



A look at MCS angle

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Outline and Data

1. Angle Definitions
2. Selection cuts
3. Angle X/Y projections
4. Data – Mc comparison
5. Angle vs NumClusters
6. Other Beam Positions
7. Energy scaling
8. Conclusions

When not specified position is (201, 14, -47)

Mc

- **SPS:**

162 e- 100 GeV 0 deg
164 e- 196 GeV 0 deg
172 e- 50 GeV 0 deg
176 e- 20 GeV 0 deg

- **PS:**

185 e- 2.5 GeV 0 deg
186 e- 2.5 GeV 0 deg

Data

- **SPS:**

2024 : e- 100 GeV 0 deg
1922 : e- 280 GeV 0 deg
1885 : e- 196 GeV 0 deg
2023 : e- 50 GeV 0 deg
2082 e- 20 GeV 0 deg
1927 e- 280 GeV 0 deg (631, 13, -47)
2016 e- 100 GeV 0 deg (631, 13, -47)
2072 e- 50 GeV 0 deg (631, 13, -47)
2109 e- 20 GeV 0 deg (631, 13, -47)

- **PS:**

1202 e- 2.5 GeV 0 deg
1204 e- 0.5 GeV 0 deg
1147 e- 5 GeV 0 deg
1148 e- 3 GeV 0 deg
1205 e- 1 GeV 0 deg
1433 e- 2.5 GeV 0 deg (607, 45, 0)
1475 e- 5 GeV 0 deg (430, 14, -47)

Merit, BTtuple and Recon ntuples used

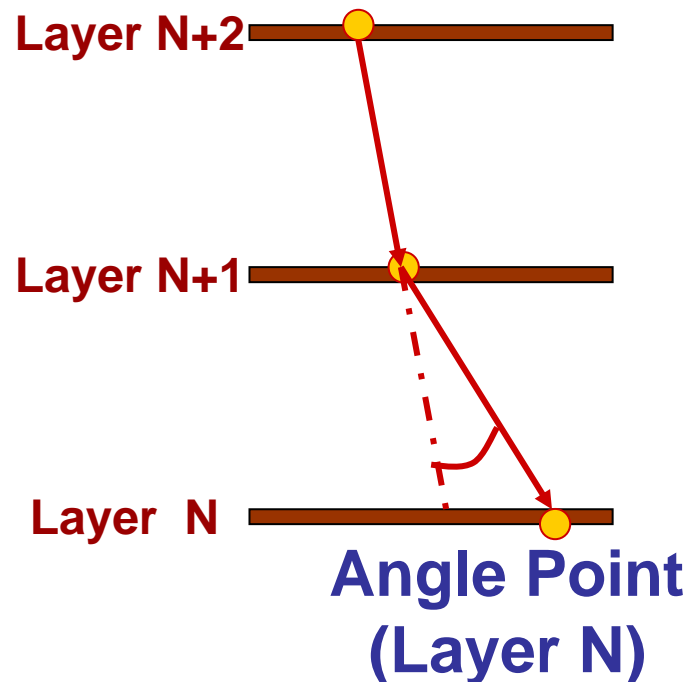


Definitions

To study MCS → definition of two different angles:

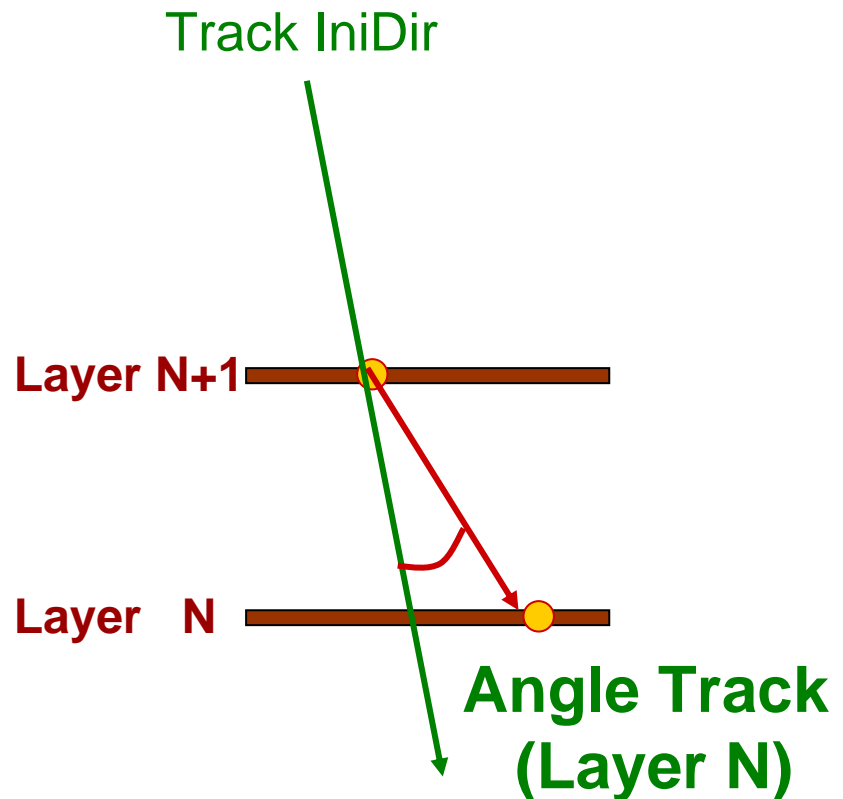
AnglePoint:

angle between two following segments of the Track



AngleTrack:

angle between Initial Track direction and Track segment



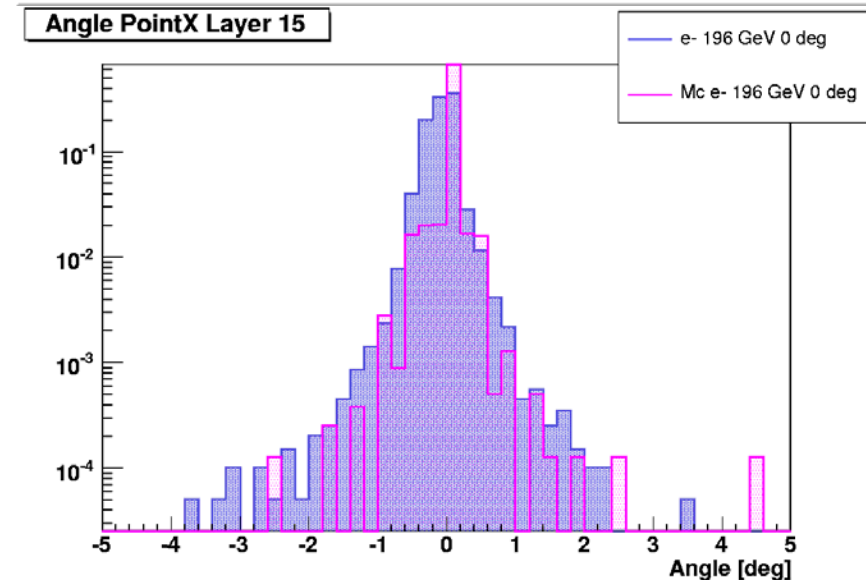
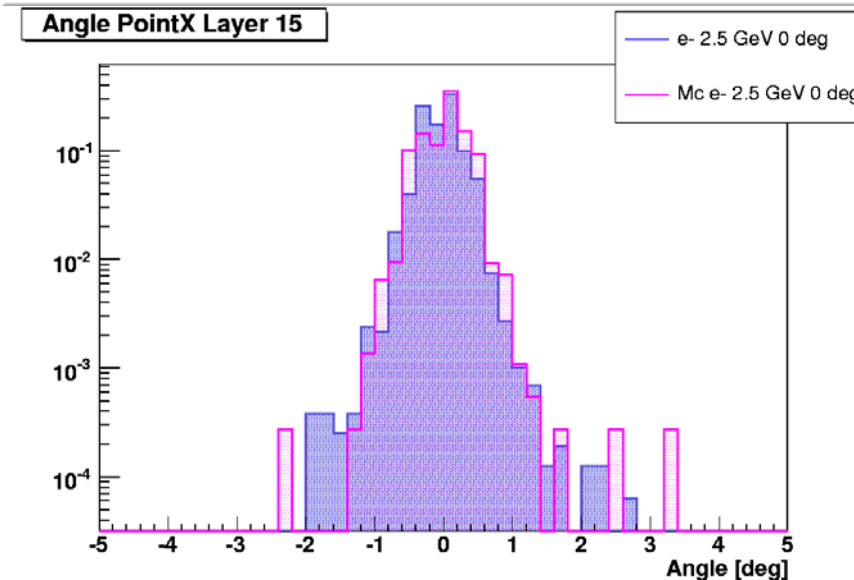
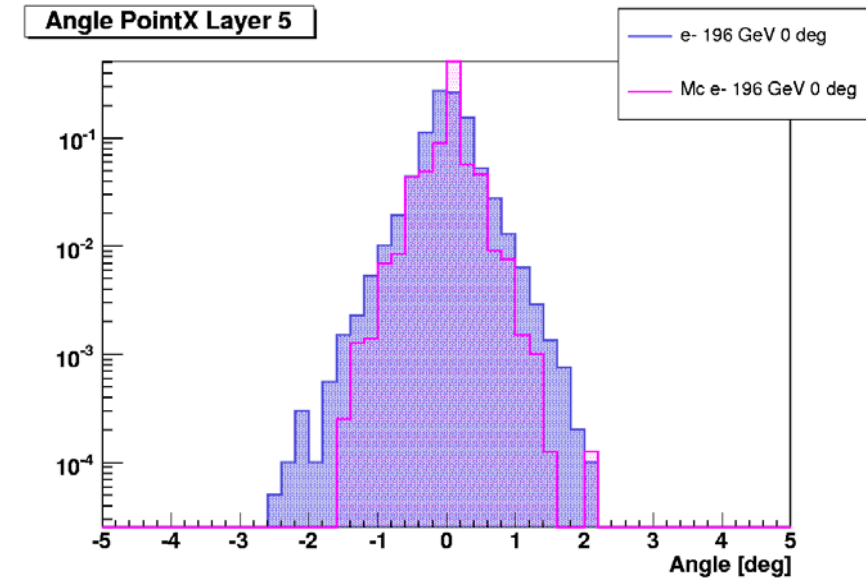
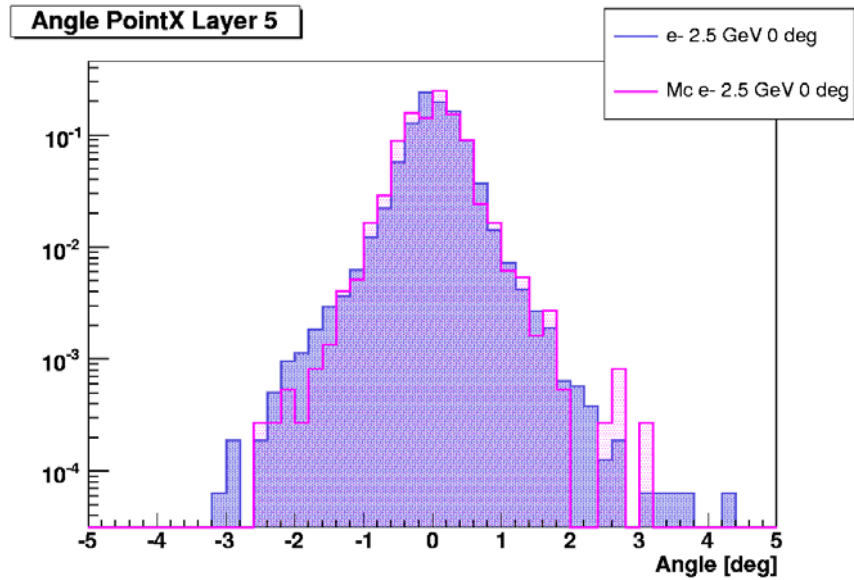


Selection Cuts

- **EvtEnergyCorr > 50**
- **Consider first Track only**
- **Tkr1NumHits == 36 (No Gaps for first Track)**



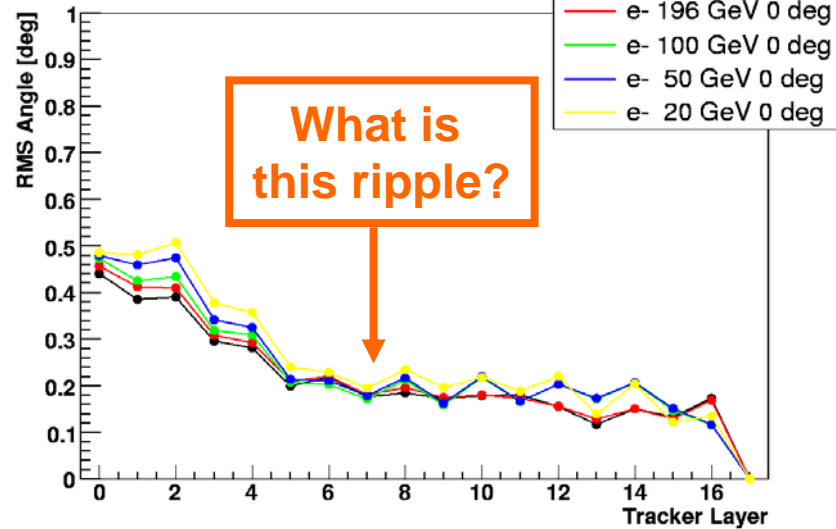
AnglePoint(X) Distributions



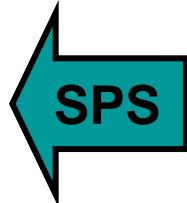
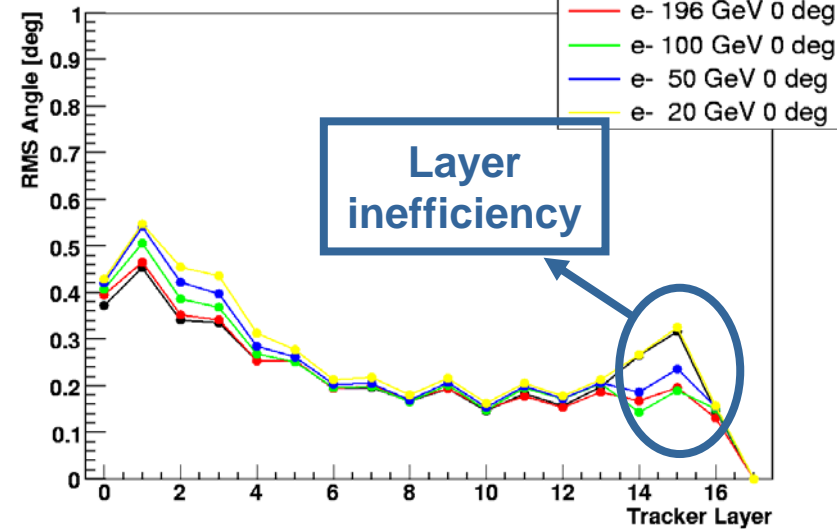


RMS Track X/Y vs Layer

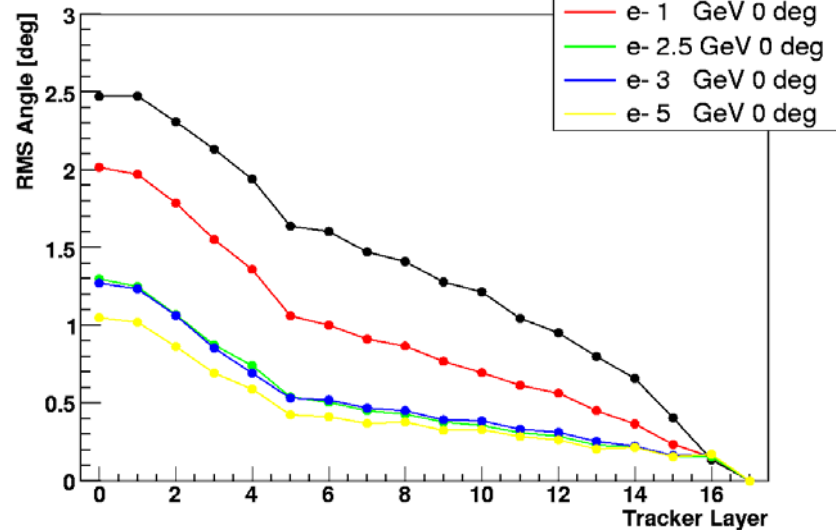
RMS TrackX vs Layer



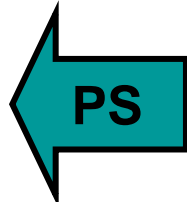
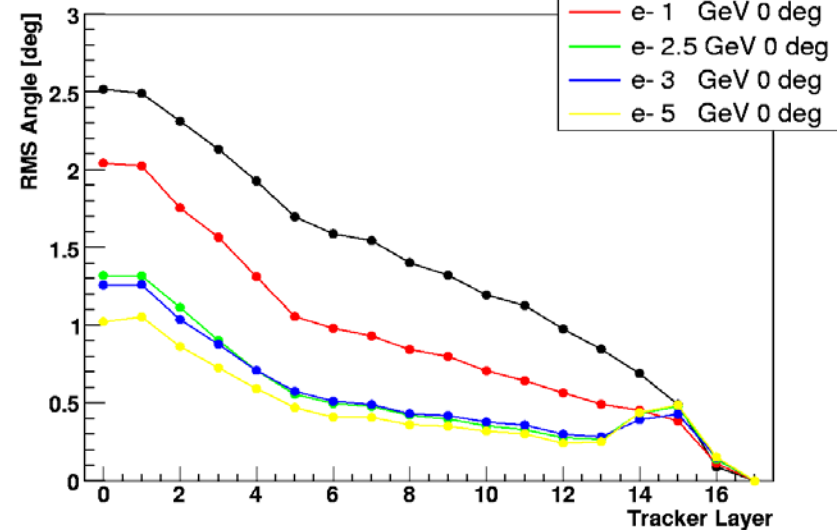
RMS TrackY vs Layer



RMS TrackX vs Layer



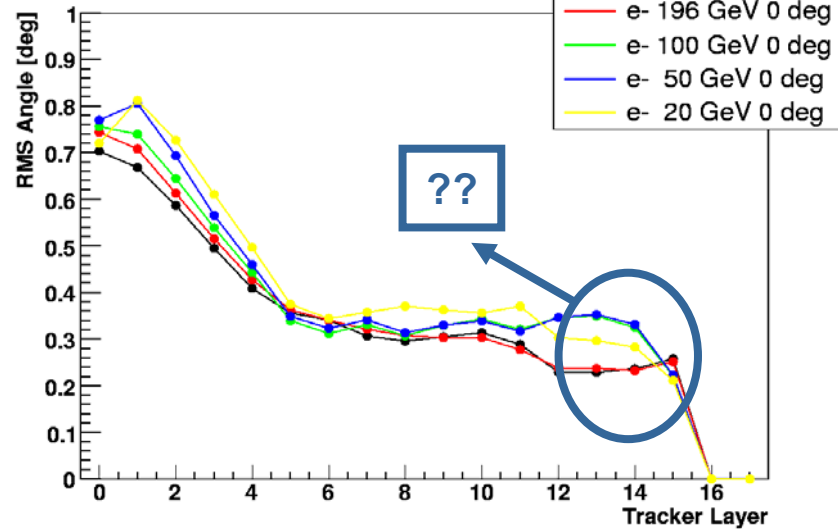
RMS TrackY vs Layer



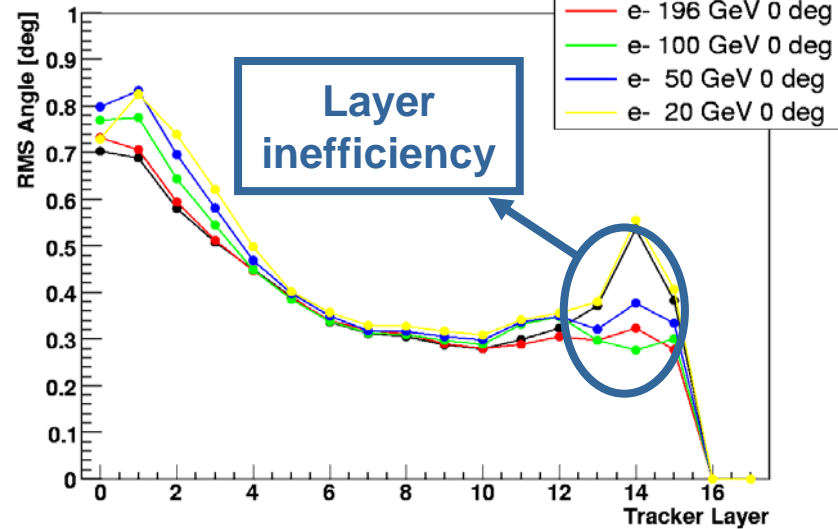


RMS Point X/Y vs Layer

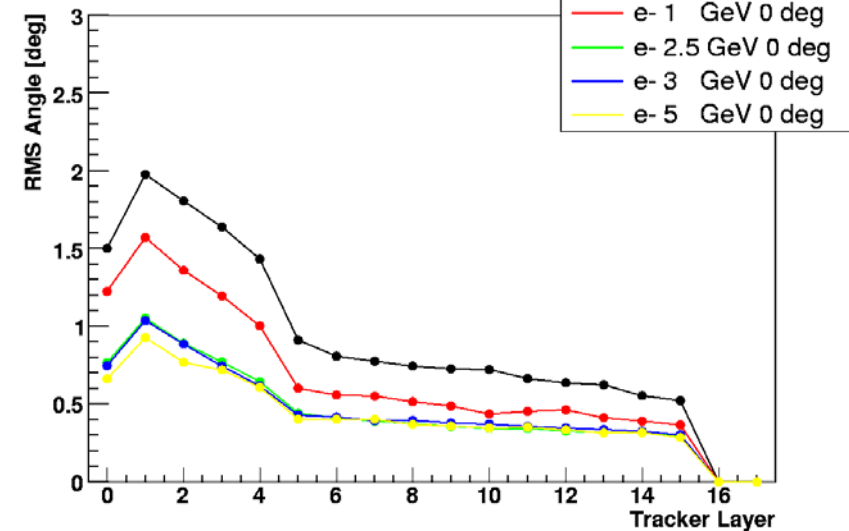
RMS PointX vs Layer



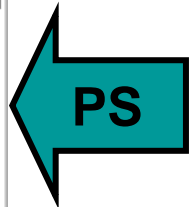
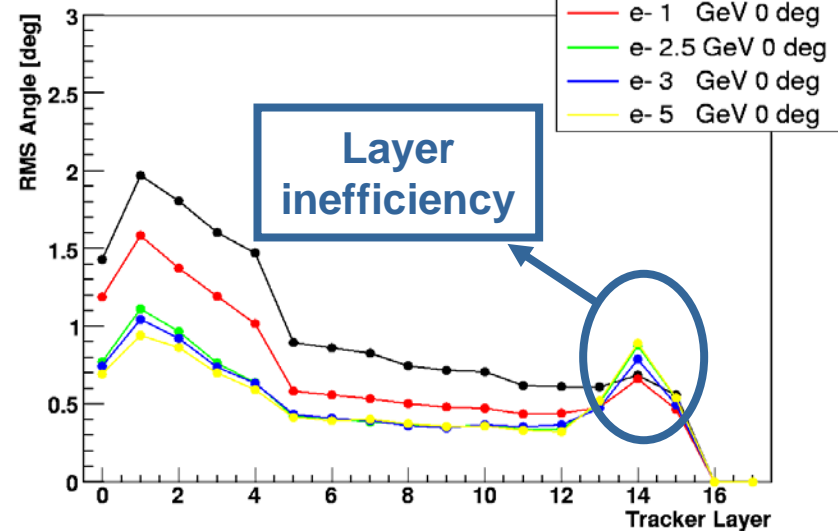
RMS PointY vs Layer



RMS PointX vs Layer

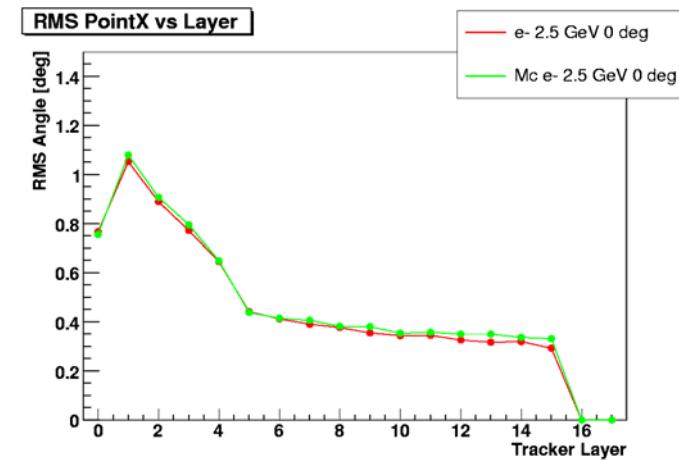
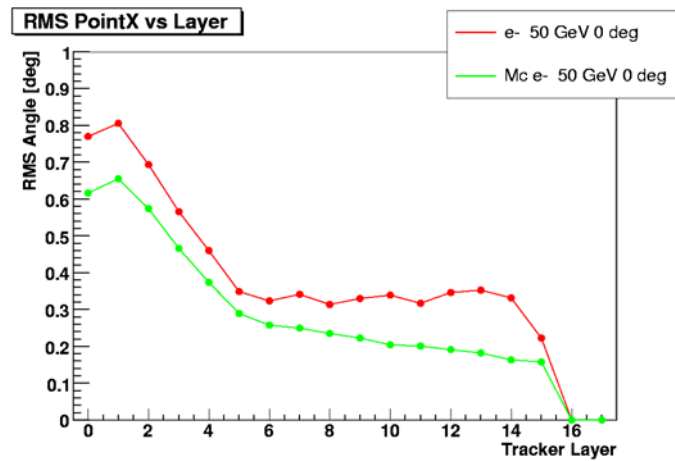
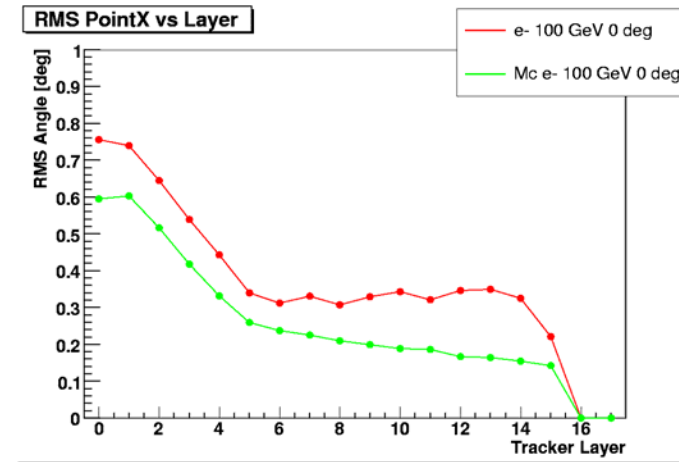
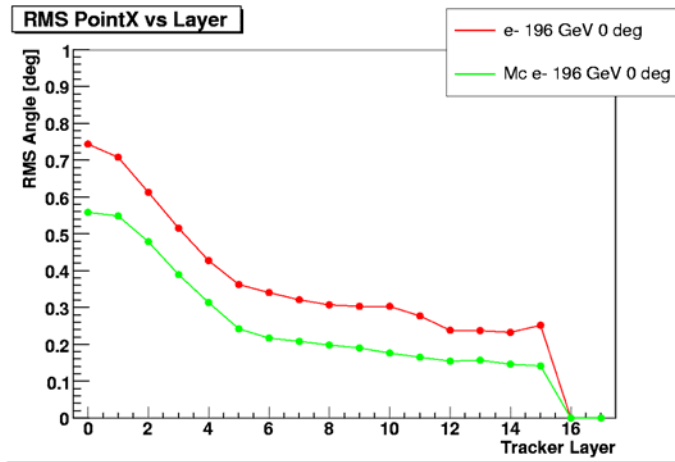


RMS PointY vs Layer



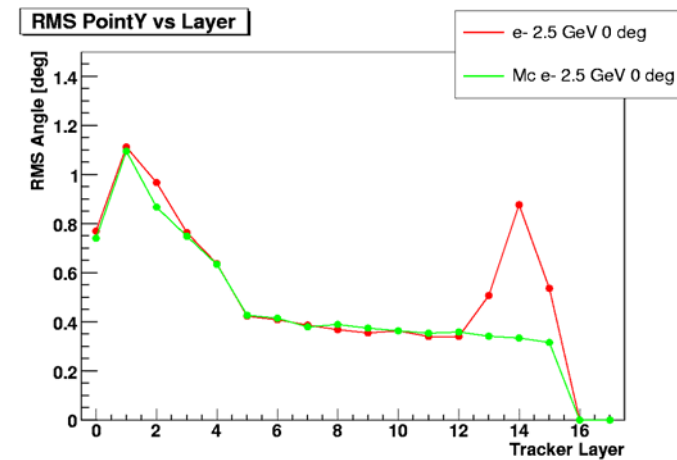
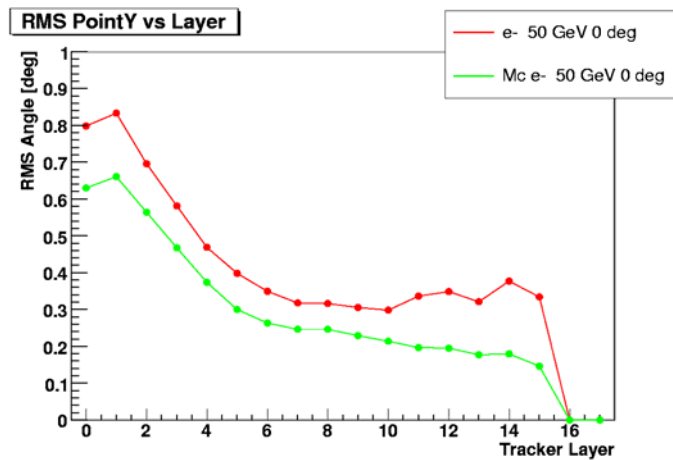
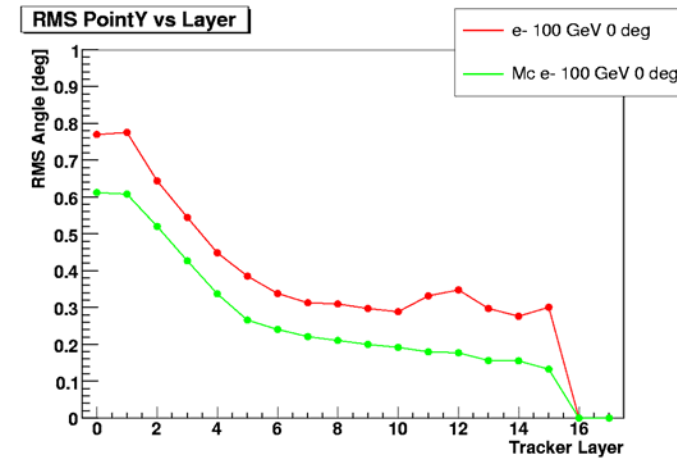
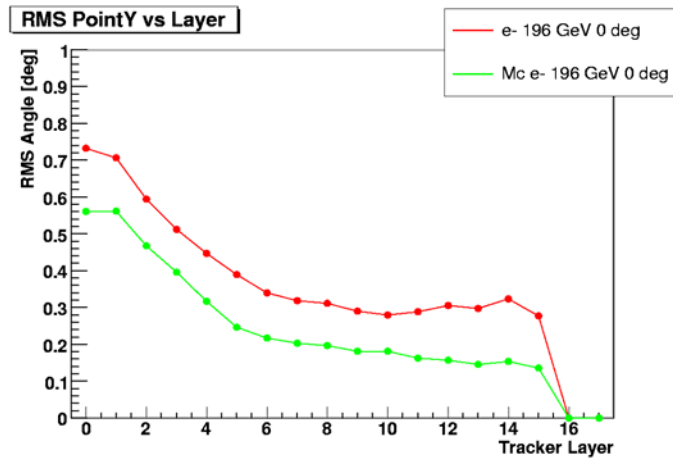


RMS PointX Data & Mc



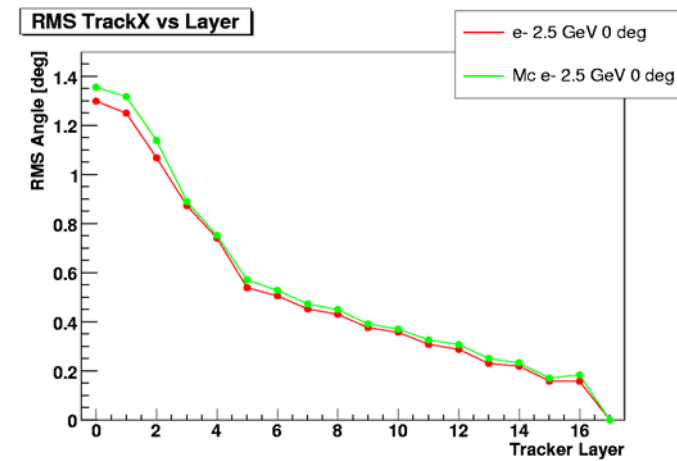
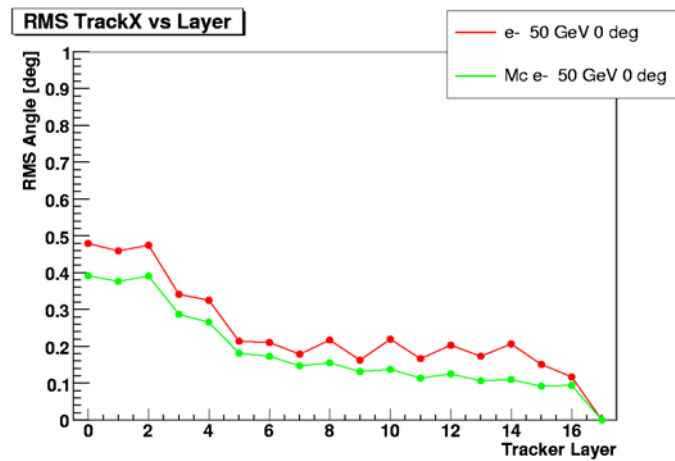
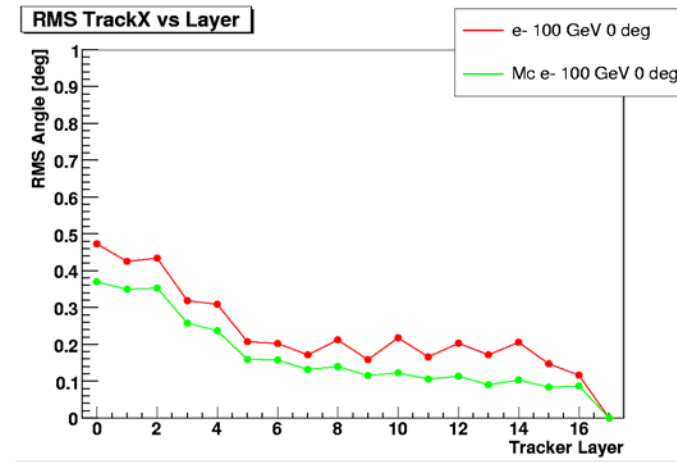
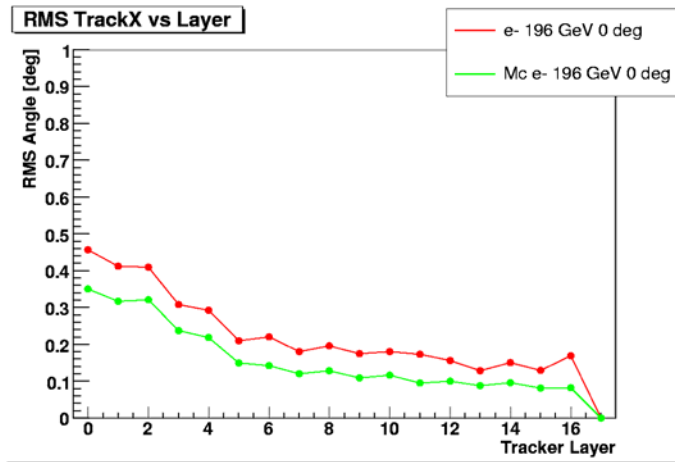


RMS PointY Data & Mc



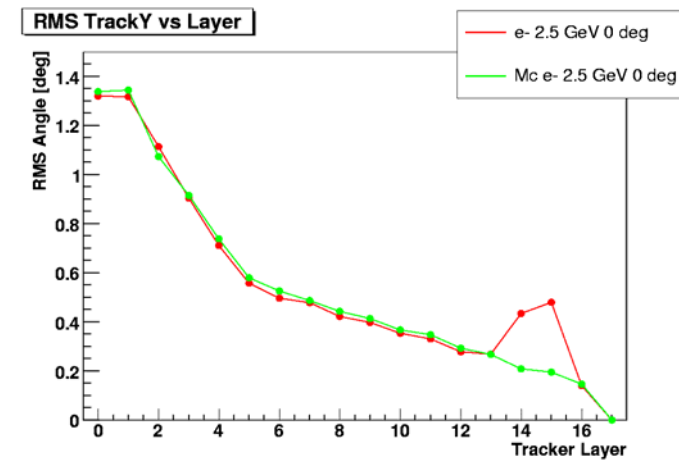
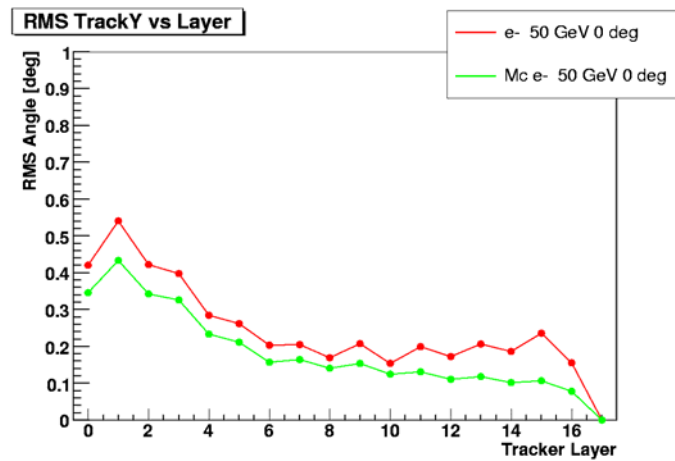
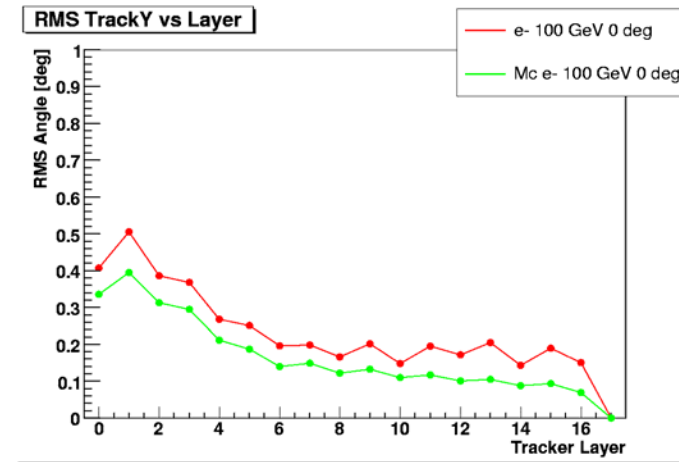
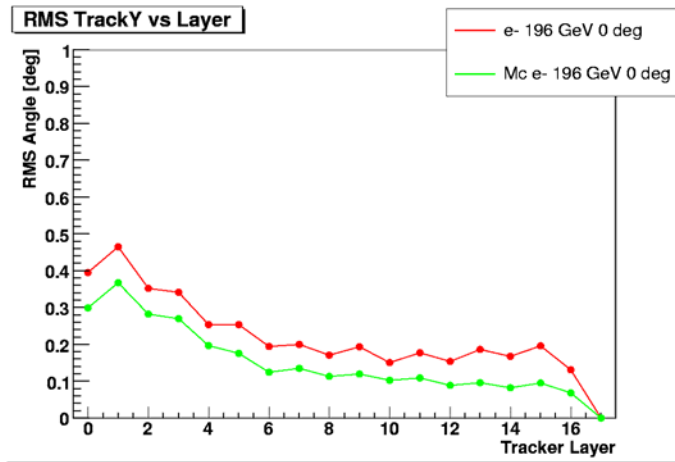


RMS TrackX Data & Mc





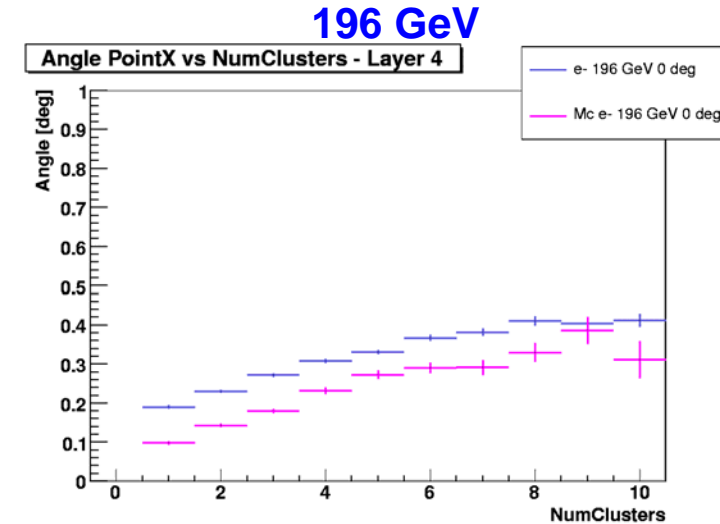
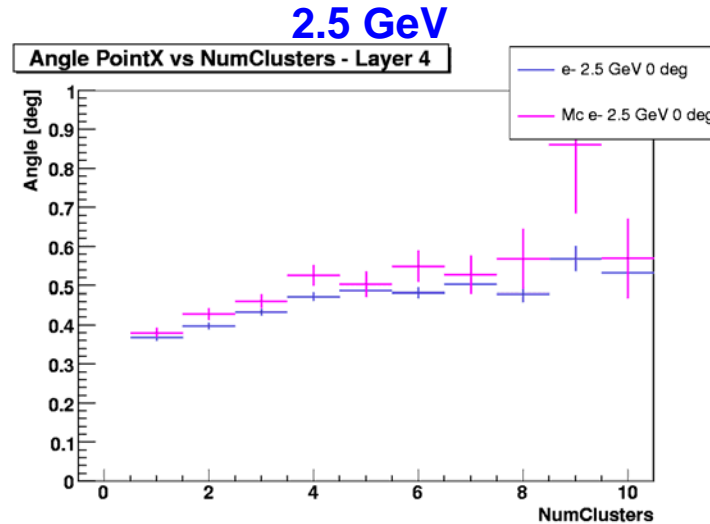
RMS TrackY Data & Mc



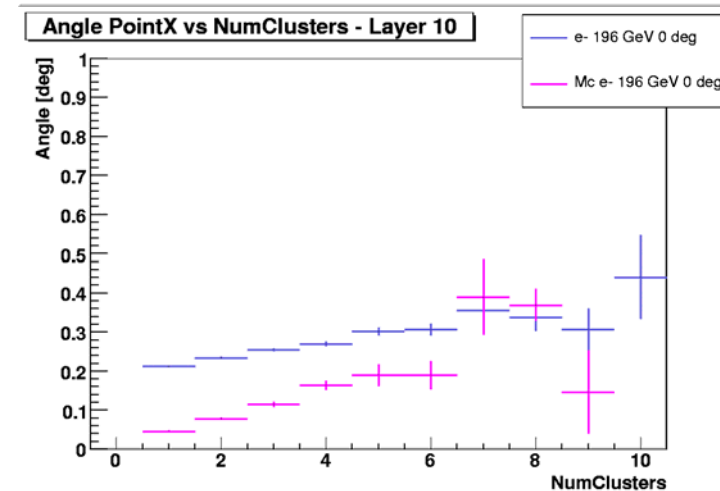
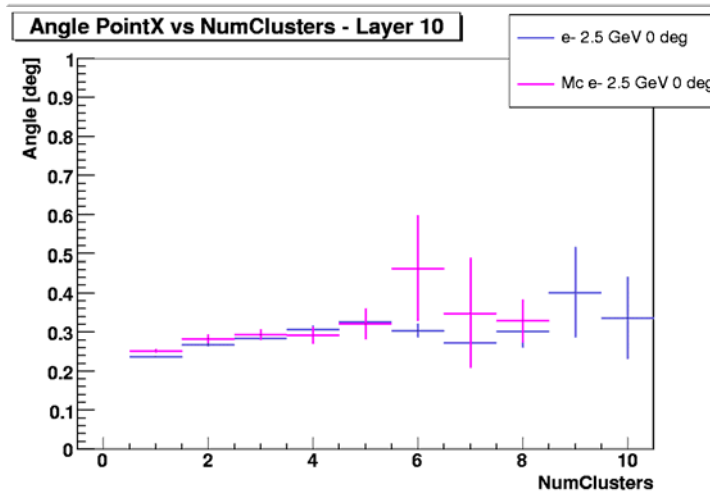


AnglePointX vs Num Clusters

Layer 4



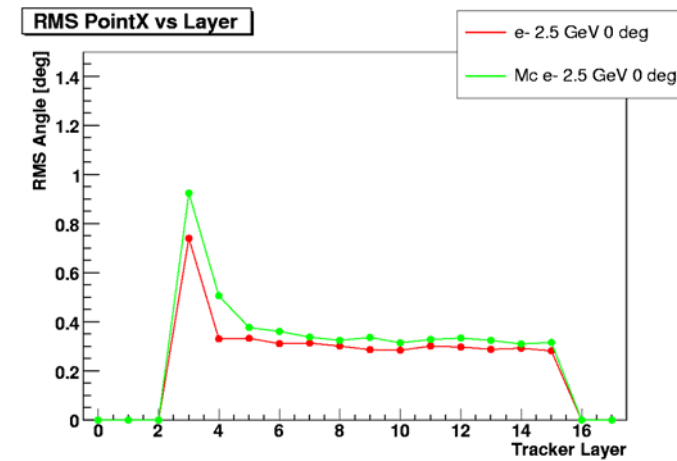
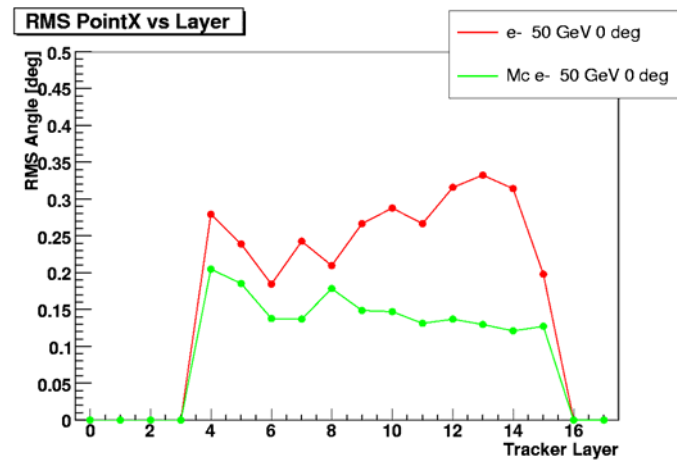
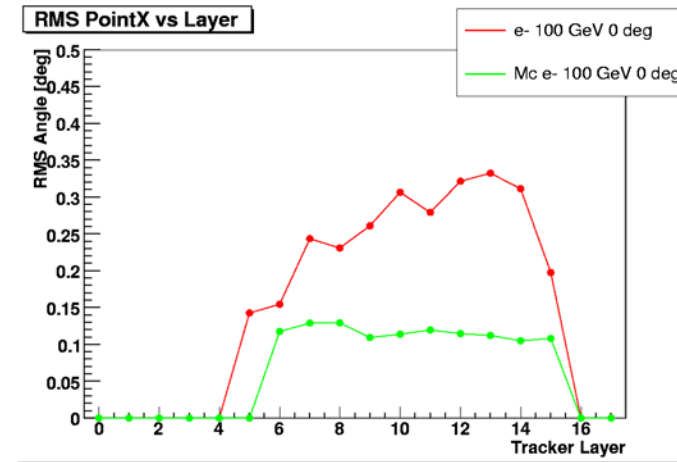
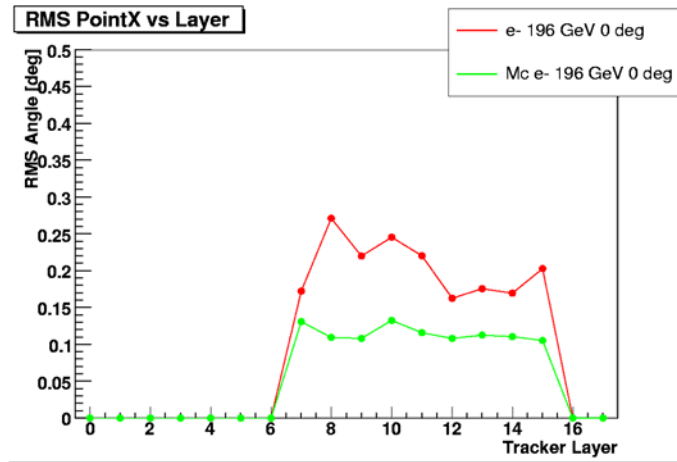
Layer 10



Cluster Multiplicity affects reconstruction

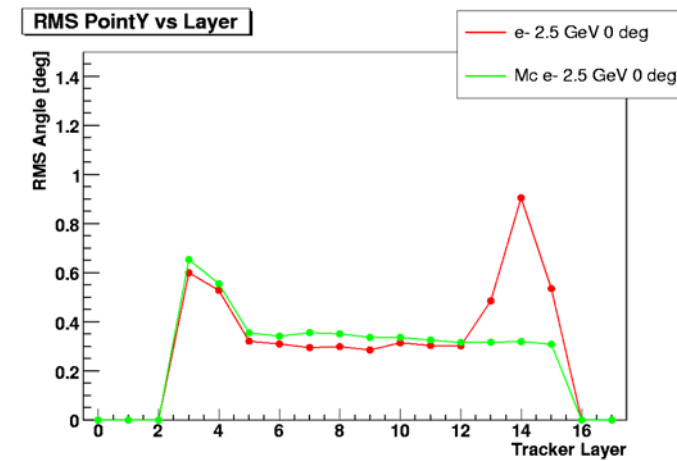
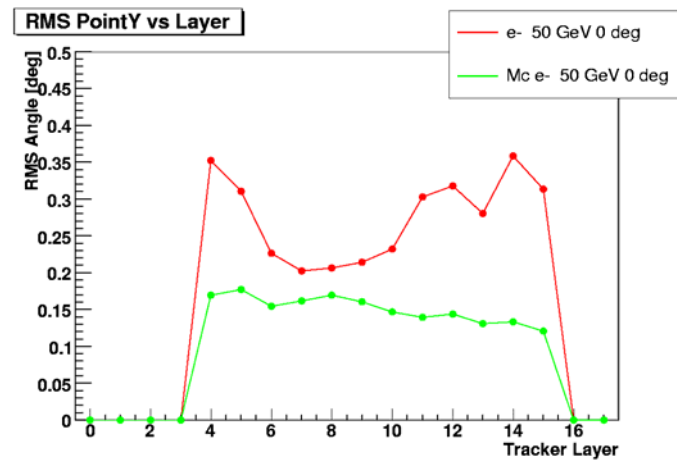
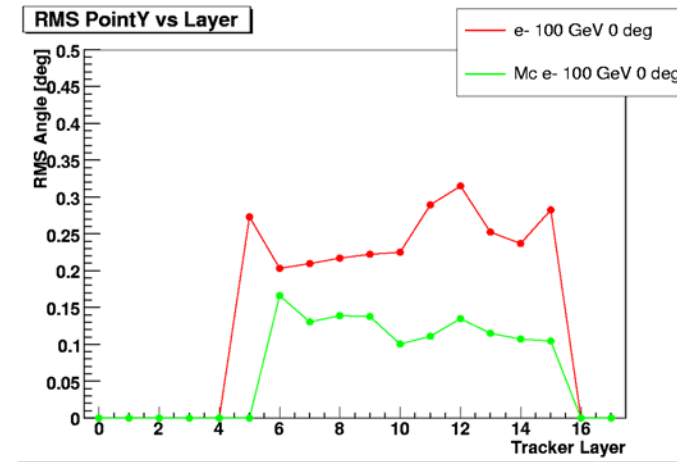
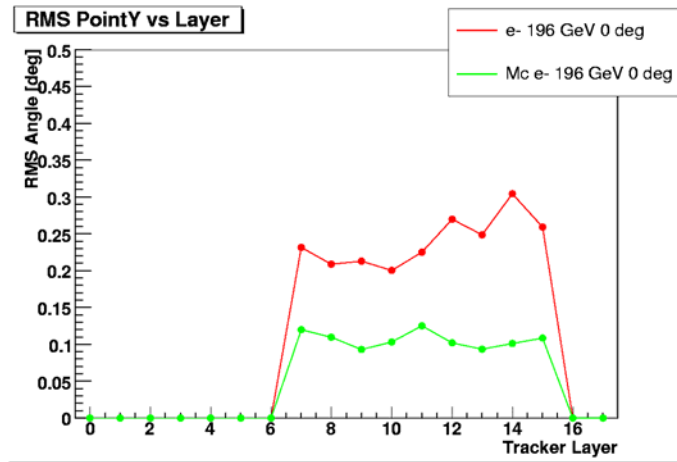


RMS PointX Data & Mc (one Hit/Layer)



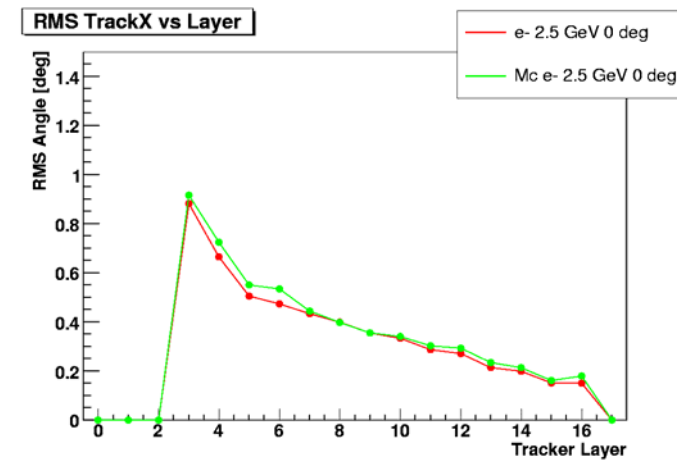
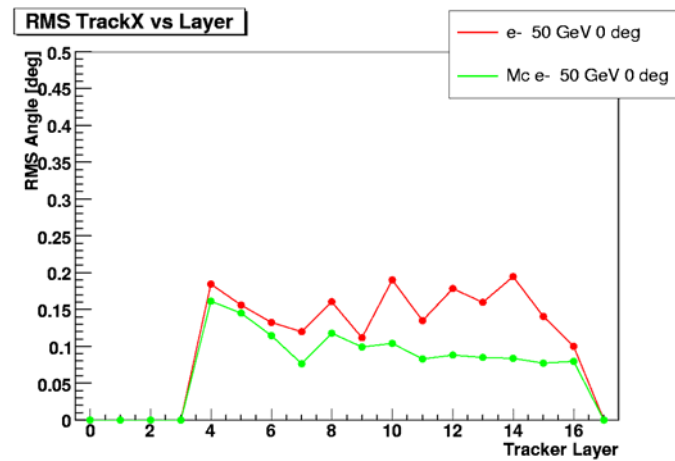
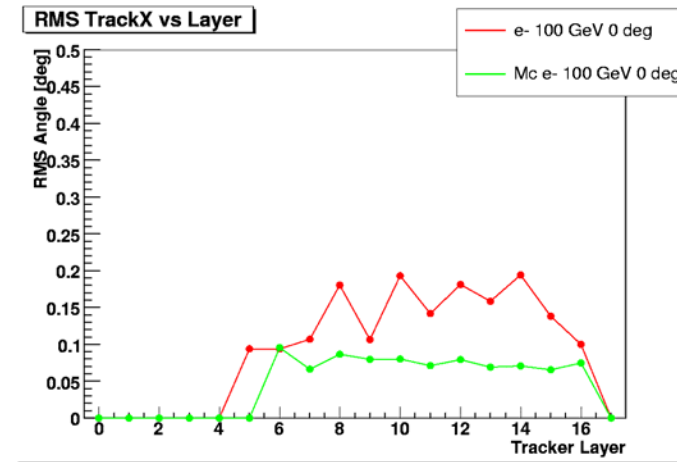
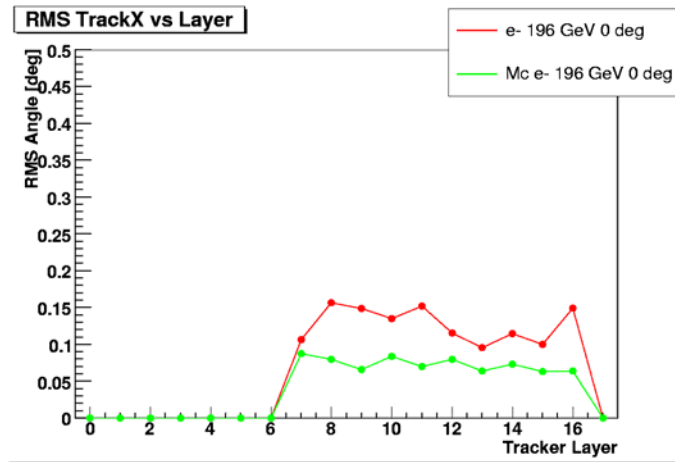


RMS PointY Data & Mc (one Hit/Layer)



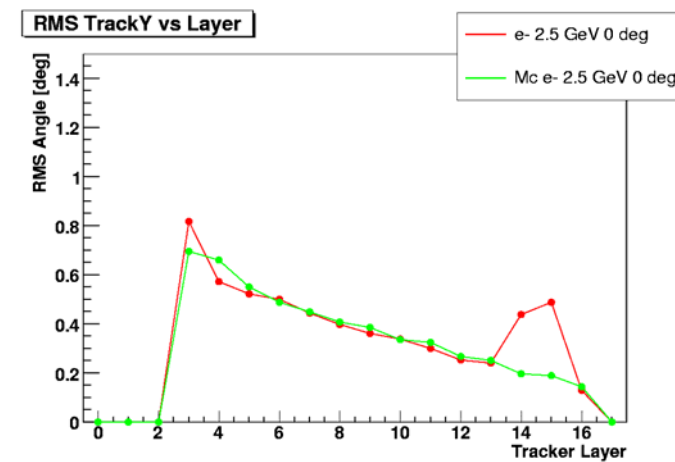
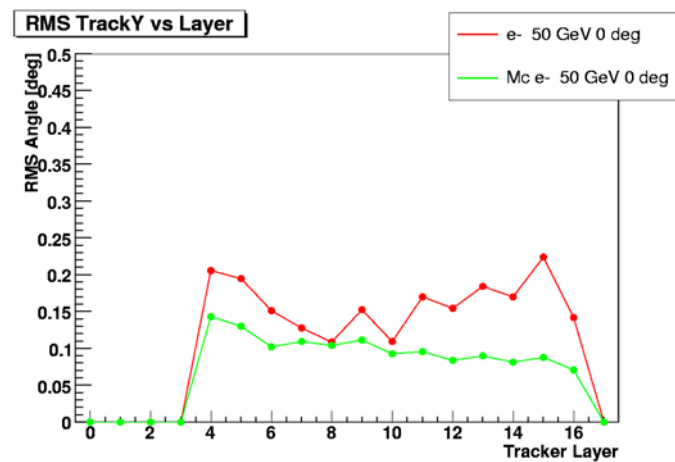
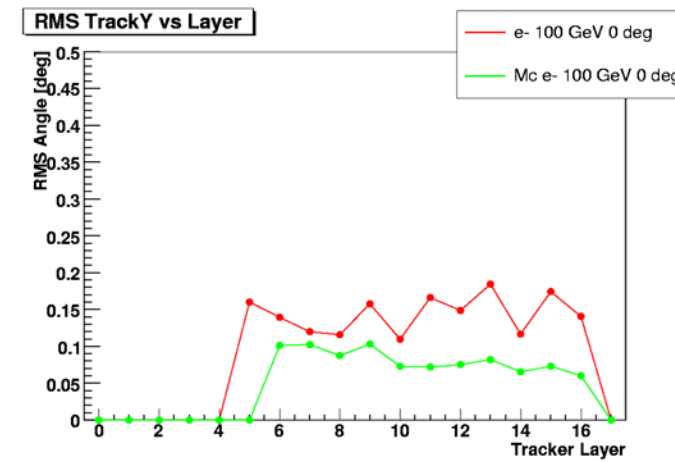
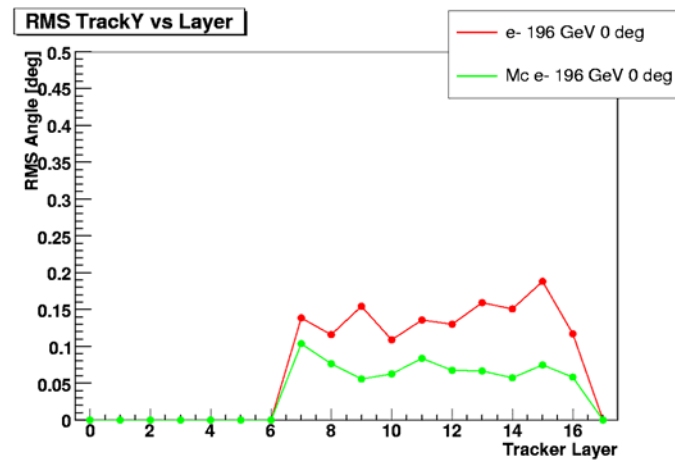


RMS TrackX Data & Mc (one Hit/Layer)





RMS TrackY Data & Mc (one Hit/Layer)



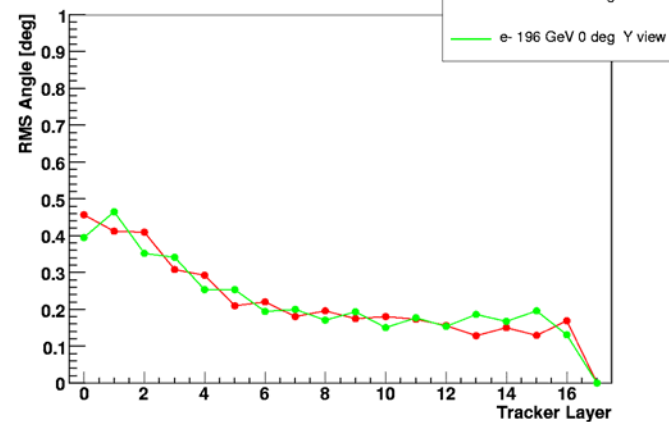


RMS TrackXY Data & Mc

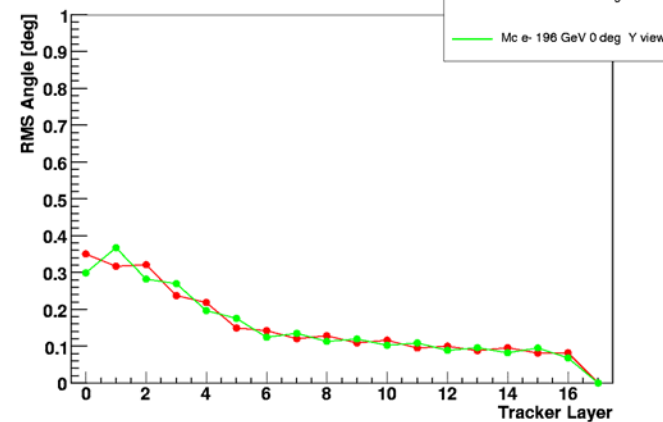
Beam

Mc

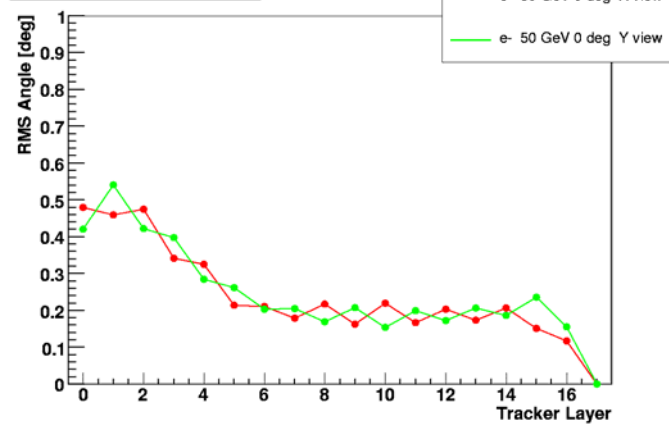
RMS TrackX/Y vs Layer



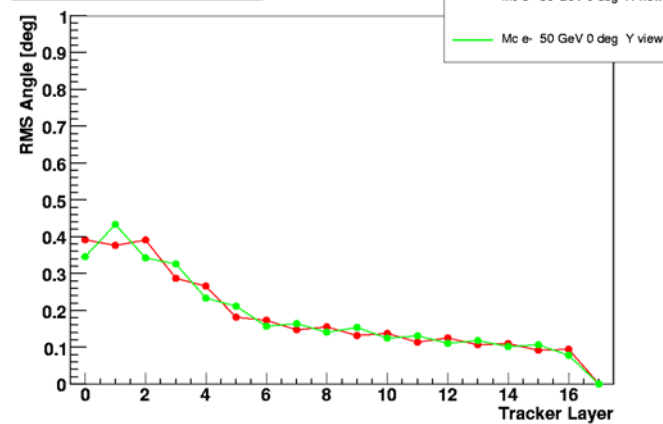
RMS TrackX/Y vs Layer



RMS TrackX/Y vs Layer



RMS TrackX/Y vs Layer



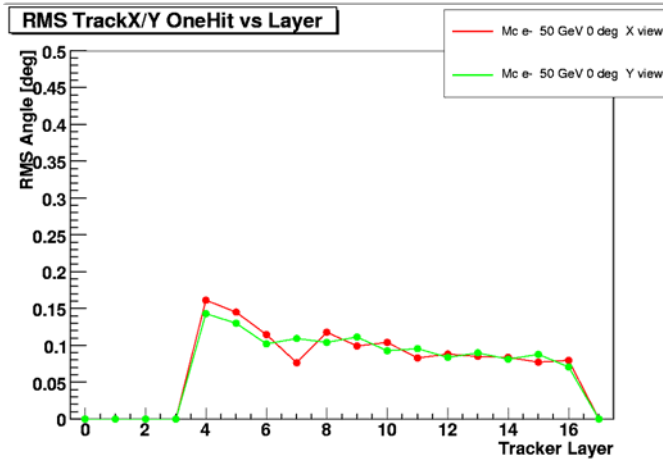
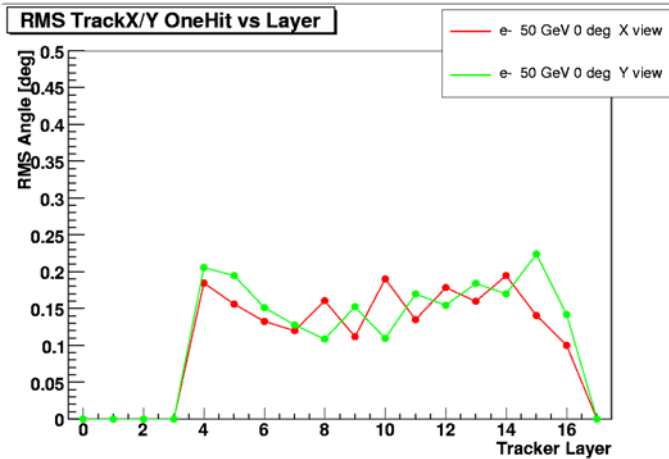
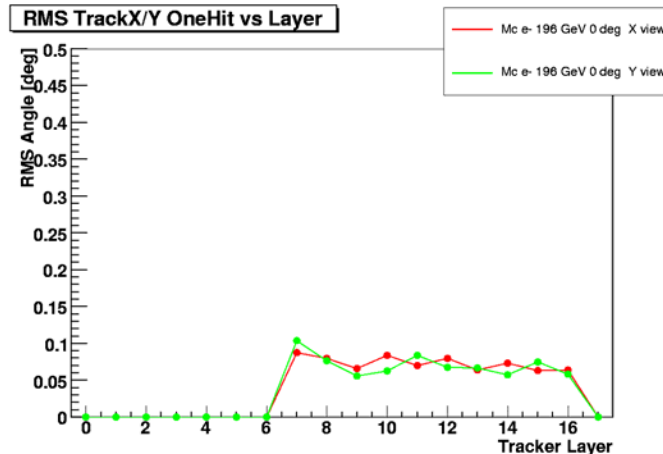
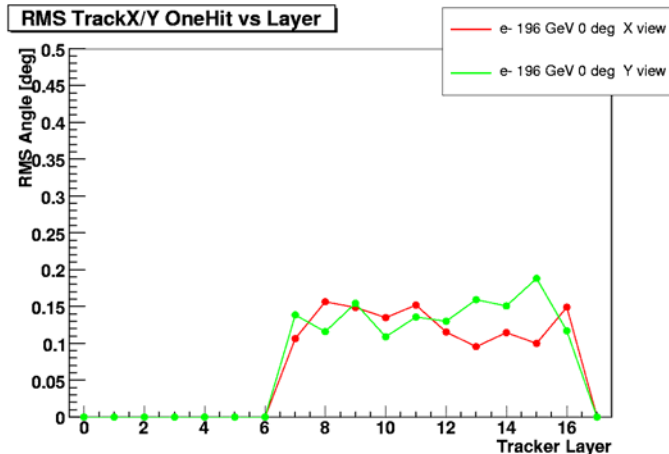
Ripple is more Evident for Beam Data !



RMS TrackXY Data & Mc (1 Hit/Layer)

Beam

Mc



Ripple is more Evident for Beam Data !

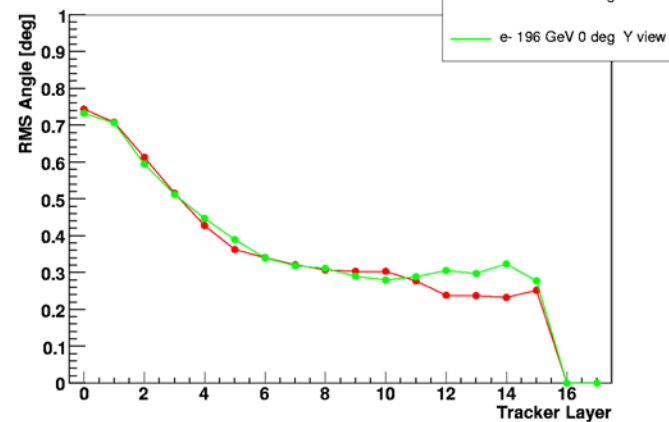


RMS PointXY Data & Mc

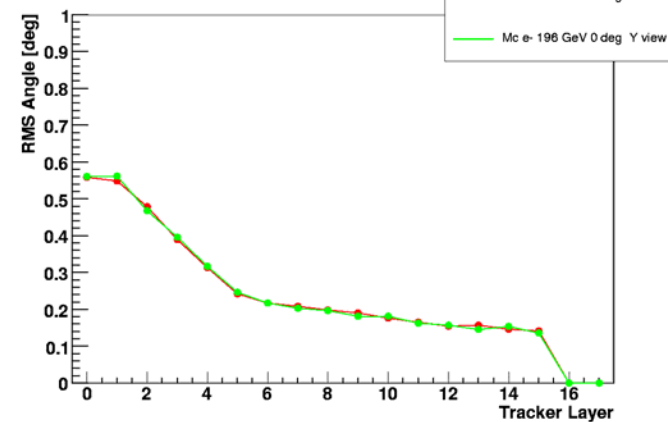
Beam

Mc

RMS PointX/Y vs Layer

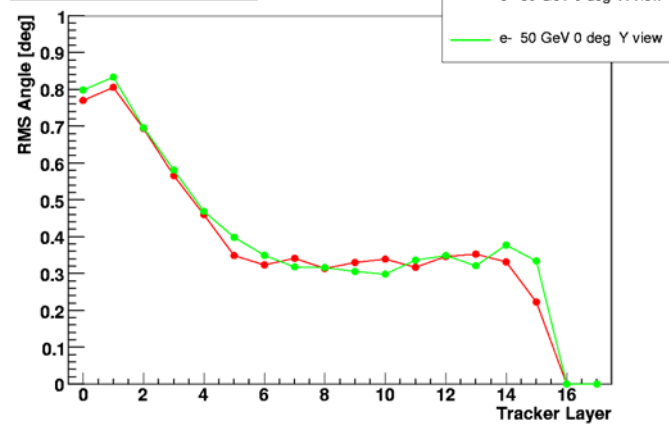


RMS PointX/Y vs Layer

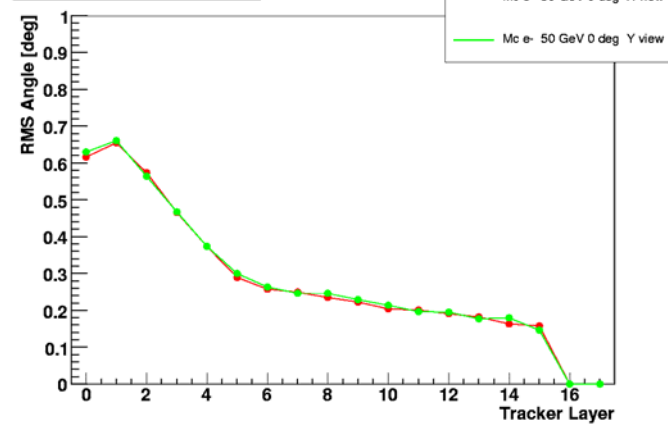


Ripple ??

RMS PointX/Y vs Layer



RMS PointX/Y vs Layer



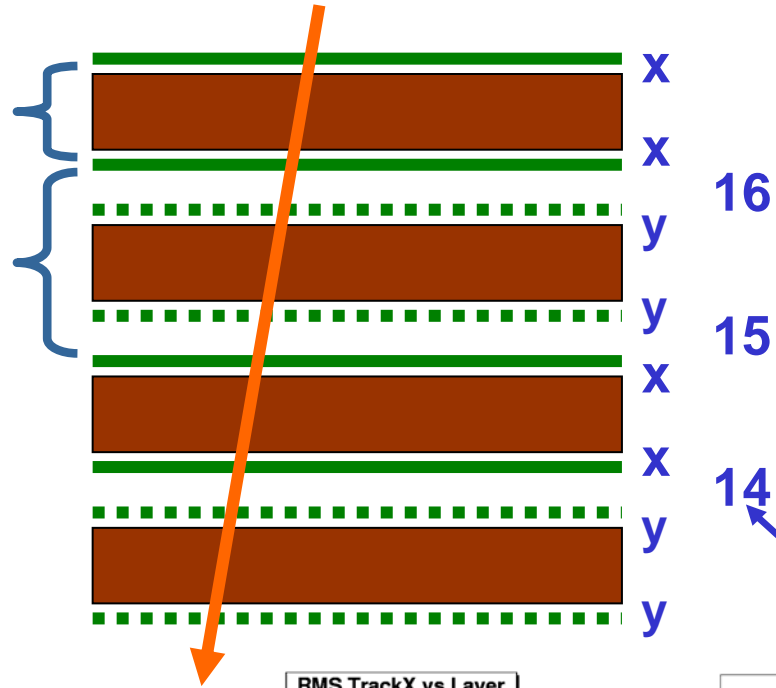


Ripple Explanation?

$\Delta z1 \rightarrow$ material = W

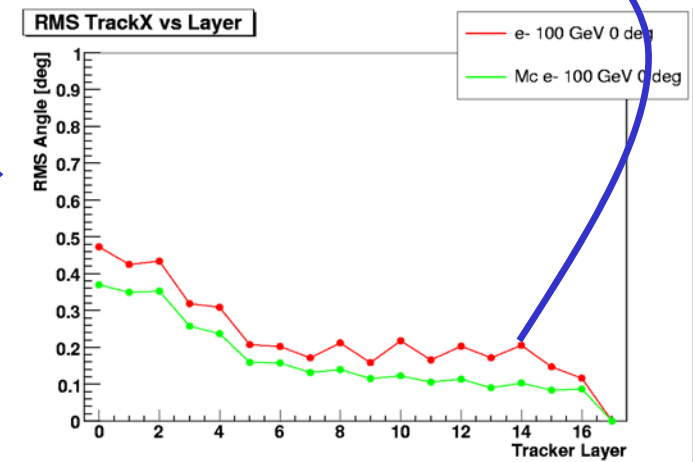
$\Delta z2 \rightarrow$ material = W+2Si

$\Delta z1 < \Delta z2$



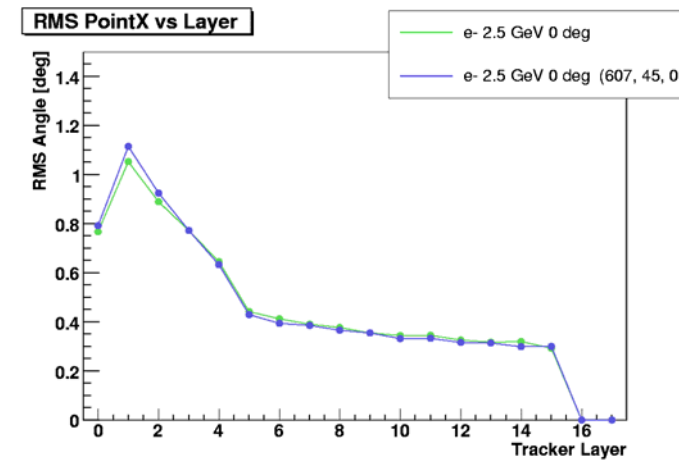
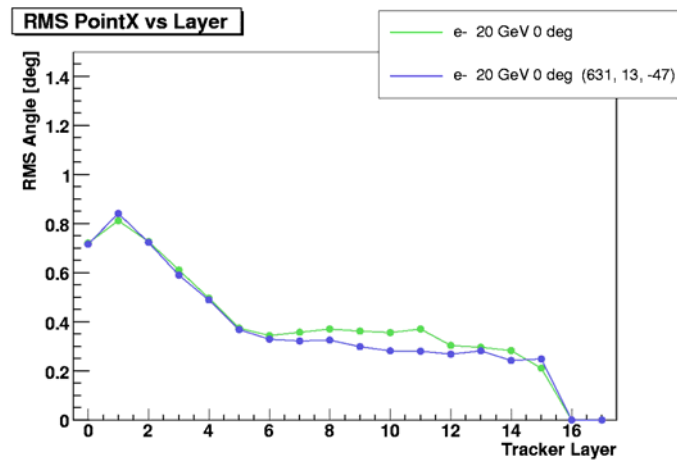
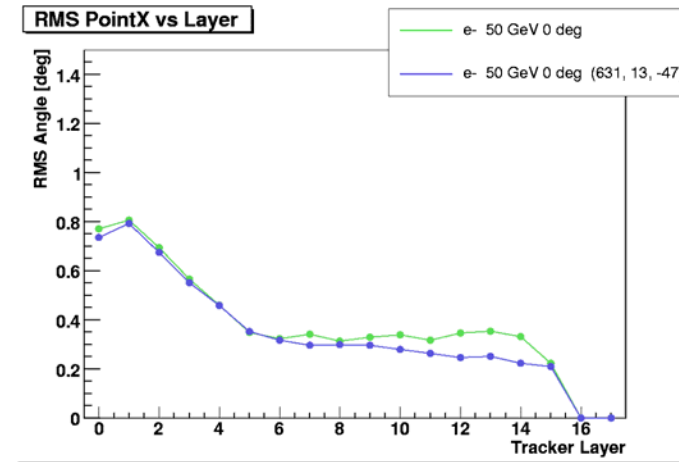
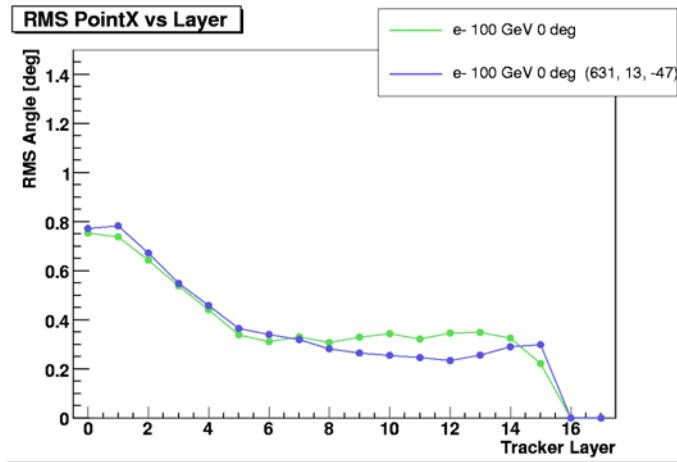
High level corresponds to $\Delta z1$ (smaller)

Why smaller effect in Mc?



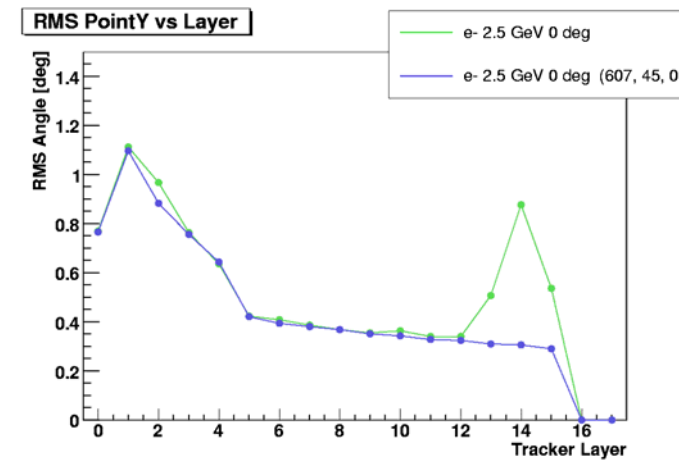
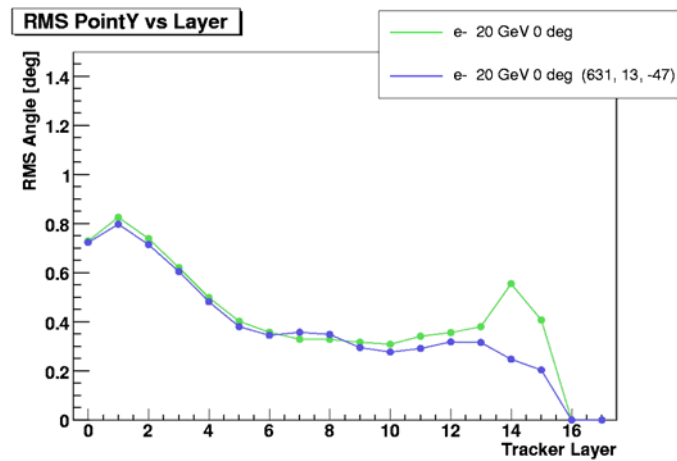
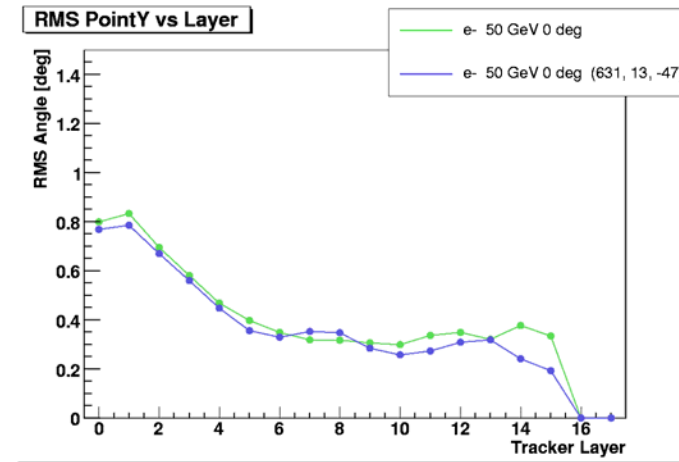
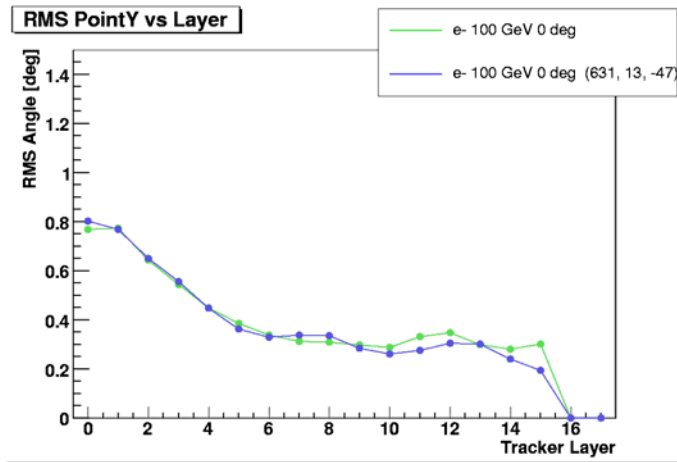


RMS PointX - different positions



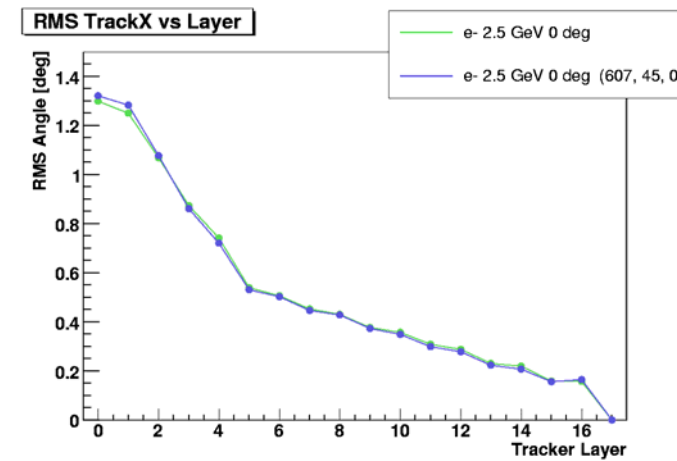
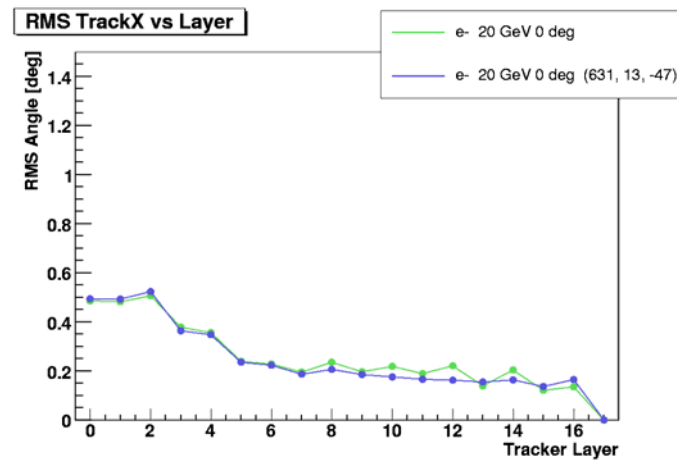
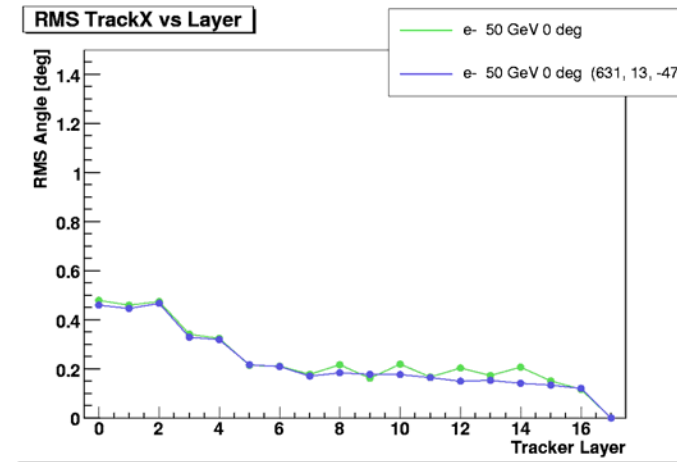
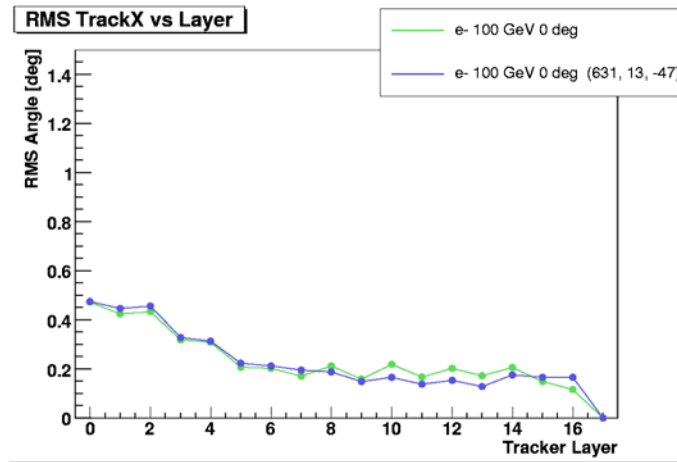


RMS PointY - different positions



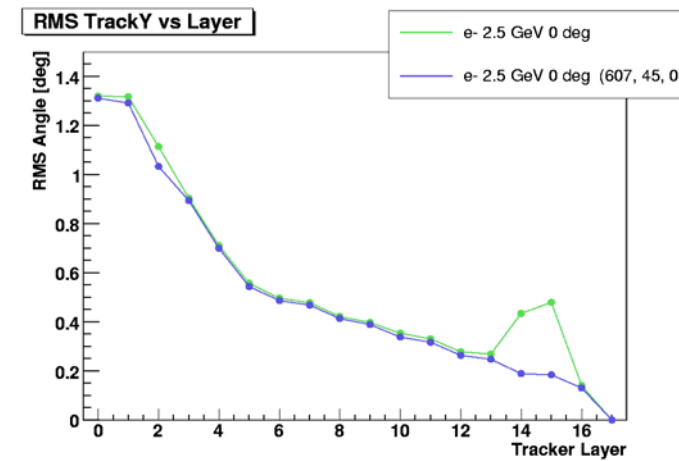
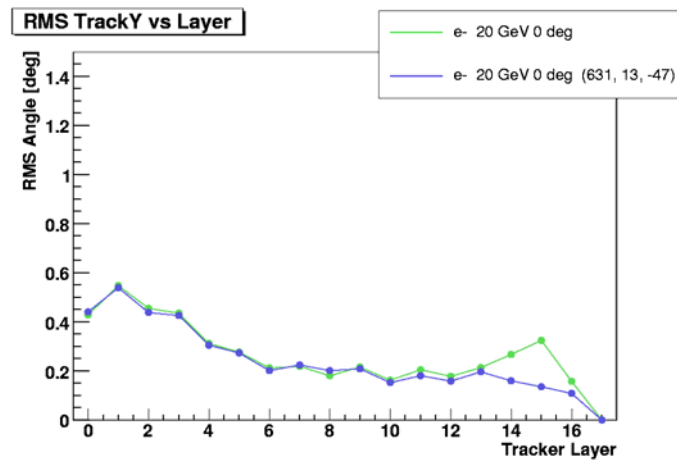
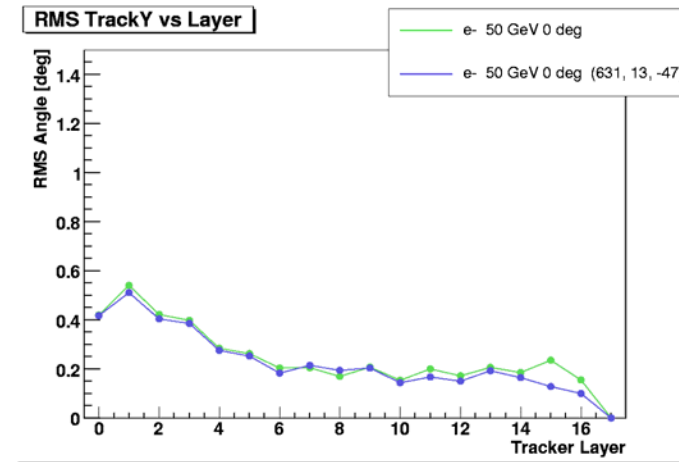
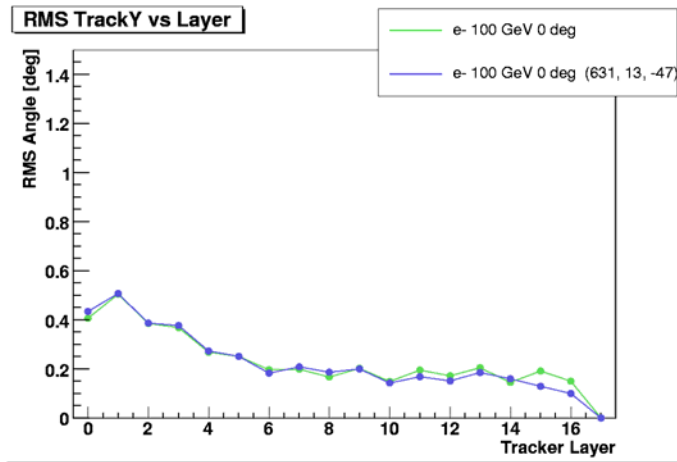


RMS TrackX - different positions



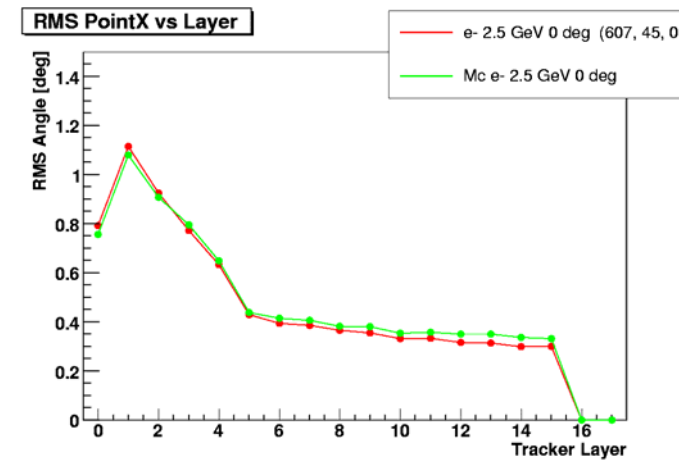
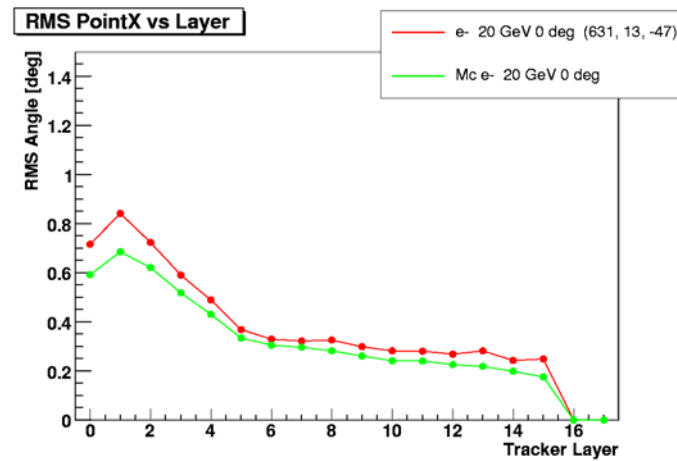
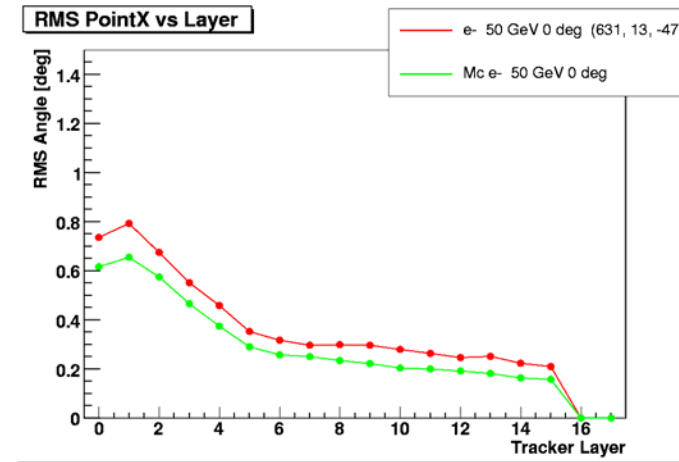
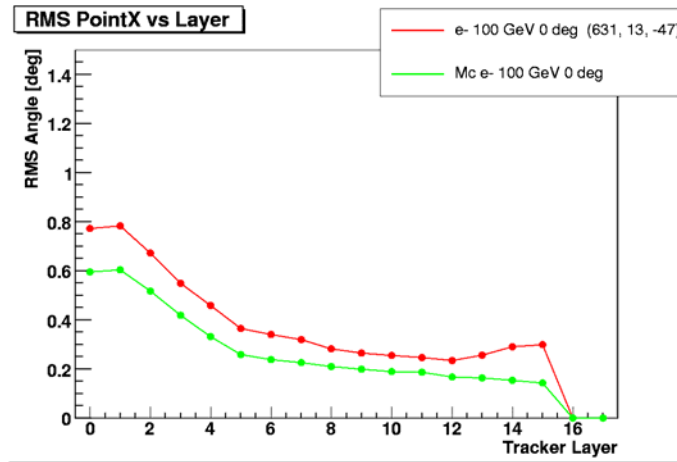


RMS TrackY - different positions



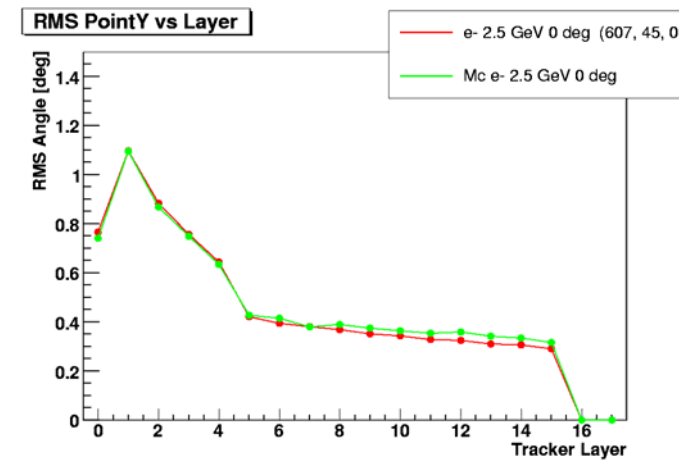
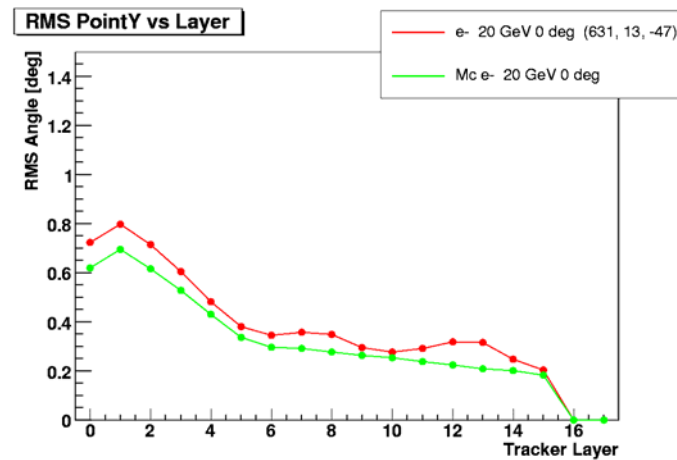
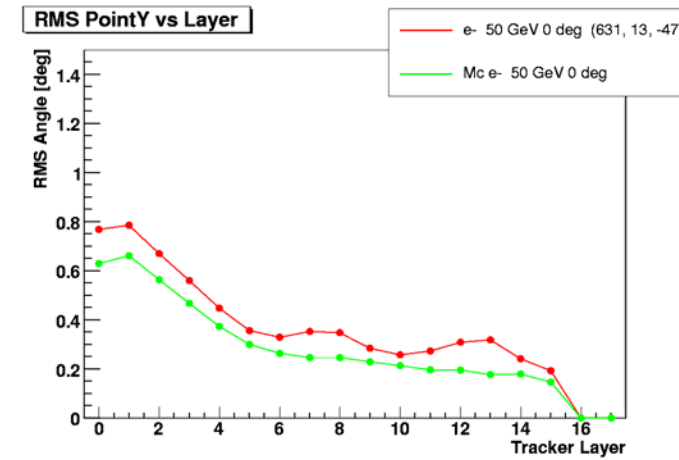
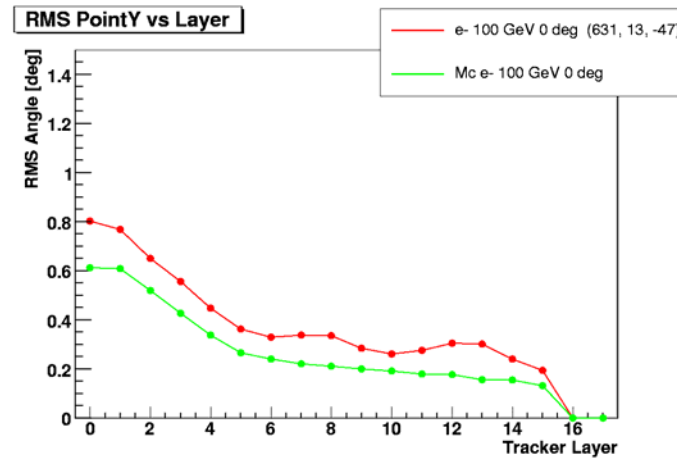


RMS PointX Data_{Pos2} vs Mc



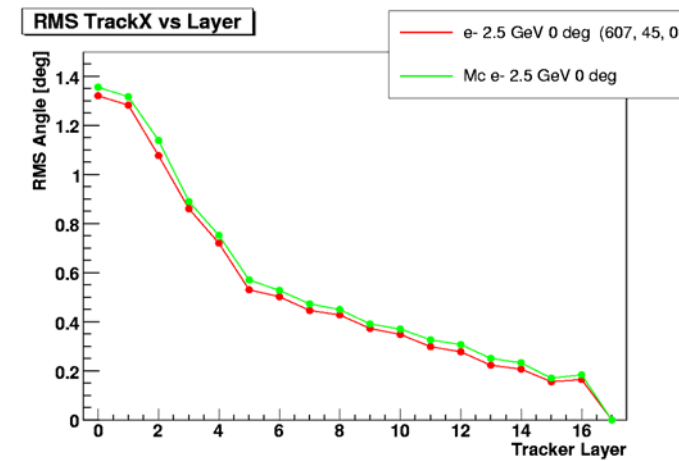
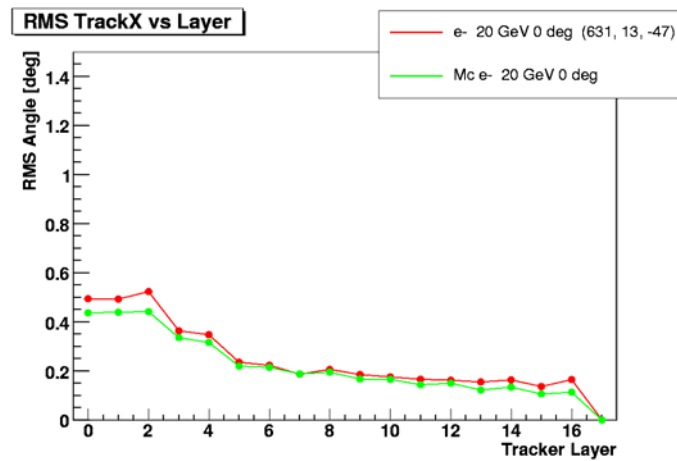
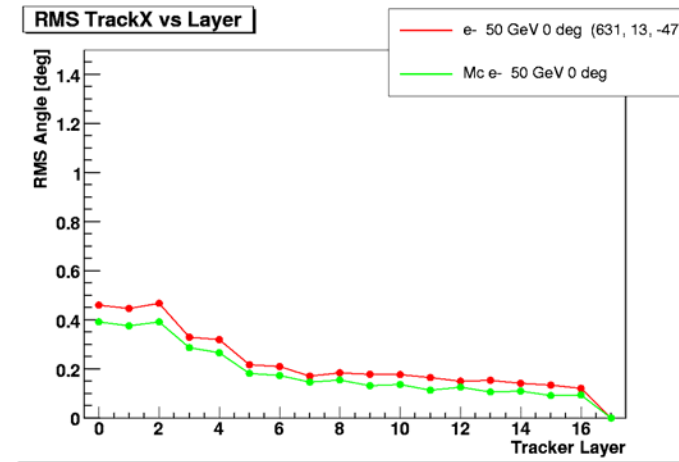
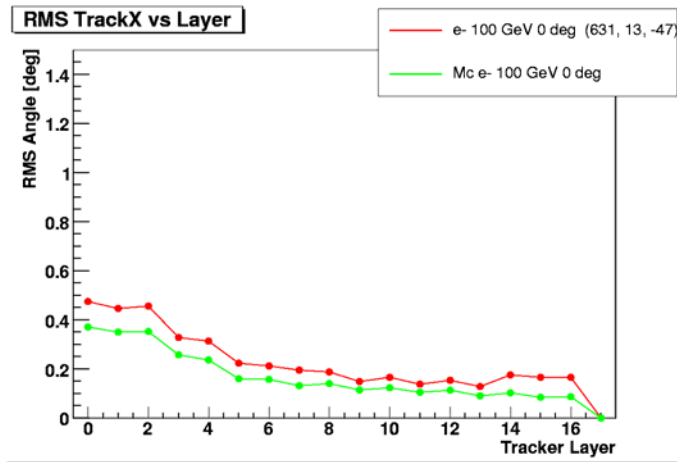


RMS PointY Data_{Pos2} vs Mc



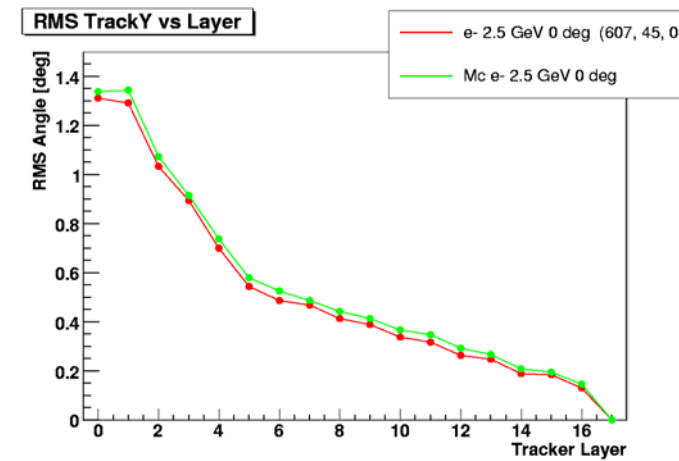
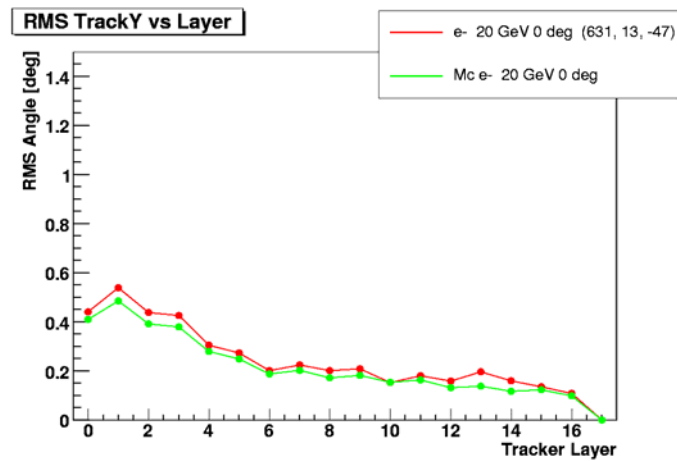
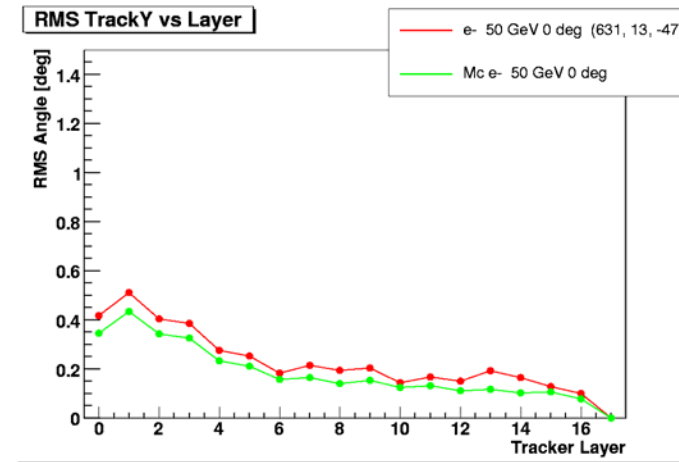
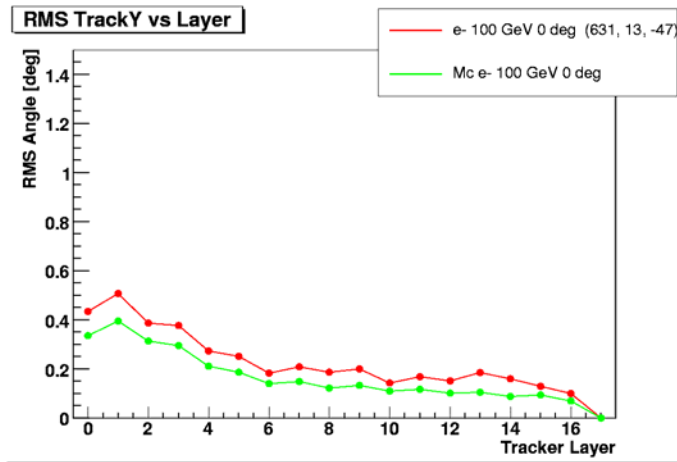


RMS TrackX Data_{Pos2} vs Mc



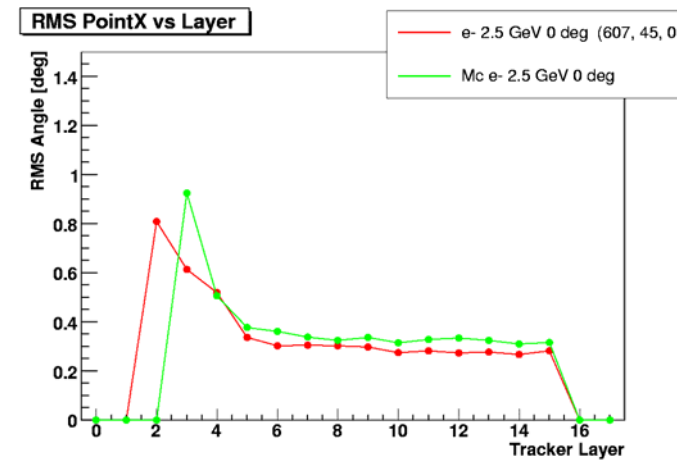
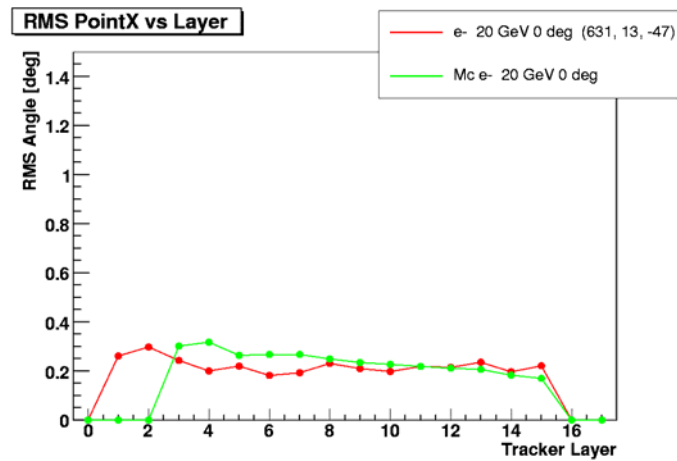
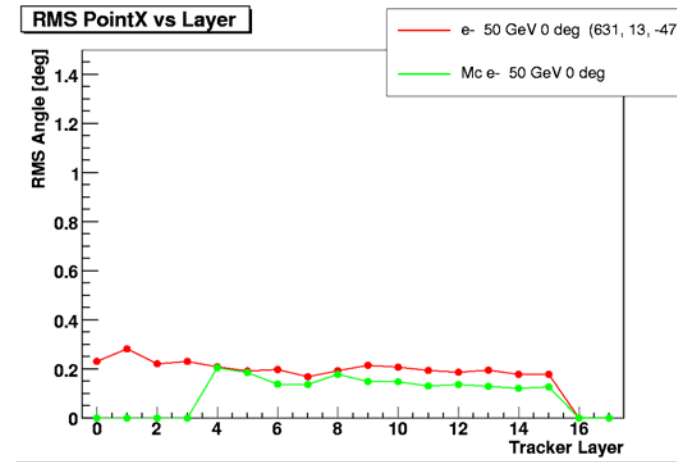
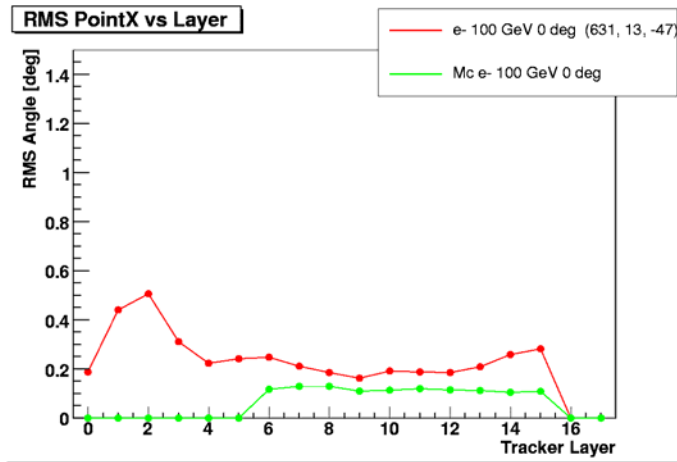


RMS TrackY Data_{Pos2} vs Mc



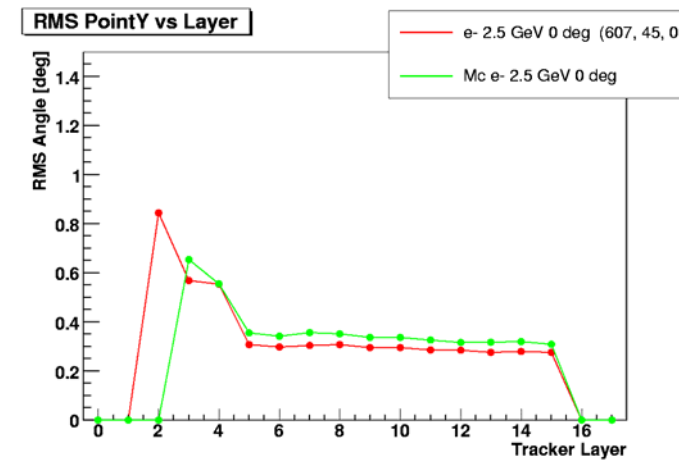
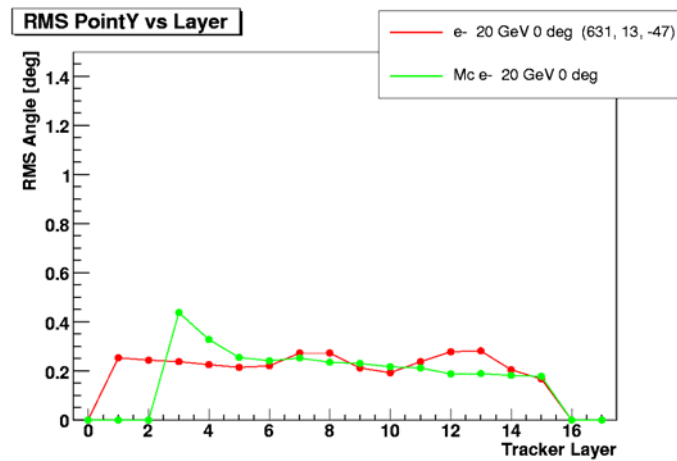
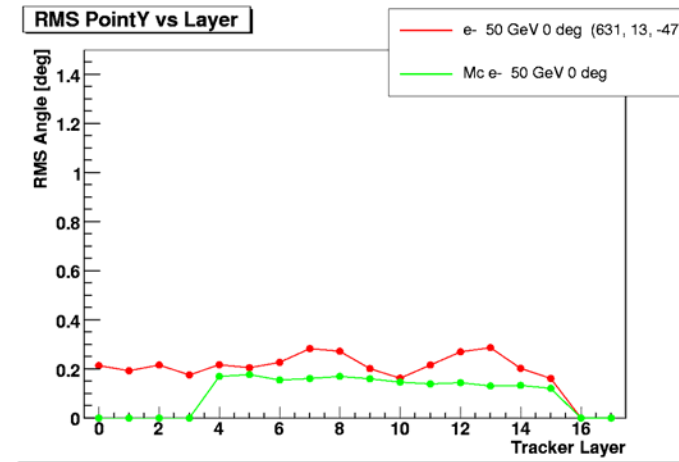
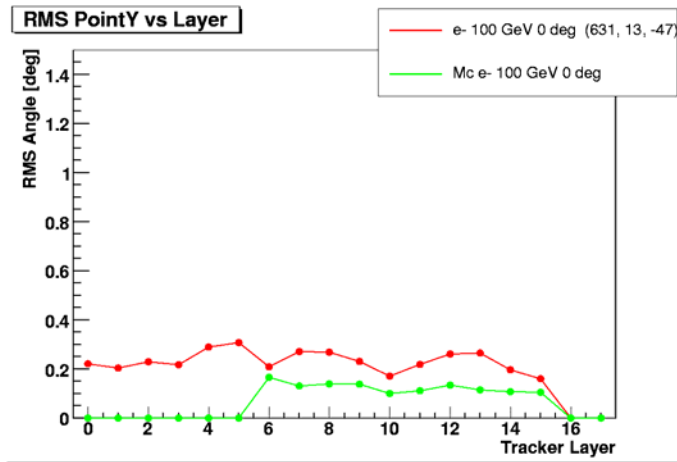


RMS PointX OneHit Data_{Pos2} vs Mc



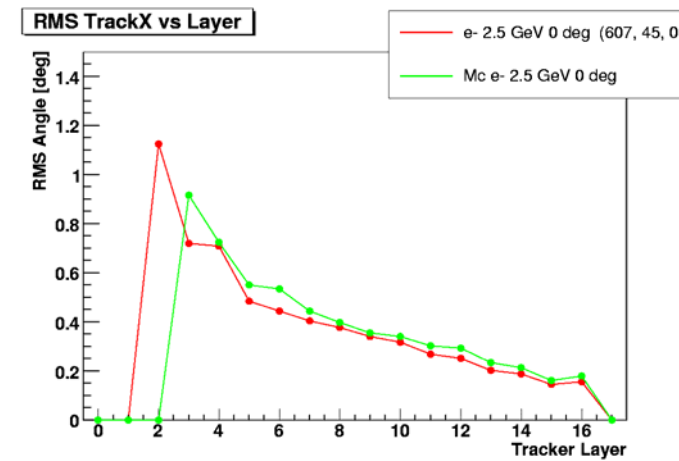
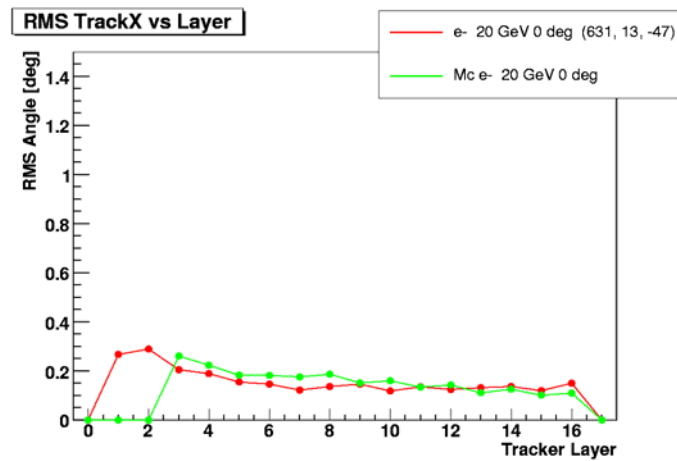
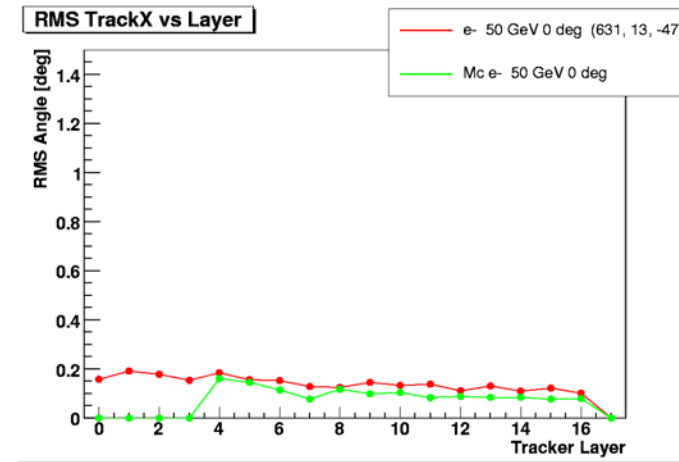
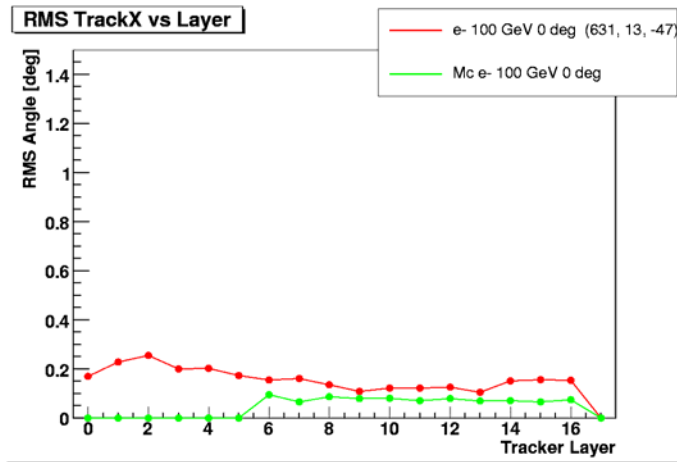


RMS PointY OneHit Data_{Pos2} vs Mc



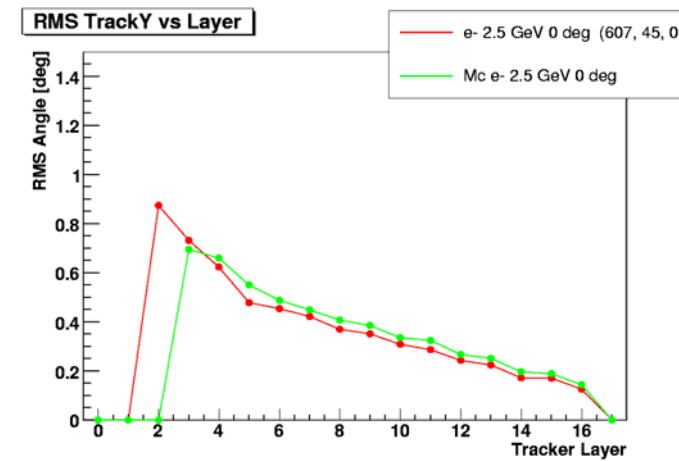
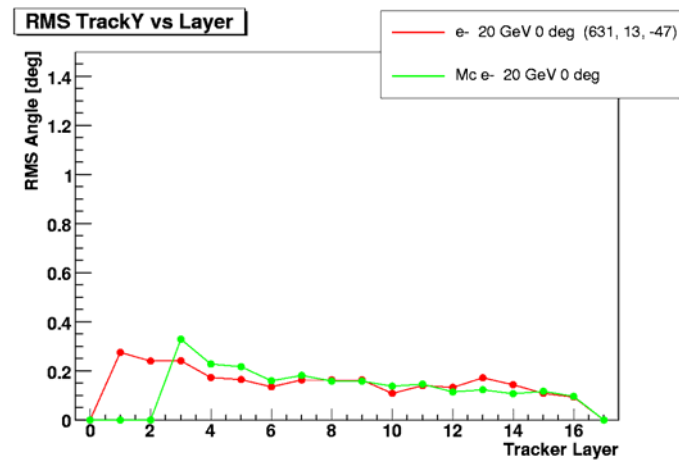
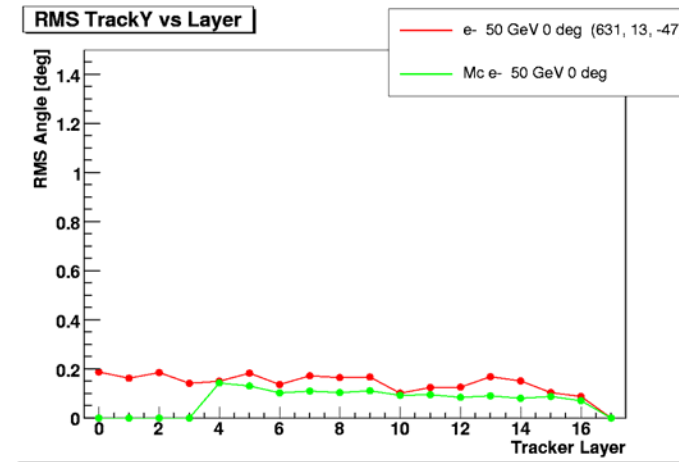
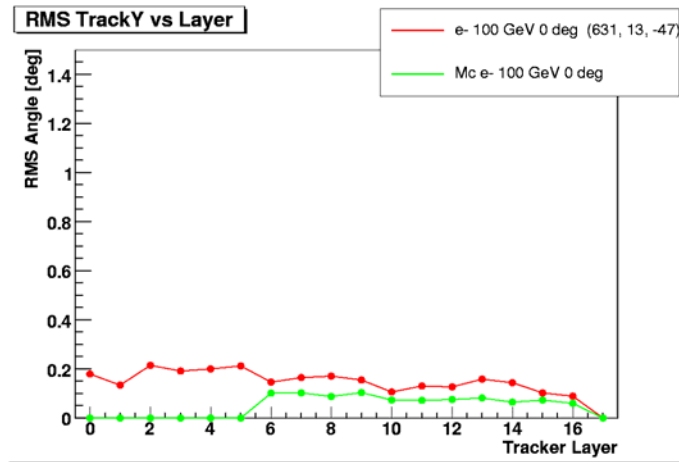


RMS TrackX OneHit Data_{Pos2} vs Mc





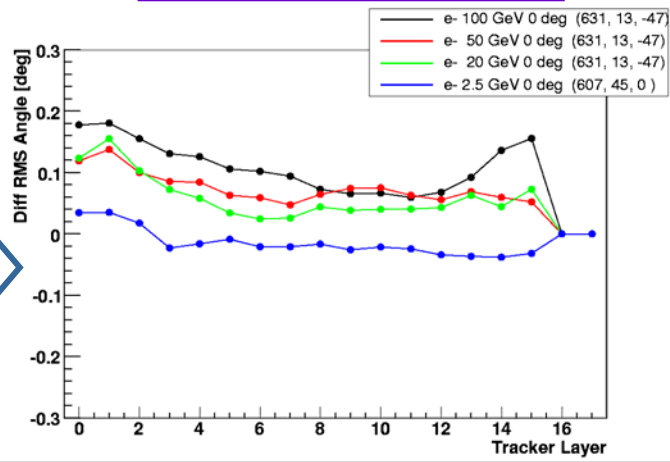
RMS TrackY OneHit Data_{Pos2} vs Mc





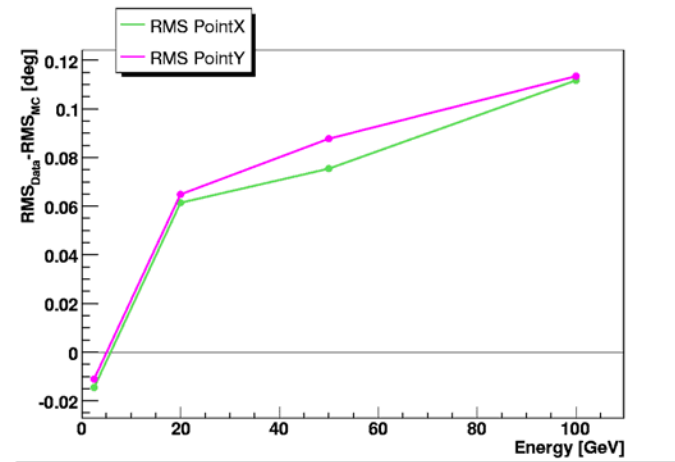
RMSPoint Difference Data_{Pos2} & Mc

RMSX Data-Mc

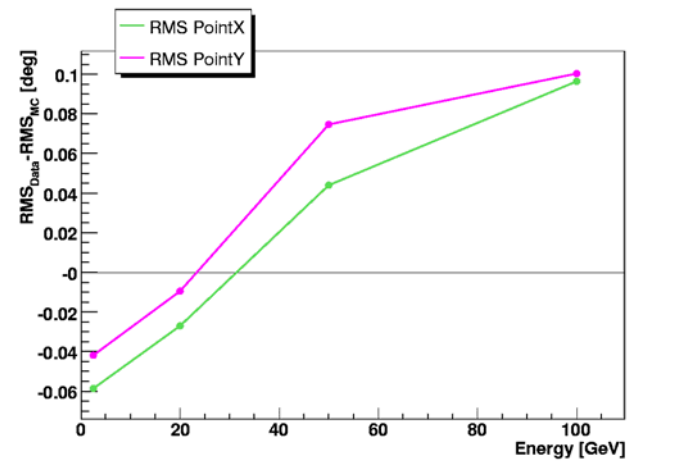
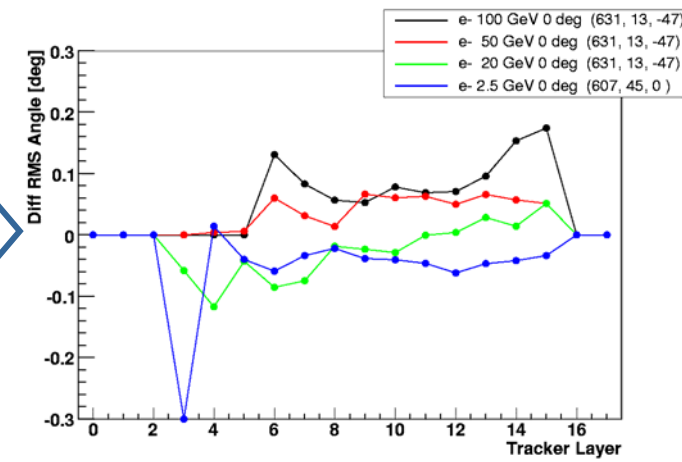


All Hits

RMS Data-Mc vs E



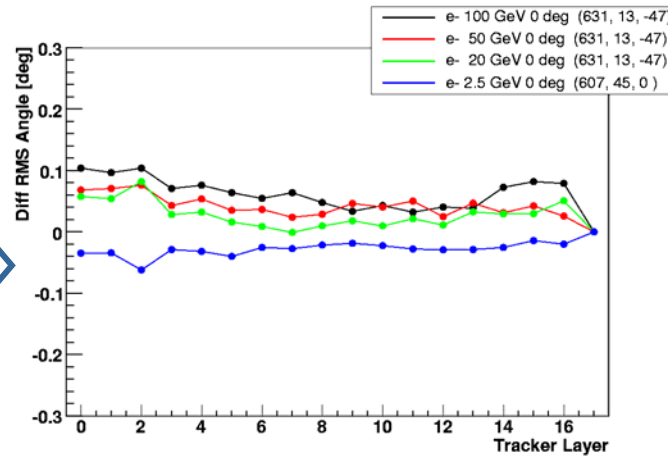
1 Hit/pl





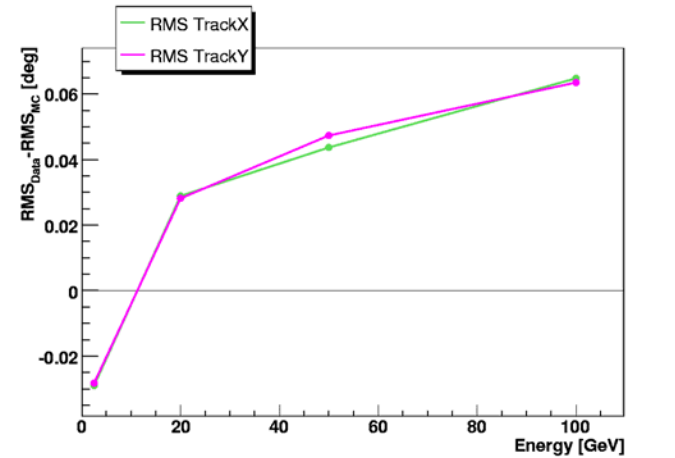
RMSTrack Difference Data_{Pos2} & Mc

RMSX Data-Mc

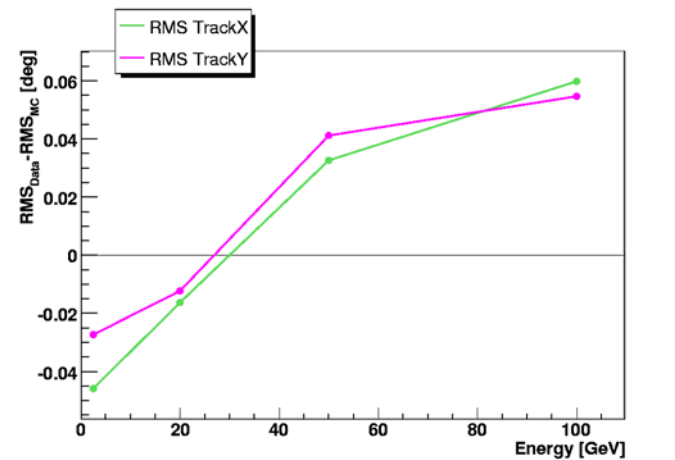
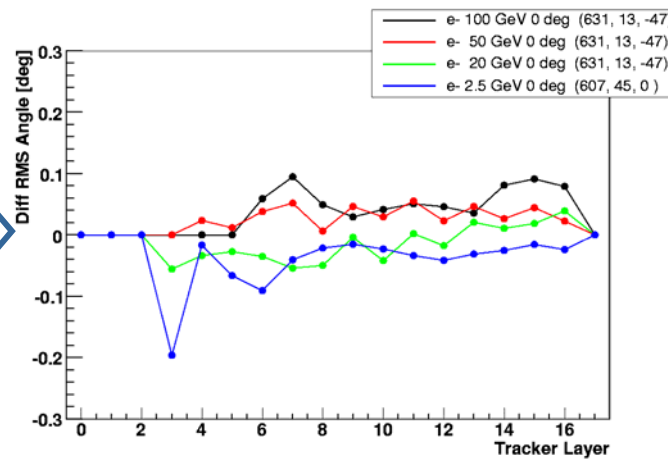


All Hits

RMS Data-Mc vs E



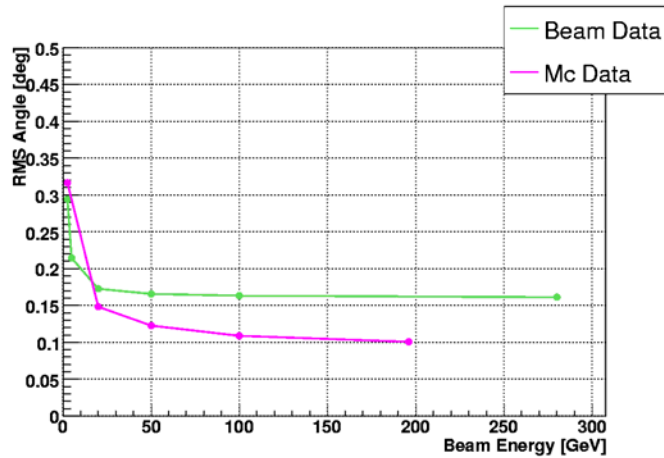
1 Hit/pl



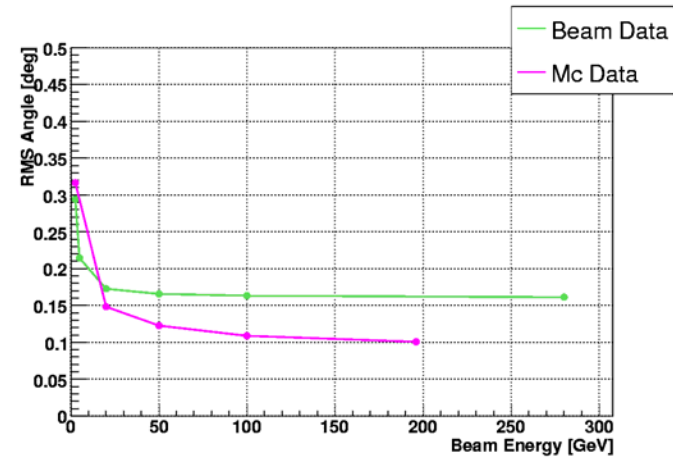


Average (thin W) RMS Point vs E

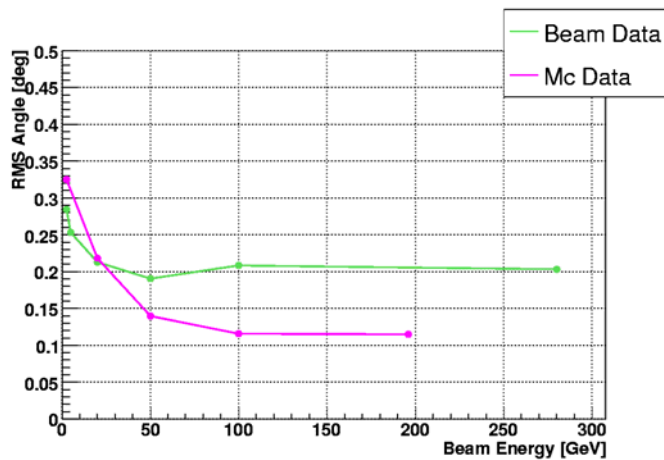
RMS PointX



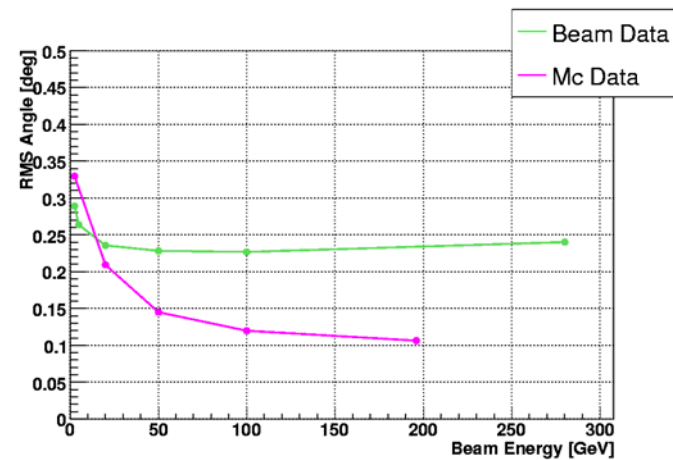
RMS PointY



All Hits



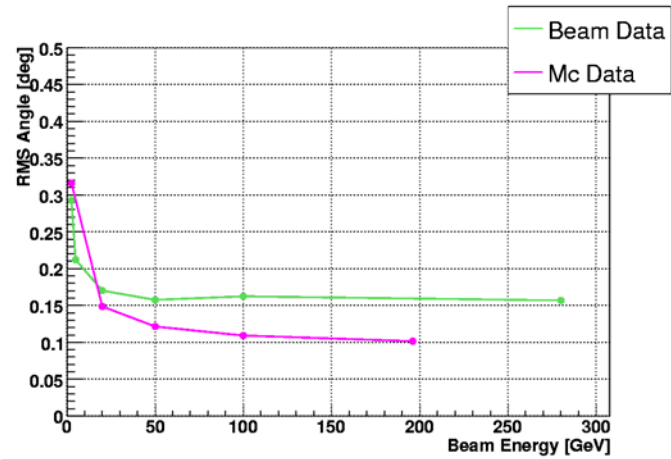
1 Hit/pl



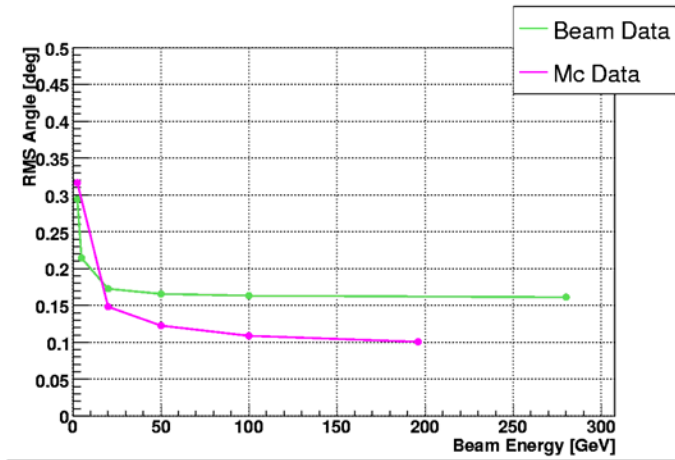


Average (thin W) RMS Track vs E

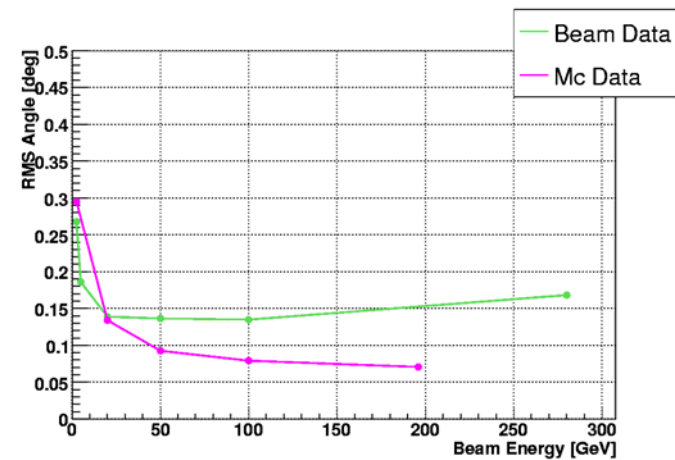
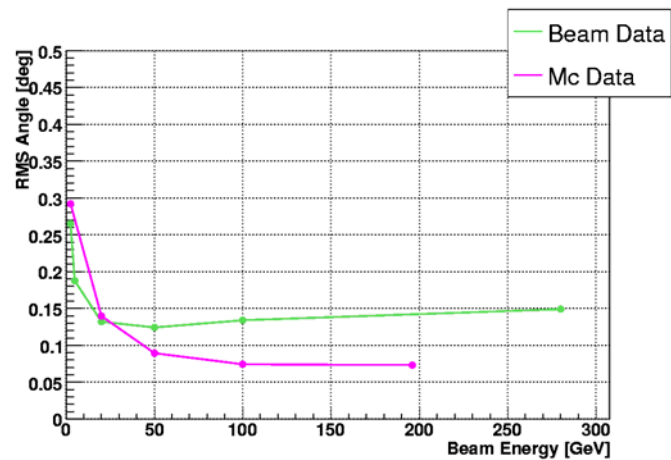
RMS TRackX



RMS TRackY



All Hits



1 Hit/pl



Conclusions

- **General MCS angle simulation:**
 - not too bad but not perfect
 - further investigations needed
- **XY ripple:**
 - seems to be a geometrical effect
 - Mc shows smaller effect (?)
- **Energy scaling:**
 - seems to be different
 - to be understood
- **Further studies**
 - Fit distributions and use Sigma instead of RMS
 - Improve event selection
 - Protons, Muons(?)
 - Other Beam angles (not easy because of gaps)



BackUp Slides

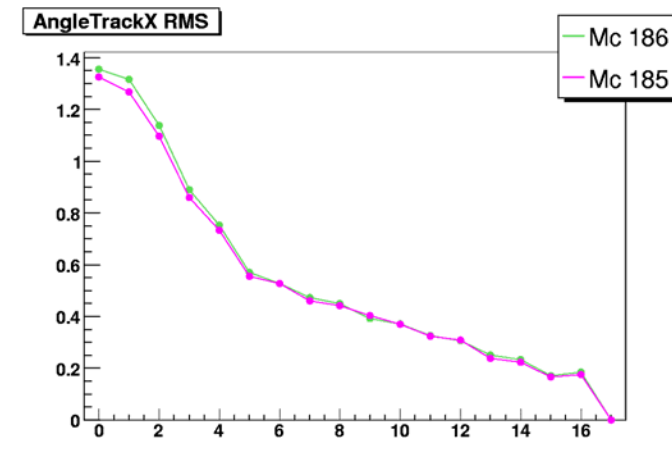
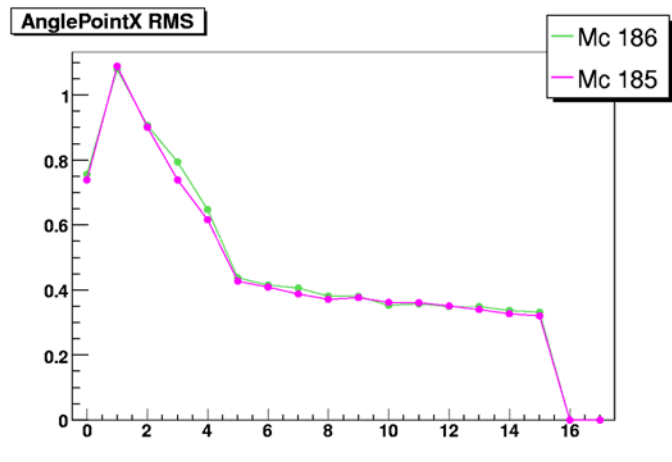


Mc 186 – 185 (2.5 GeV 0 deg)

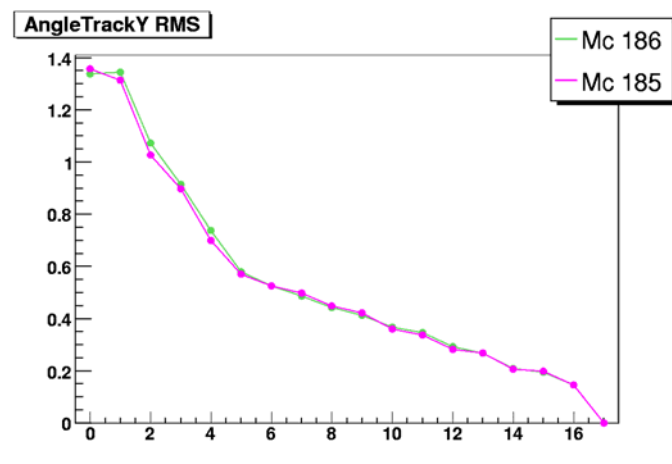
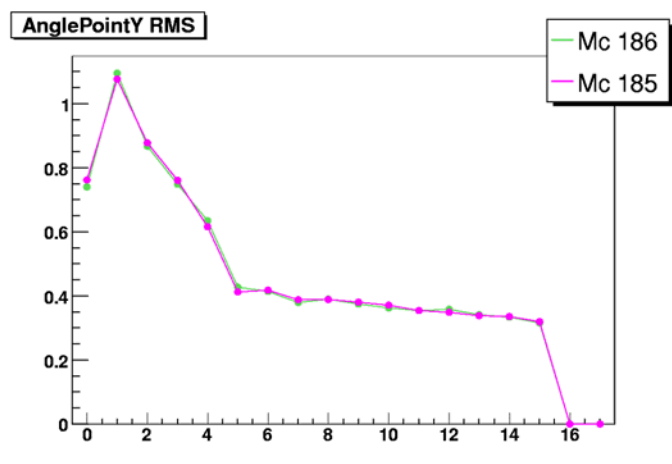
RMSPoint

RMSTrack

X

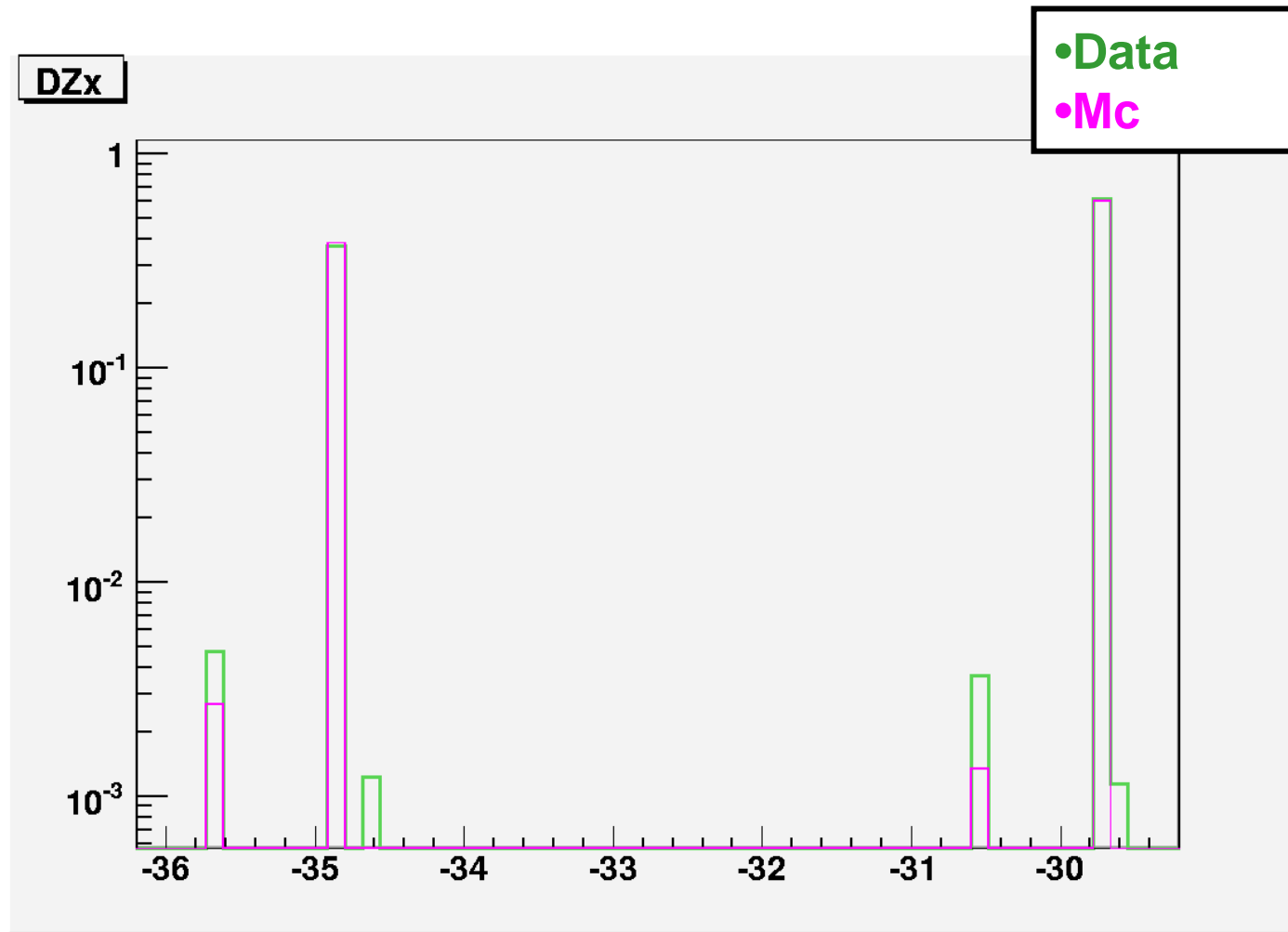


Y



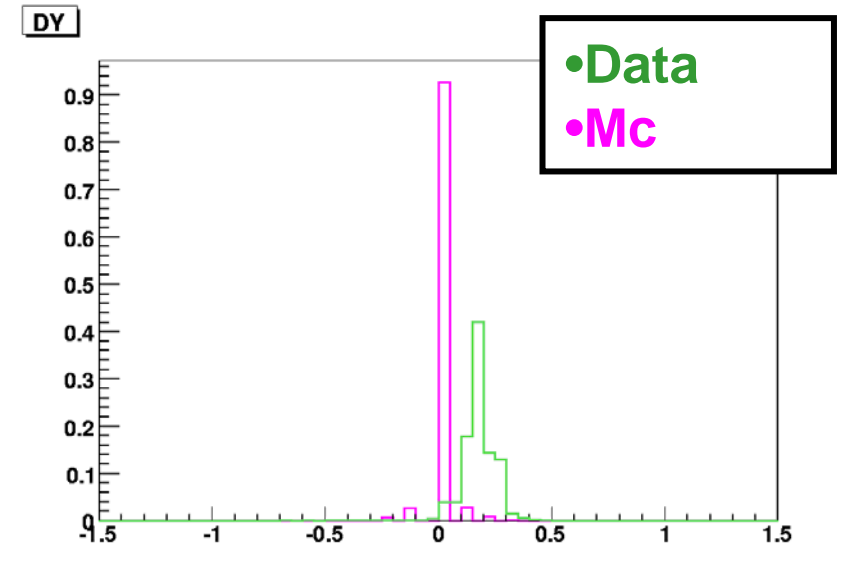
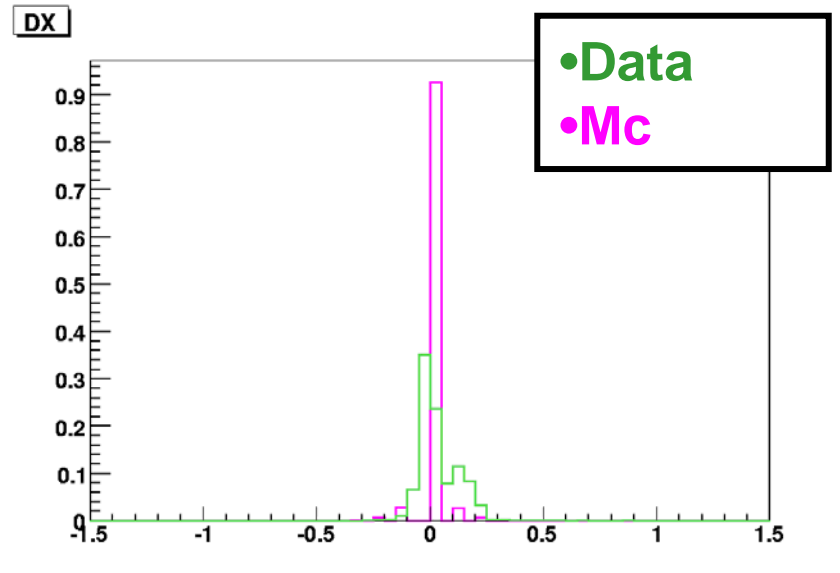


DZx



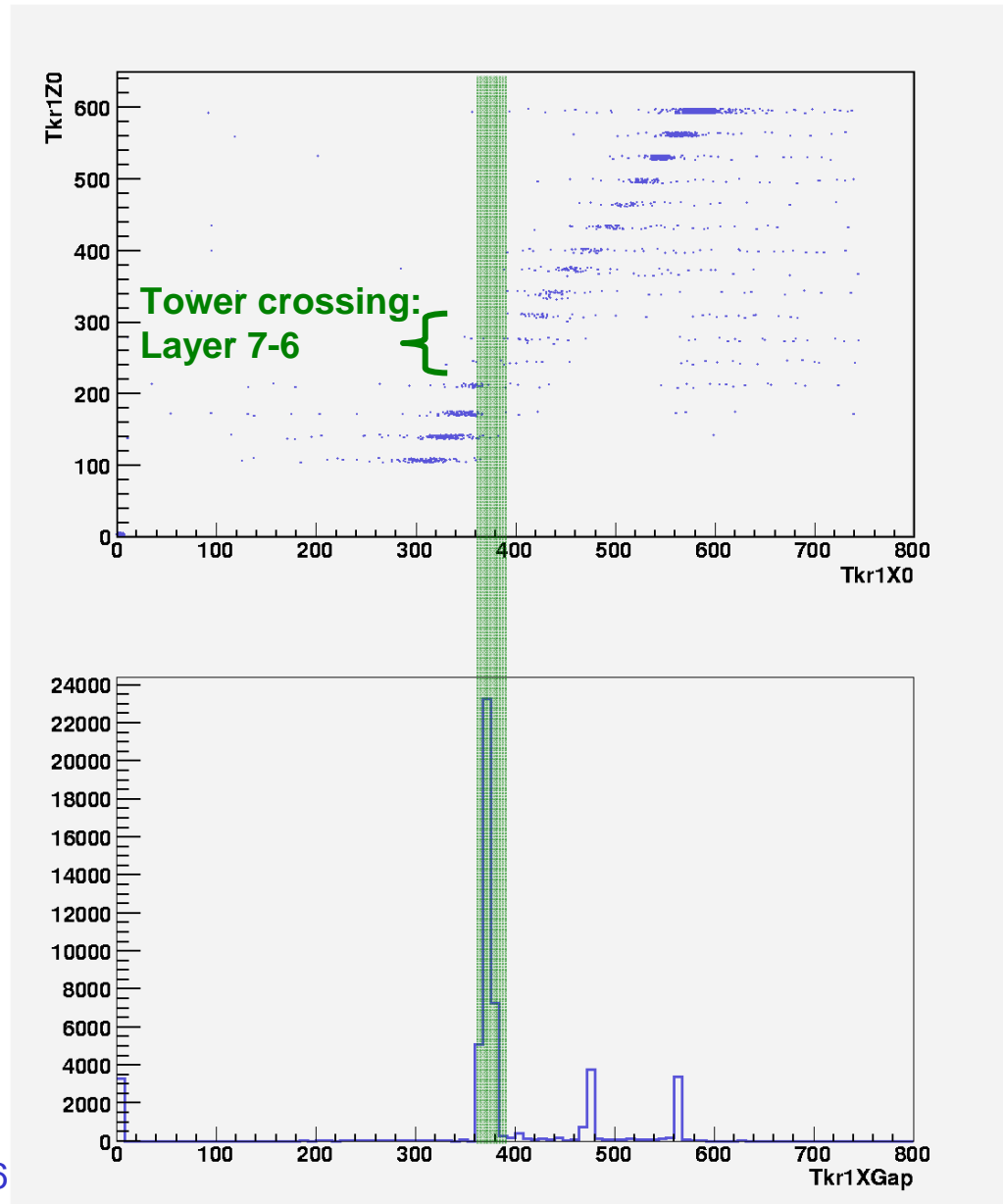


DX - DY





30 deg Beam



Paris 15 Nov 2006

Armani – INFN Perugia