Studies of Number of Hits/Lever Arm (Generation Level)

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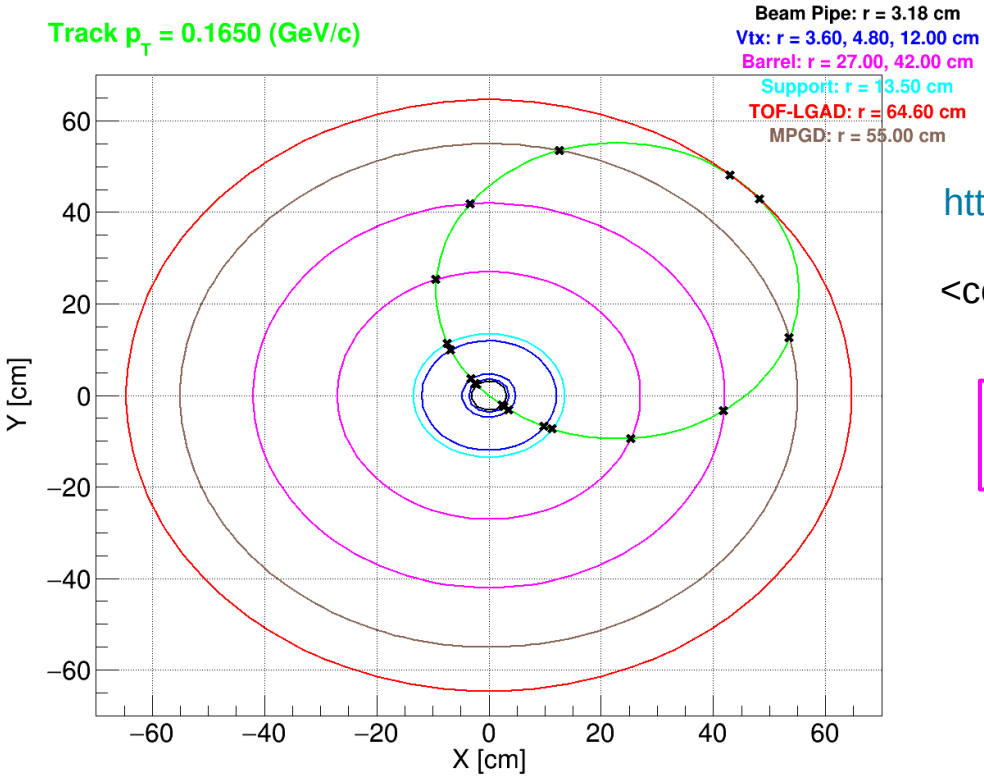
EPIC Configuration

epic_brycecanyon.xml with calorimeters and far forward detectors removed

Curling tracks

```
shyam@shyam:~/eic/epic$ git tag -l
22.10.0
22.10_rc1
22.11.0
shyam@shyam:~/eic/epic$ git checkout 22.10.0
shyam@shyam:~/eic/epic$ git pull origin main
```



https://github.com/eic/epic/blob/main/compact/definitions.xml

<constant name="Solenoid_rmin"value="1420.0*mm"/>

p_{Tmin} = 0.3*1.7*1.42/2 = 0.3621 GeV/c

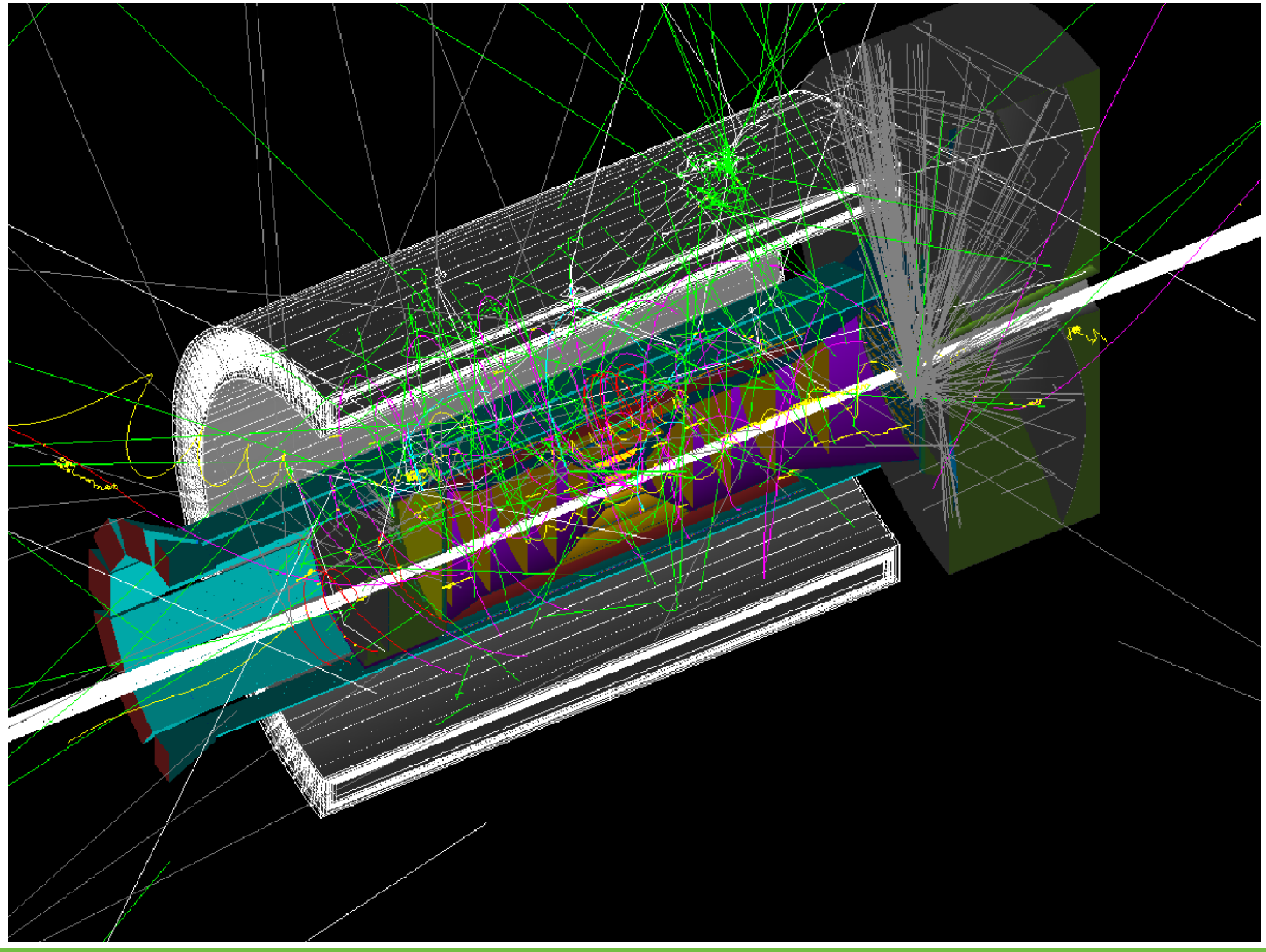
Barrel EMCal

P_{Tmin} = 0.3*1.7*0.78/2 = 0.199 GeV/c

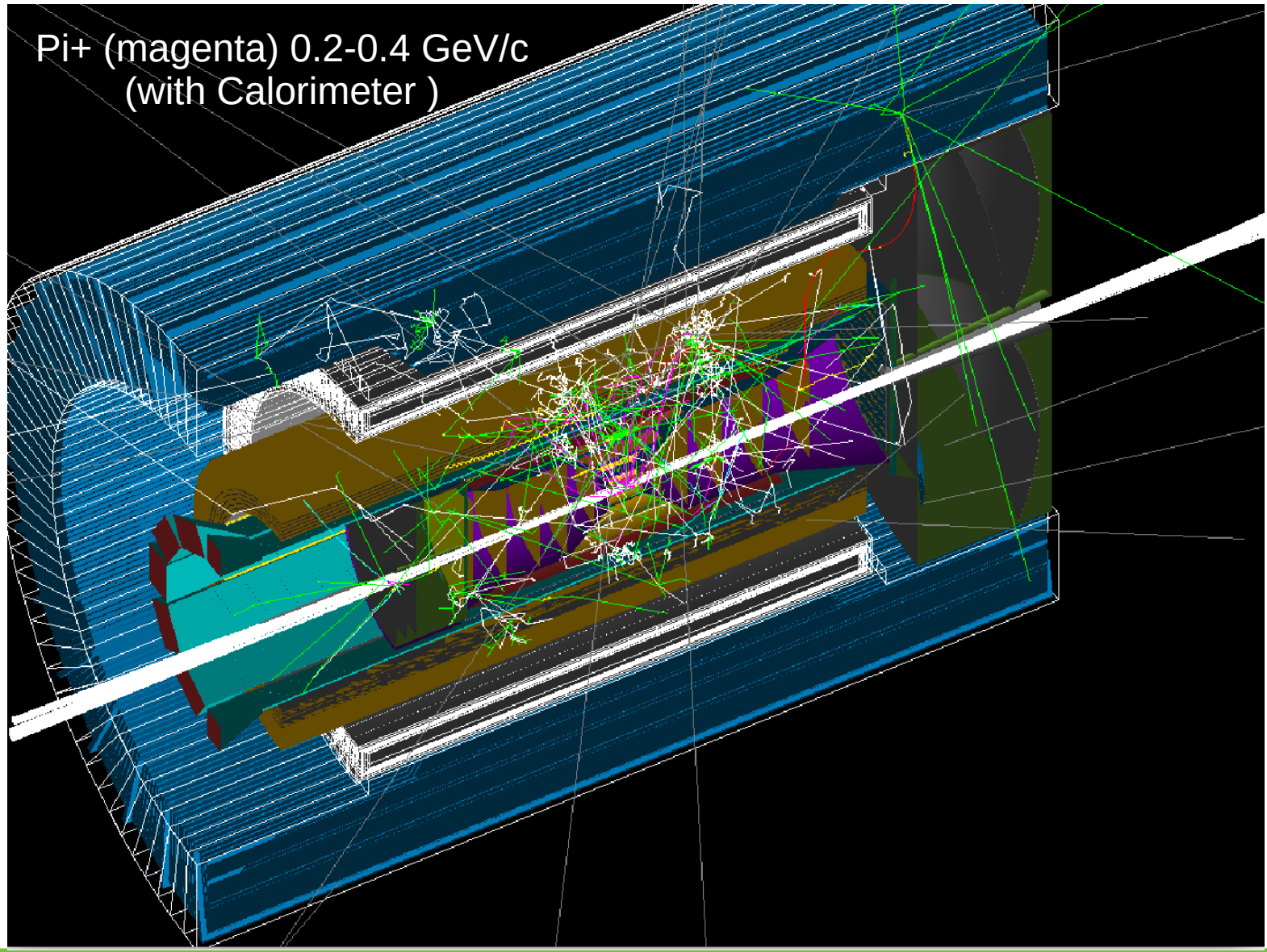
field_map="fieldmaps/MARCO_v.6.4.1.1.3_1.7T_Magnetic_Field_Map_2022_11_14_rad_coords_cm_T.txt"
url="https://github.com/eic/epic-data/raw/64b7ca6306b138b7f000e696c82bd8f72db1da56MARCO_v.6.4.1.1.3_1.7T_Magnetic_Field_Map_**2022_11_14_rad**_coords_cm_T.txt"

Generation Level (Curling Tracks)

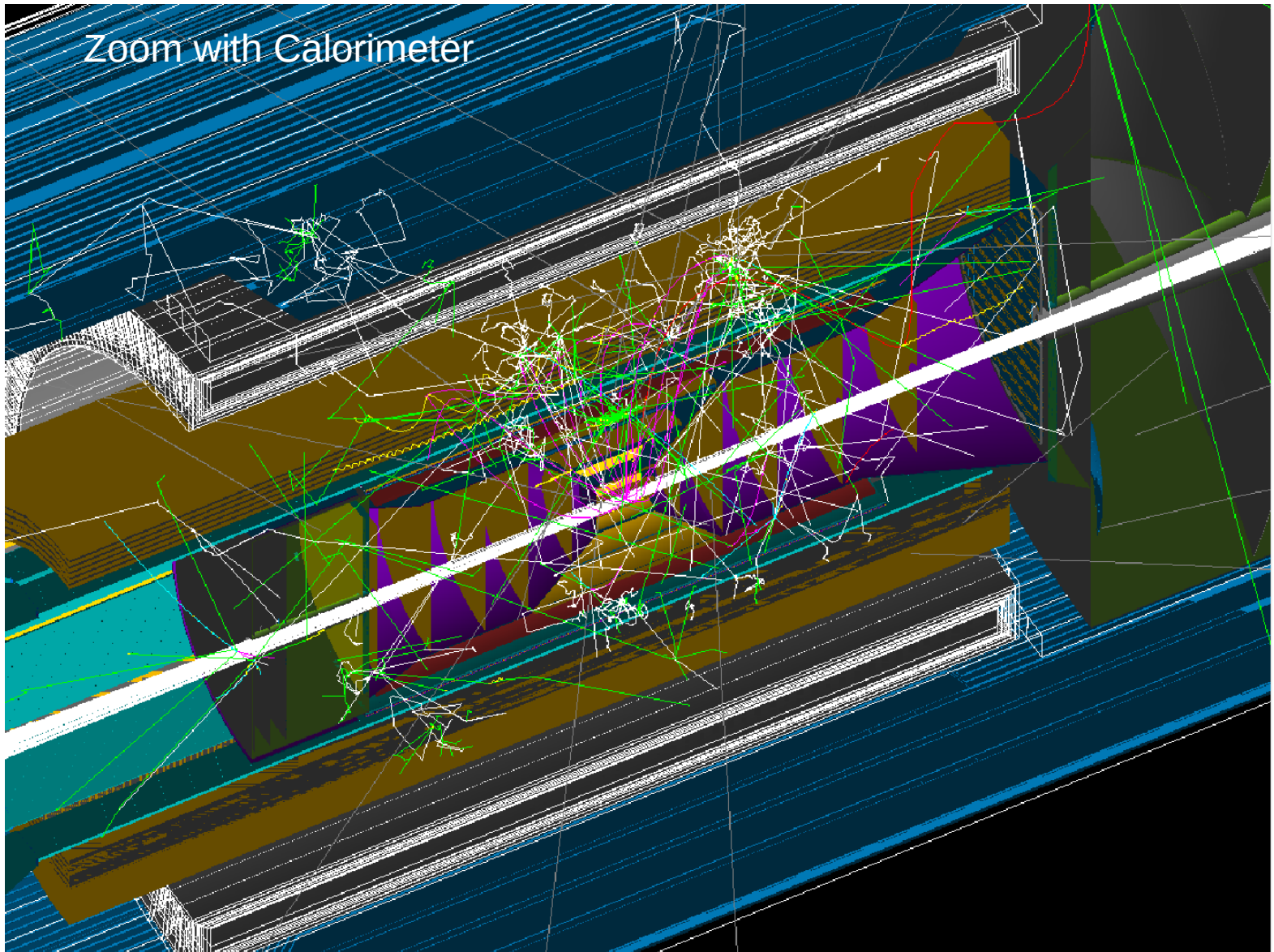
Pi+ (magenta) 0.2-0.4 GeV/c (Calorimeter removed)



Generation Level (Curling Tracks)

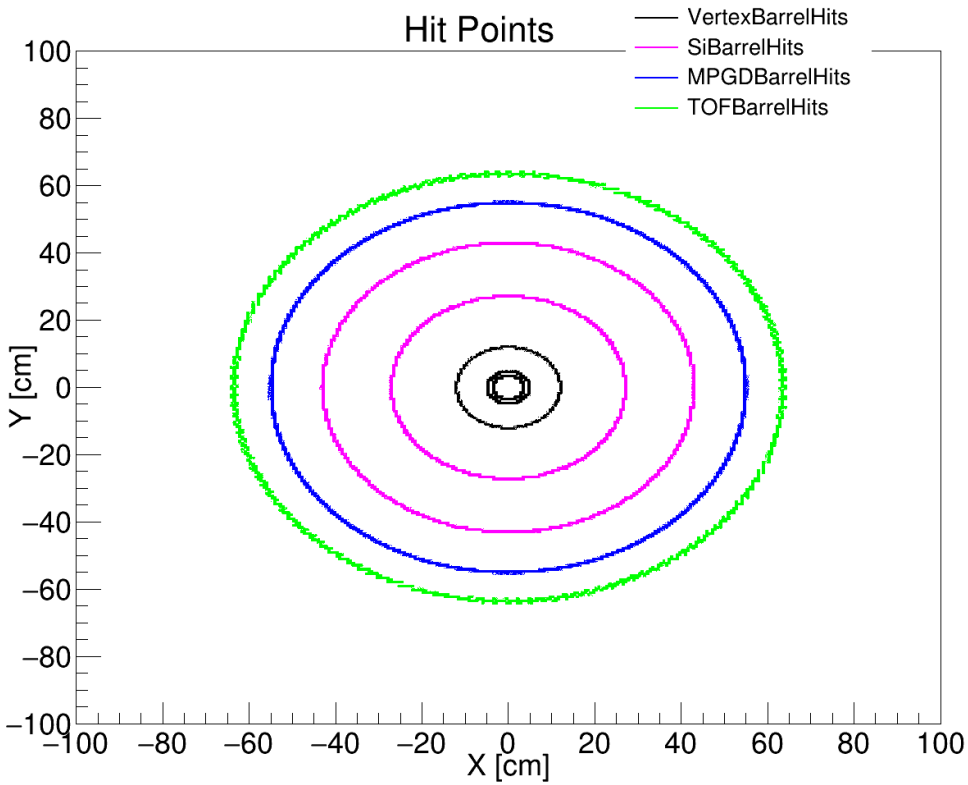


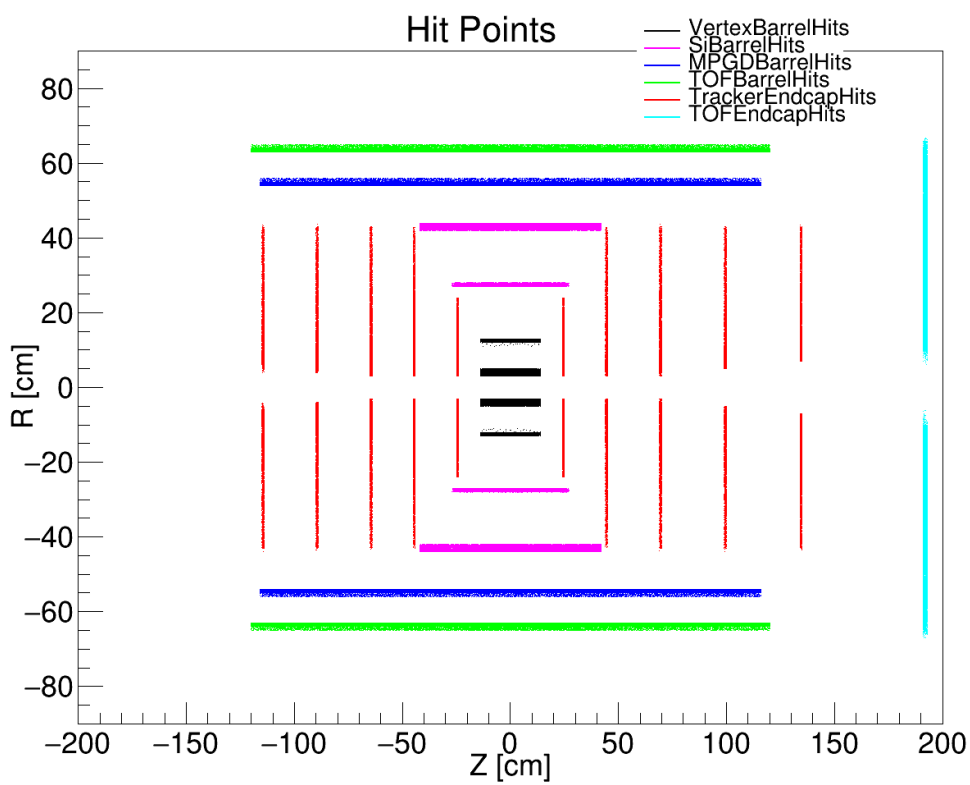
Generation Level (Curling Tracks)



3M mu- in the momentum range [0.1,10.] GeV/c and η [-3.5,3.5]

ETOF hits included





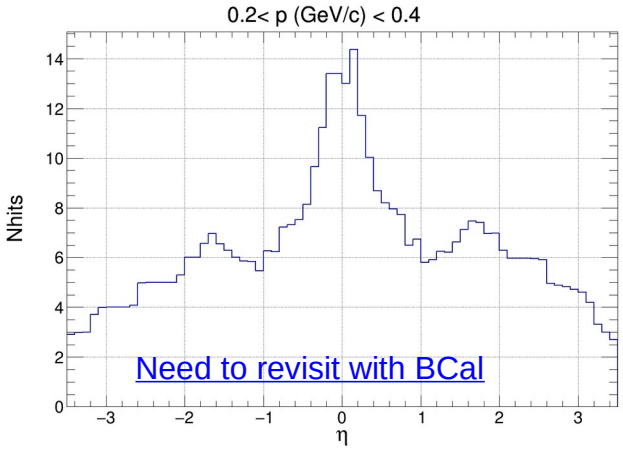
VertexBarrelHits.quality

quality = 0 for primary hits

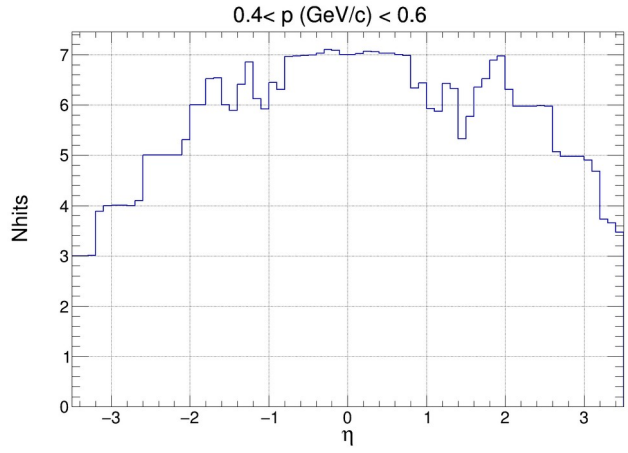
Secondary Hits removed using quality

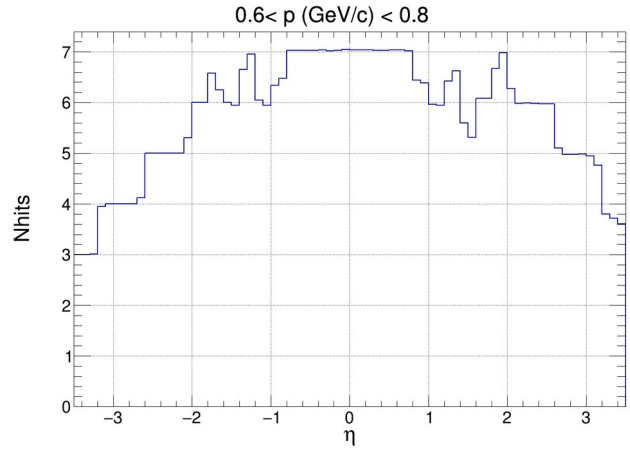
Nhits (Generation Level)

At larger η with ETOF average hits < 4

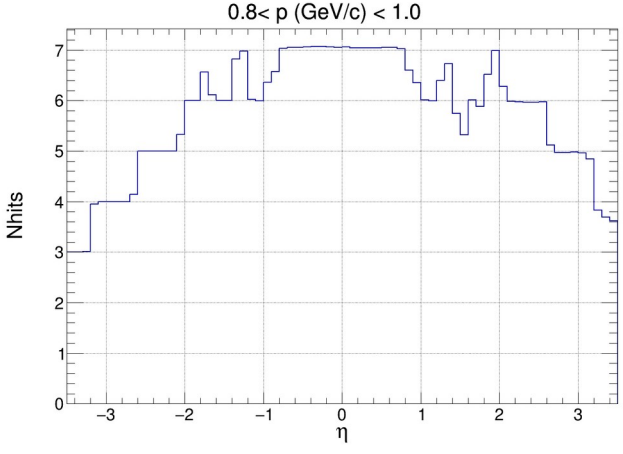


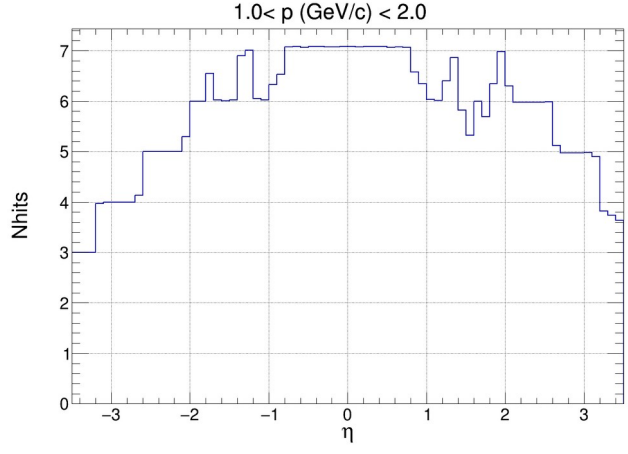
Need to revisit with BCal

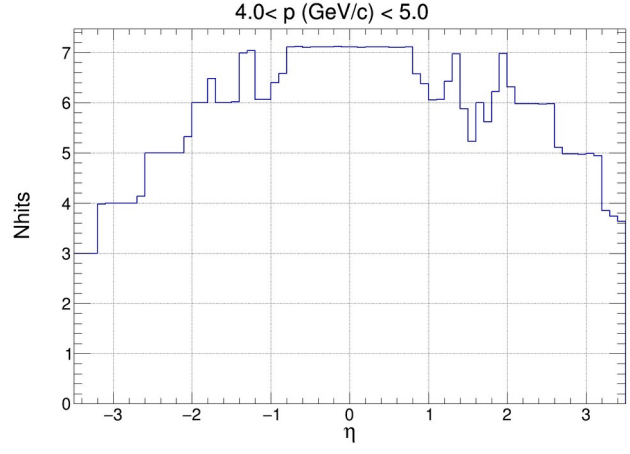




3 hit case may bias the results



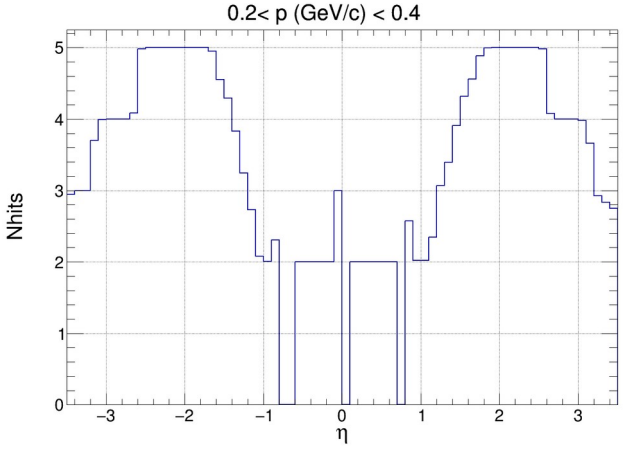


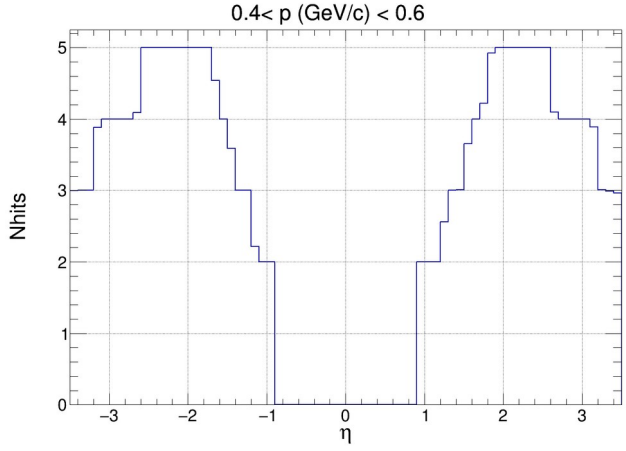


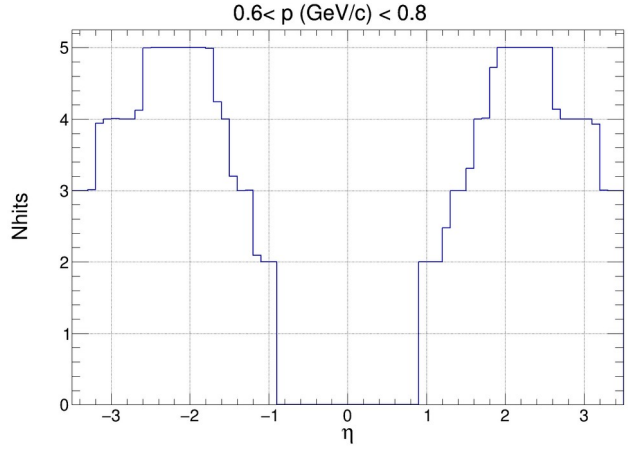
Nhits and Lever Arm for Disks (Generation Level)

Positive eta DiskZ: [25,45,70,100,135]

Negative eta DiskZ: [-25,-45,-65,-90,-115]

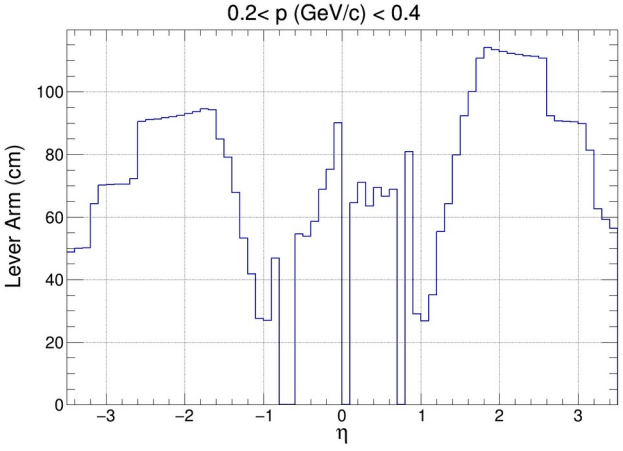


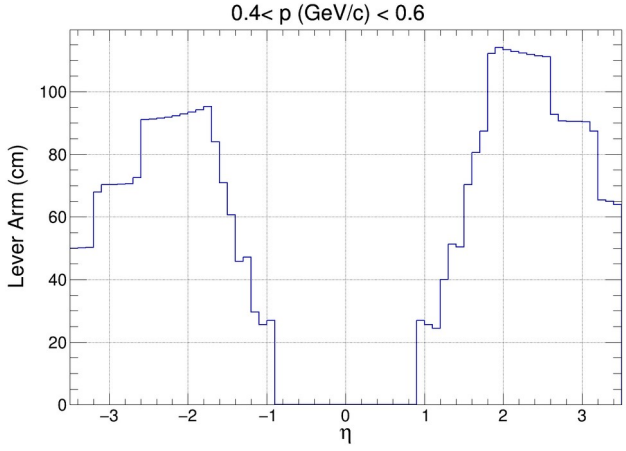


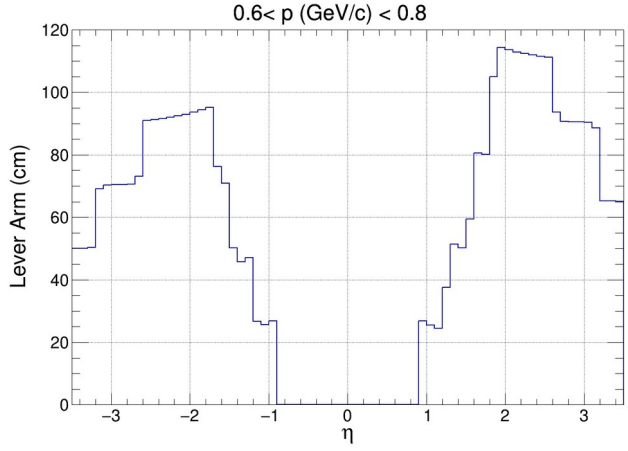


$$\frac{\Delta p_T}{p_T}|_{m.s.} = \frac{N}{\sqrt{(N+1)(N-1)}} \frac{0.0136\,\mathrm{GeV/c}}{0.3\beta B_0 L_0} \sqrt{\frac{d_{tot}}{X_0 \sin\theta}} \left(1 + 0.038 \ln \frac{d}{X_0 \sin\theta}\right)$$

Lever Arm is larger for η>0 which improves momentum resolution







Nhits and Lever Arm for Disks (Generation Level)

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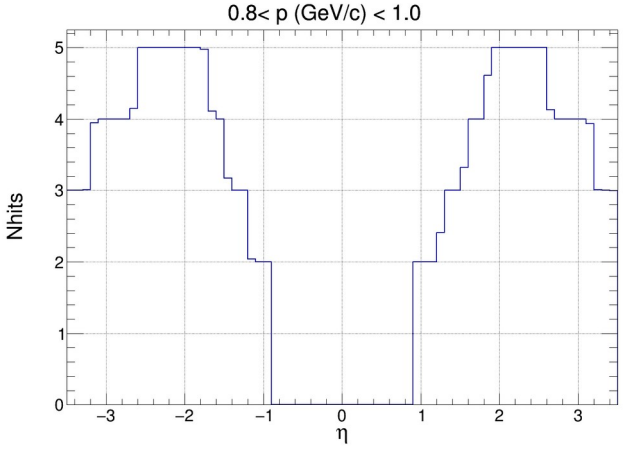

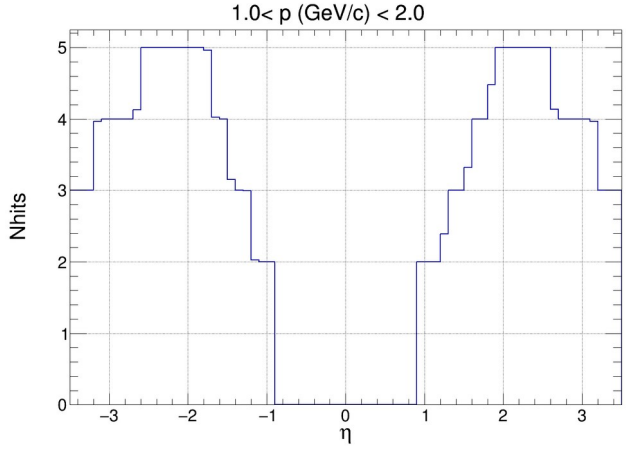

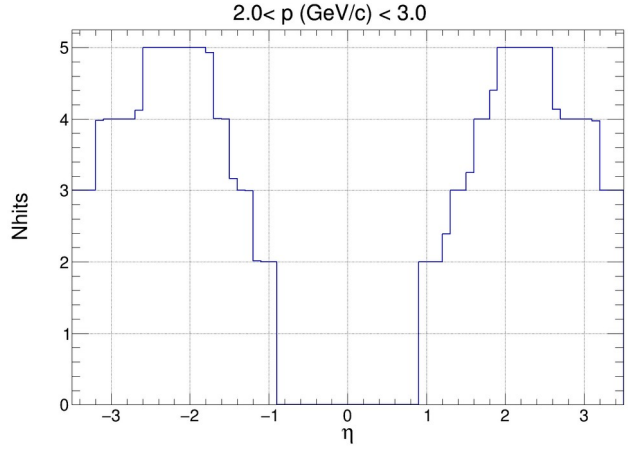

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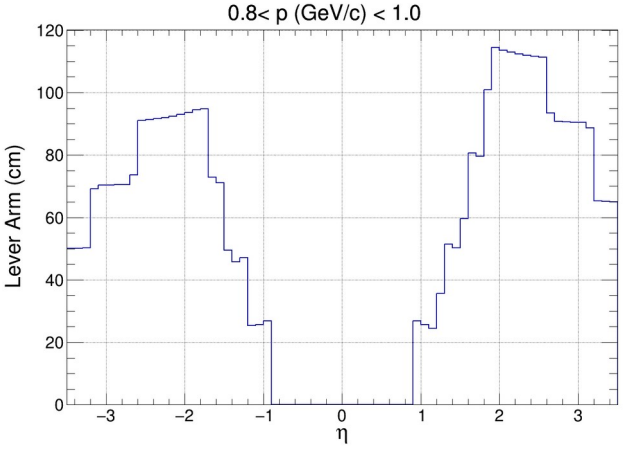
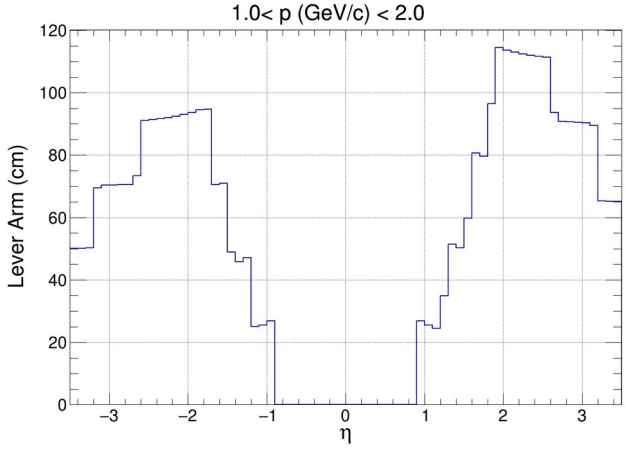
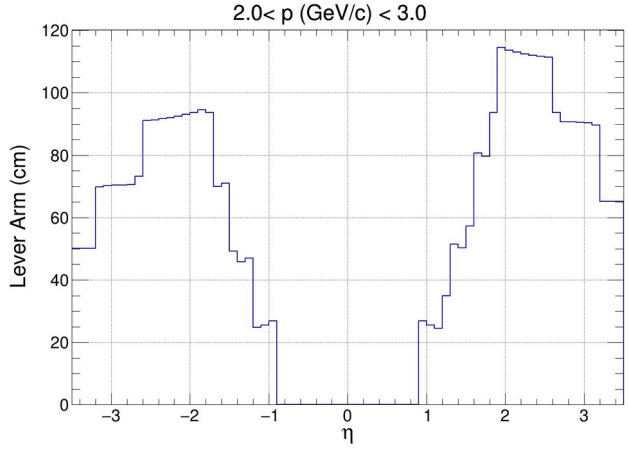


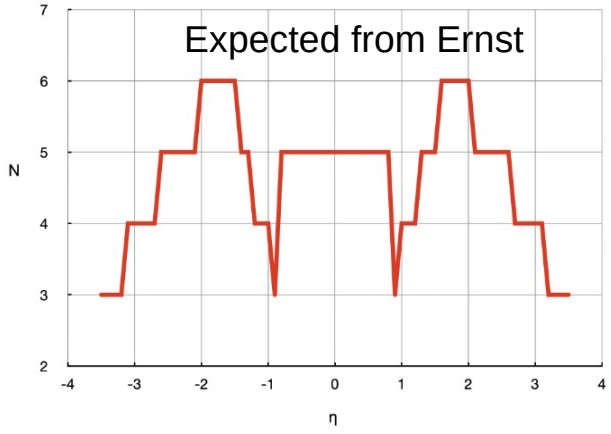


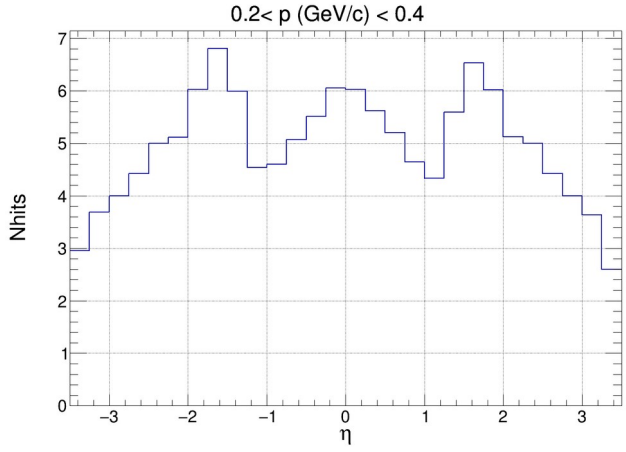


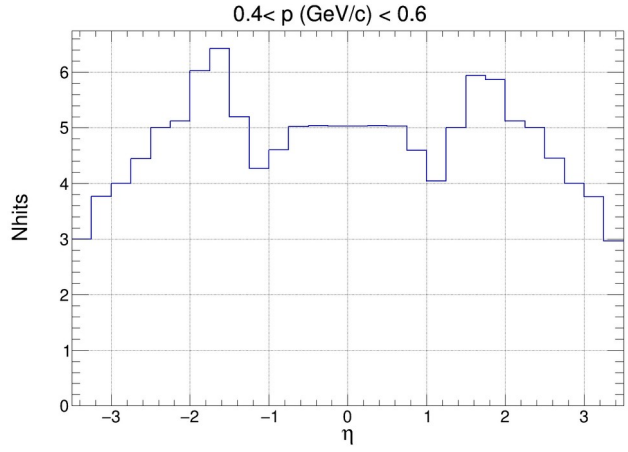
Comparison with Expected (Ernst)

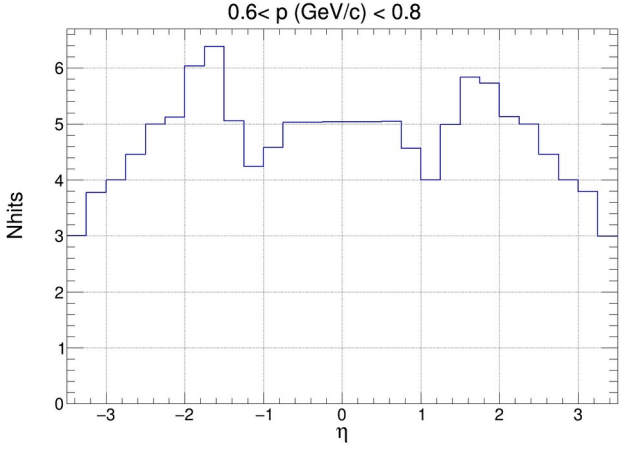
https://indico.bnl.gov/event/18272/contributions/72893/attachments/45972/77709/20230209%20-%20EIC%20tracking%20WG.pdf

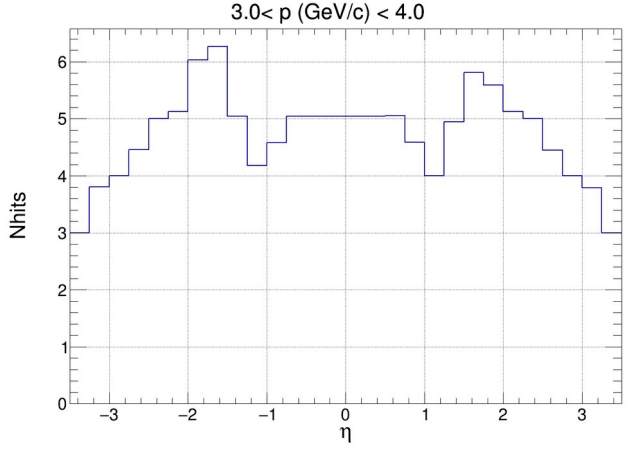
Only with Silicon Layers

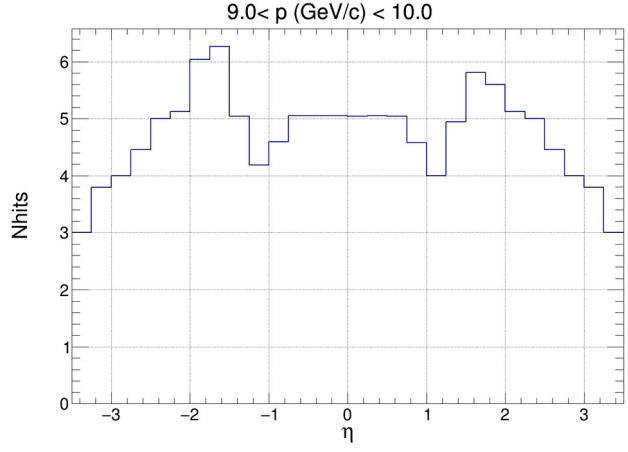






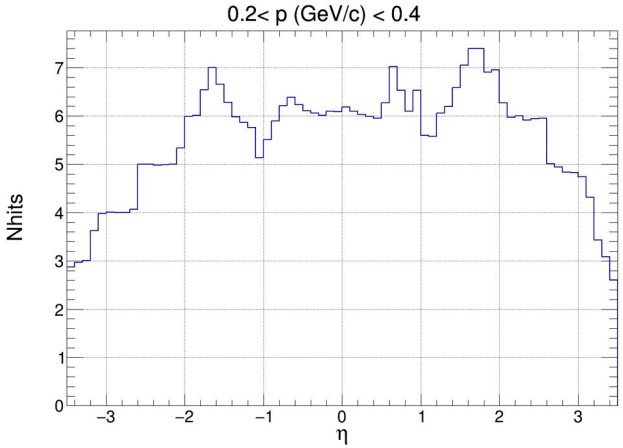


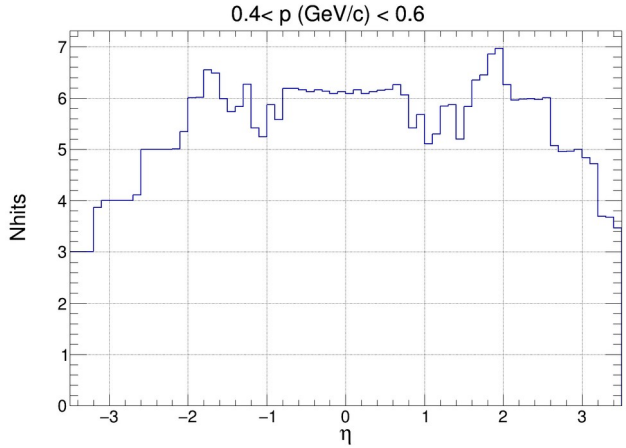


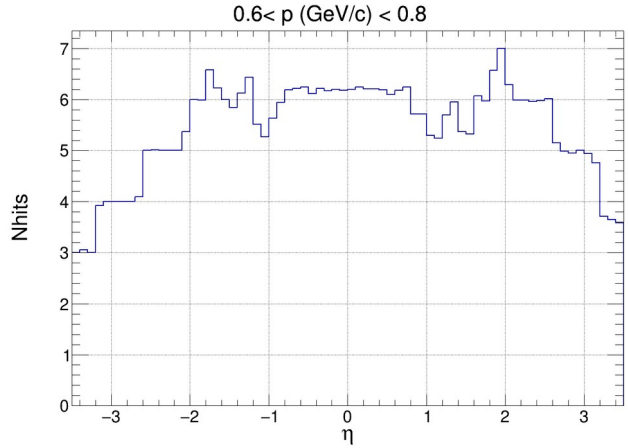


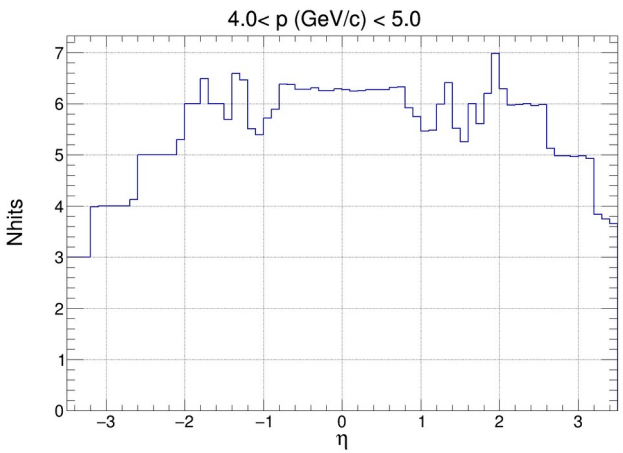
Nhits (Generation Level) with Bcal

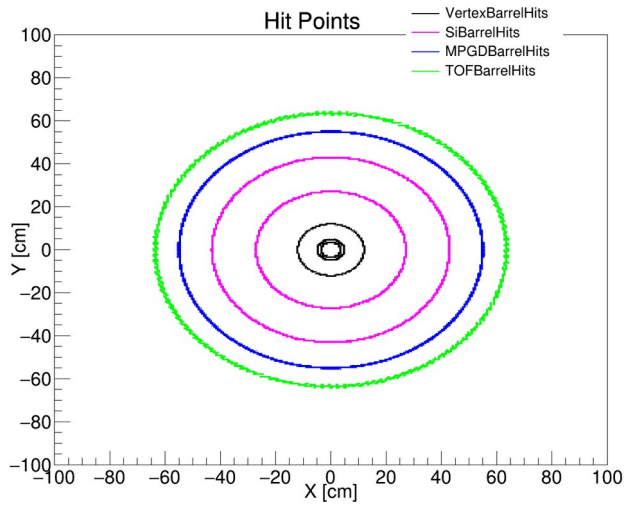
One hit is missing in MPGD layer in most of the cases (Need to Understand)

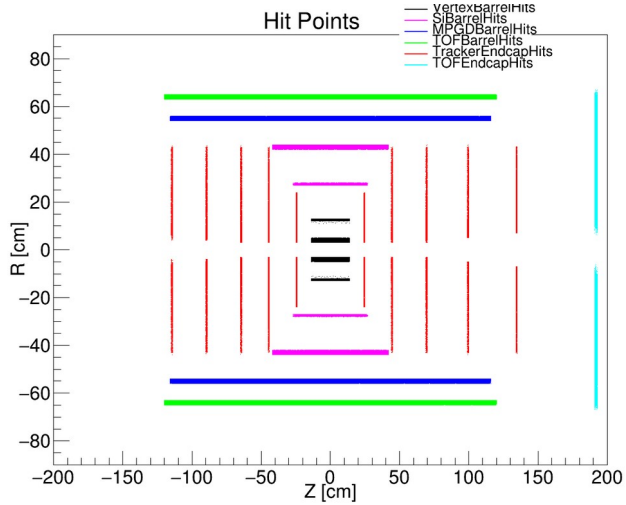




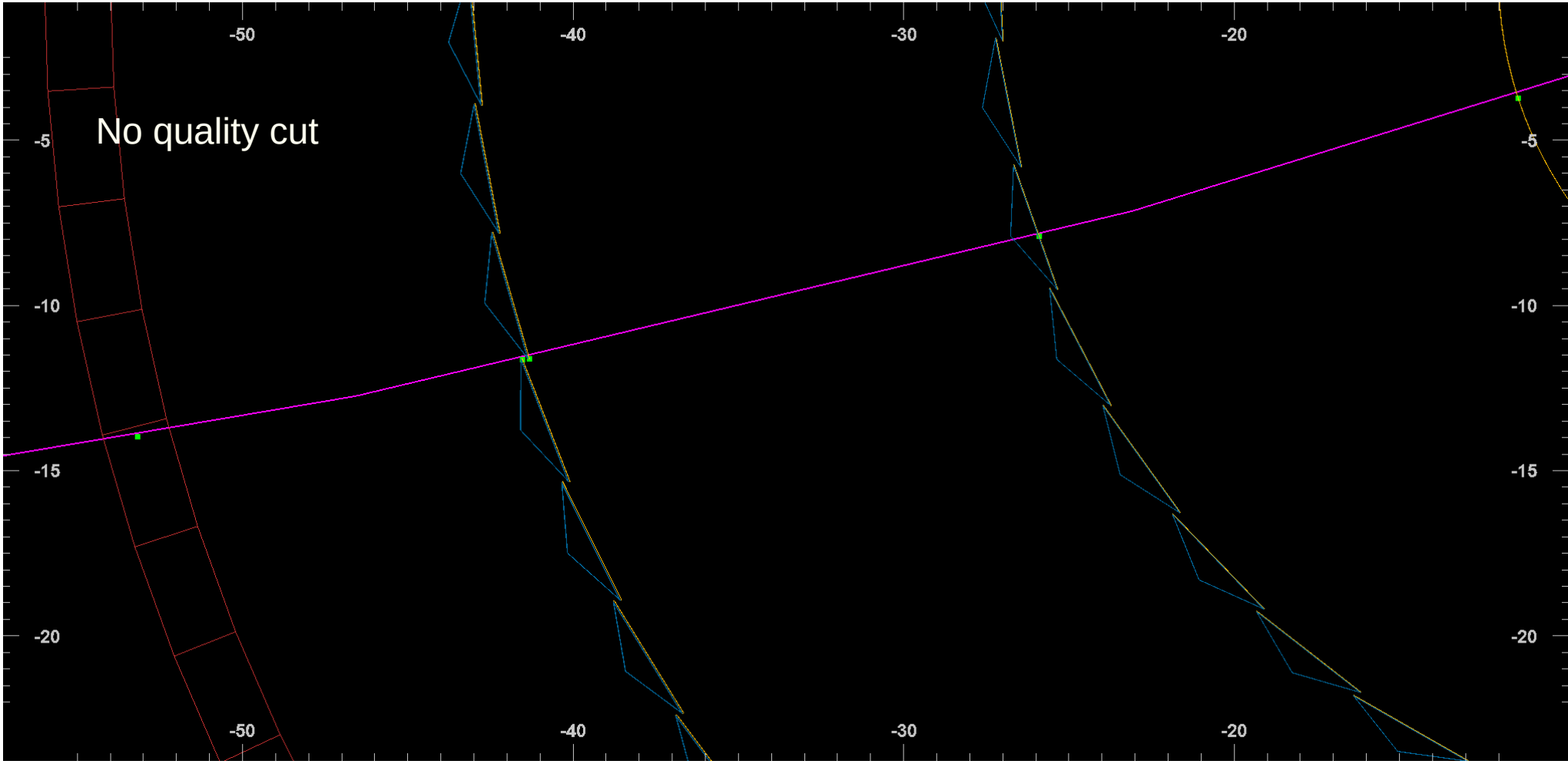








Event Display (Event 394331)-Old



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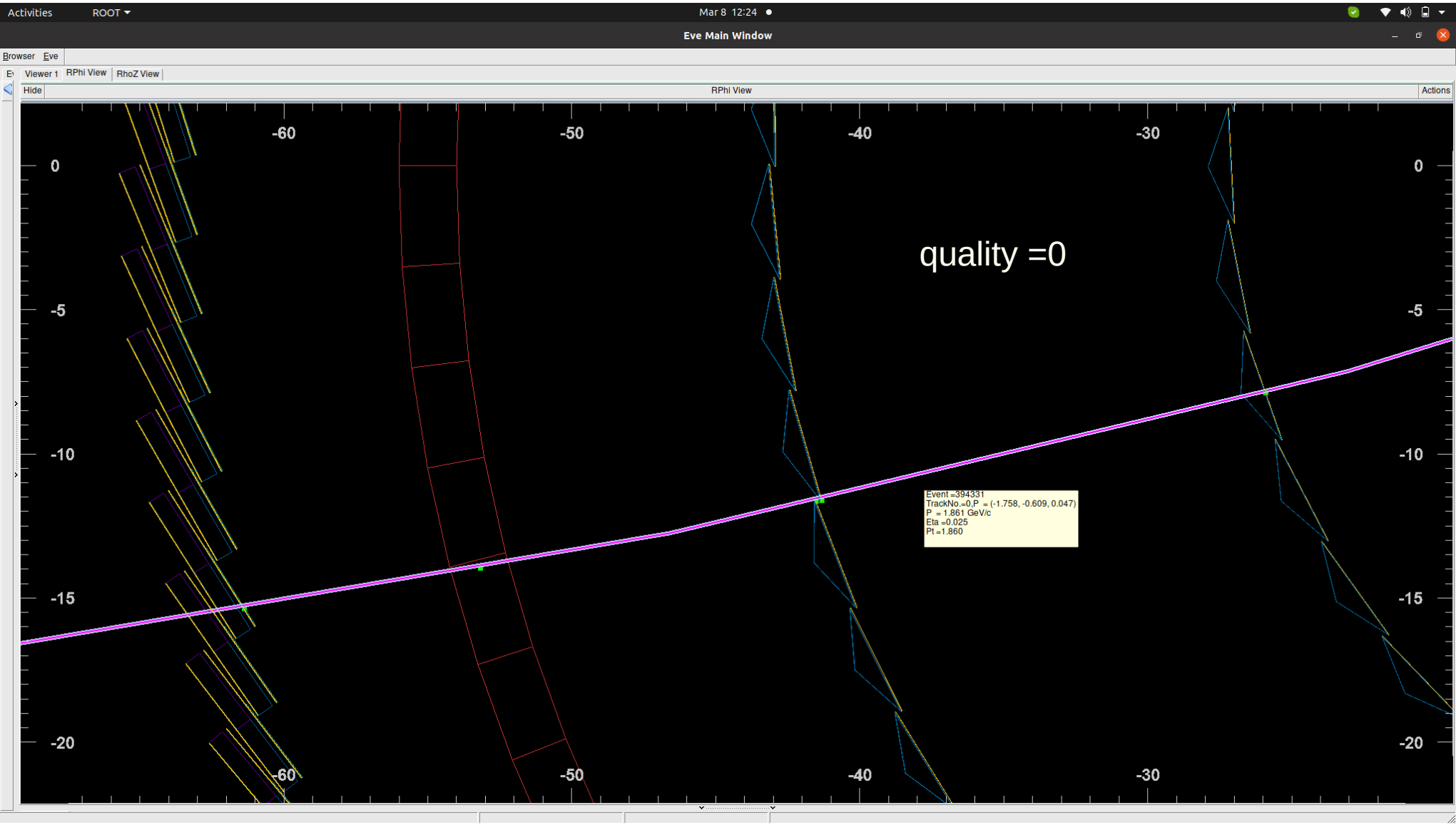
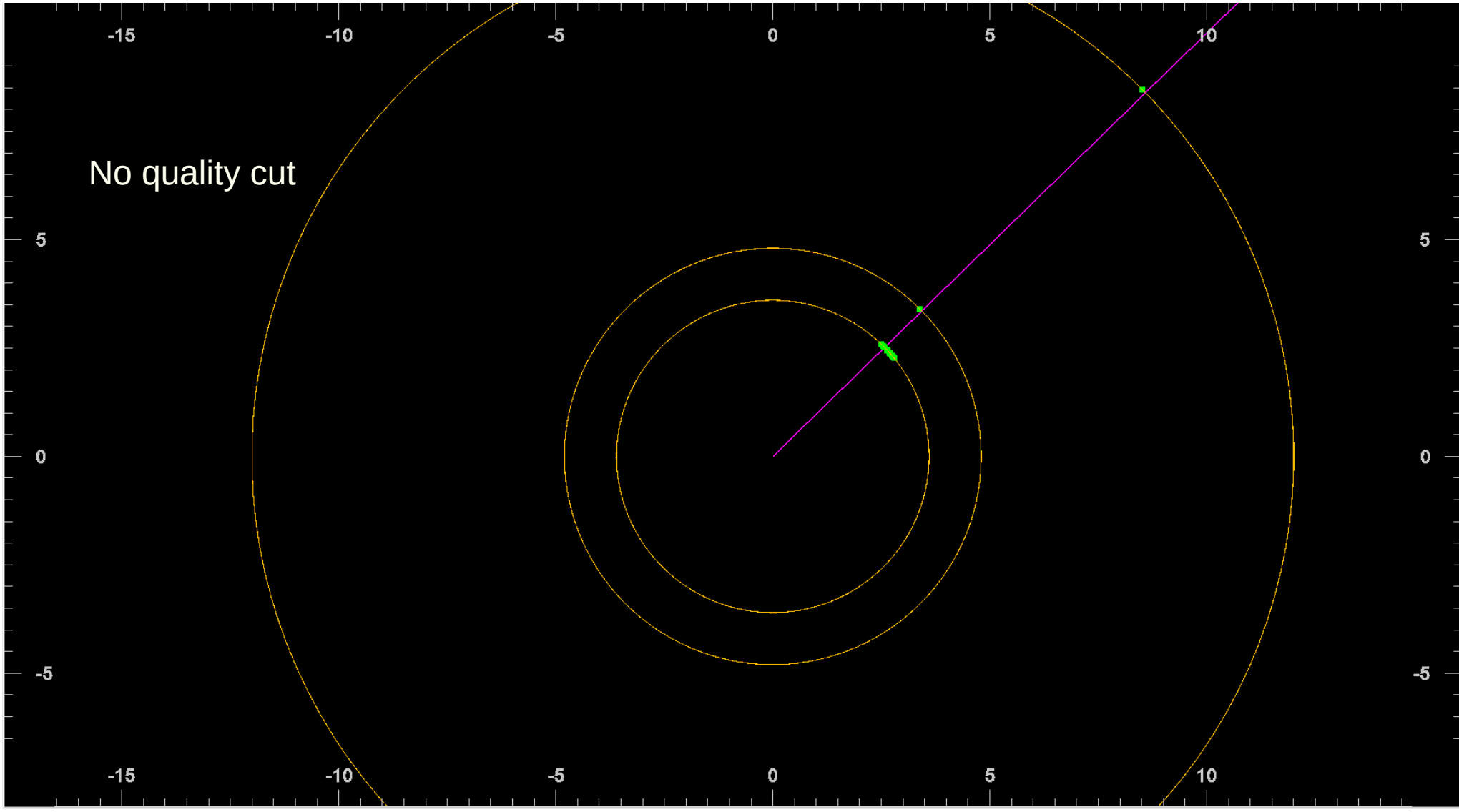


Event Display R-Phi View (Event 544)-Old



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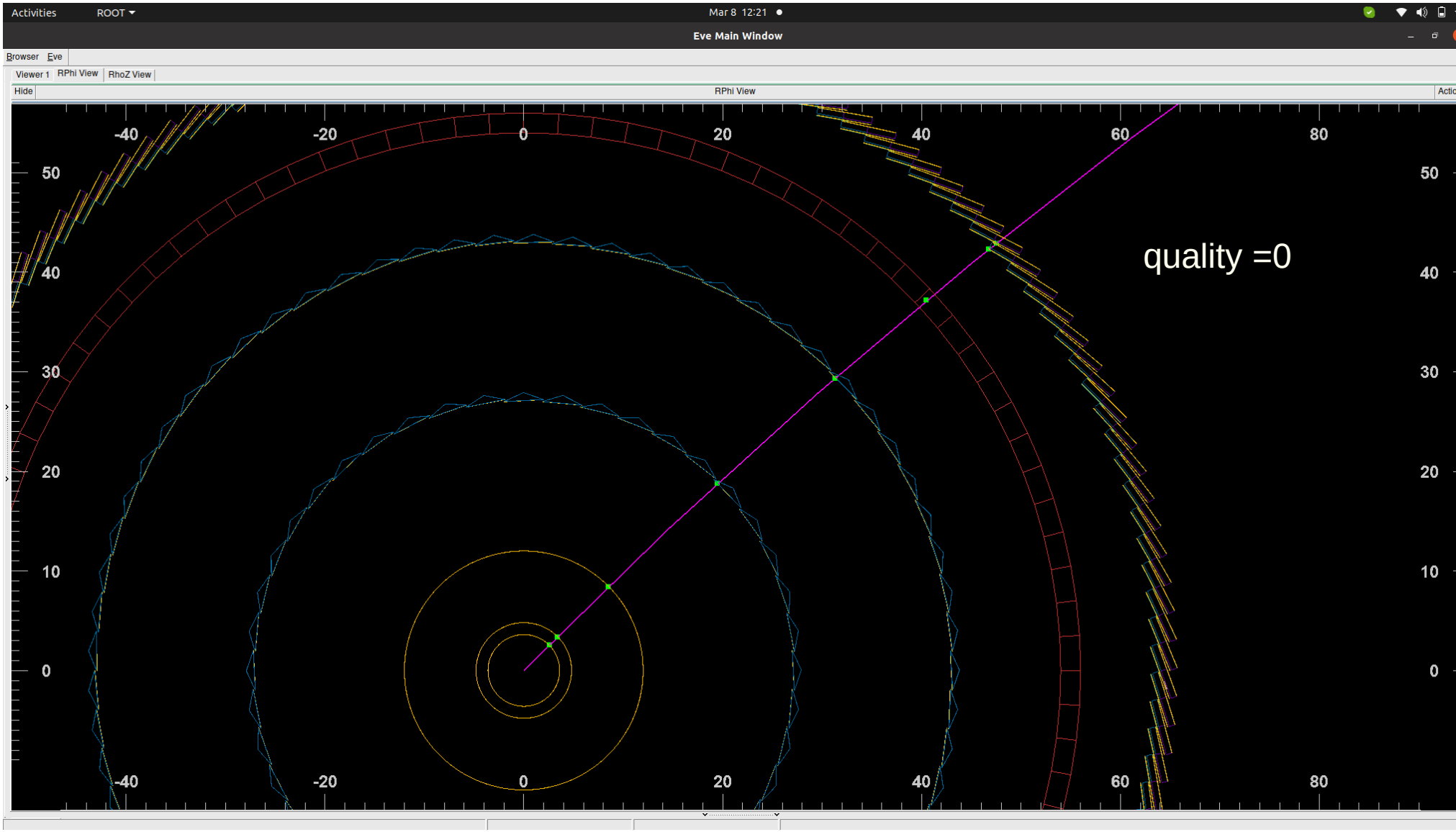
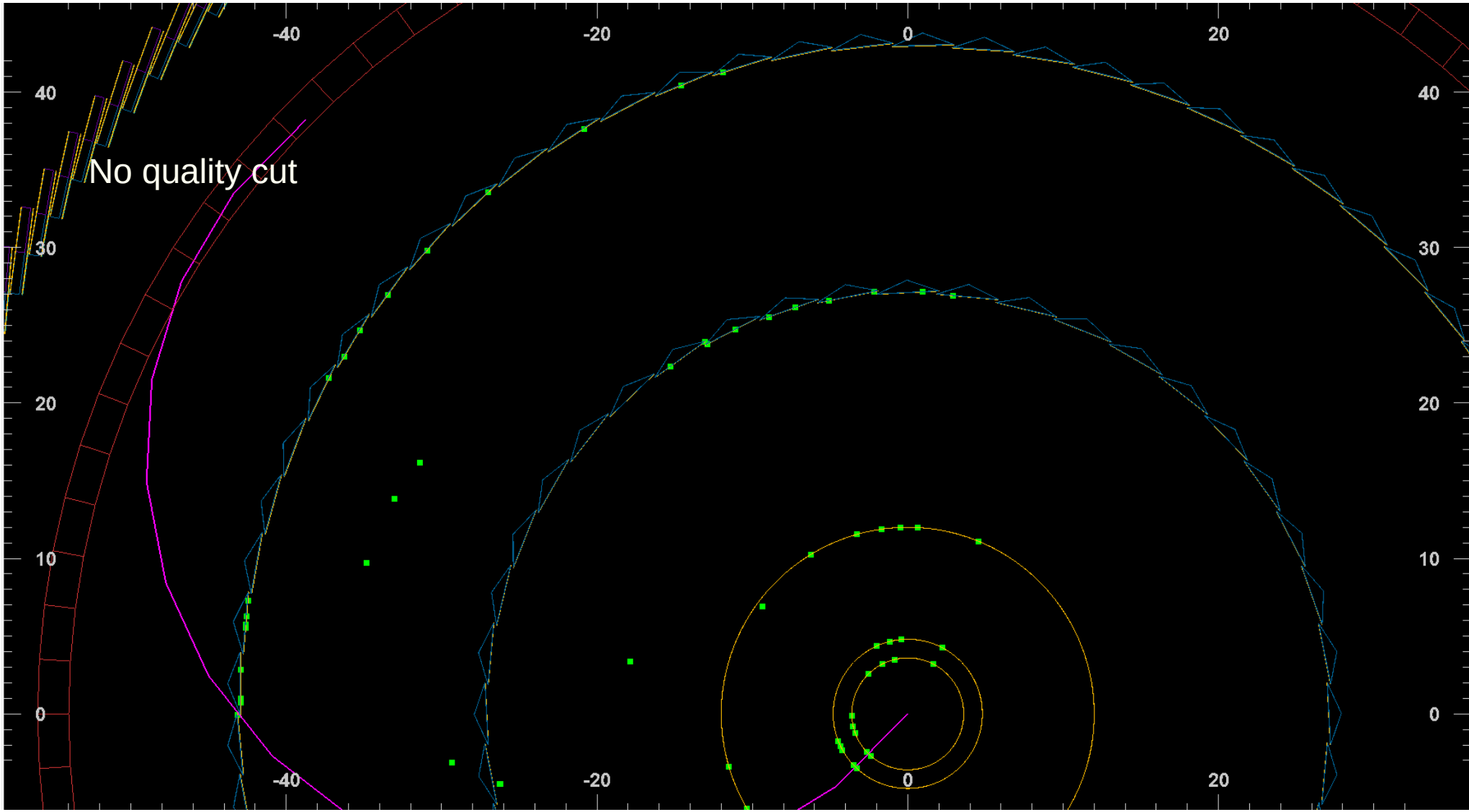
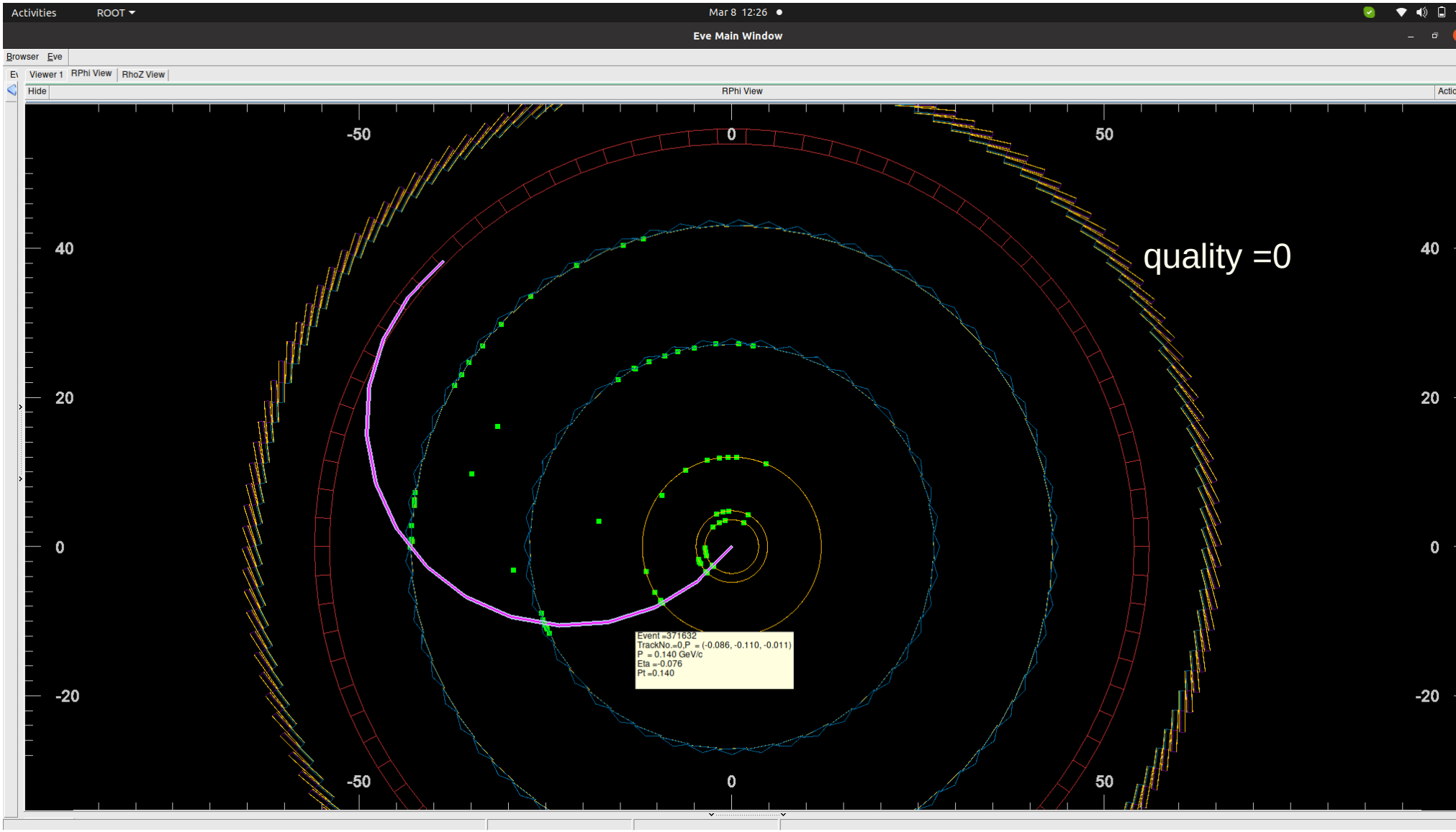


Event Display (Event 371632)-Old



Event Display (Event 371632)-New



Summary

- Checked the number of Hits and Lever Arm using Monte Carlo points
- Very low momentum range (0.2-0.4 GV/c) situation tracks are absorbed in Barrel Calorimeter
- I seen missing hits in MPGD layer in few cases (will check it again which reduced hits to 6 at eta = 0)
- Curling tracks situation will be there momentum below < 0.2 GeV/c
- Things to be done:
  - Currently writing trajectory plugin to have chi2/ndf, number of hits, etc.