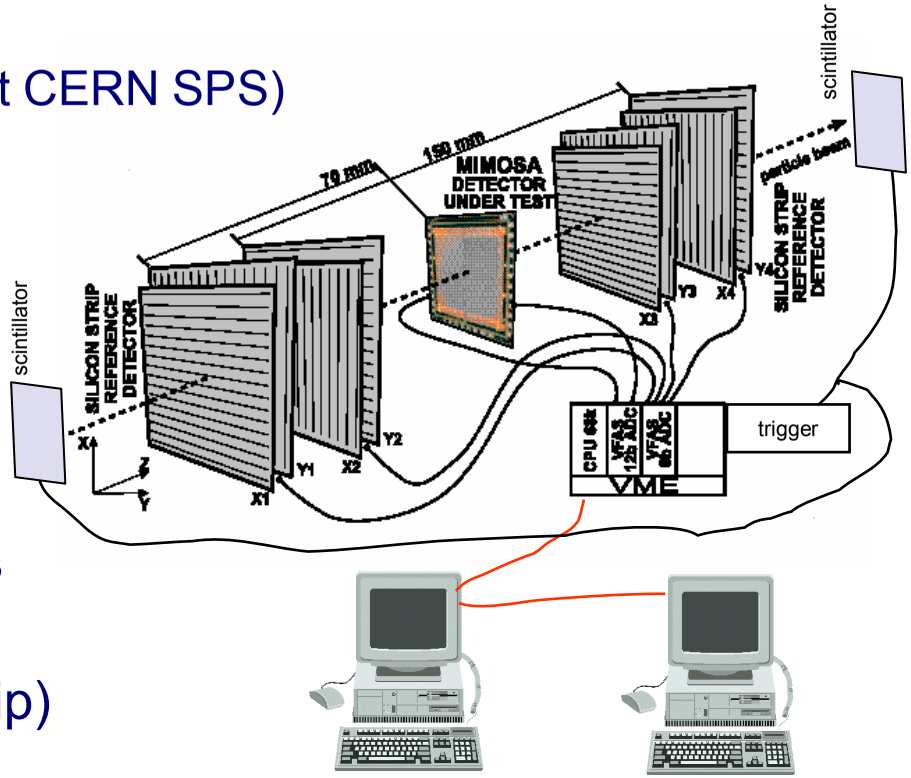
CMOS Beam Tests

- Why do we do the beam tests ?
  - The best way to have M.I.P
    - pions or muons ~ 120 GeV/c (at CERN SPS)
  - We can investigate:
    - Charge collection
    - Detection efficiency
    - Single point resolution
  - We can do this for :
    - Different temperatures (cooling system)
    - Different beam incidence angles
- Telescope :
  - 8 reference detectors (silicon strip)
    - 4 in x direction
    - 4 in y direction
  - 2 coincidence scintillators (trigger)

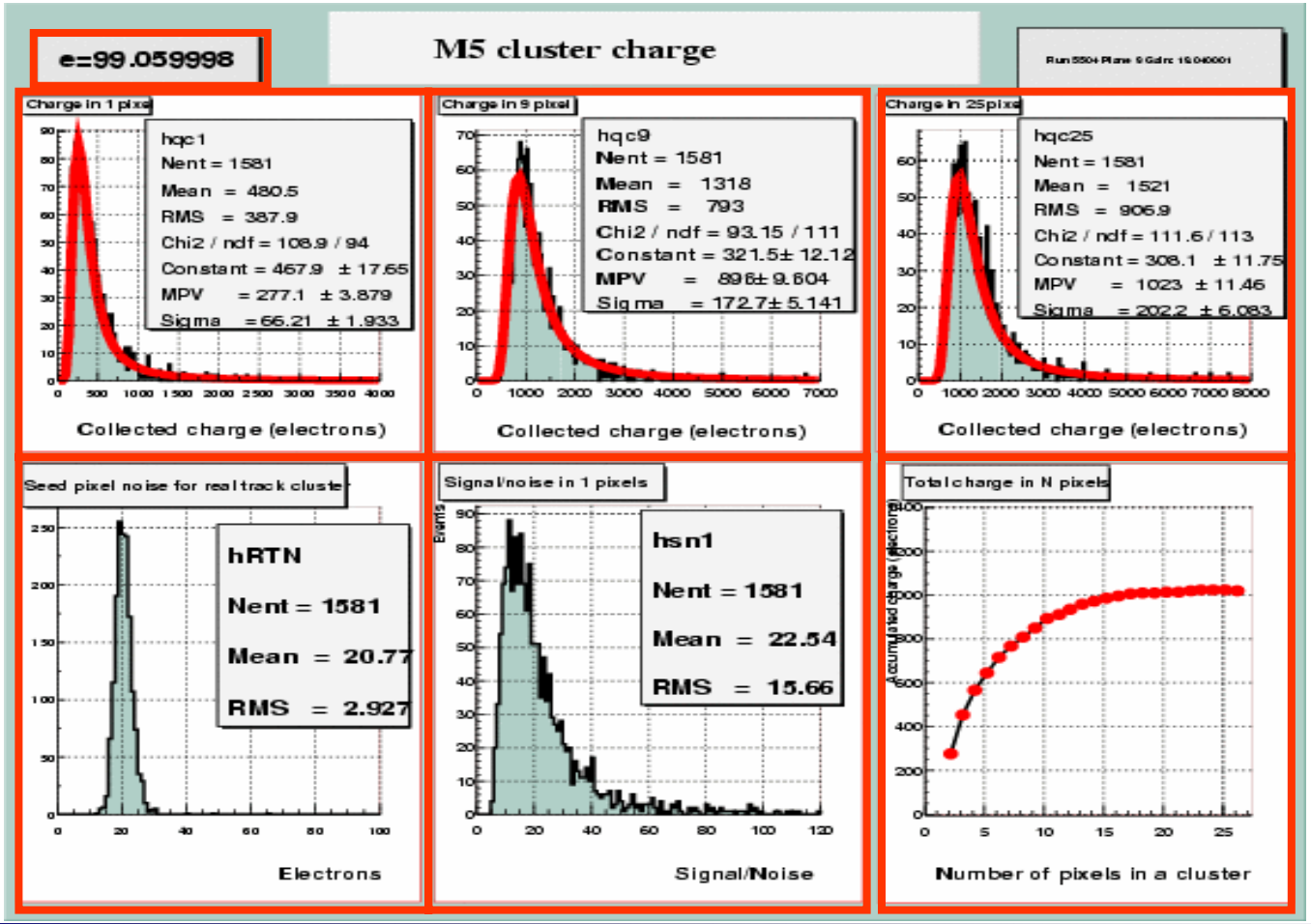


VME acquisition system

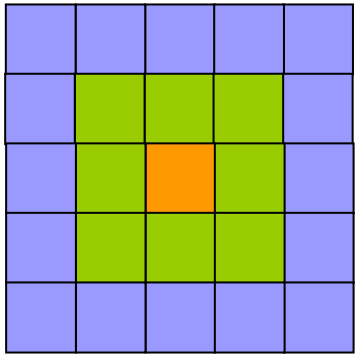
- Data acquisition
  - 2 ADC boards :
    - 12 bits for mimosa (4 channels)
      - We take only 2 by 2 channels
    - 8 bits for reference detectors
  - Different kinds of data format :
    - Small chip (limited by transmission rate)
      - Frame 0 (12 bits) ,frame 1 (12bits), CDS (8bits) on board
    - Big chip (limited by readout speed)
      - CDS (12 bits) on board
      - Acquisition faster and data size smaller
  - Run duration
    - Big chip : 9h / 20 000 evts
    - Small chip : 3h / 150 000 evts
- ADC board configurations via LabView
- Monitoring via Root
  - Reference detectors
    - Raw data
    - Beam profil
    - Signal histogram (Landau)
  - Mimosa chip
    - Raw data
    - Signal histogram (Landau)
    - Plots of 2D or 3D matrices after CDS
- Users :
  - IReS – LEPSI
  - RD 42 (CERN)

Typical results /1

Charge collection

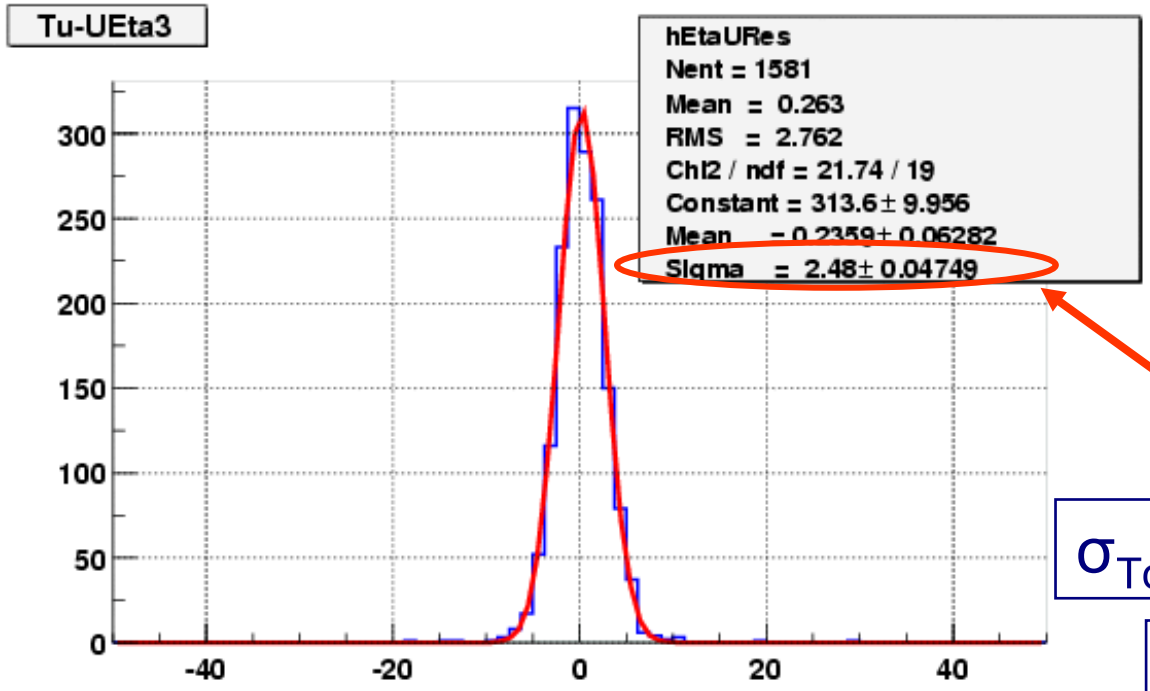


Cluster



Typical results /2

Single point resolution



$\sigma_{Tot} = (\sigma^2_{tel} + \sigma^2_{mim})^{1/2}$

$\sigma_{tel} \sim 1\mu m$

Beam test program

- 2004 (SPS CERN):
  - Mimosa 5b (big chip 1M pixels 2×2 cm^2)
  - Mimosa 9 (small chip with opto technology + 20 µm epitaxy)
  - Mimosa 7 (small CP chip photoFET)
  - MimoStar 1(small chip proto for STAR upgrade)
    - About 50 days from May 10th to November 2nd, 2004
    - Most of the time in parasitic mode (LHCB velo, RD 42)
- 2005 (DESY ?):
  - CP chip (Mimosa 8)
  - Mimosa 10
  - MimoStar 2
- 2006 (DESY ?) :
  - 3 different chips