Study of FARICH reconstruction

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SPD Physics & MC meeting
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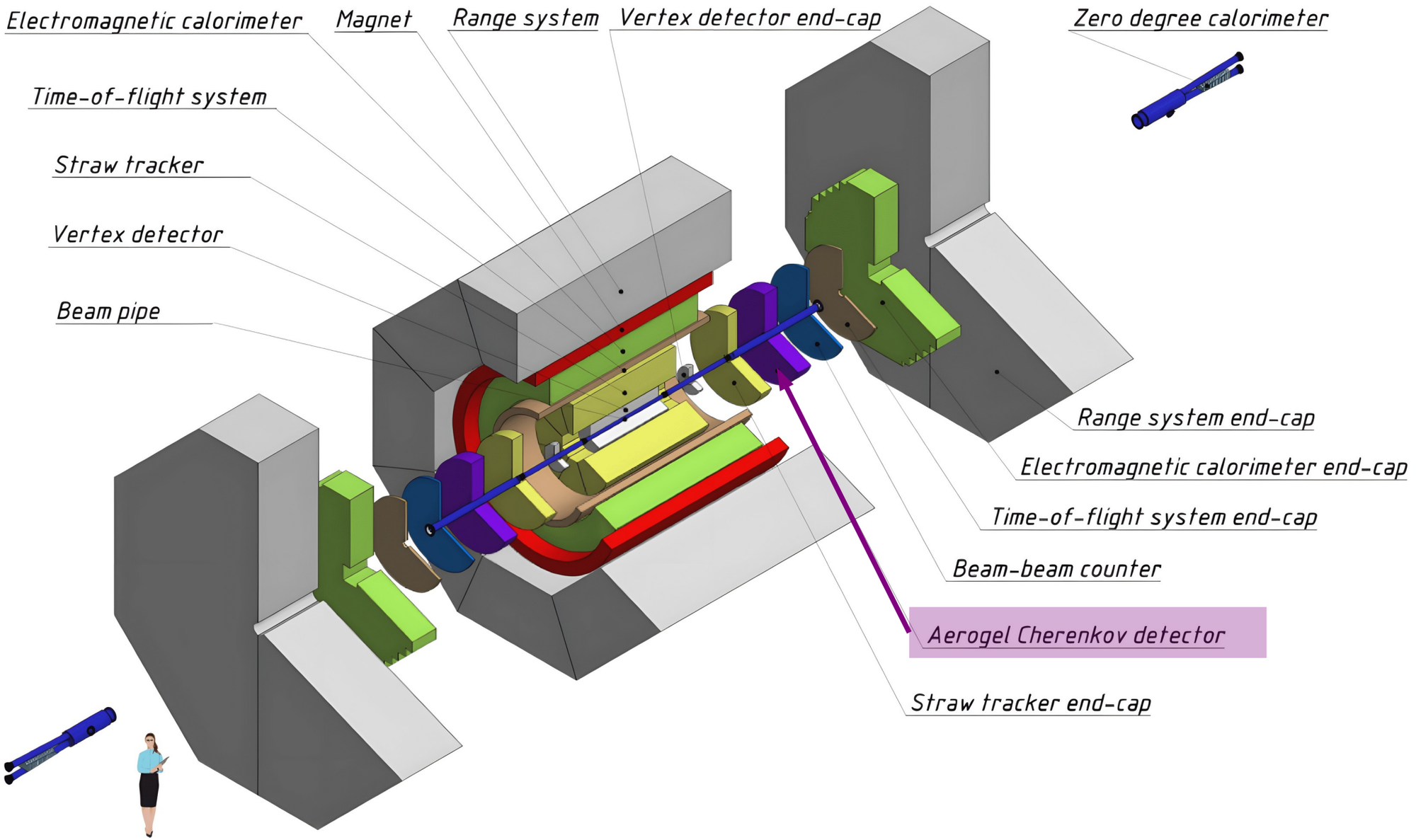
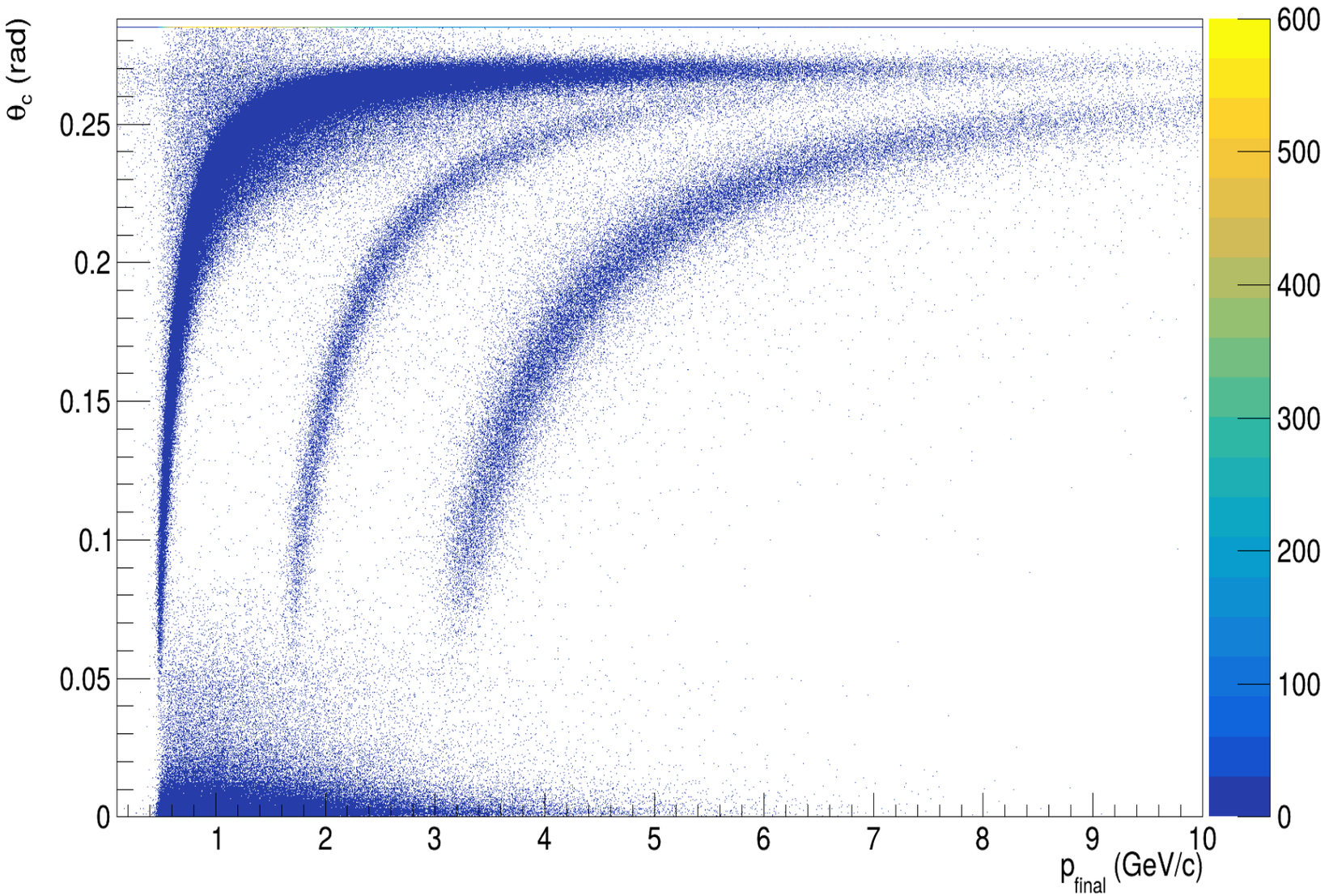
Focusing Aerogel RICH detector in SPD



Current status of FARICH in SpdRoot

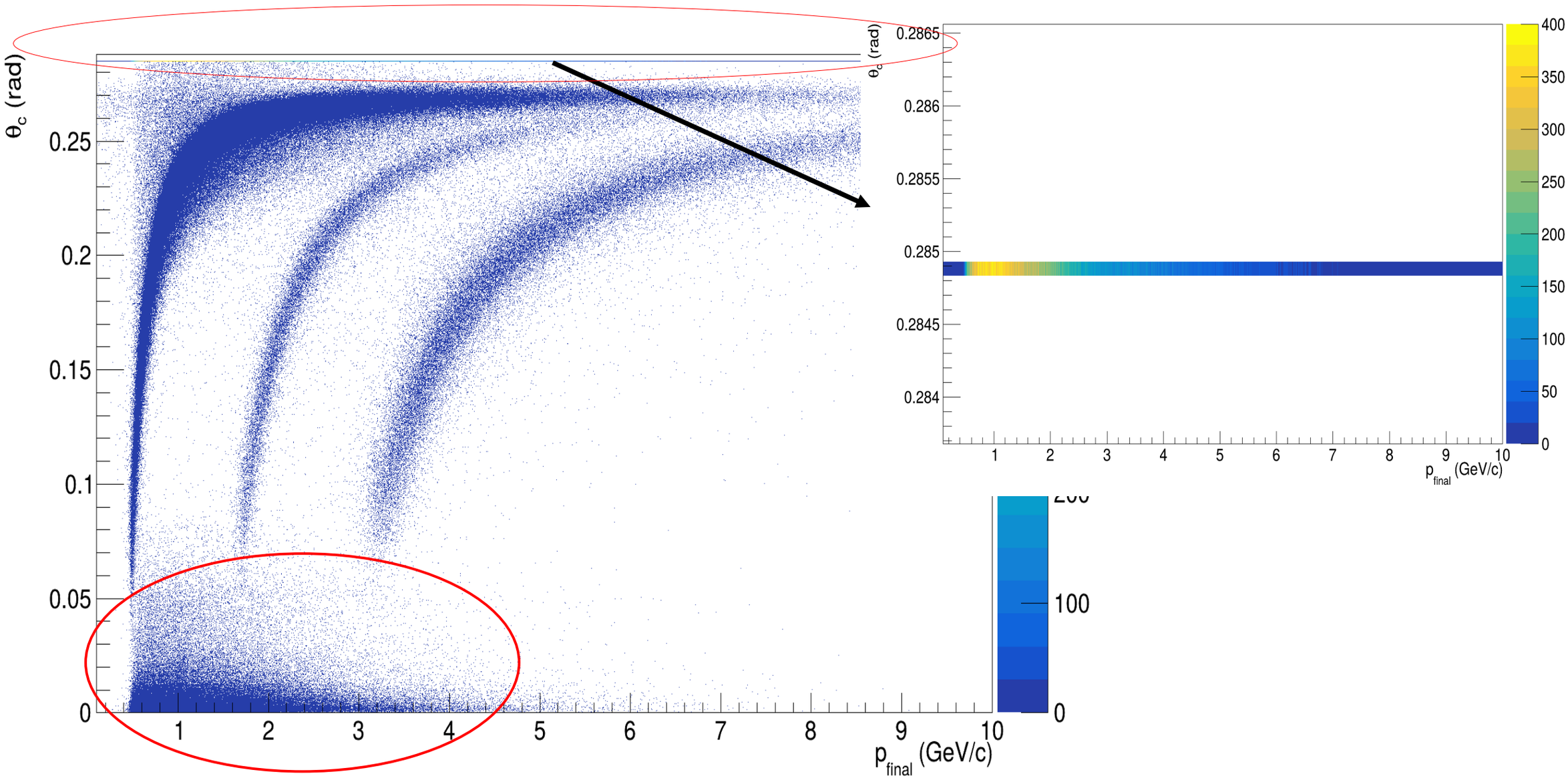


Minimbias

Convergency

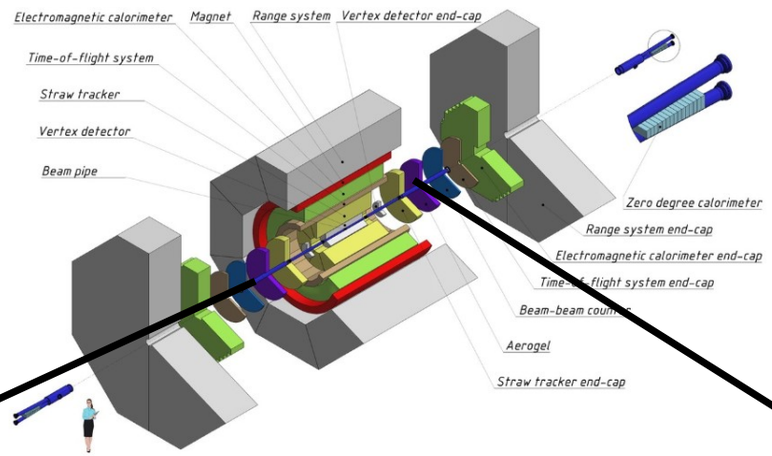
$\chi^2_{track} / NDF > 4$

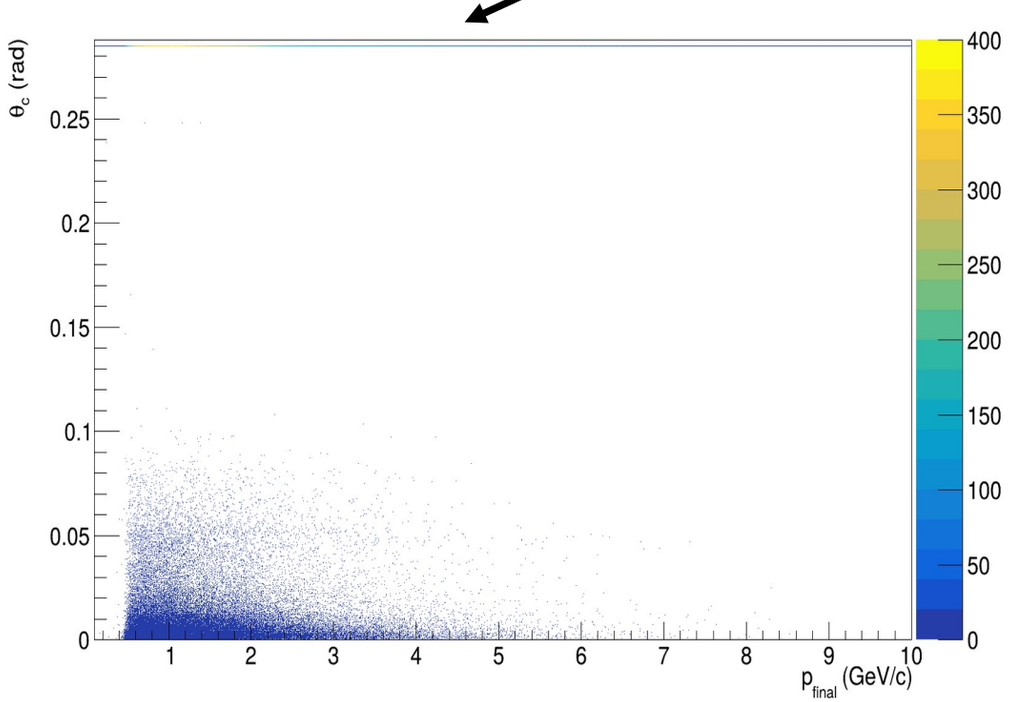
Current status of FARICH in SpdRoot

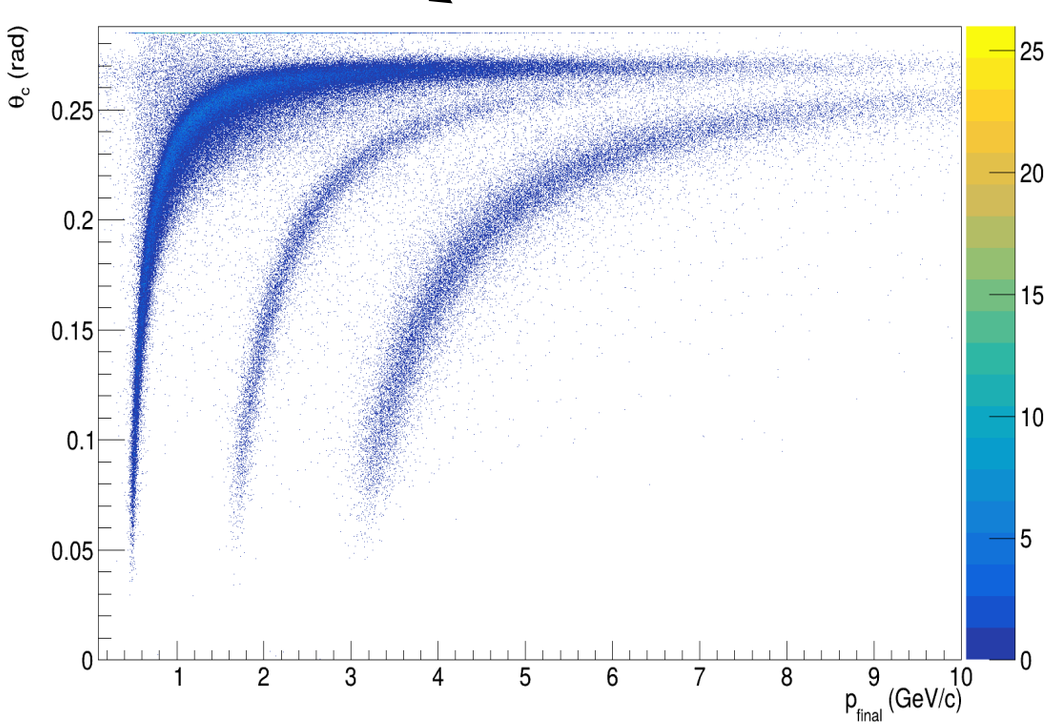


Current status of FARICH in SpdRoot

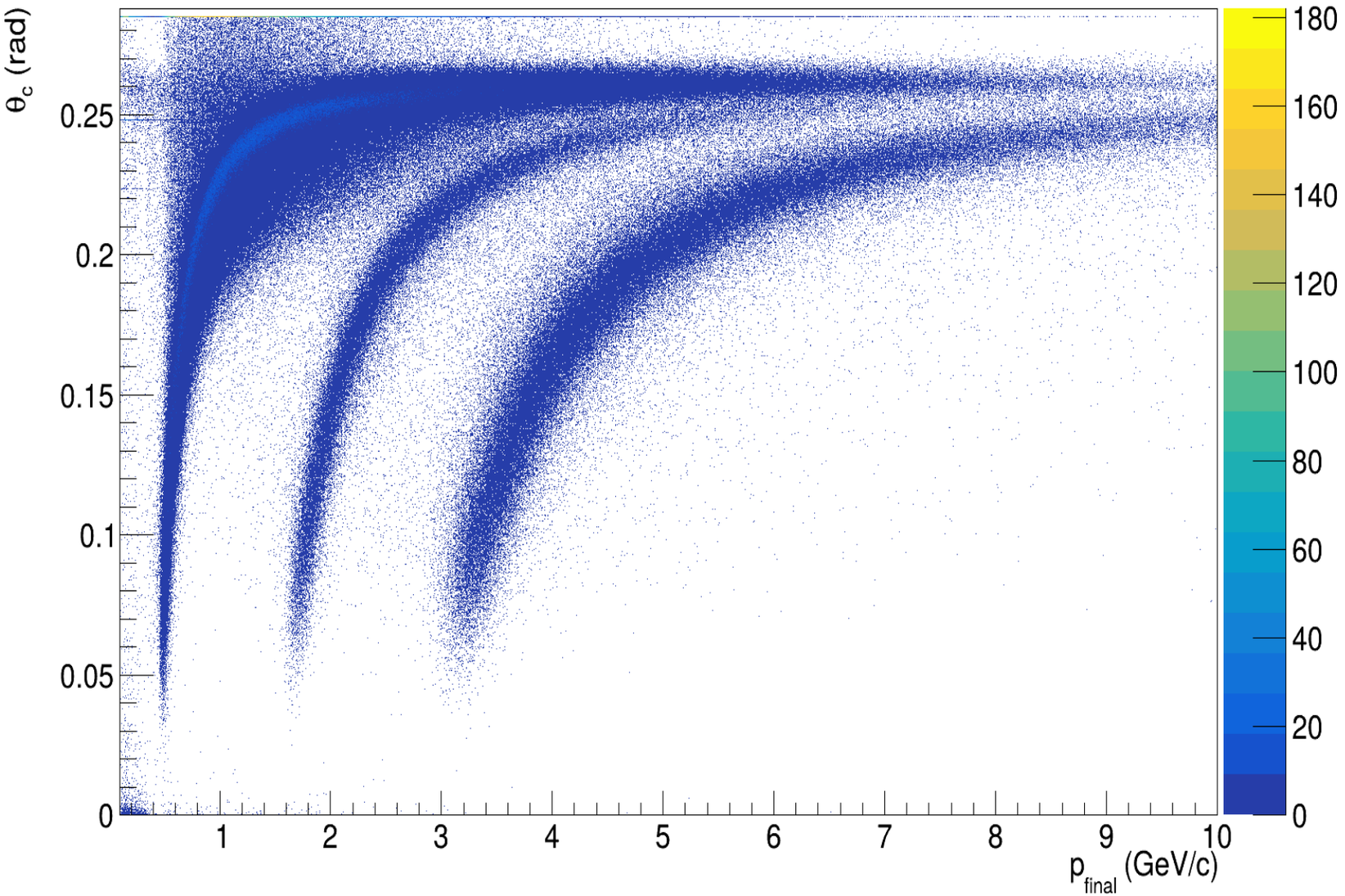
Error in formula







Corrected FARICH in SpdRoot

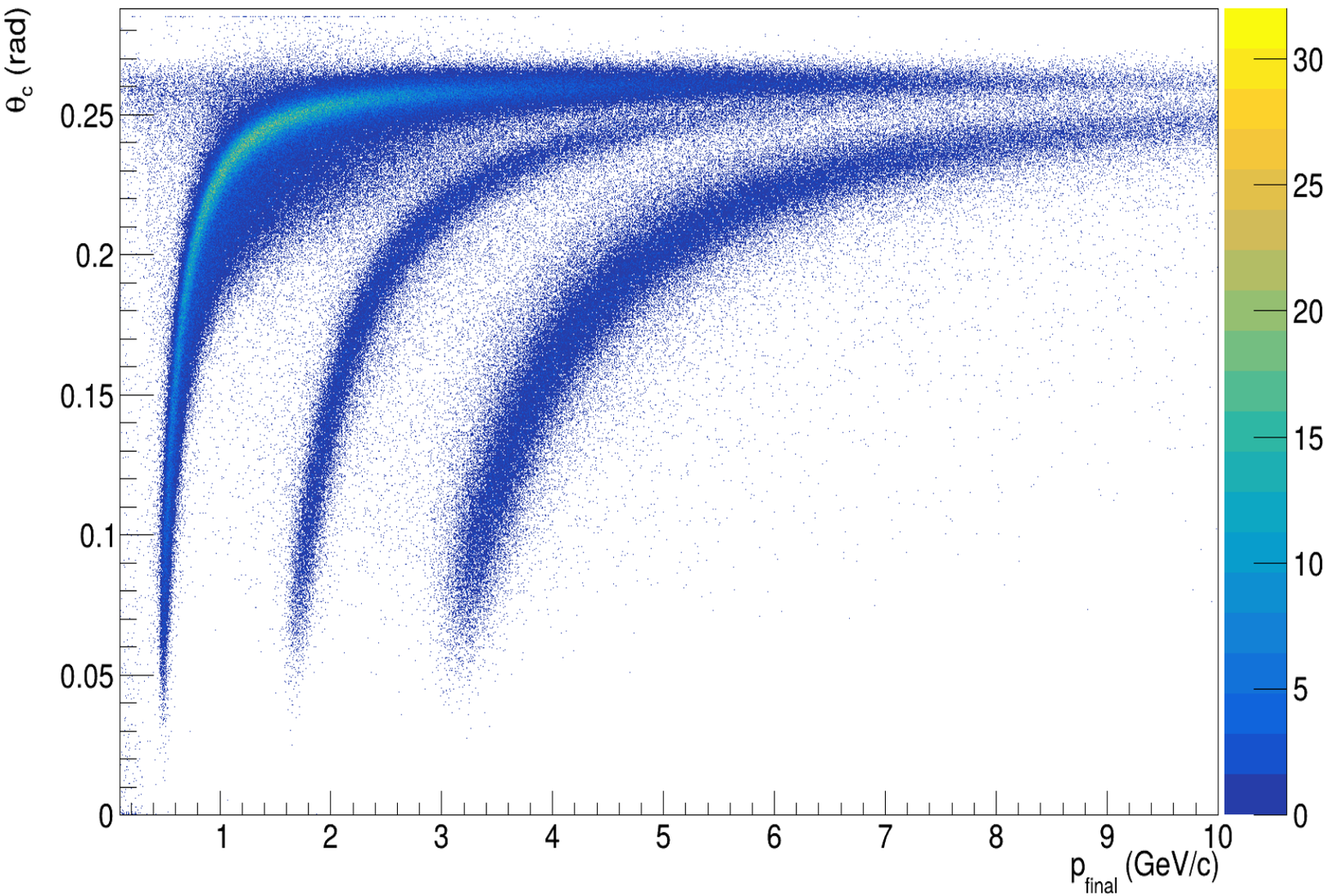


Minimbias

Convergency

$\chi^2_{track} / NDF > 4$

Corrected FARICH in SpdRoot



Minimbias

Convergency

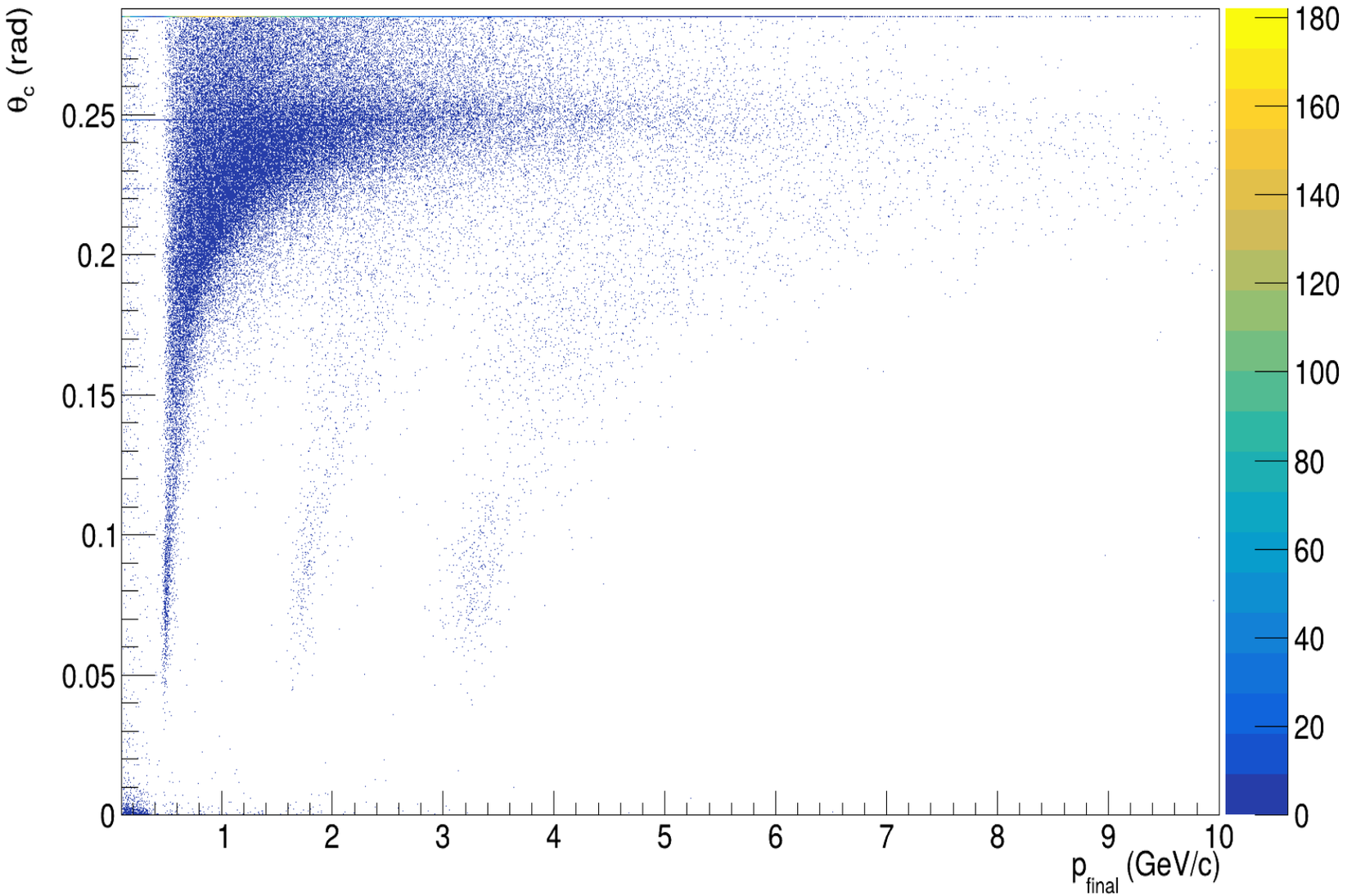
$\chi^2_{track} / NDF > 4$

$\chi^2_{fit\,\theta(\phi)} / NDF > 4$

Cut 9 % of events

Corrected FARICH in SpdRoot

Events which were cut



Minimbias

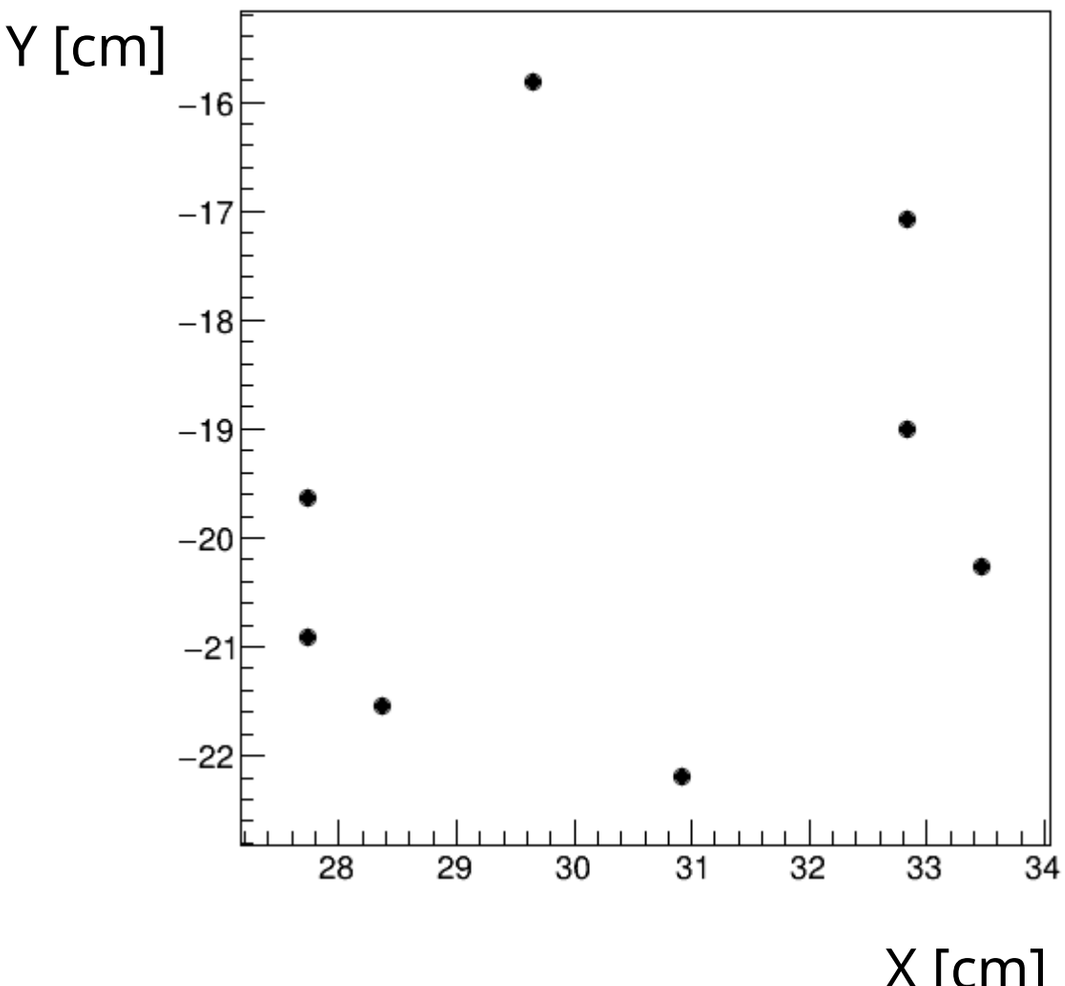
Convergency

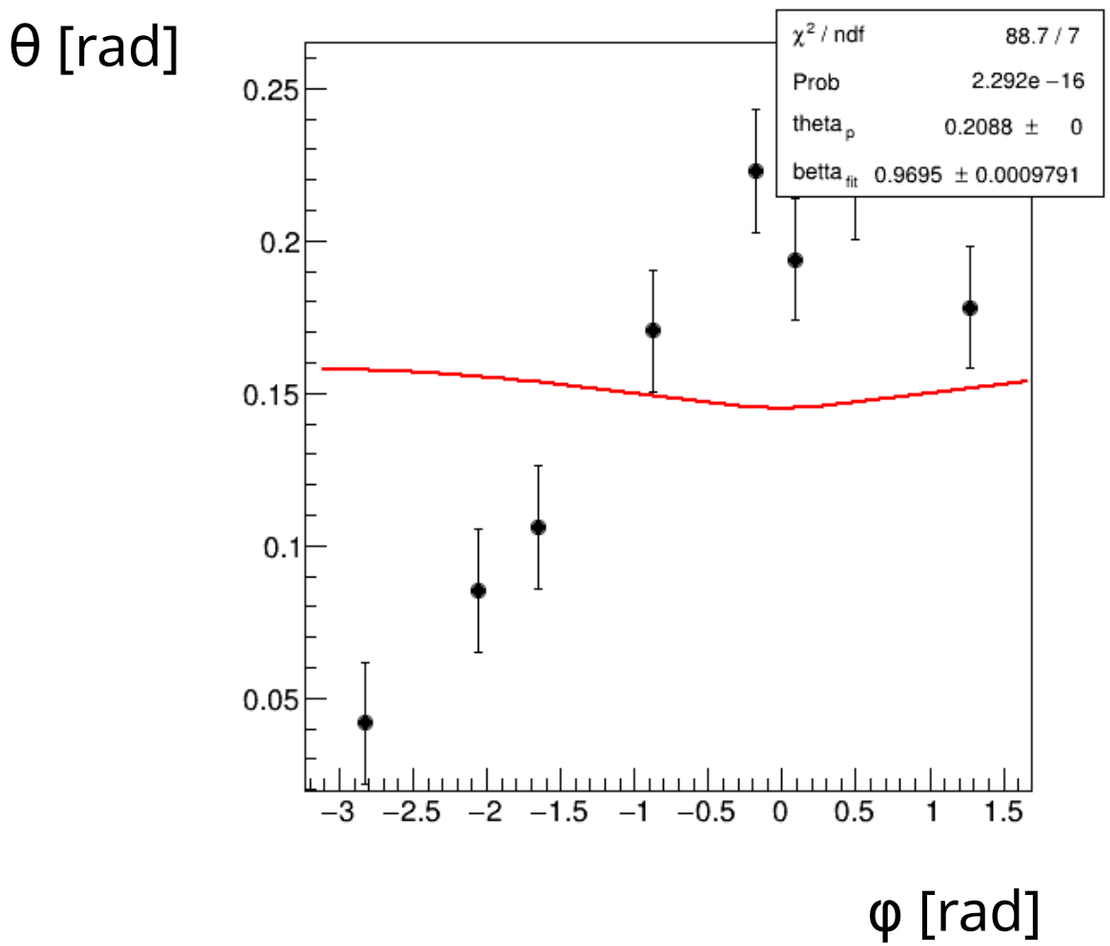
$\chi^2_{track} / NDF > 4$

$\chi^2_{fit\,\theta(\phi)} / NDF < 4$

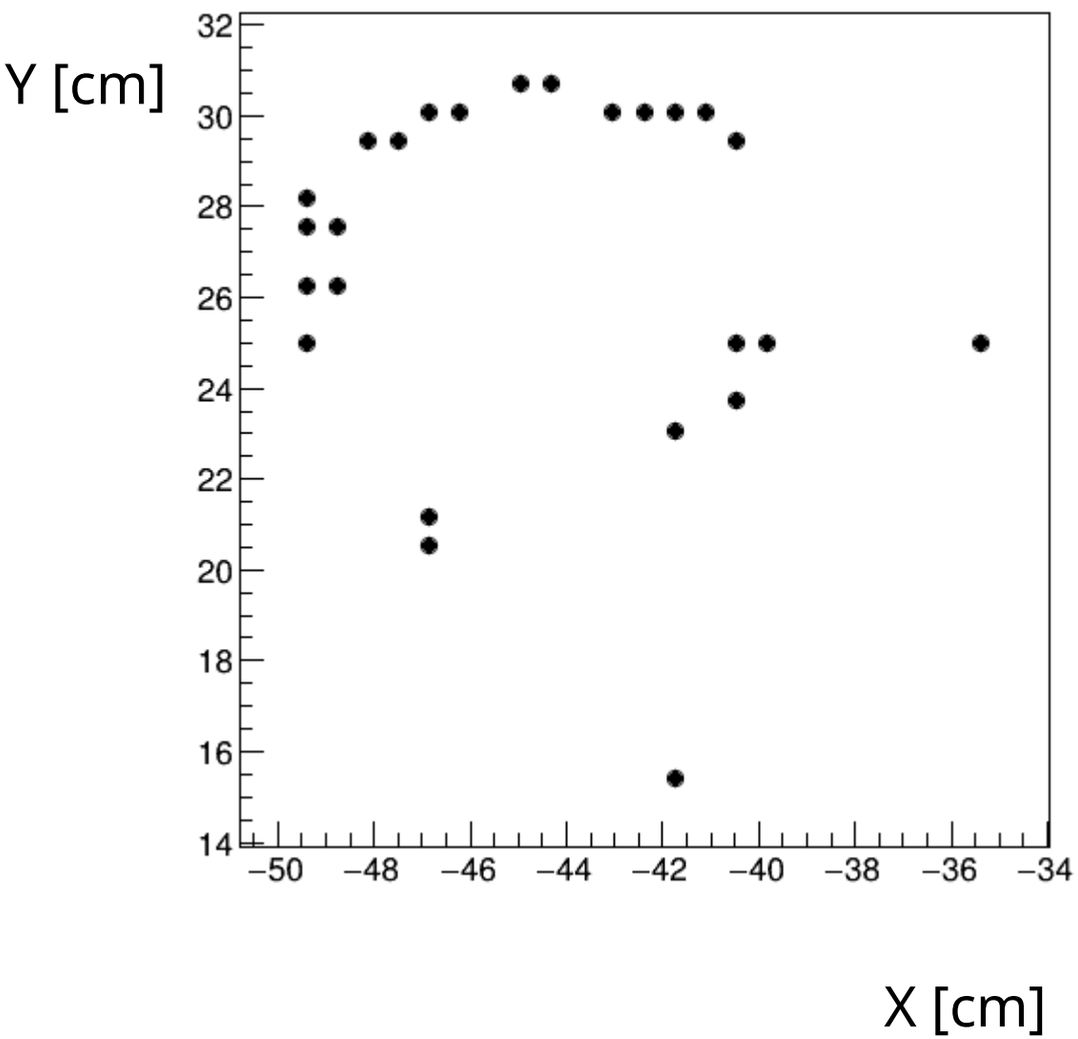
Cut 9 % of events

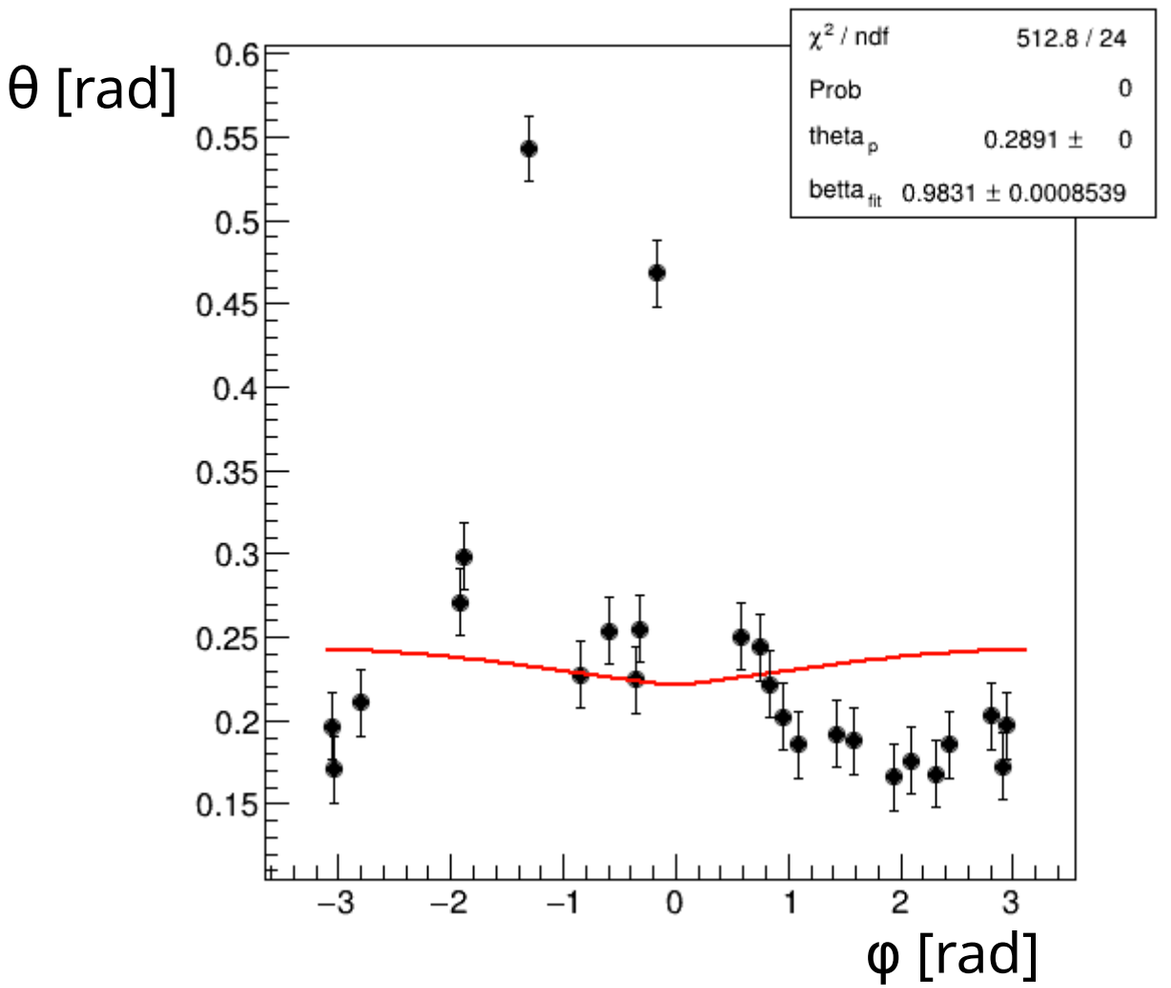
Case 1


Y [cm]
−16
−17
−18
−19
−20
−21
−22
28
29
30
31
32
33
34
X [cm]


θ [rad]
χ² / ndf 88.7 / 7
Prob 2.292e −16
theta_p 0.2088 ± 0
betta_fit 0.9695 ± 0.0009791
0.25
0.2
0.15
0.1
0.05
−3
−2.5
−2
−1.5
−1
−0.5
0
0.5
1
1.5
φ [rad]

Case 2


Y [cm]
X [cm]
32
30
28
26
24
22
20
18
16
14
−50
−48
−46
−44
−42
−40
−38
−36
−34


θ [rad]
φ [rad]
χ² / ndf 512.8 / 24
Prob 0
theta_p 0.2891 ± 0
betta_fit 0.9831 ± 0.0008539
0.6
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
−3
−2
−1
0
1
2
3

Ideal case

OpRayleigh false
Associate Cherenkov photons to track

Real life

OpRayleigh true
Extrapolate track to surface of photon detector and select photons

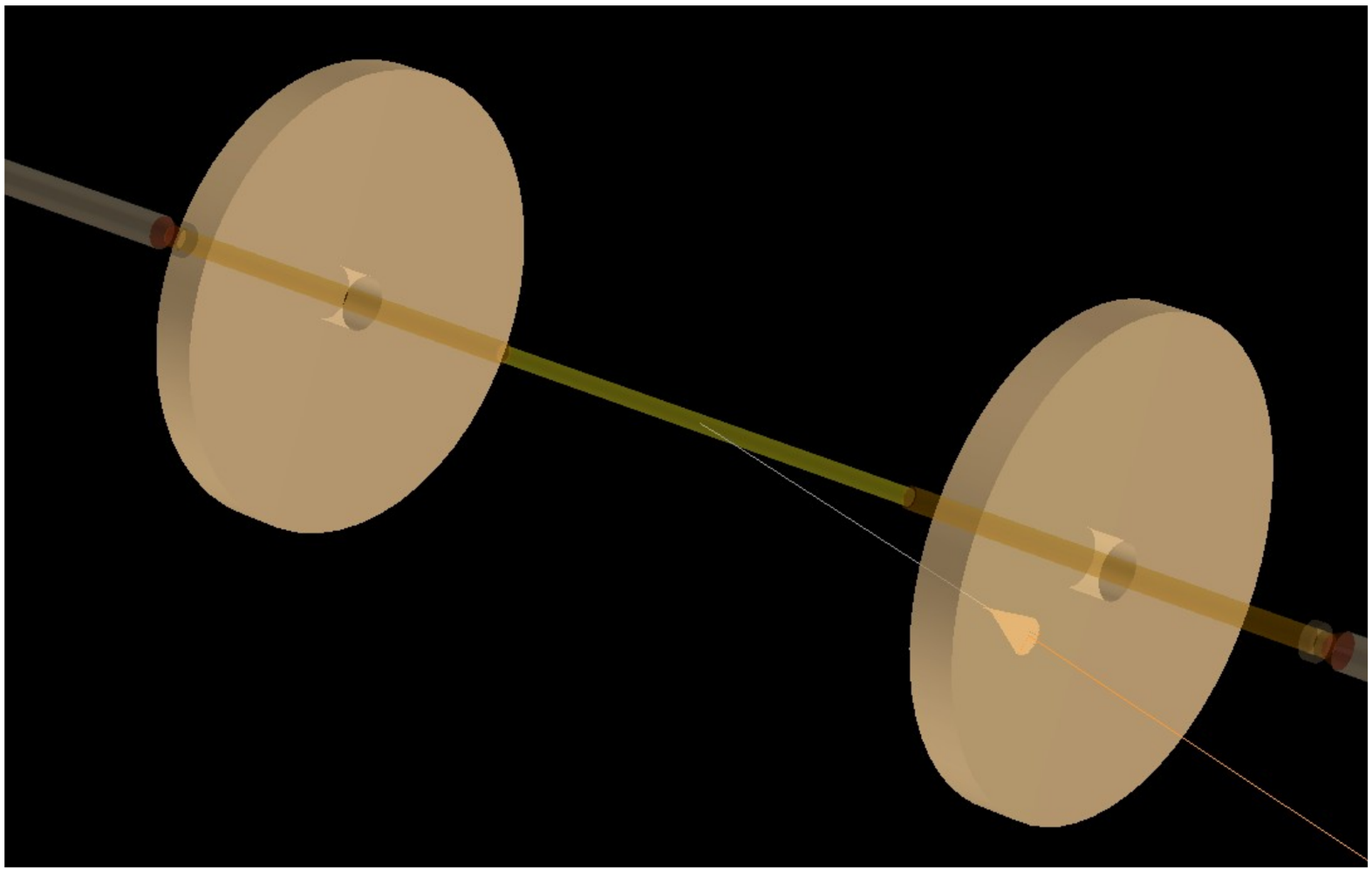
Input for study resolution

Pion+

0.5 0.8 1 2 3 4 6 GeV

Phi = 180

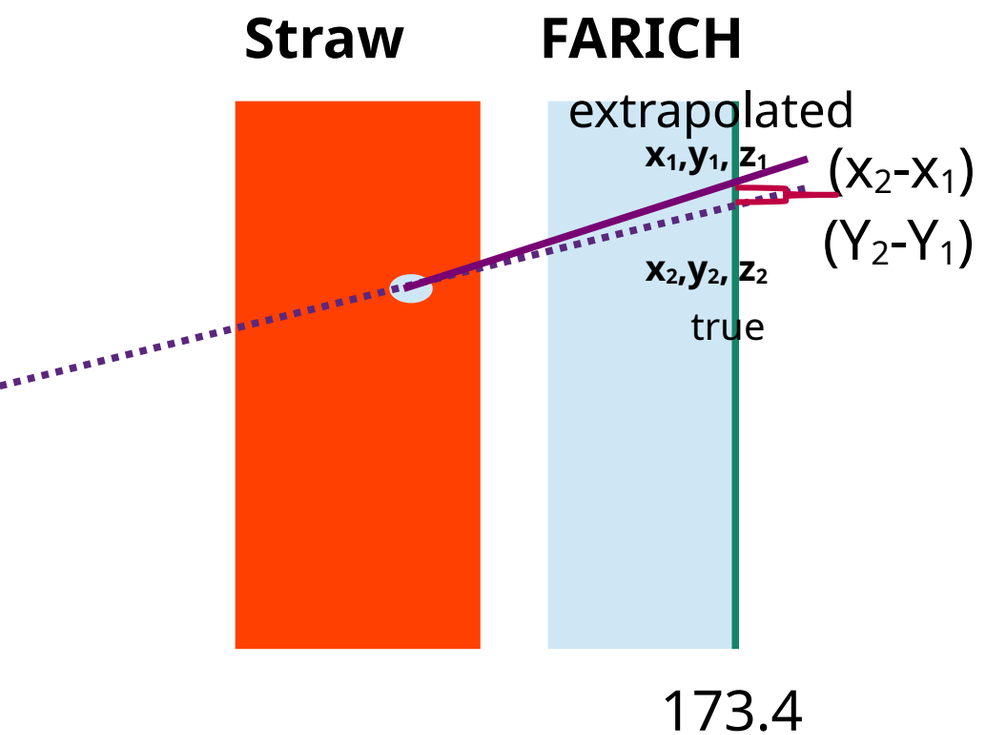
Theta = 15



Set-up
DSSD + STRAW+FARICH

Analysis

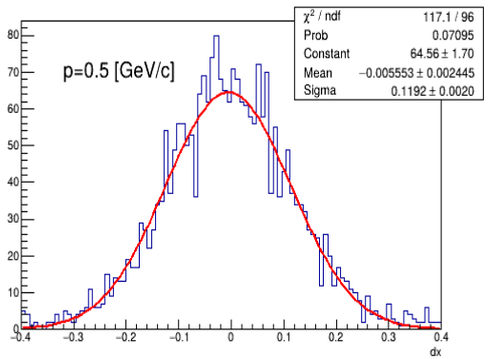
state last point (Straw) → extrapolate in plane (0,0,173.4)

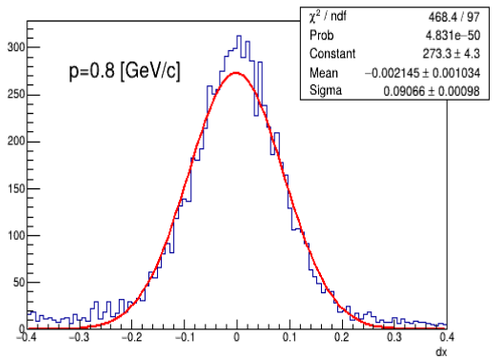


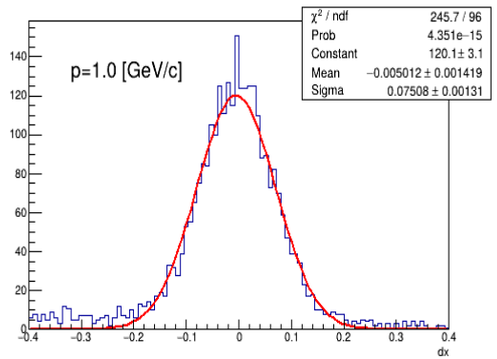
MCP PMT N6021

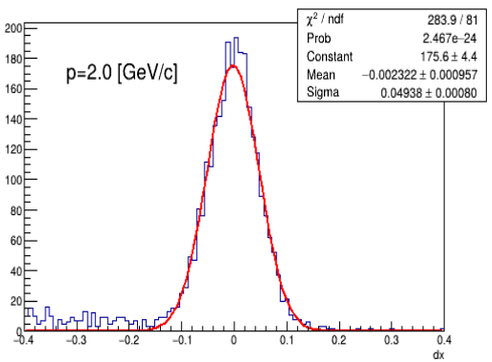
- 8×8 pixels with size 5.8×5.8 mm²
- Lateral size 51×51 mm²
- Width = 1.7 mm

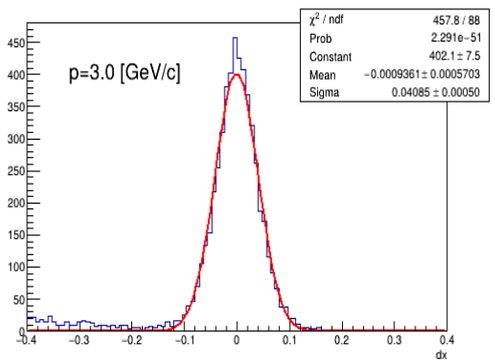
$X_{true} - X_{extrapolated}$ for different momentum

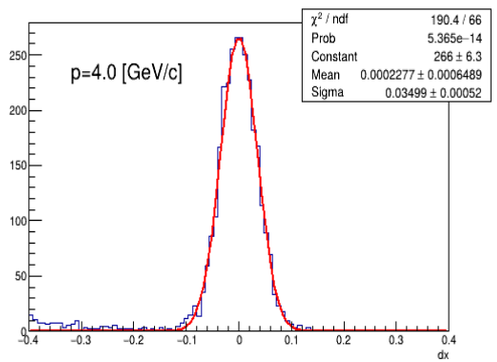


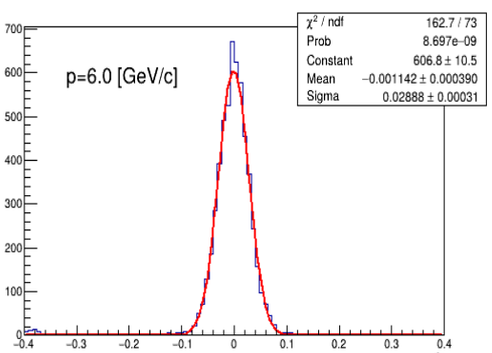




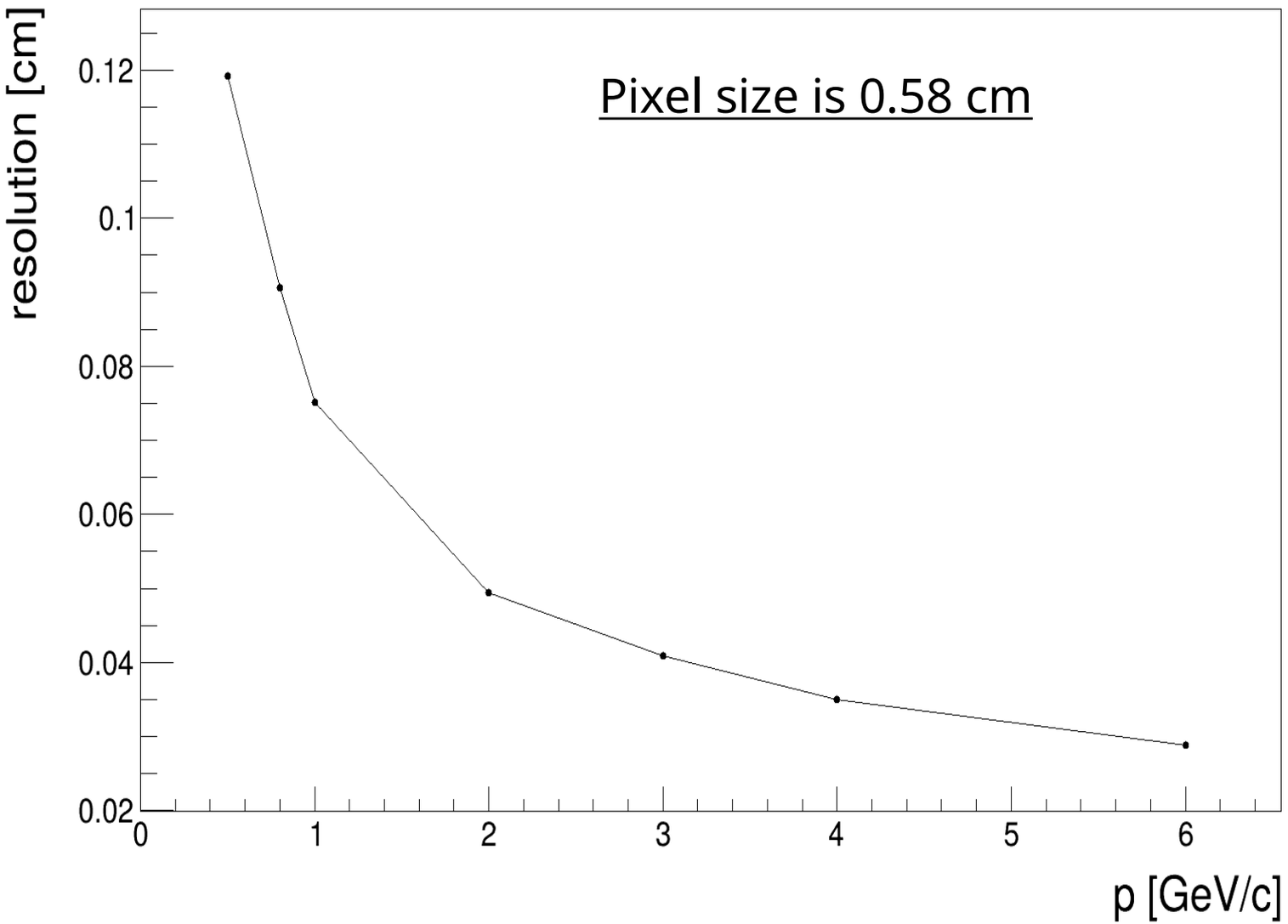








Resolution


Pixel size is 0.58 cm
resolution [cm]
0.12
0.1
0.08
0.06
0.04
0.02
0
1
2
3
4
5
6
p [GeV/c]

Conclusion

- In the FARICH reconstruction code, bugs were fixed.
- LH is still under investigation.
- Resolution of extropalated track to surface of photon detector is less then size of pixel