Update on the Bonn Tracking Station Data Analysis

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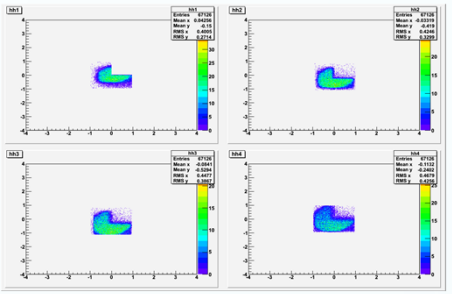
29 XI 2010

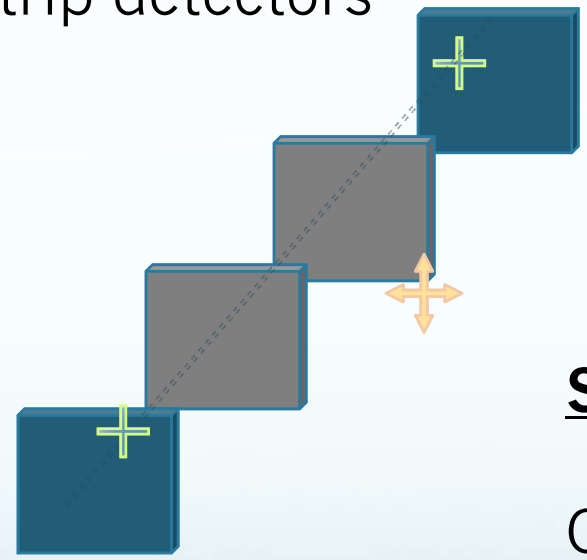
- The Bonn Tracking Station:
  - ✓ Setup
  - ✓ DAQ to PANDAroot Conversion
  - ✓ Energy Calibration and Alignment
  - ✓ Scattering Measurements
  - ✓ Setup Optimization
  - ✓ Simulations

The Bonn Tracking Station

Experimental Setup:

4 scintillators (for the trigger 3 out of 4)
2 double sided silicon strip detectors
4 single sided silicon strip detectors





Available beams:

Protons: 800 MeV/c
2.95 GeV/c
Electrons: 1 – 5 GeV

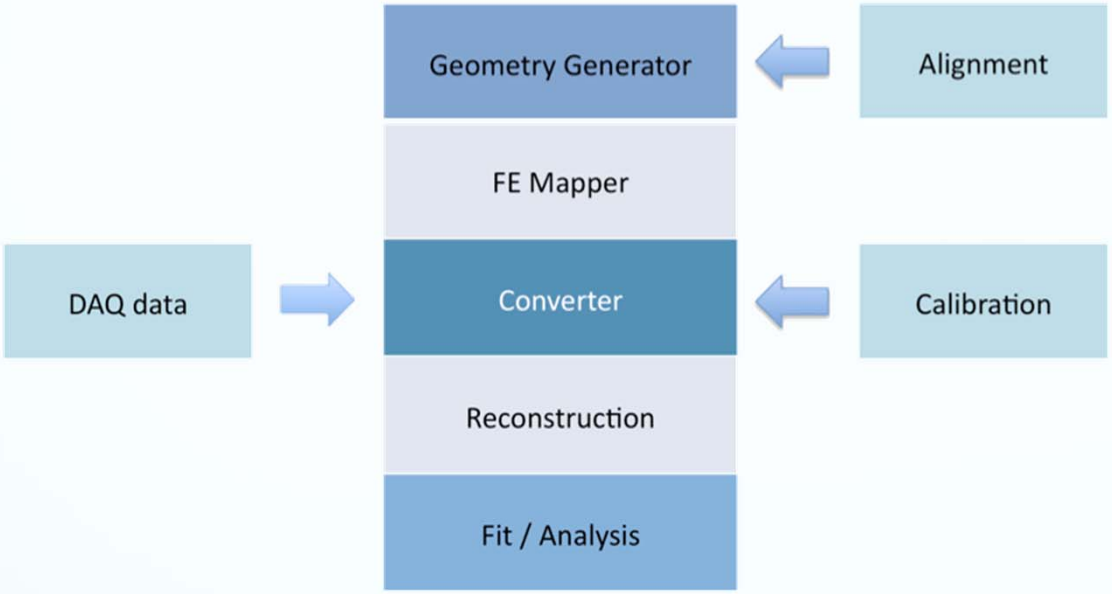
Scattering Volumes:

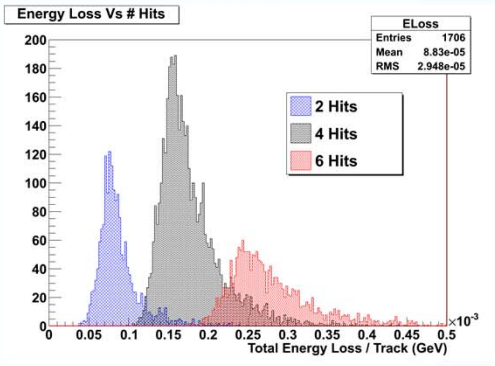
Carbon foil
Carbon Boxes (1 cm, 2 cm)

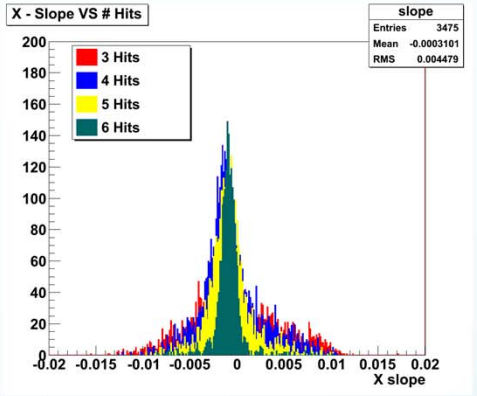
Software Tools:

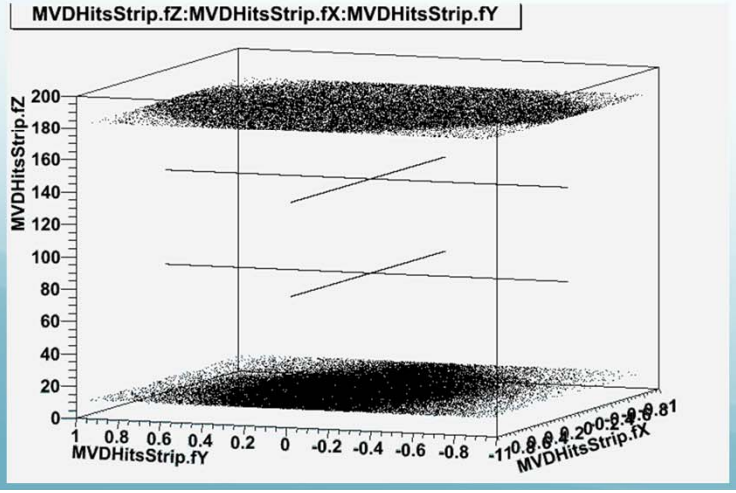
Offline alignment
Calibration
DAQ → pandaroot
Analysis tools

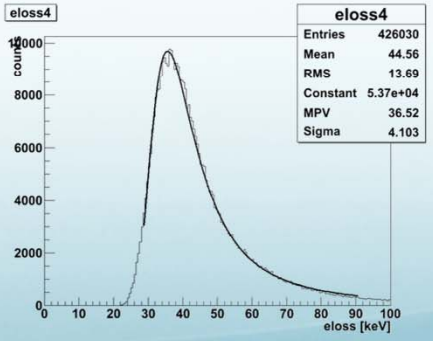
DAQ to PANDAroot

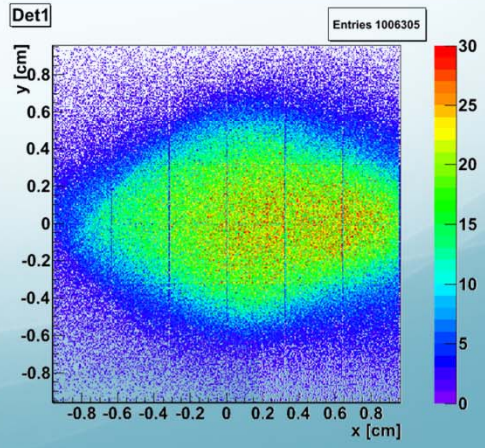












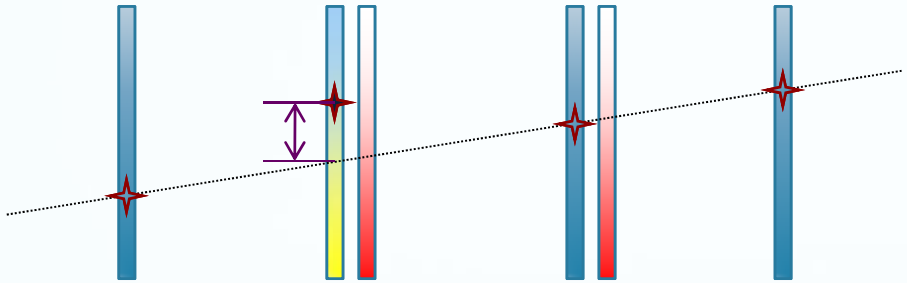
Energy Calibration

Realized in two steps:

- ✓ Same charge injected on each of the FE channels
  → to resolve differences in the response

- ✓ MIP hypothesis
  → to set an absolute ADC counts-to-energy-loss scale

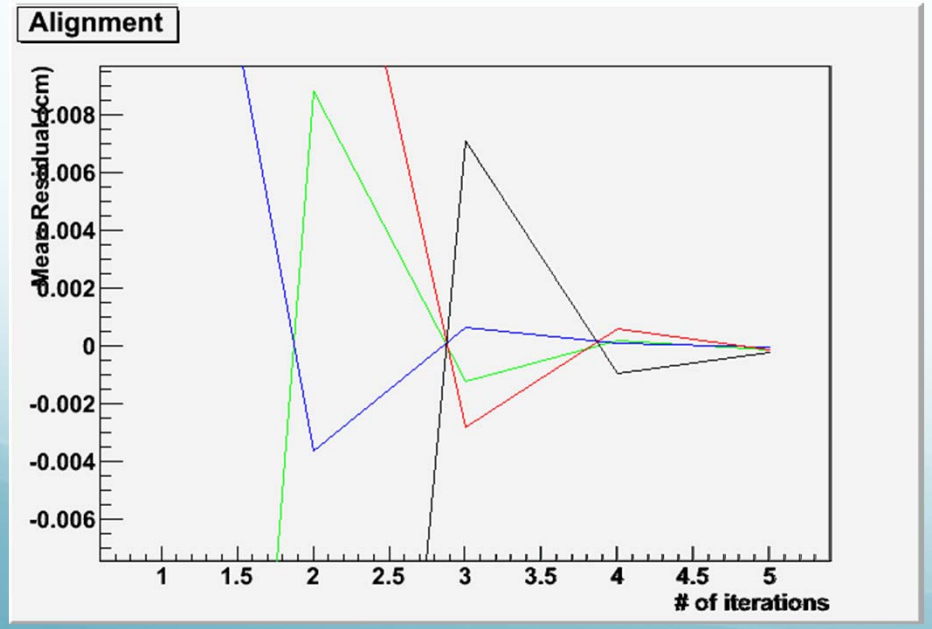
Alignment

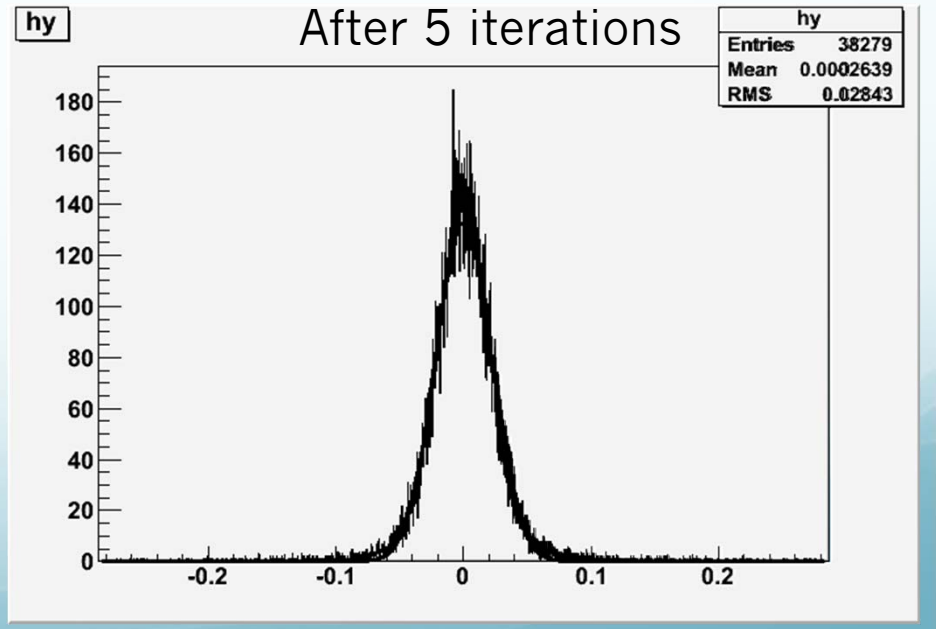


Iterative procedure to align sensors:

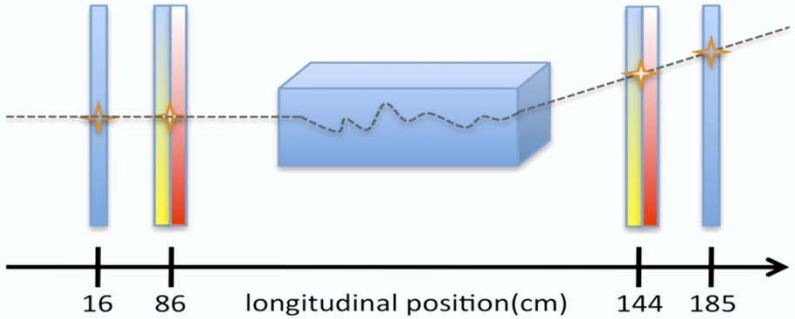
1. Measure residual on the 1st sensor
2. Correct the position of the 1st sensor
3. 2nd sensor… 6th sensor

4. Reiterate the whole loop





Scattering Measurements

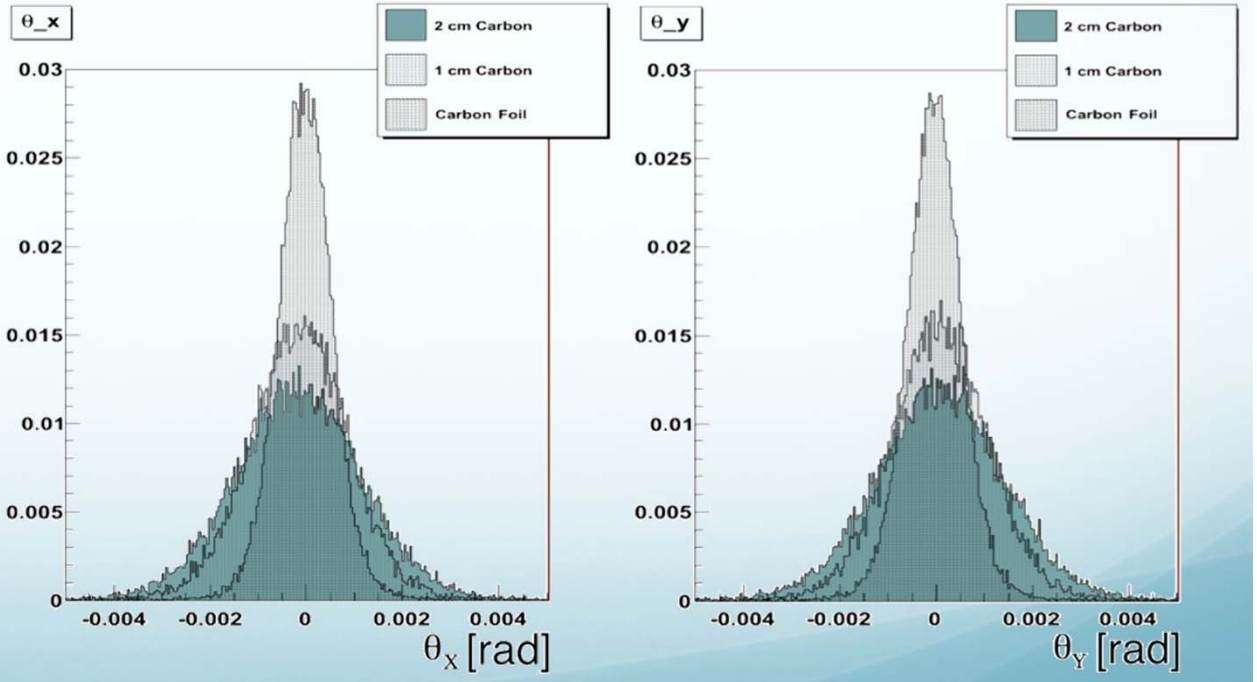


2 hits before the volume
2 hits downstream

Measurements of the scattering angle

Volumes:

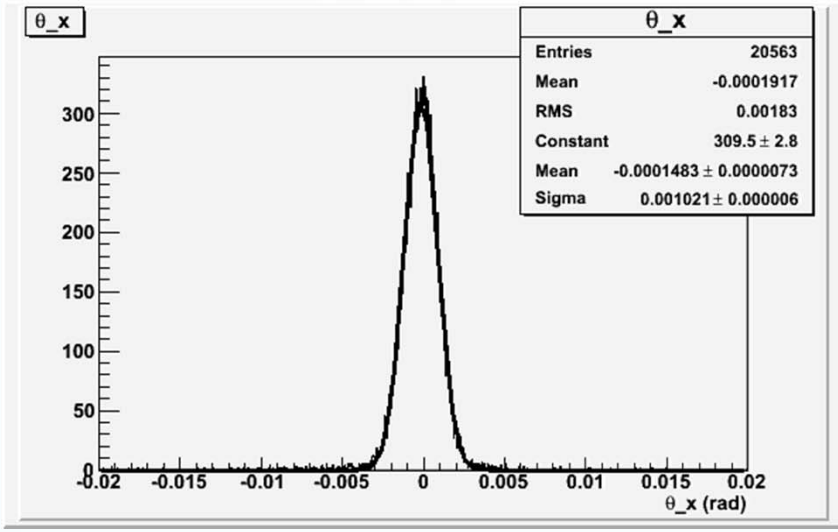
- a carbon foil (0.6 mm thick)
- 1 cm of C-like material (1.79 g/cm^3)
- 2 cm of C-like material (1.69 g/cm^3)

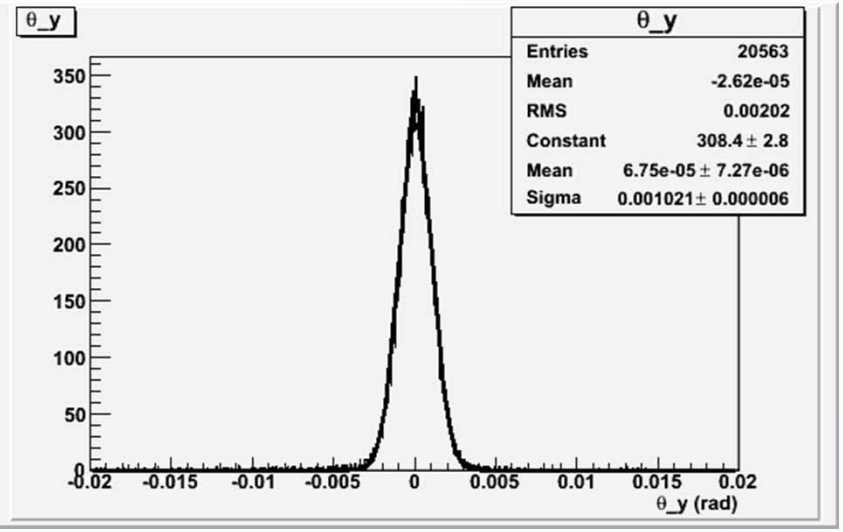


Beam: 2.95 GeV/c protons

Scattering – Measured Data

GEANT3 → Sigma 0.001011



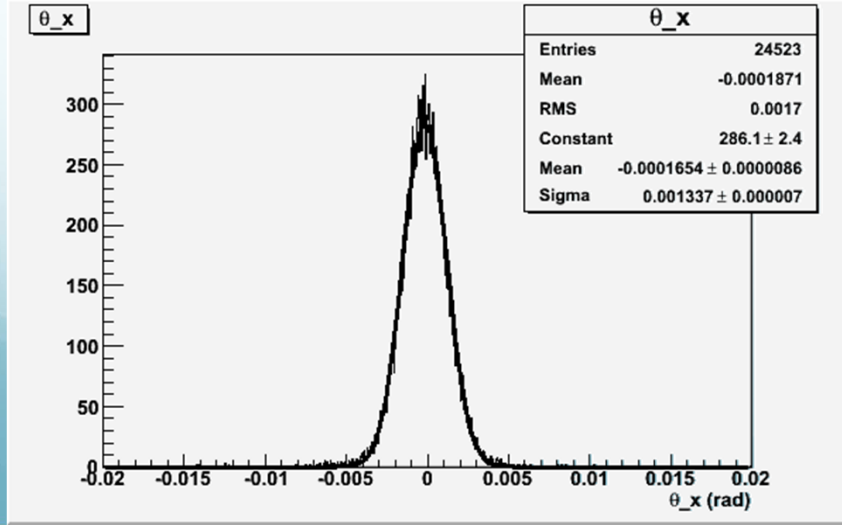


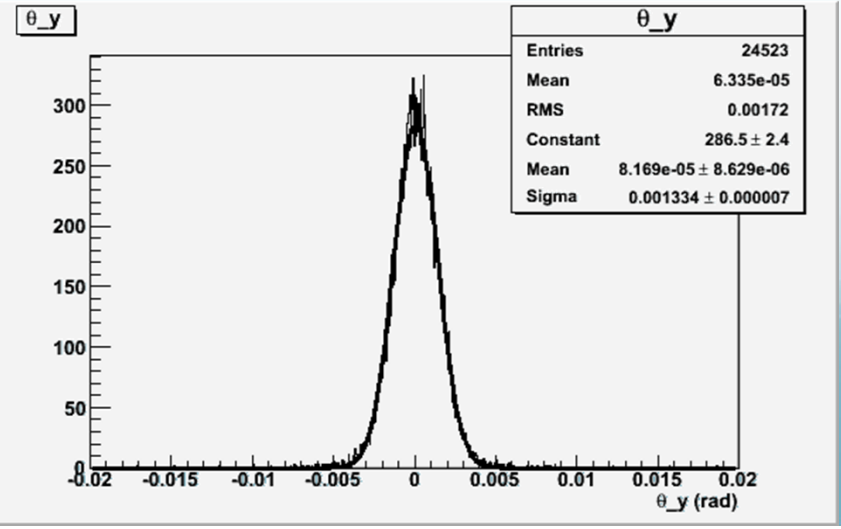
2.95 GeV/c protons scattering in:

→ 1 cm of C-like material

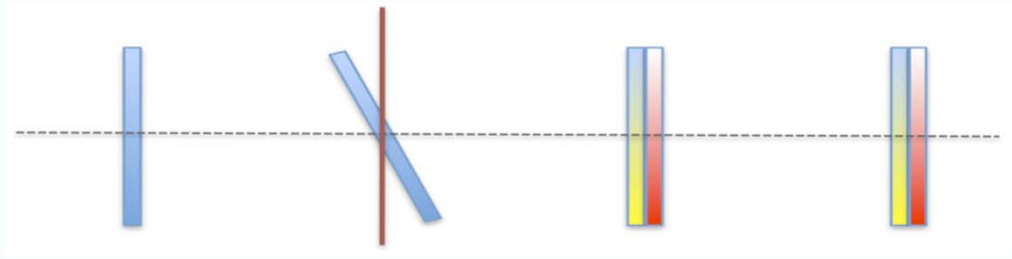
→ 2 cm of C-like material

GEANT3 → Sigma 0.001334

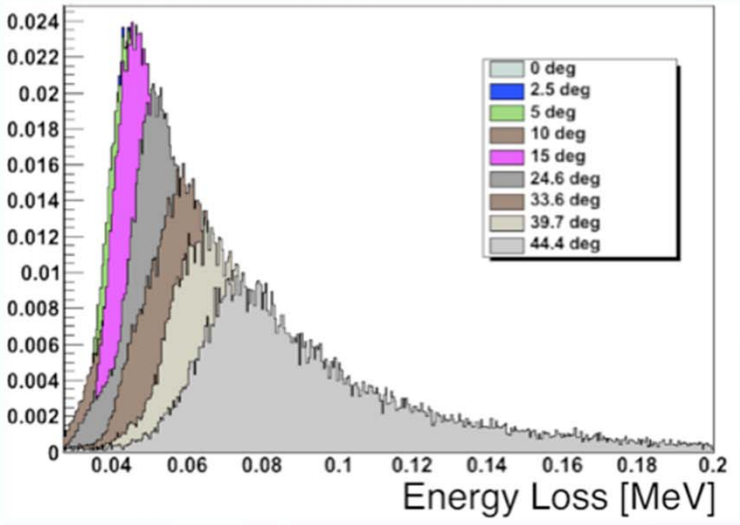


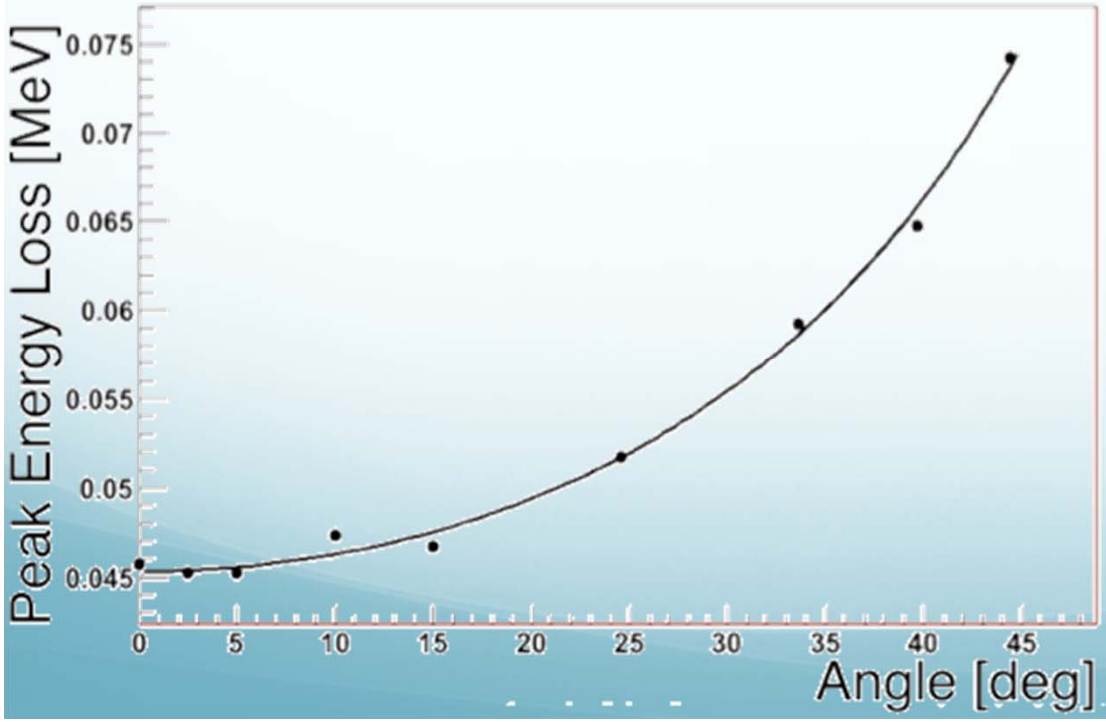


Rotation of One Sensor

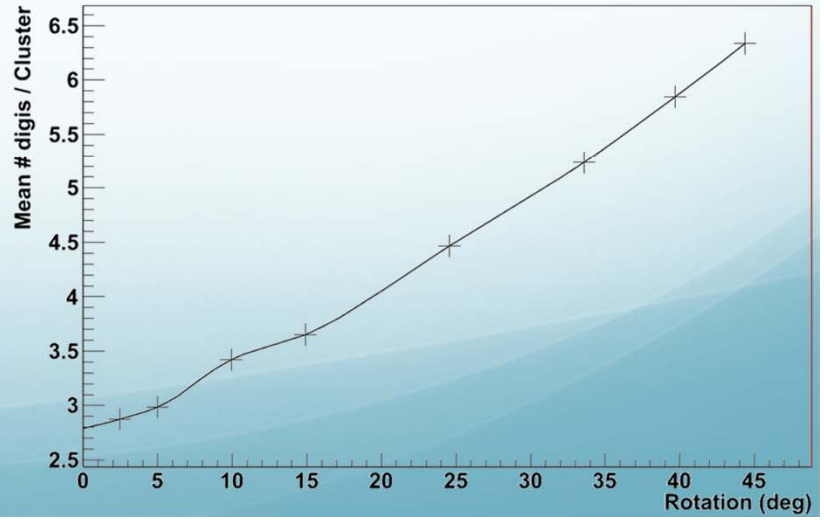


4 GeV electrons @ DESY [Hamburg]

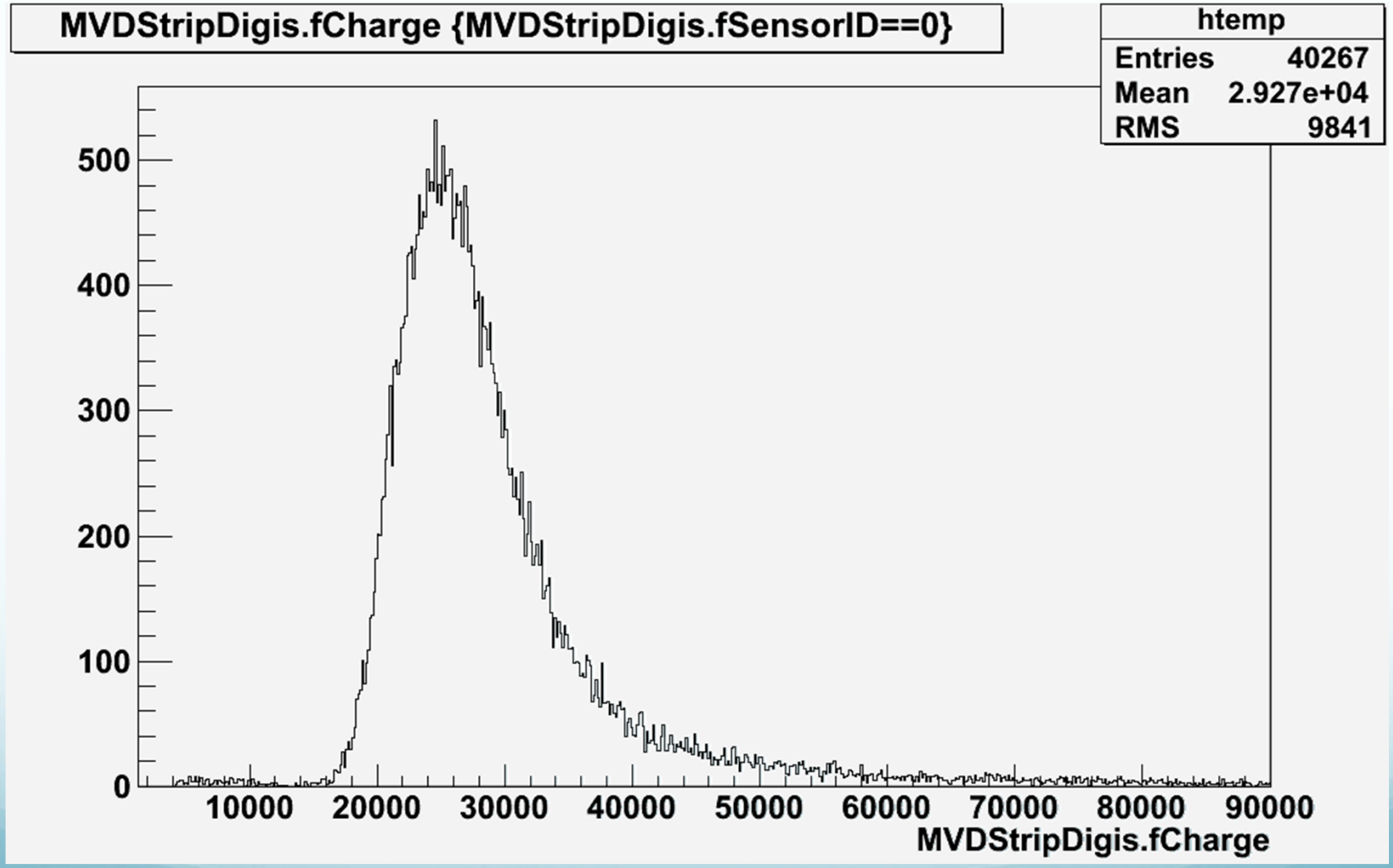




Energy loss and cluster size in the rotated sensor

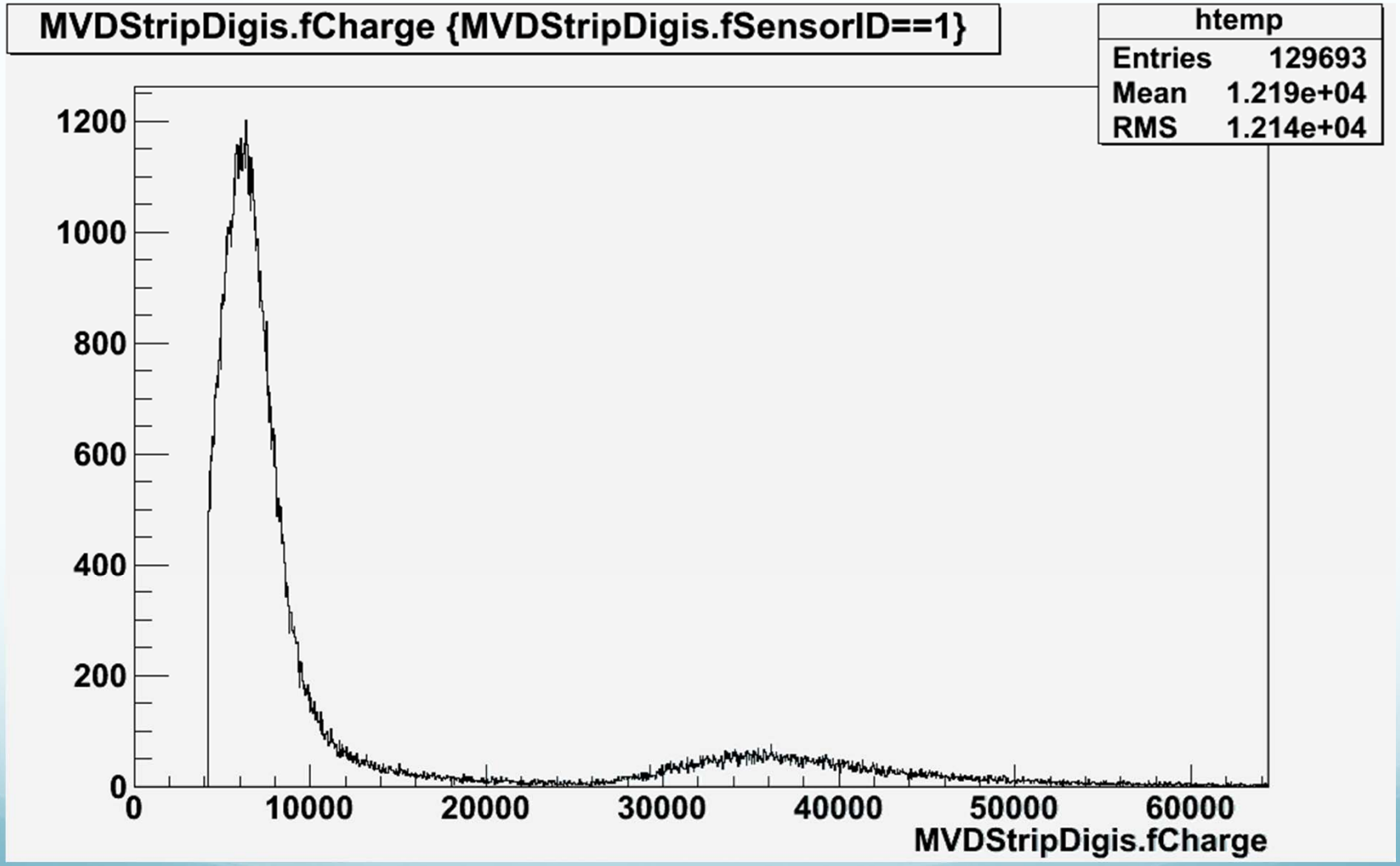


Rotation of One Sensor - Simulations



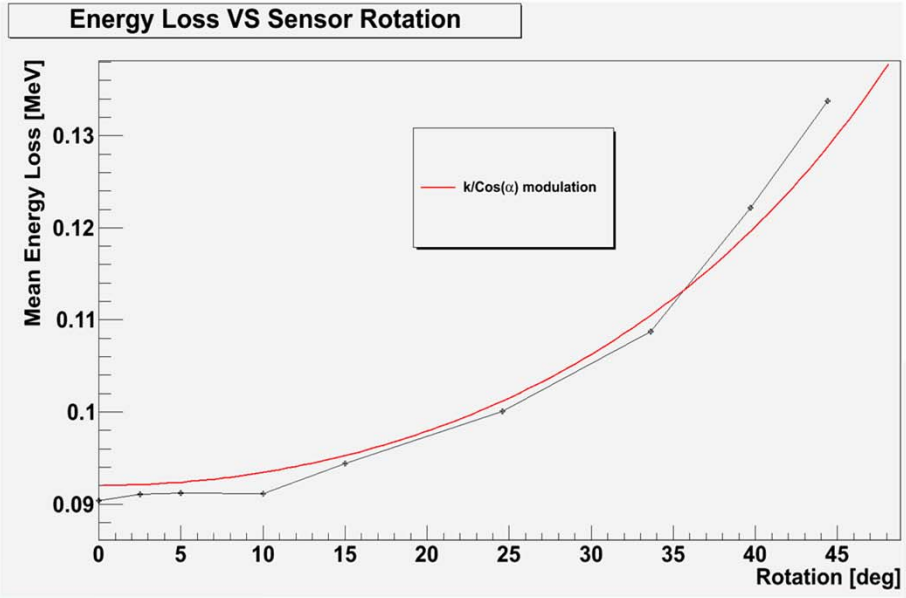
Electrons of 4 GeV - 0 deg rotation

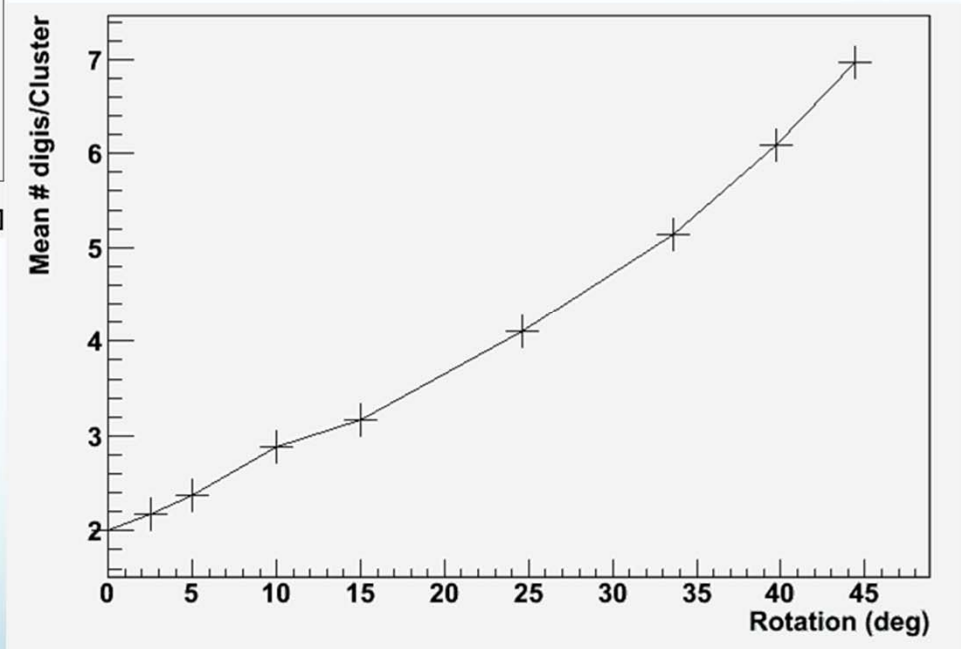
Rotation of One Sensor - Simulations



Electrons of 4 GeV - 44.4 deg rotation

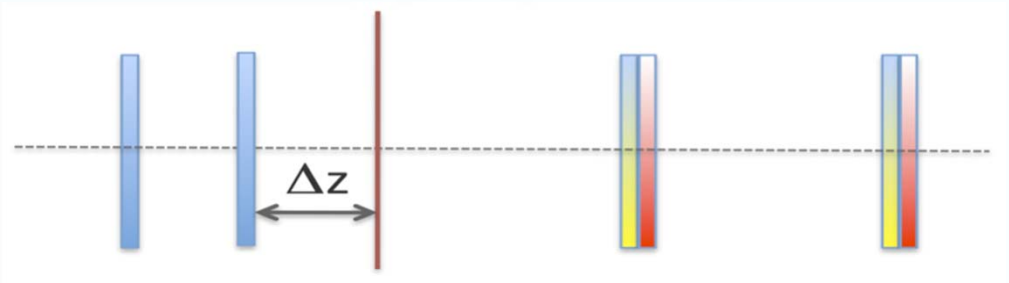
Rotation of One Sensor - Simulations





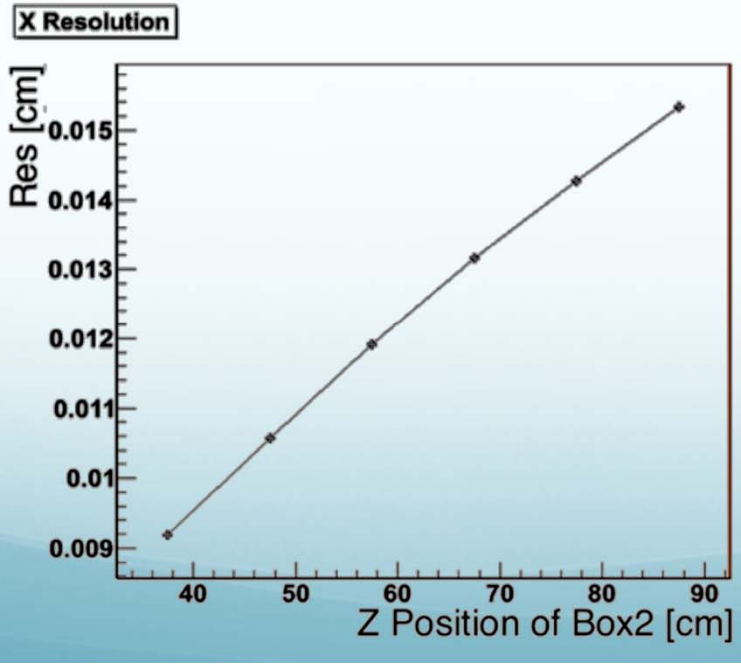
Electrons of 4 GeV

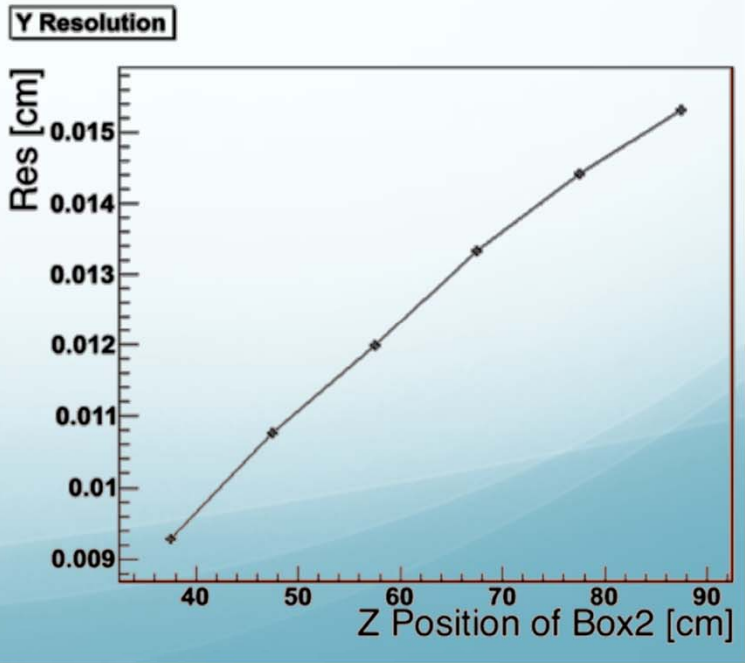
Translation of One Sensor



3 GeV electrons @ DESY [Hamburg]

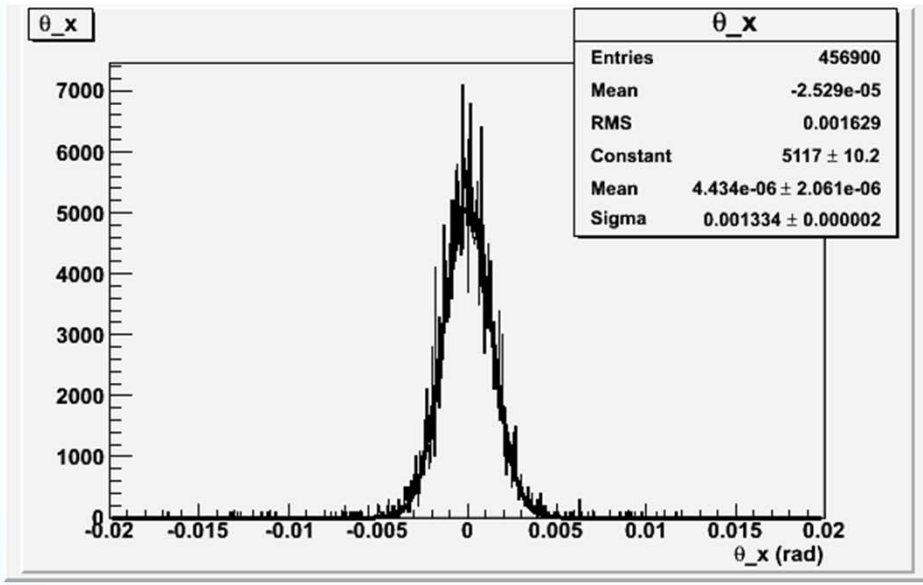
Defining the following estimator: $RES = \sqrt[4]{\sigma_1 * \sigma_2 * \sigma_3 * \sigma_4}$

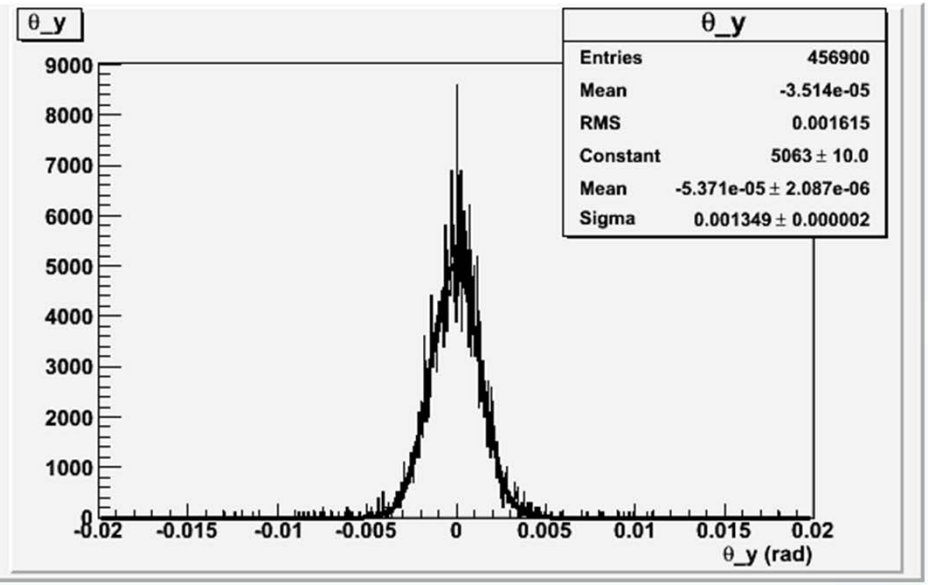




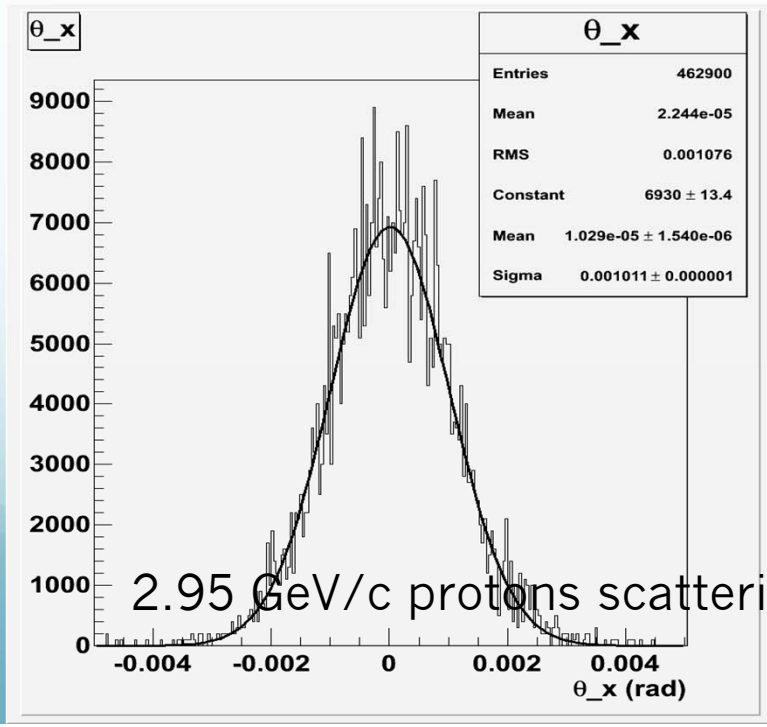
THANKS FOR YOUR ATTENTION

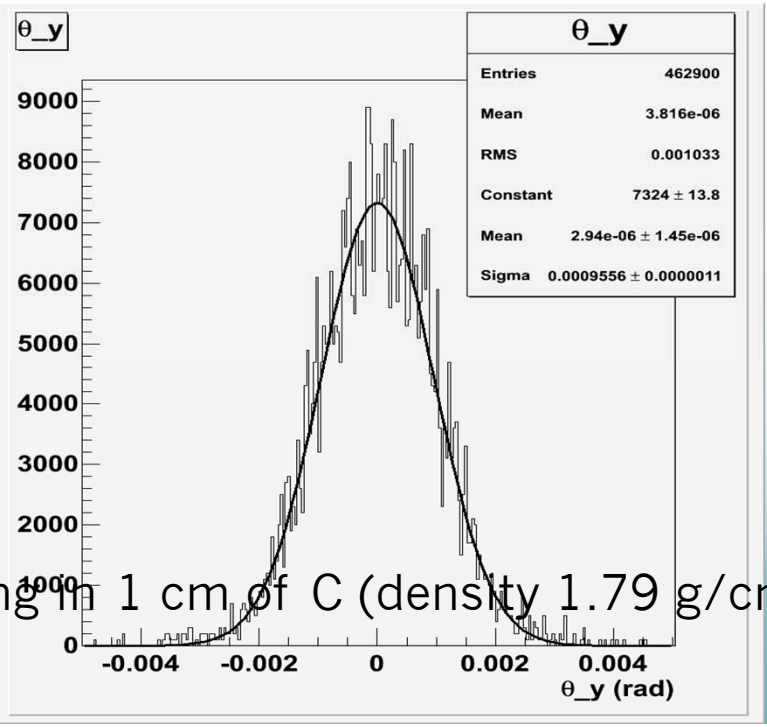
BACKUP SLIDES



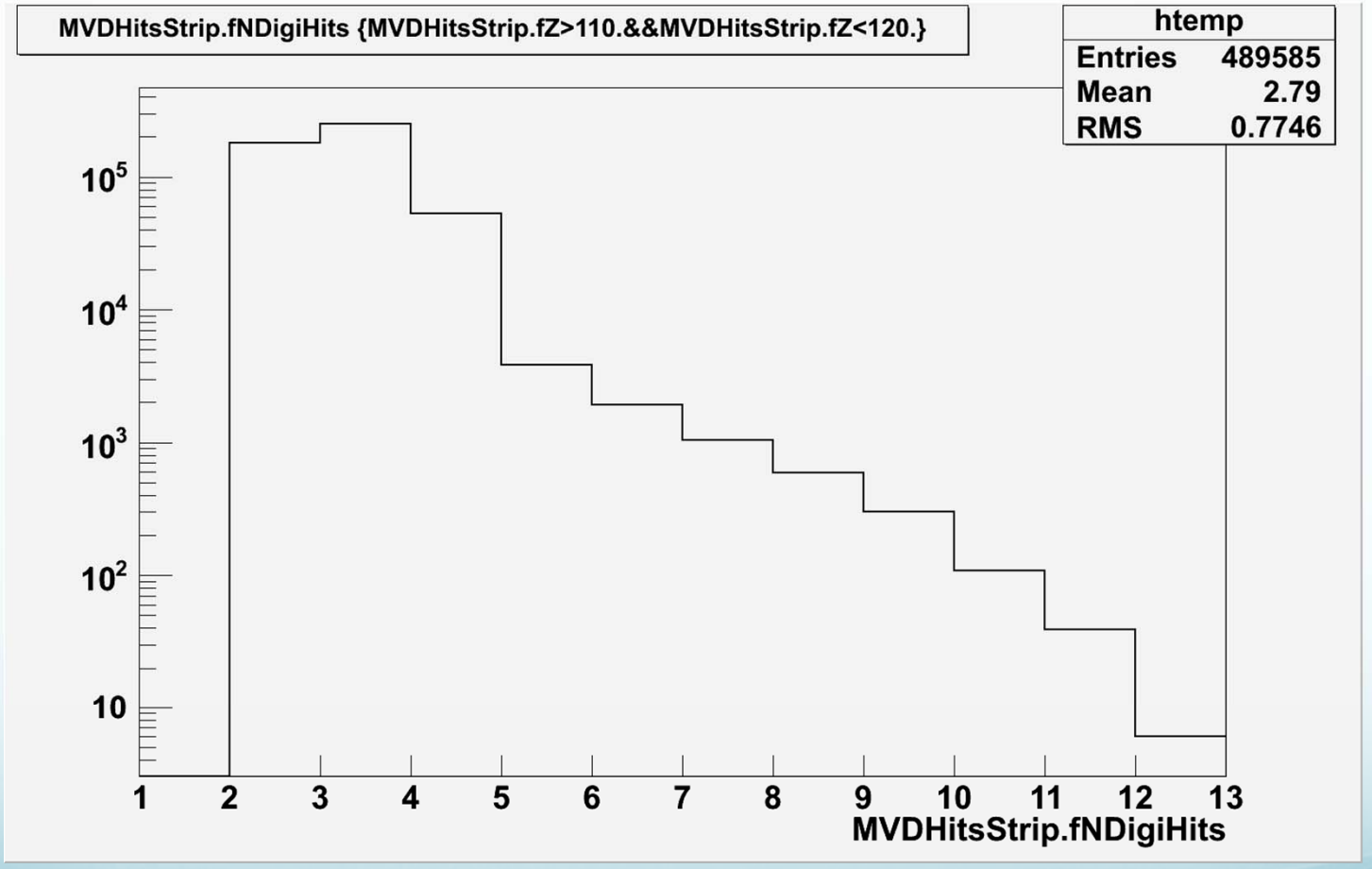


2.95 GeV/c protons scattering in 2 cm of C (density 1.69 g/cm3)





2.95 GeV/c protons scattering in 1 cm of C (density 1.79 g/cm3)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10^4
10^3
10^2
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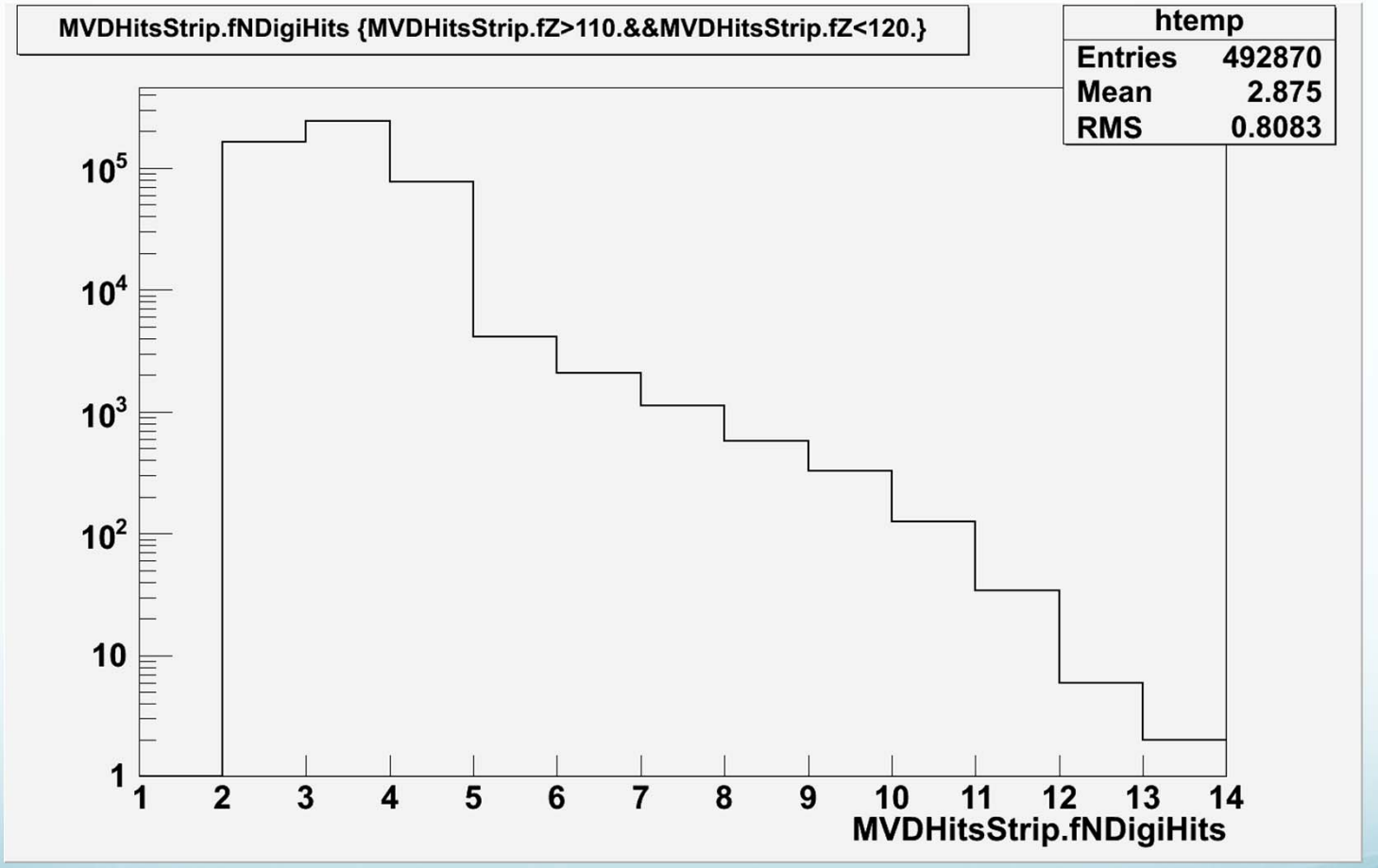
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10^3
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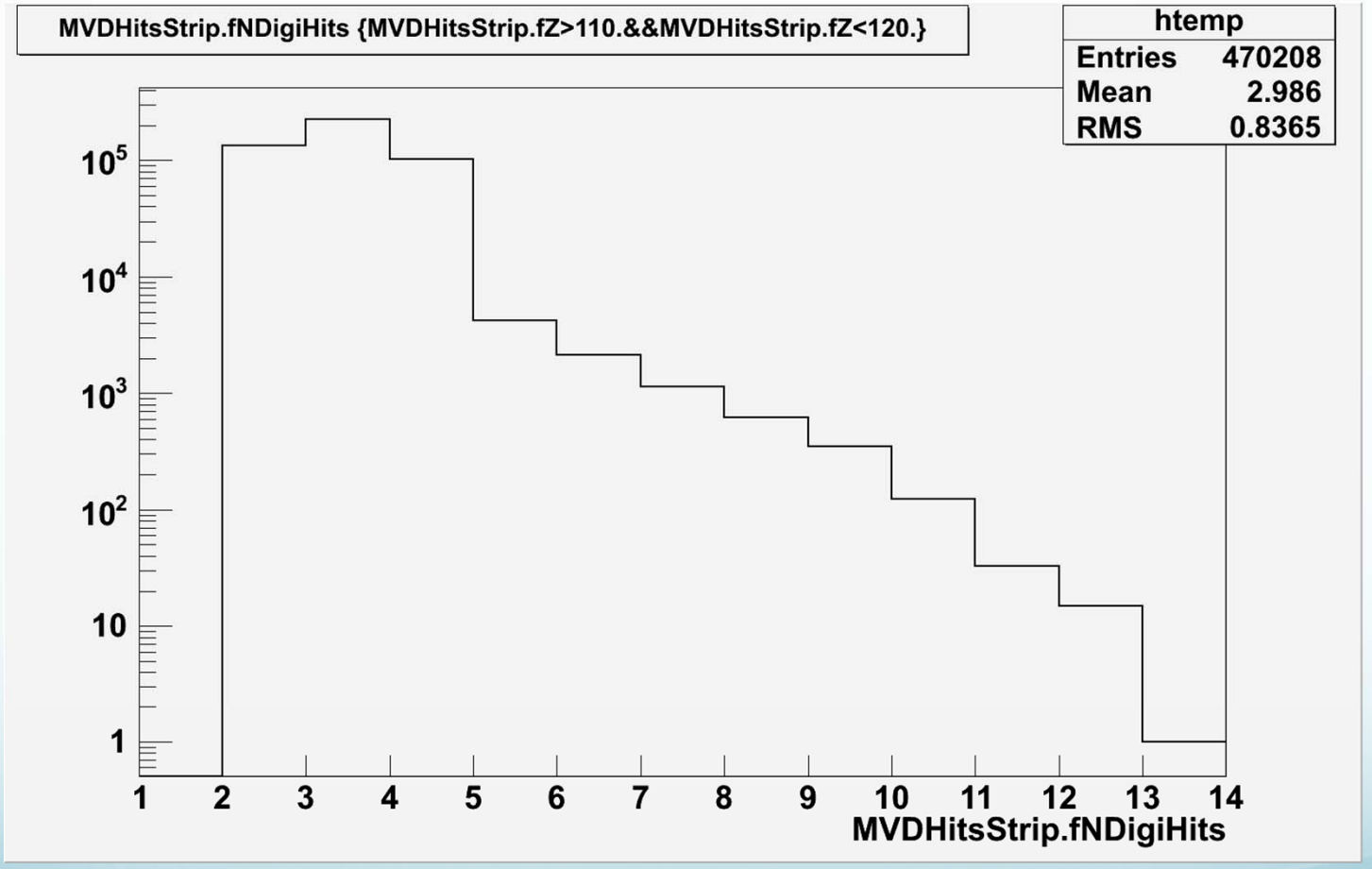
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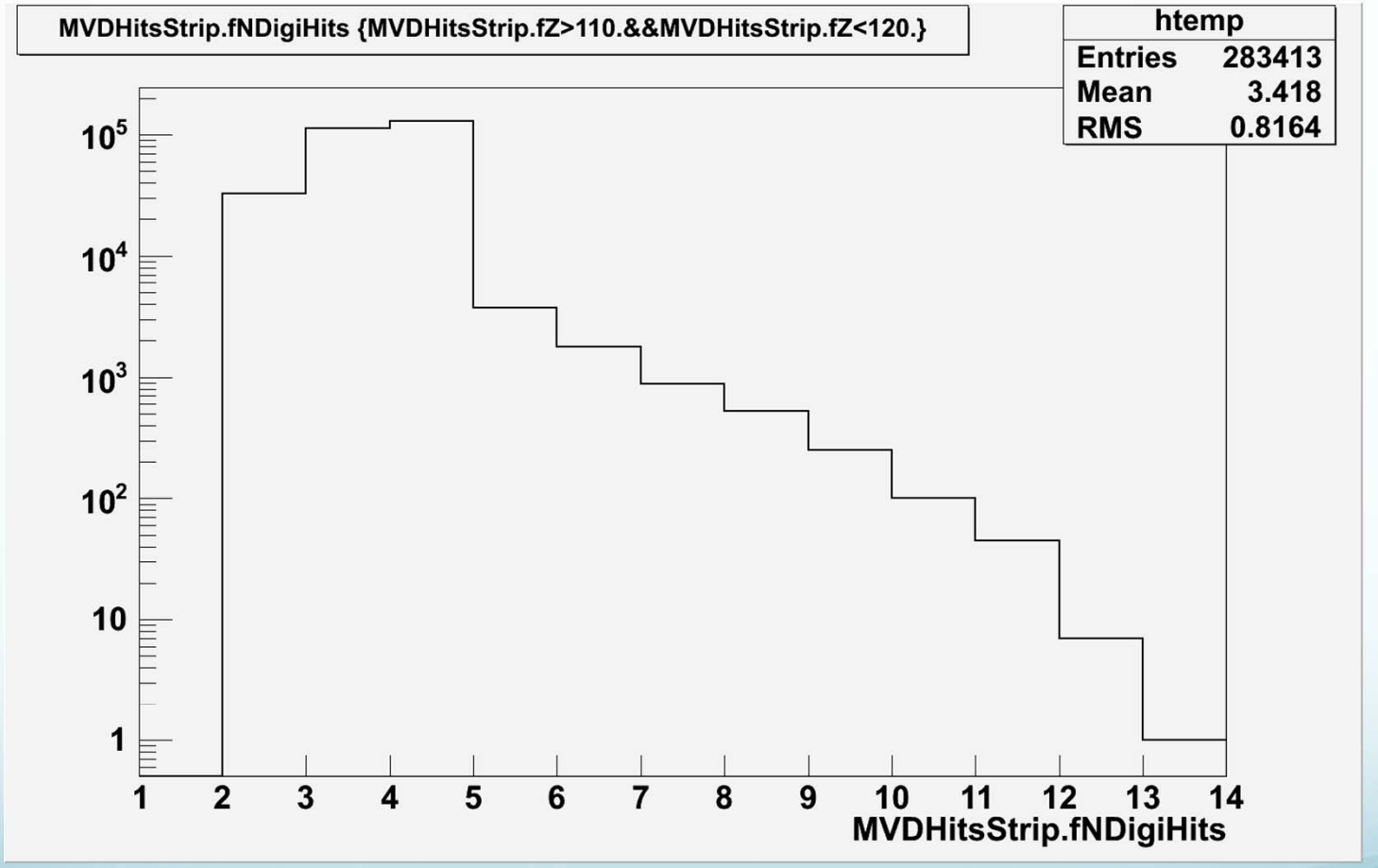
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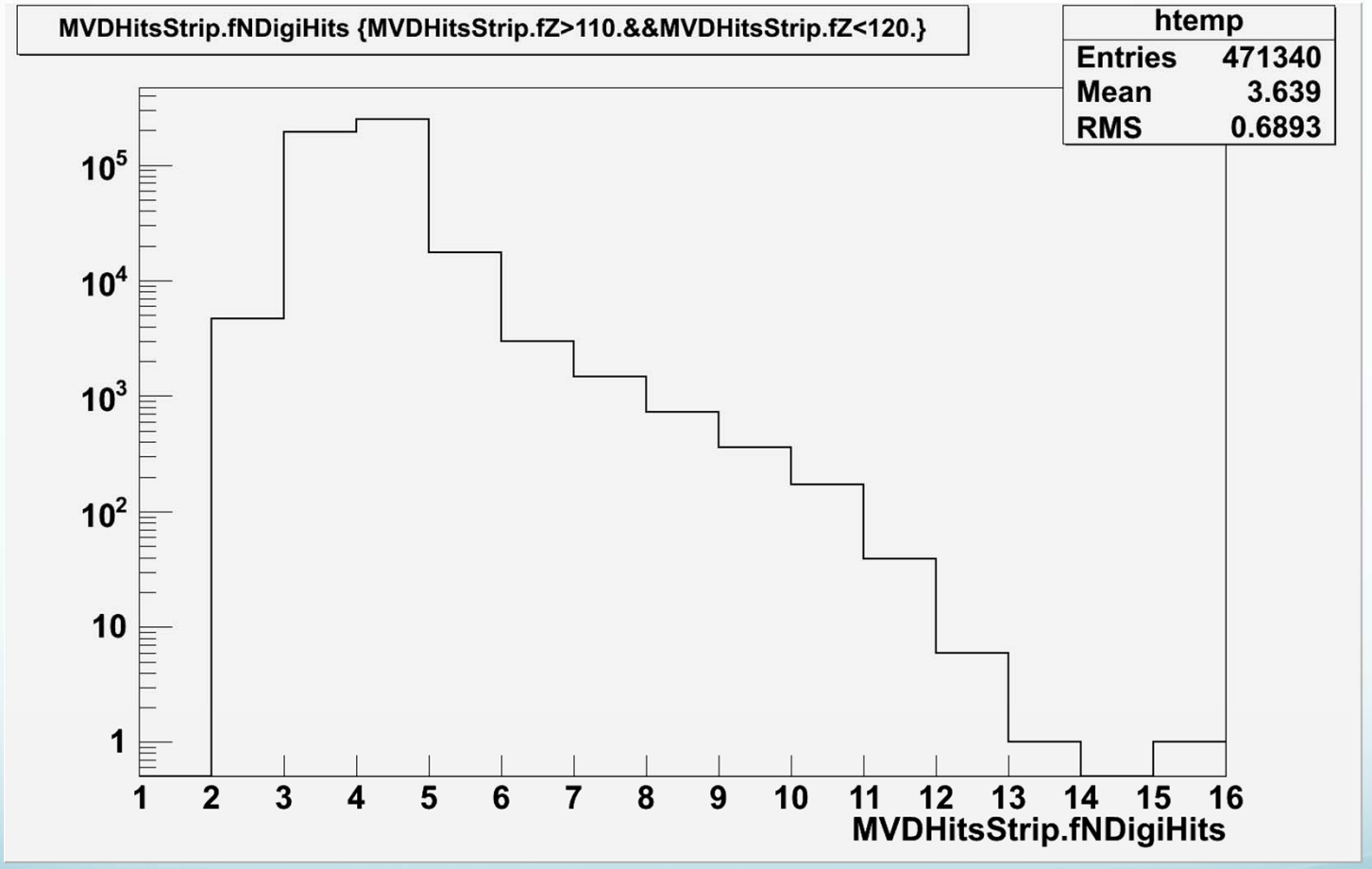
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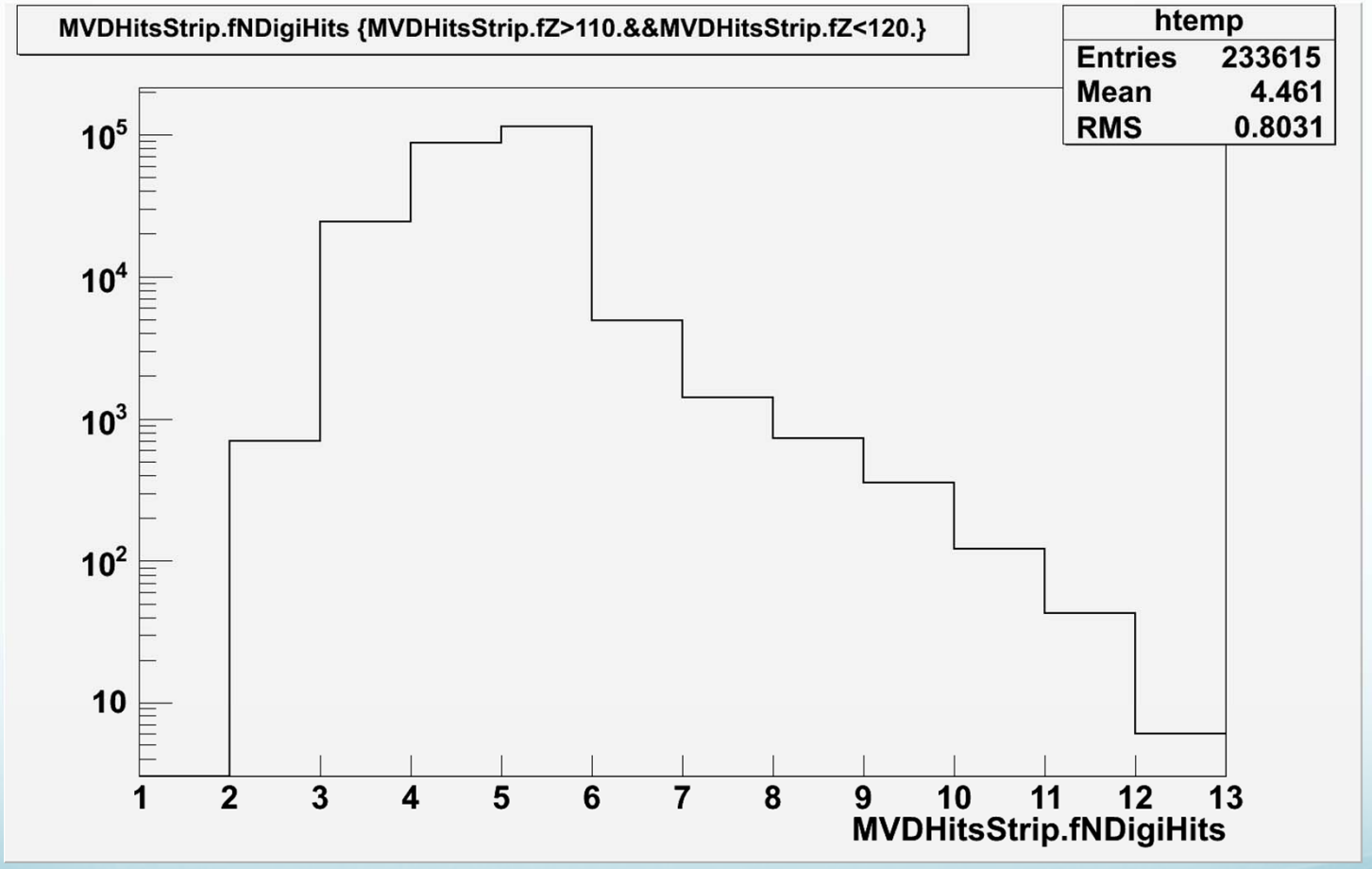
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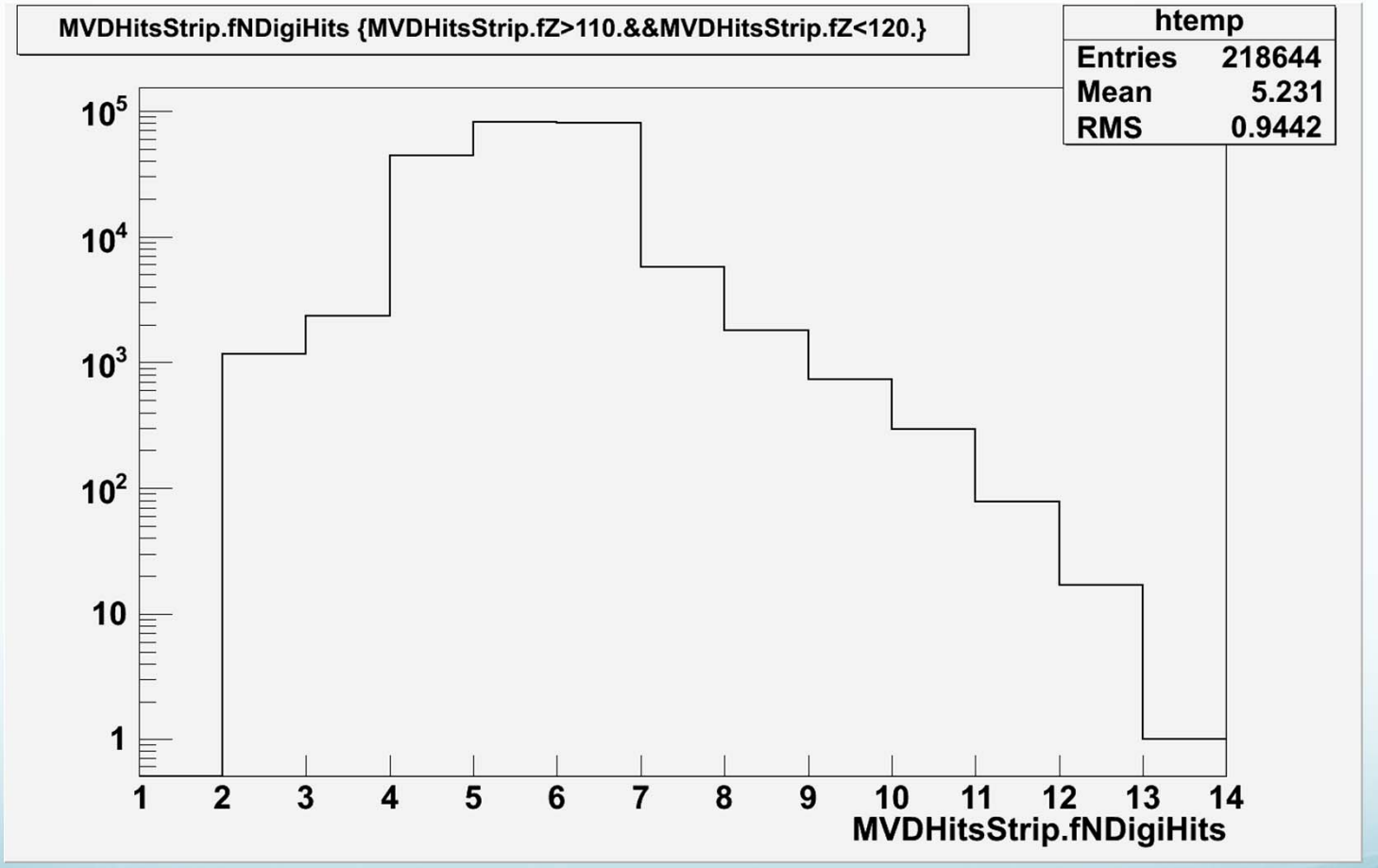
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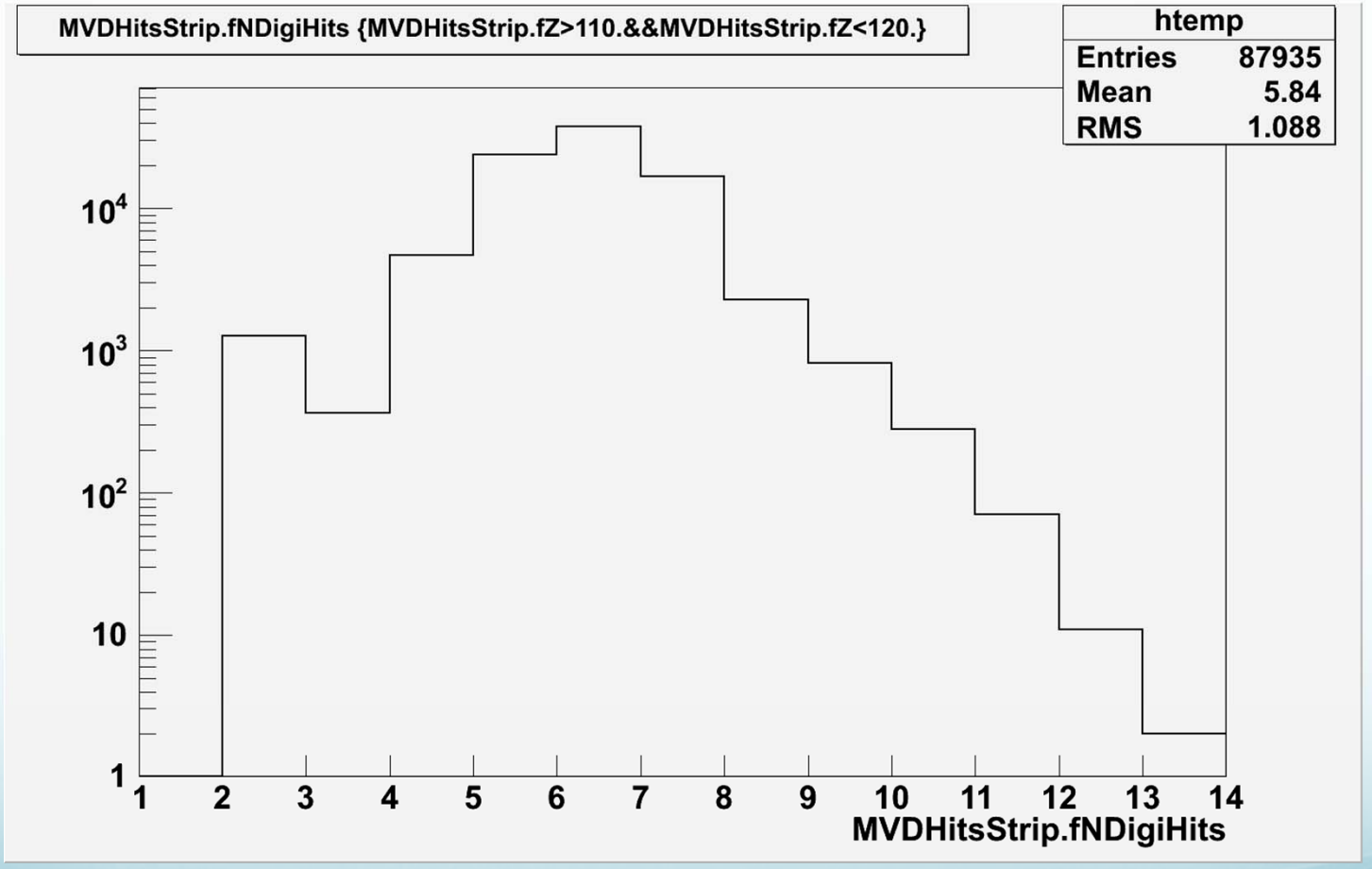
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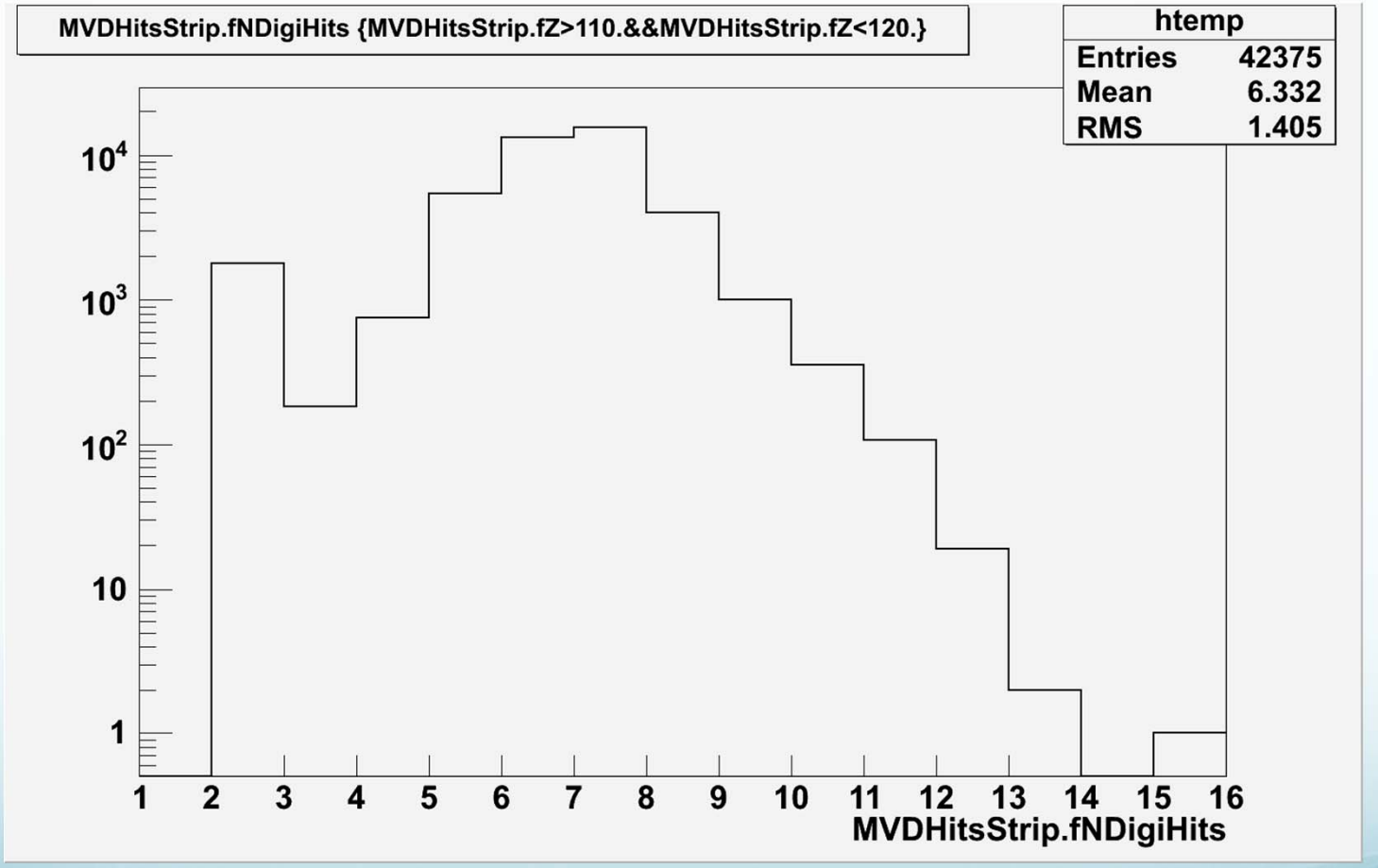
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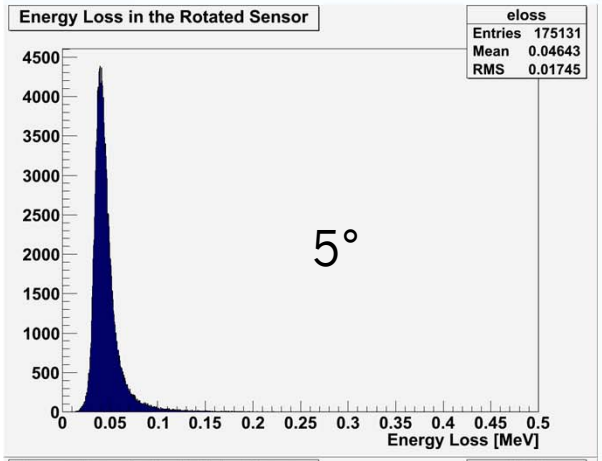
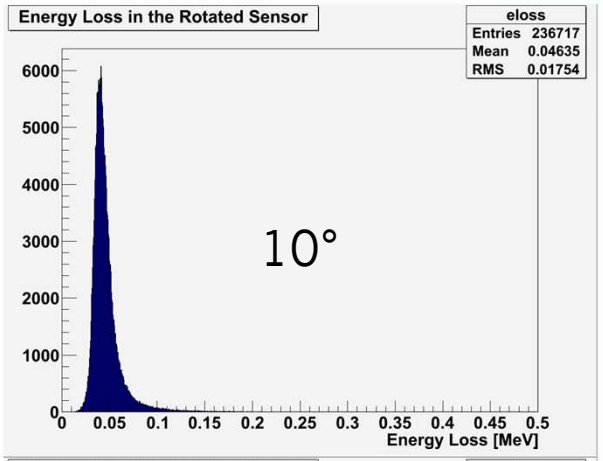
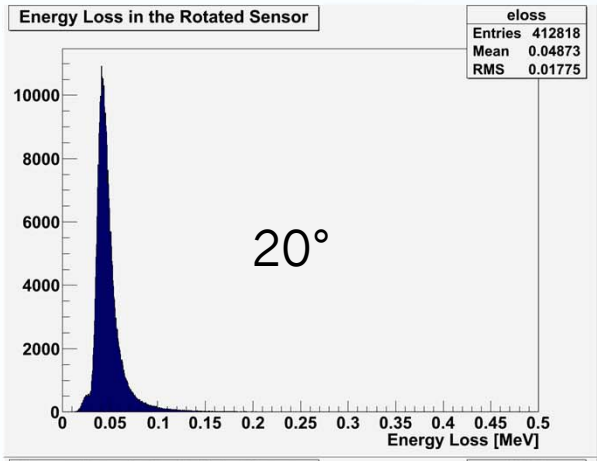
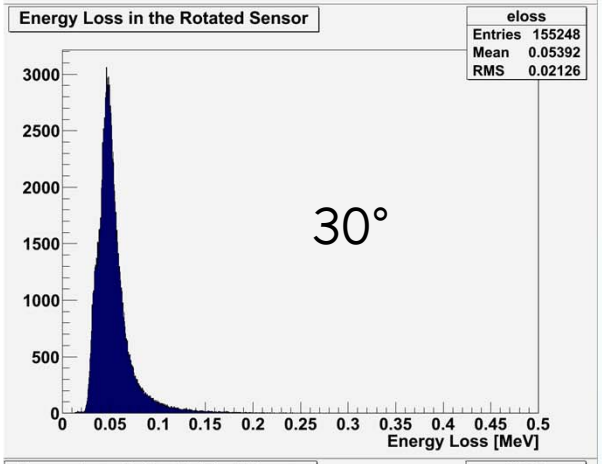
10^3
10^2
10
1
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
MVDHitsStrip.fNDigiHits

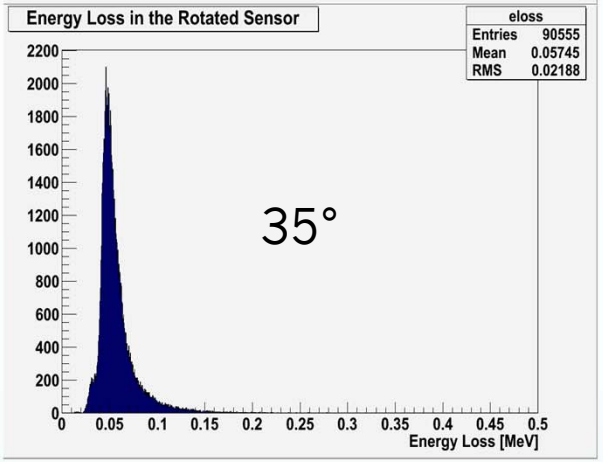
2.95 GeV/c protons @ COSY

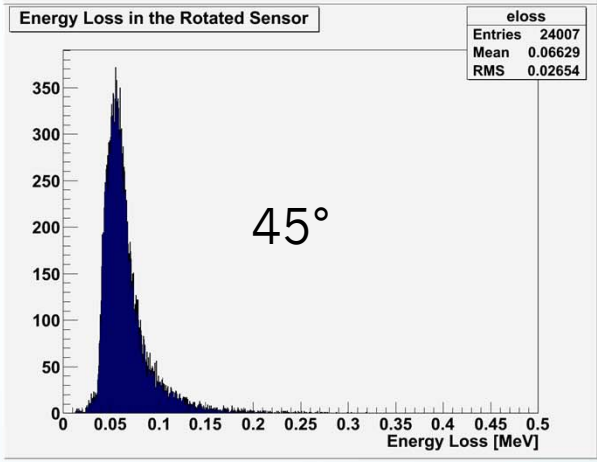

Energy Loss in the Rotated Sensor
eloss
Entries 175131
Mean 0.04643
RMS 0.01745
5°
Energy Loss [MeV]

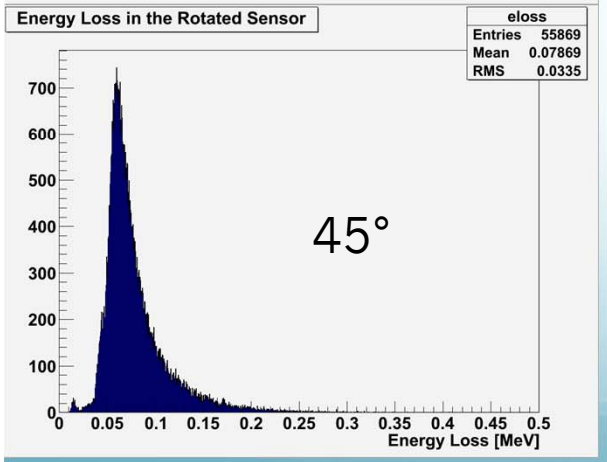

Energy Loss in the Rotated Sensor
eloss
Entries 236717
Mean 0.04635
RMS 0.01754
10°
Energy Loss [MeV]


Energy Loss in the Rotated Sensor
eloss
Entries 412818
Mean 0.04873
RMS 0.01775
20°
Energy Loss [MeV]


Energy Loss in the Rotated Sensor
eloss
Entries 155248
Mean 0.05392
RMS 0.02126
30°
Energy Loss [MeV]

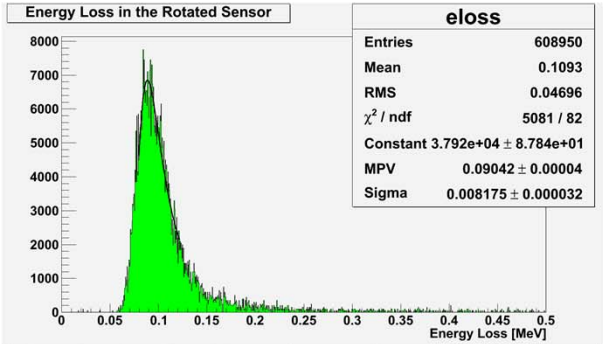

Energy Loss in the Rotated Sensor
eloss
Entries 90555
Mean 0.05745
RMS 0.02188
35°
Energy Loss [MeV]

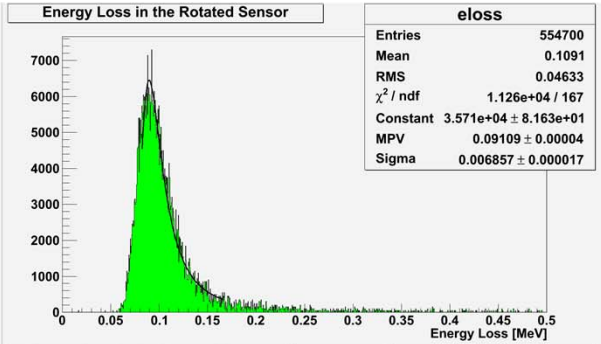

Energy Loss in the Rotated Sensor
eloss
Entries 24007
Mean 0.06629
RMS 0.02654
45°
Energy Loss [MeV]

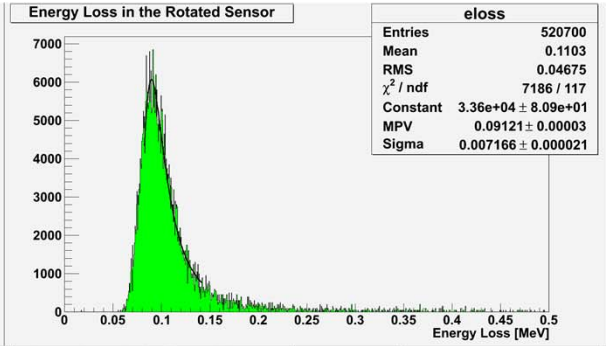

Energy Loss in the Rotated Sensor
eloss
Entries 55869
Mean 0.07869
RMS 0.0335
45°
Energy Loss [MeV]

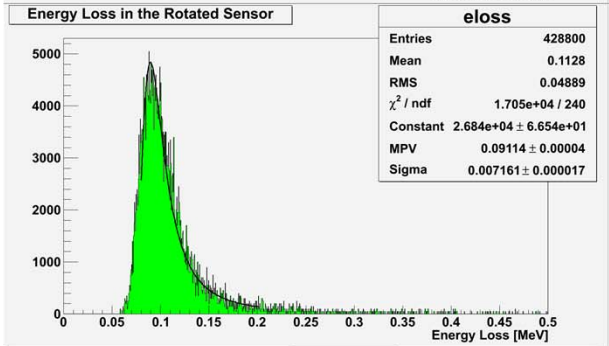
DATA

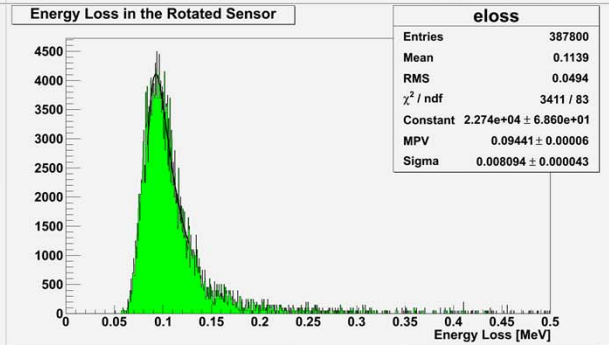
4 GeV electrons @ DESY

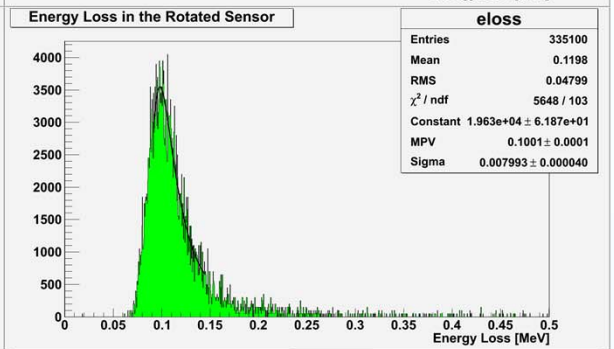


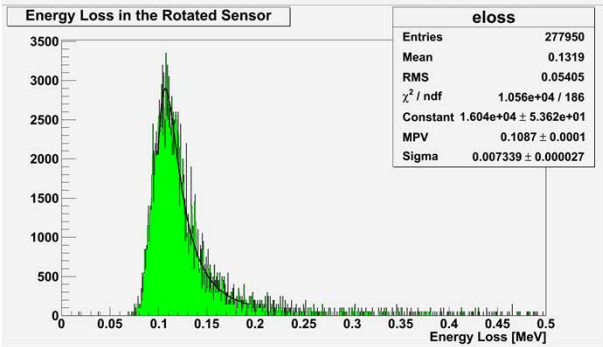


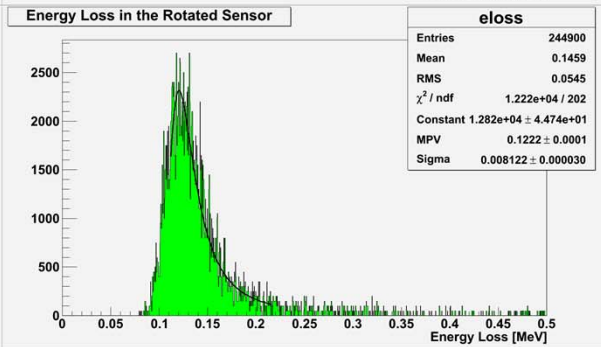


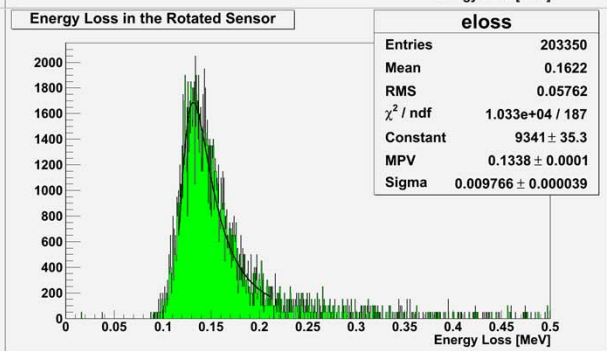
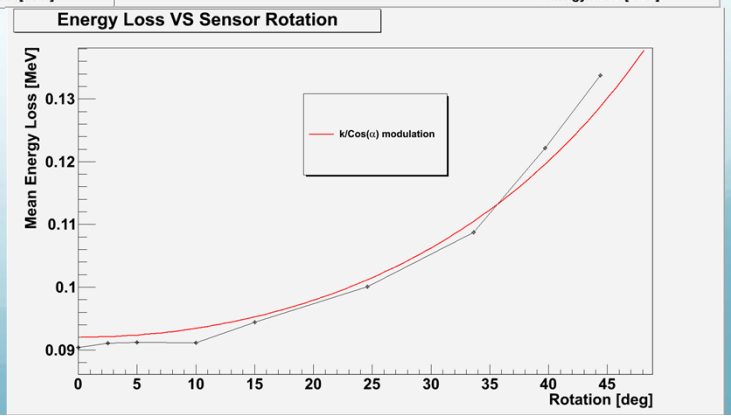












SIMULATIONS