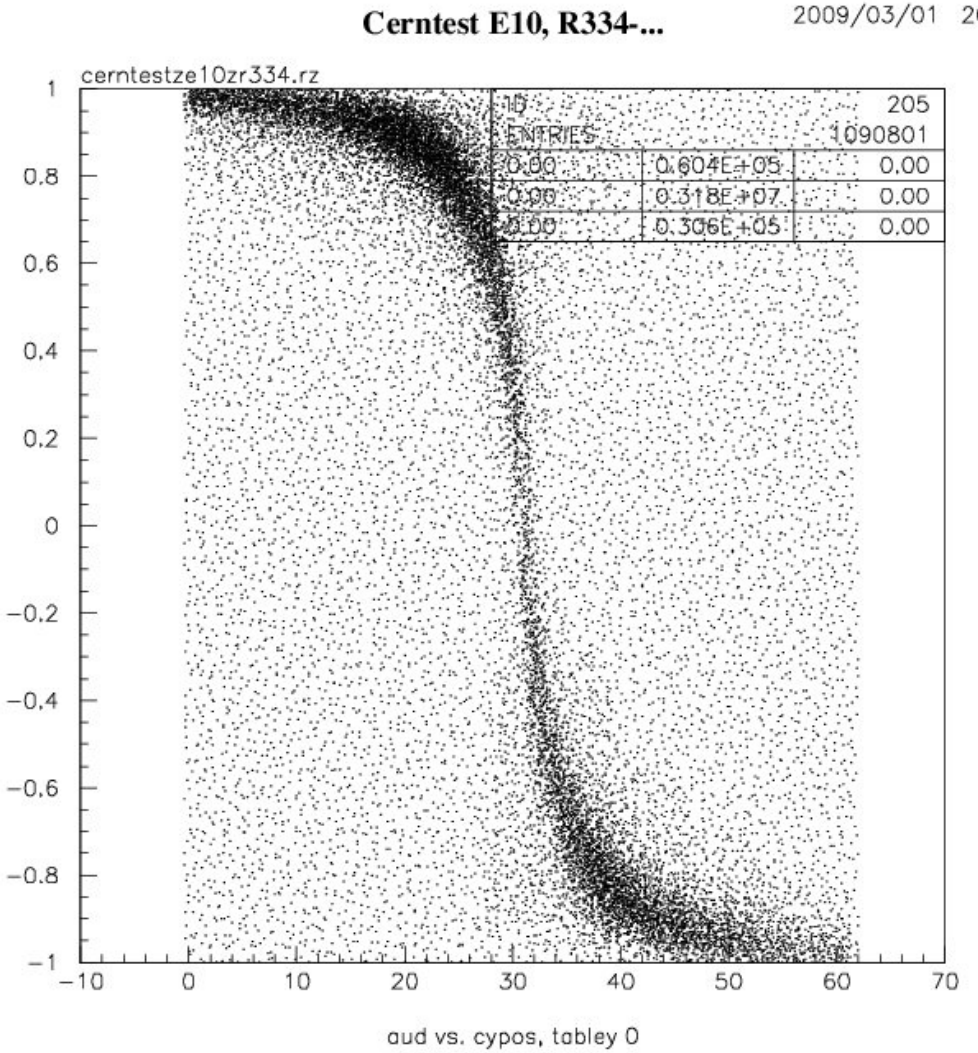
Subroutines:	GUKINE
	UGEOM
	UGFFGO
	CREATEBEAMPROFILE
	CREATETESTBEAM (new)
Include files:	GEOMETRY.INC
	GENERATOR.INC
Steering:	TPOLMC.CARDS
Makefile	

A very first look at TPOLMC simulated (CERN) Testbeam Data

aud vs. cypos

Asymmetry up-down (eta), vs. y-position from Silicon detector

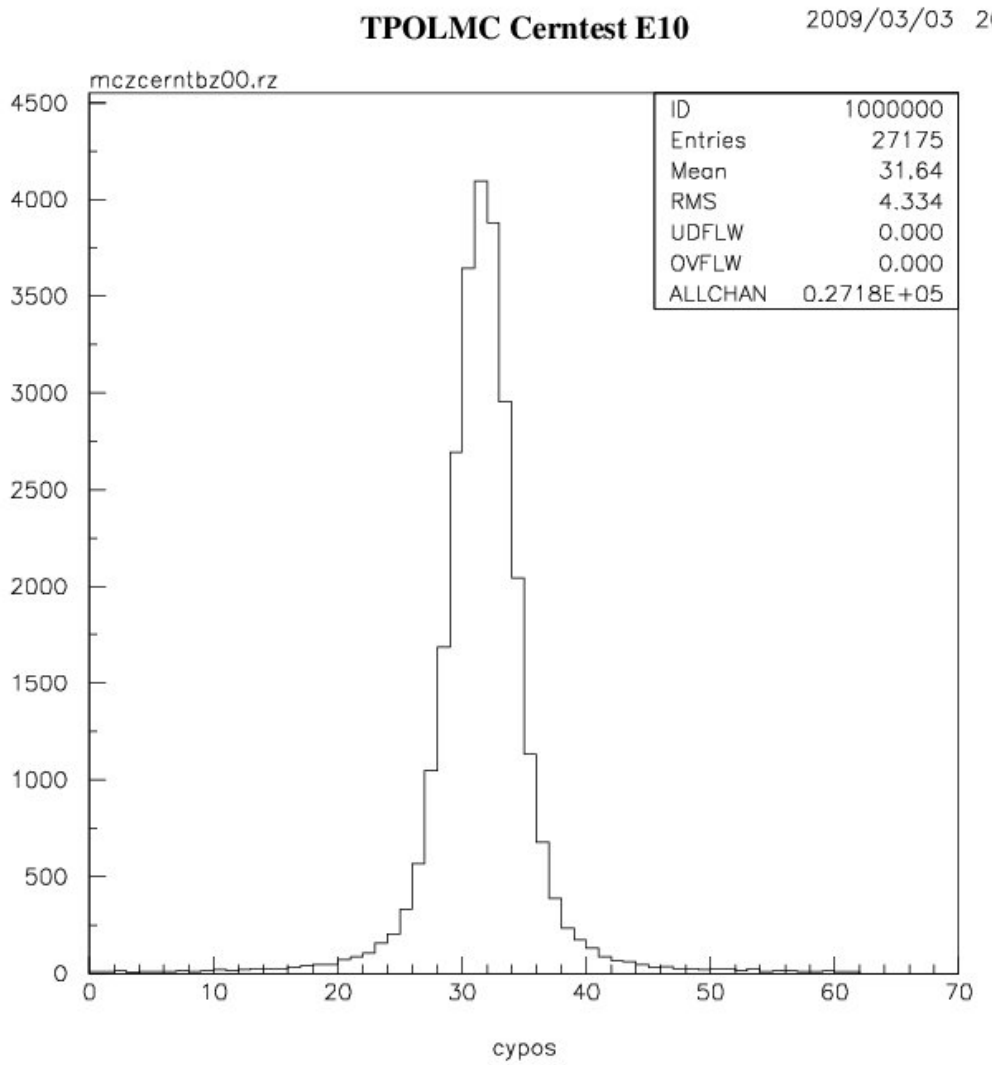


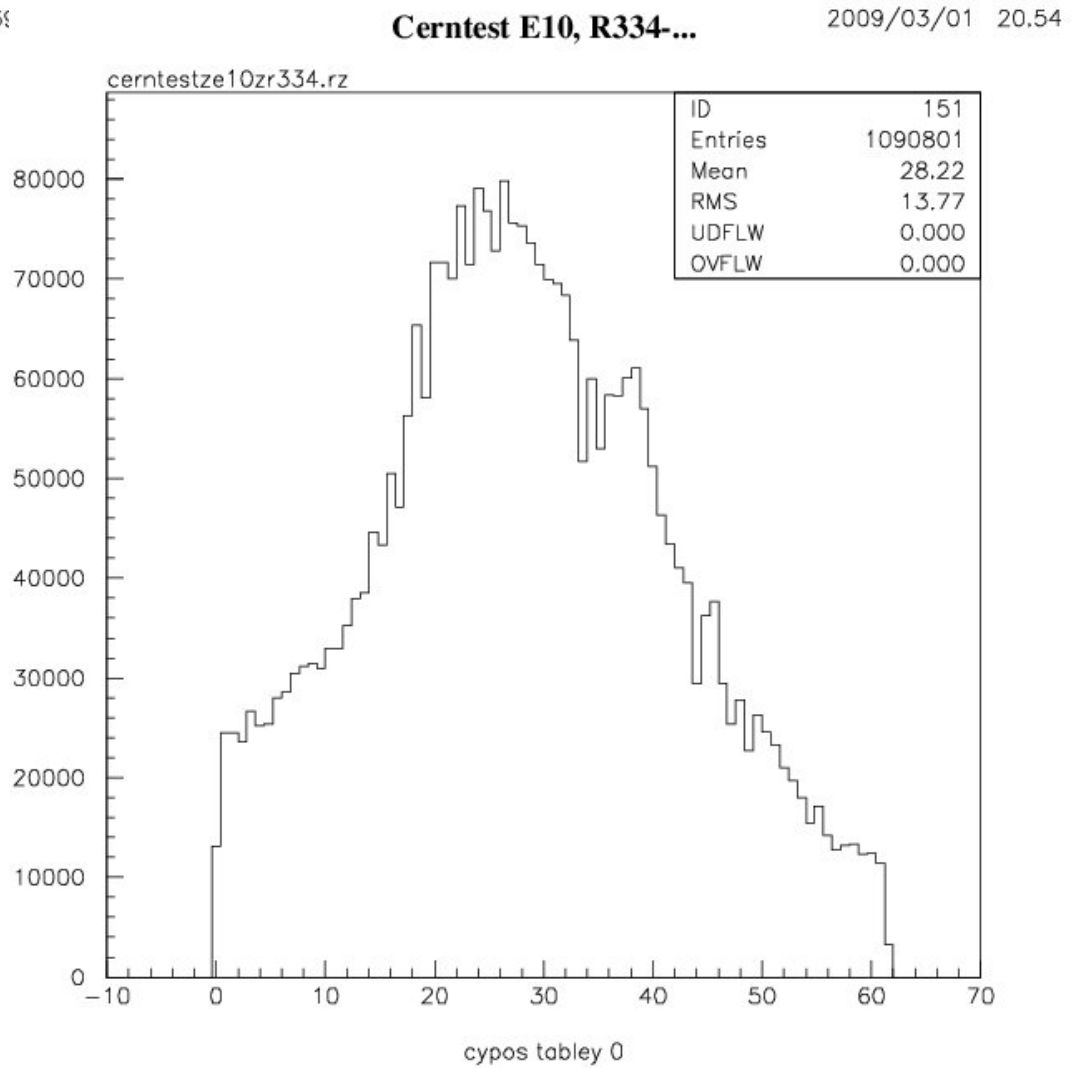


A very first look at TPOLMC simulated (CERN) Testbeam Data

cypos gives some idea of the e-beam profile;
much broader, and asymmetric in the real data

cypos

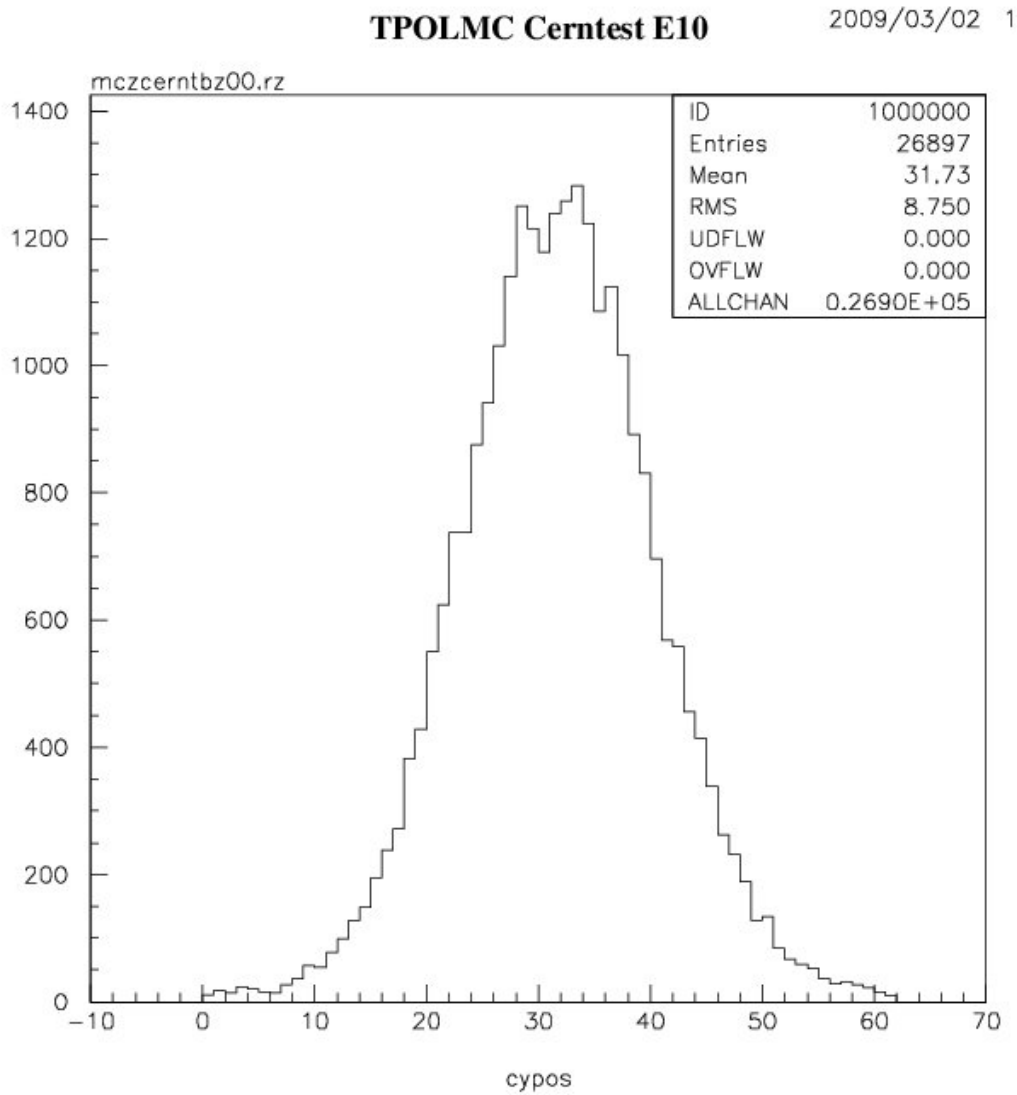


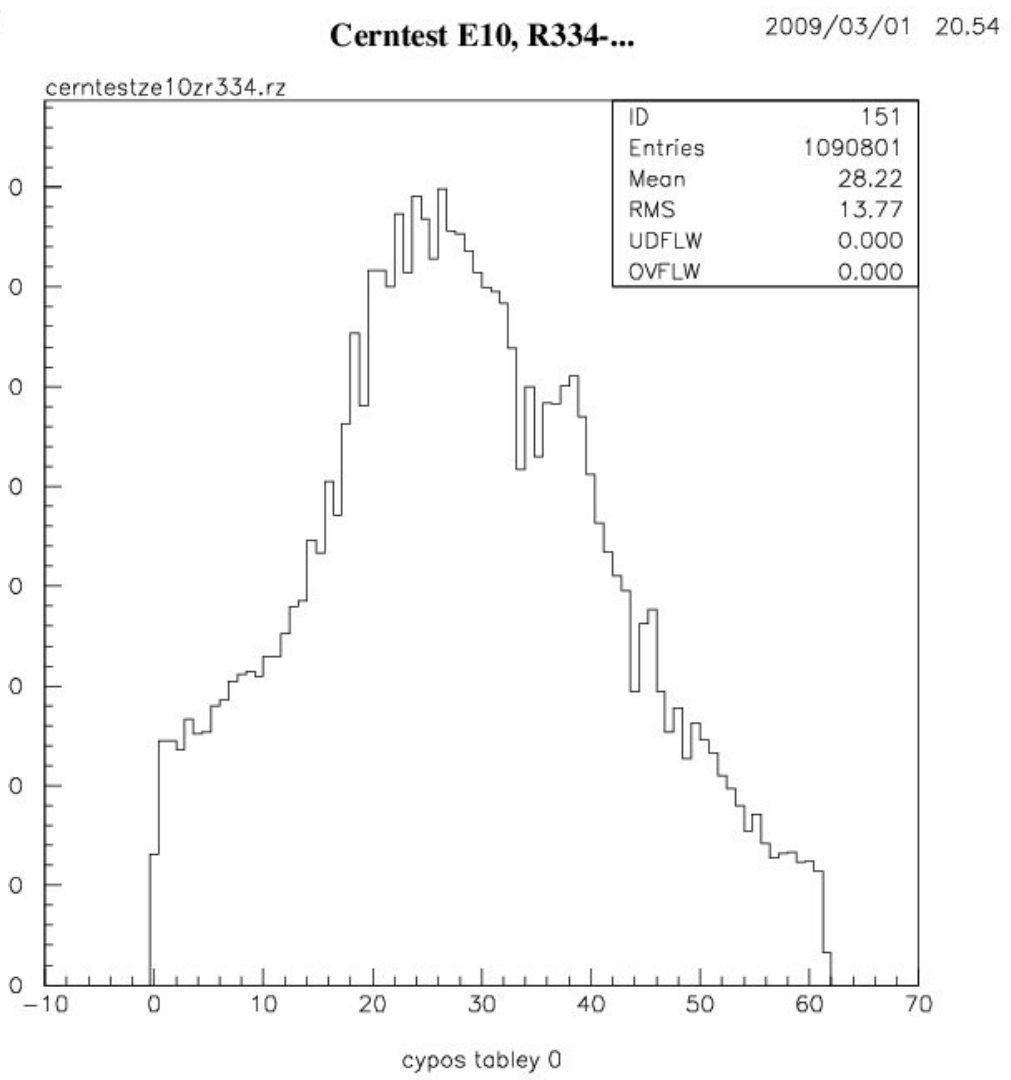


A very first look at TPOLMC simulated (CERN) Testbeam Data

Try a broader beam in the simulation:

cypos

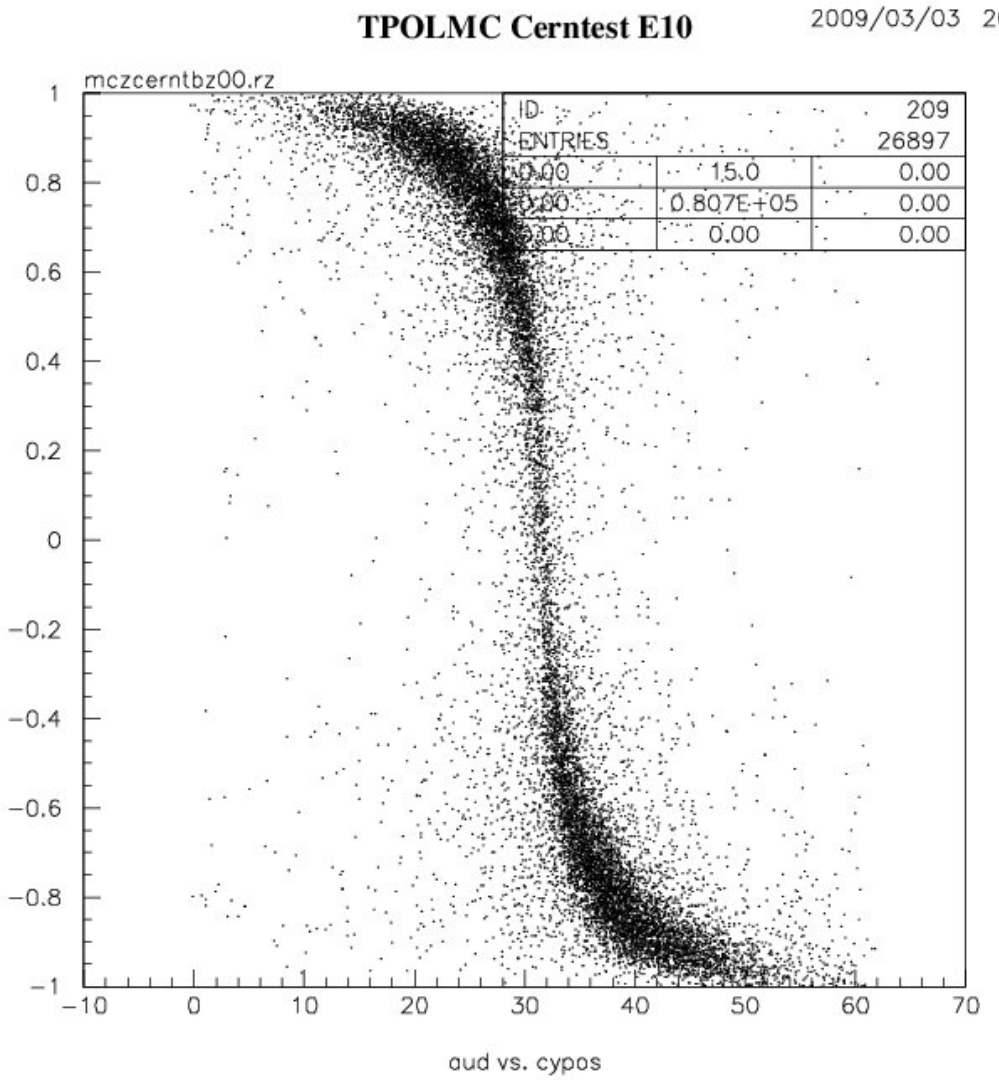


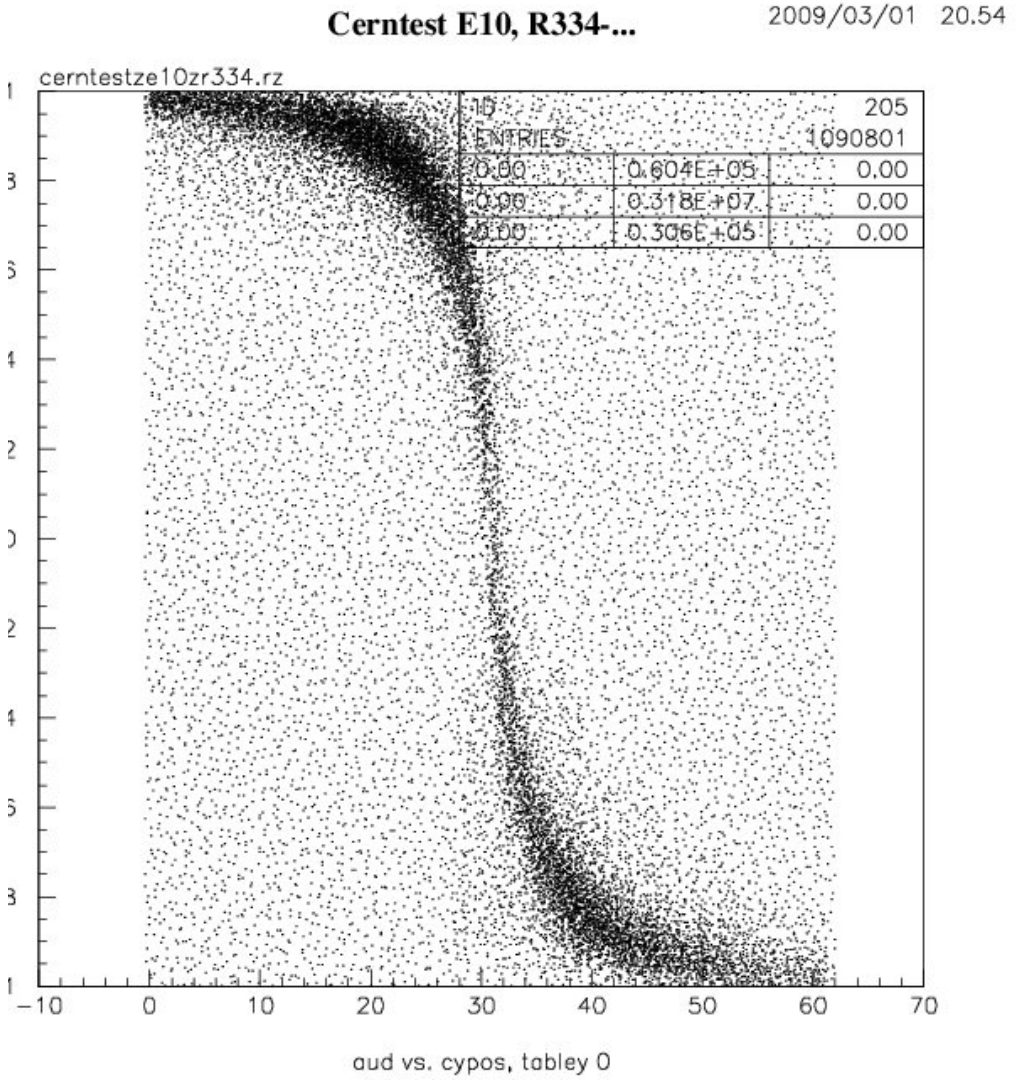


A very first look at TPOLMC simulated (CERN) Testbeam Data

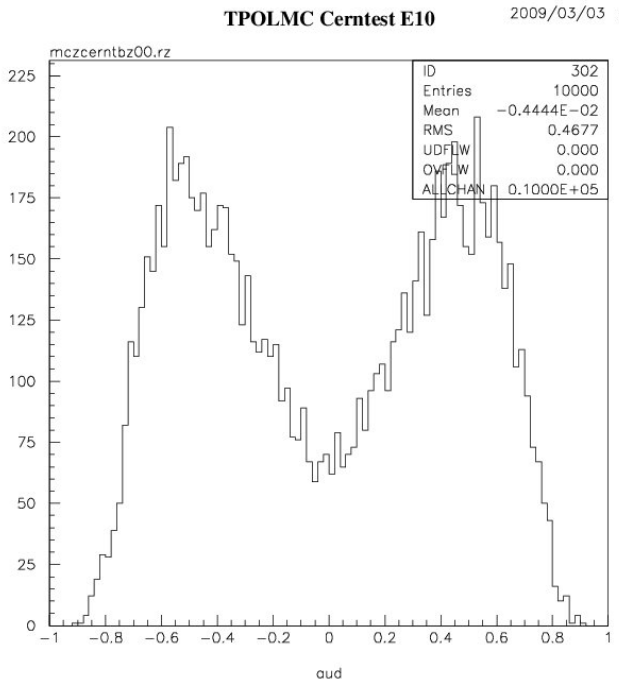
aud vs. cypos

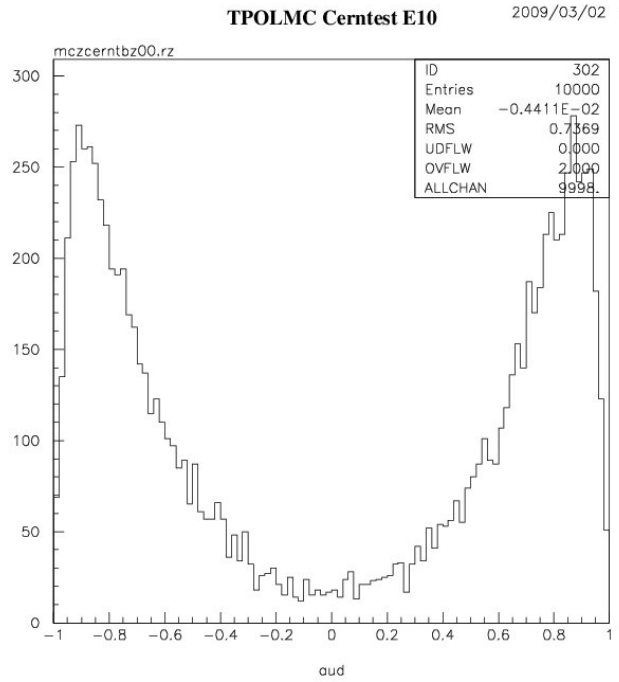
With a broader e-beam simulation ...





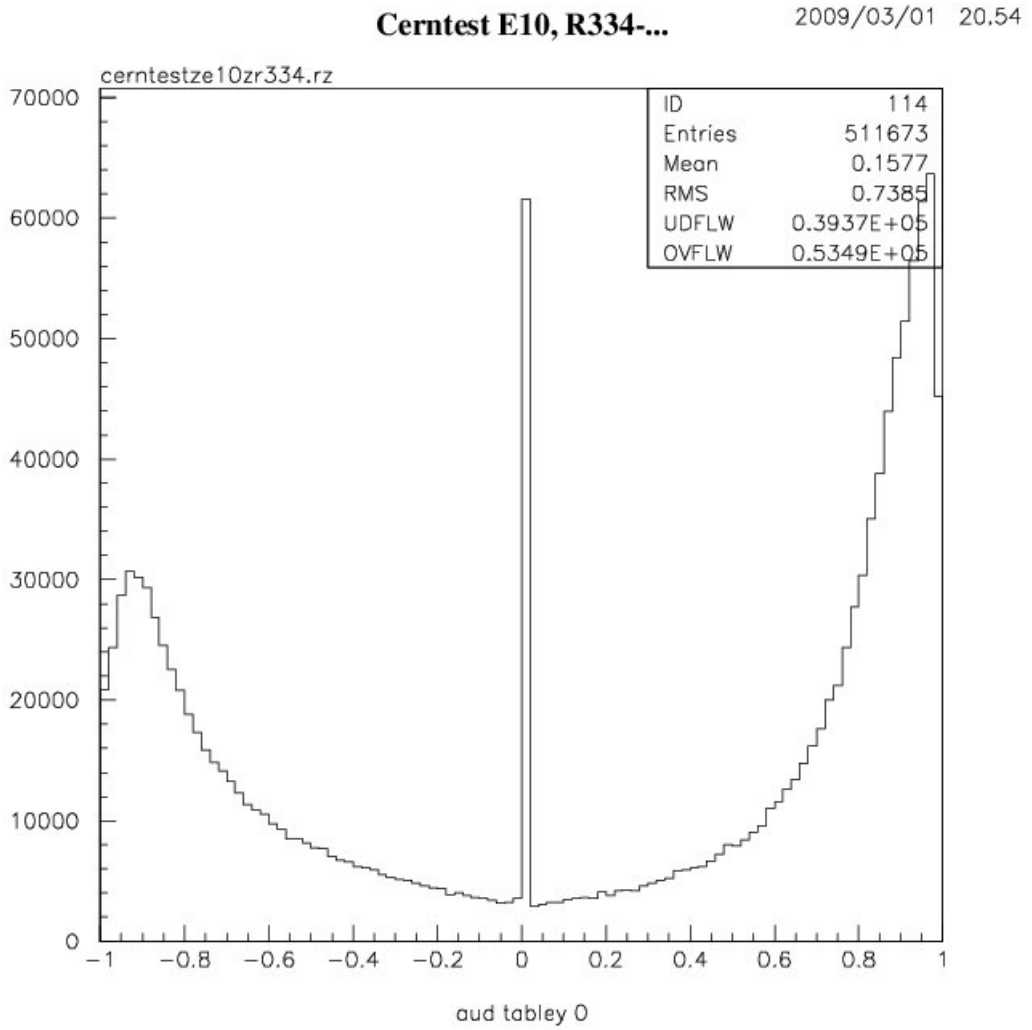
A very first look at TPOLMC simulated (CERN) Testbeam Data





aud

Confirms that the real e-beam is asymmetric ...



SUMMARY:

A long way to go still:

- Select clean events in the real data,
- Establish and simulate
  a realistic e-beam profile

==> study details of digitization,
i.e. the real work ...