Charged pion analysis

Simulation
- Acc. X Rec. efficiency with dead map

Korea Univ.
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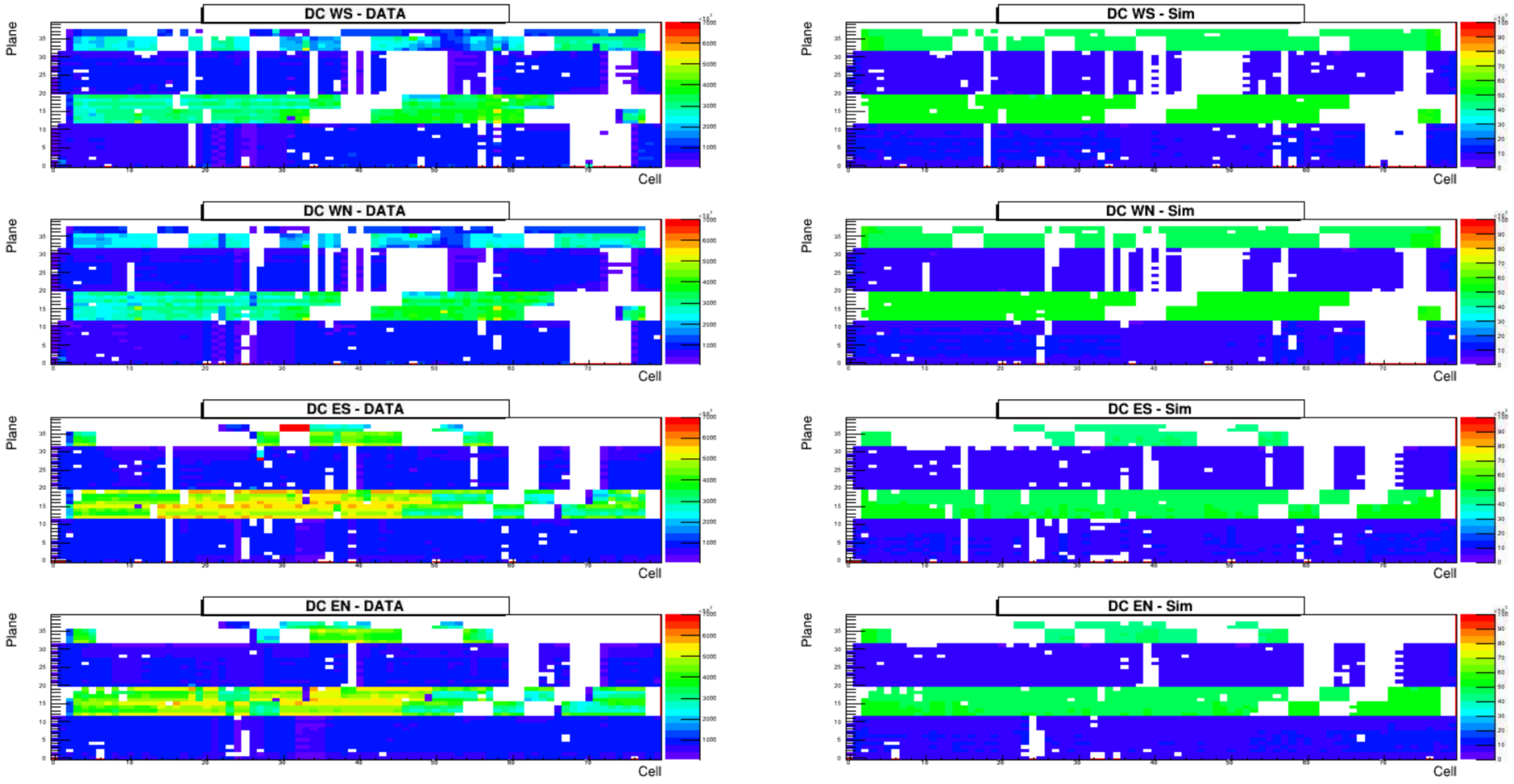
2019. 07. 04 Radiation lab. meeting

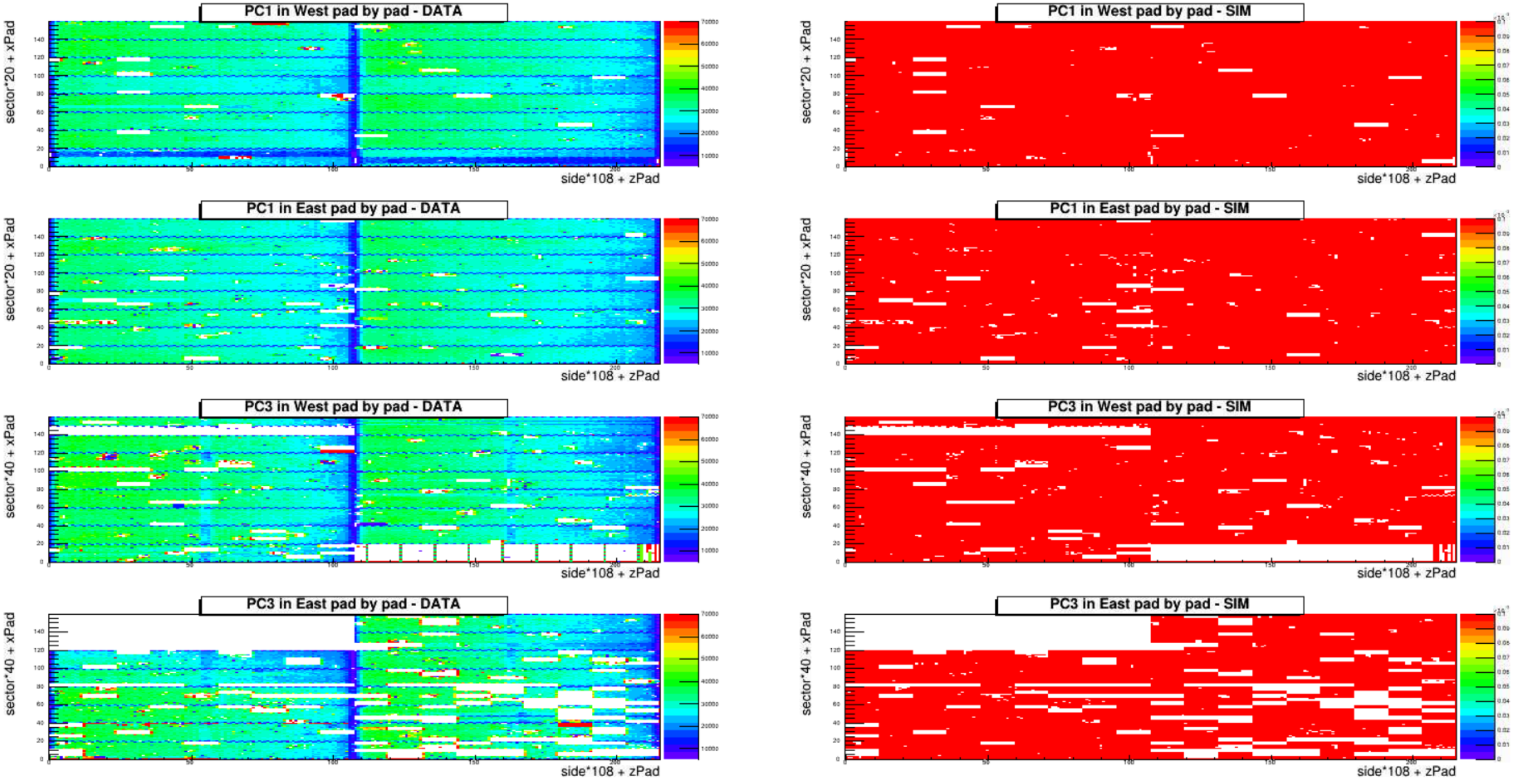
Dead map

DC, PC, RICH for Run15

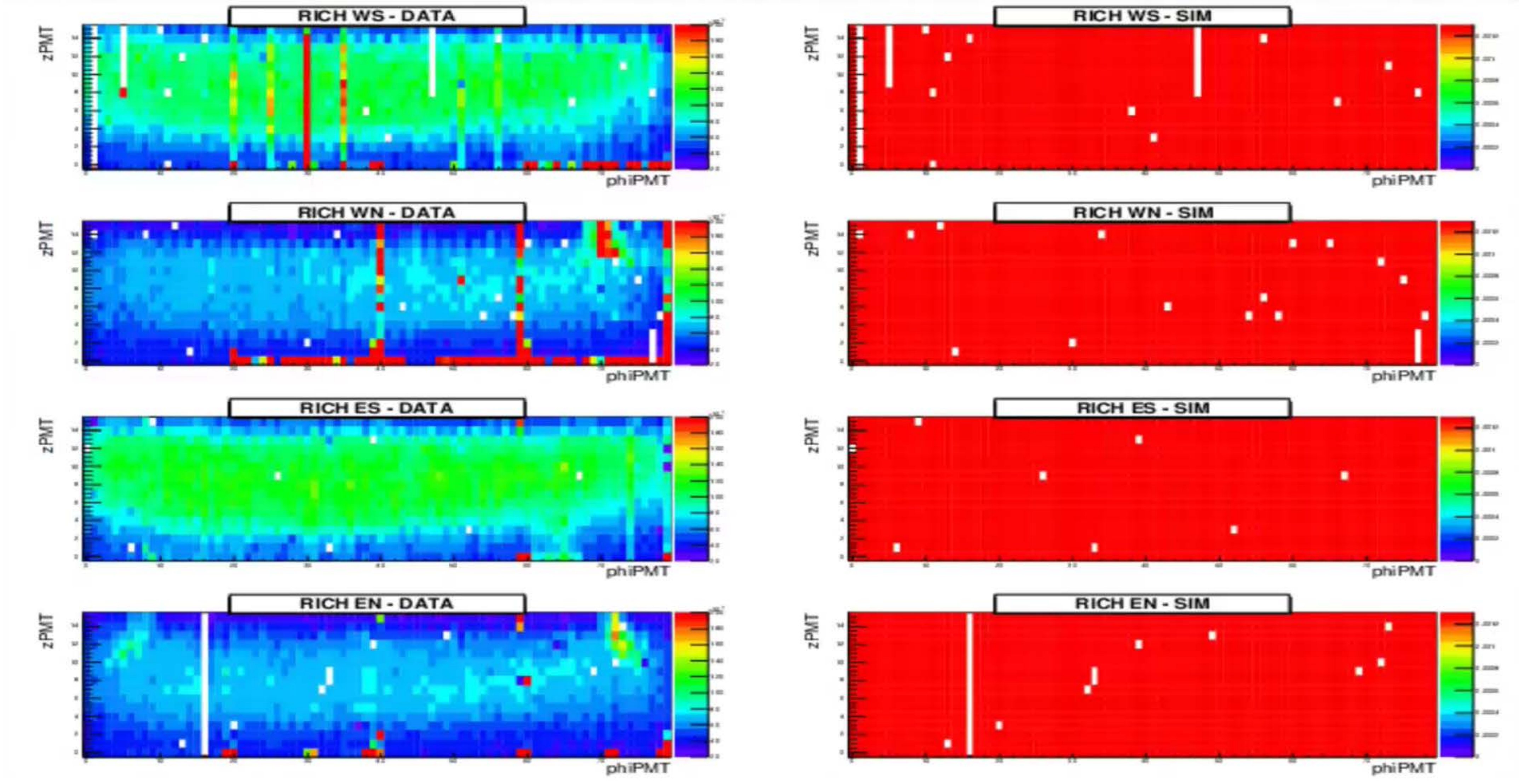
DC dead map


DC WS - DATA
DC WS - Sim
DC WN - DATA
DC WN - Sim
DC ES - DATA
DC ES - Sim
DC EN - DATA
DC EN - Sim
Plane
Cell

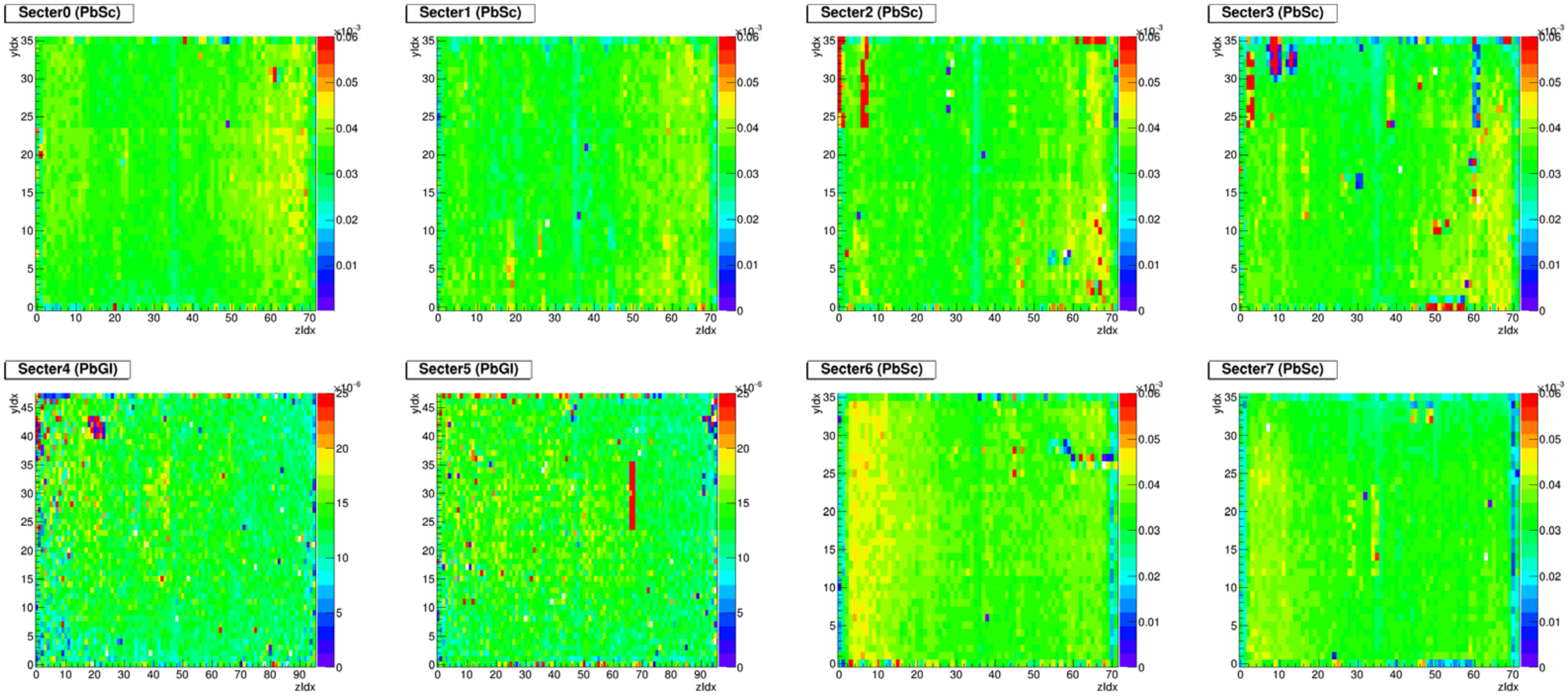
PC dead map


PC1 in West pad by pad - DATA
PC1 in West pad by pad - SIM
PC1 in East pad by pad - DATA
PC1 in East pad by pad - SIM
PC3 in West pad by pad - DATA
PC3 in West pad by pad - SIM
PC3 in East pad by pad - DATA
PC3 in East pad by pad - SIM
sector*20 + xPad
sector*40 + xPad
side*108 + zPad

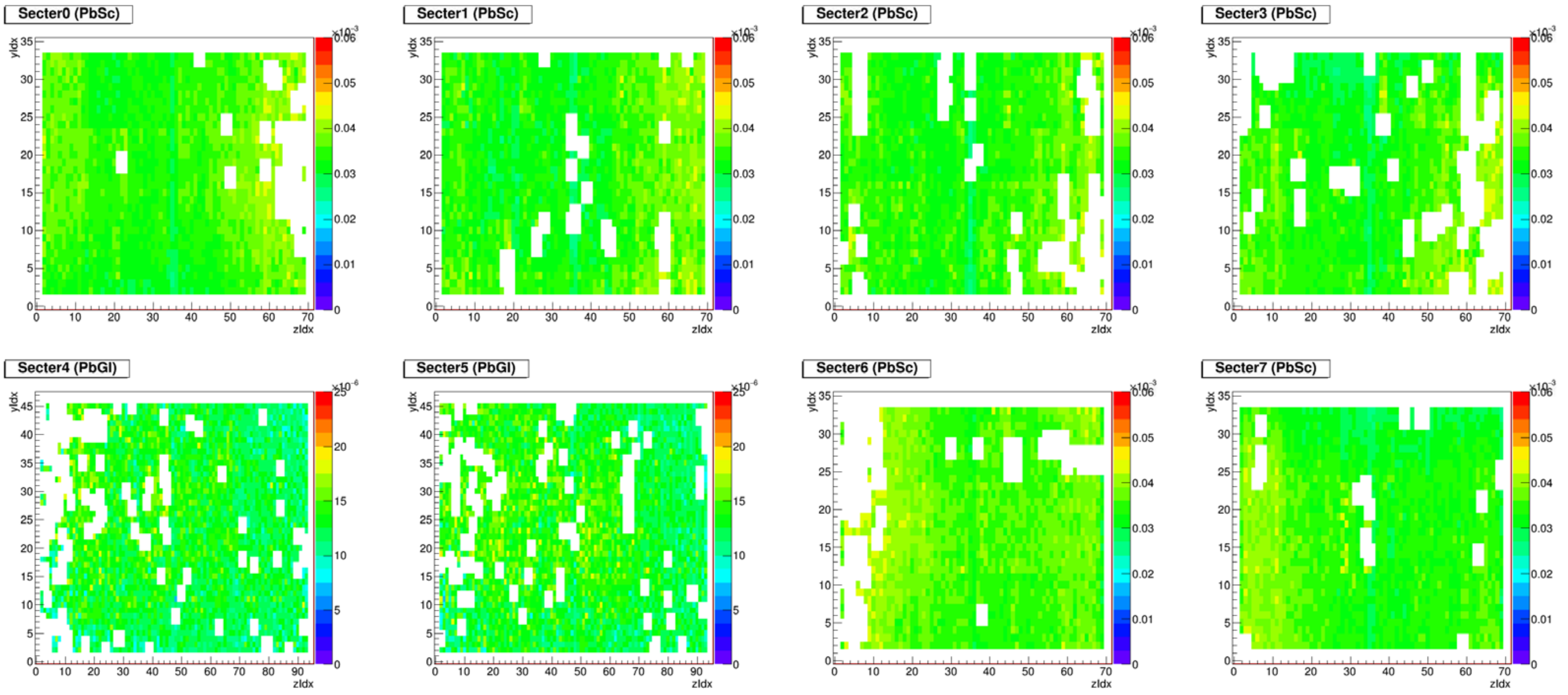
RICH dead map



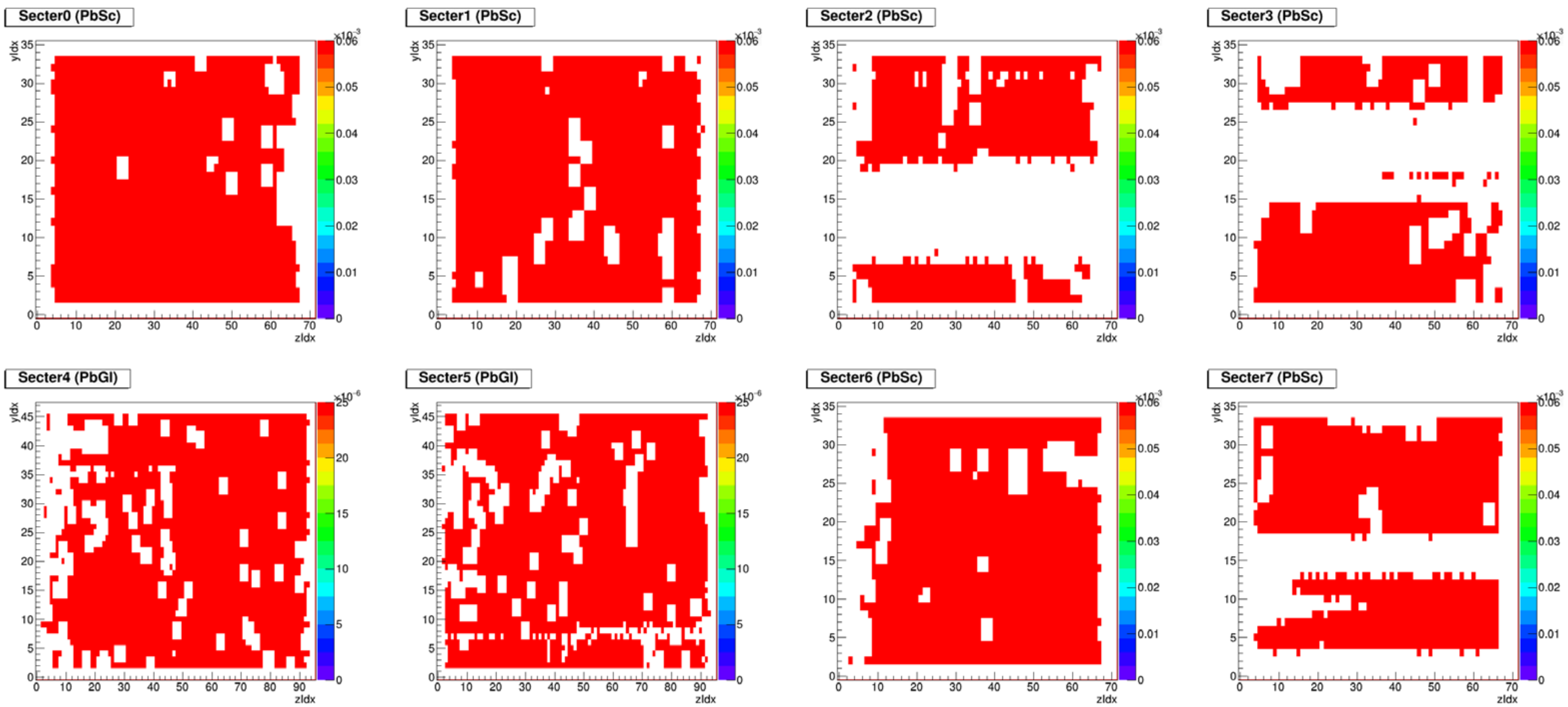
EMCal Distribution



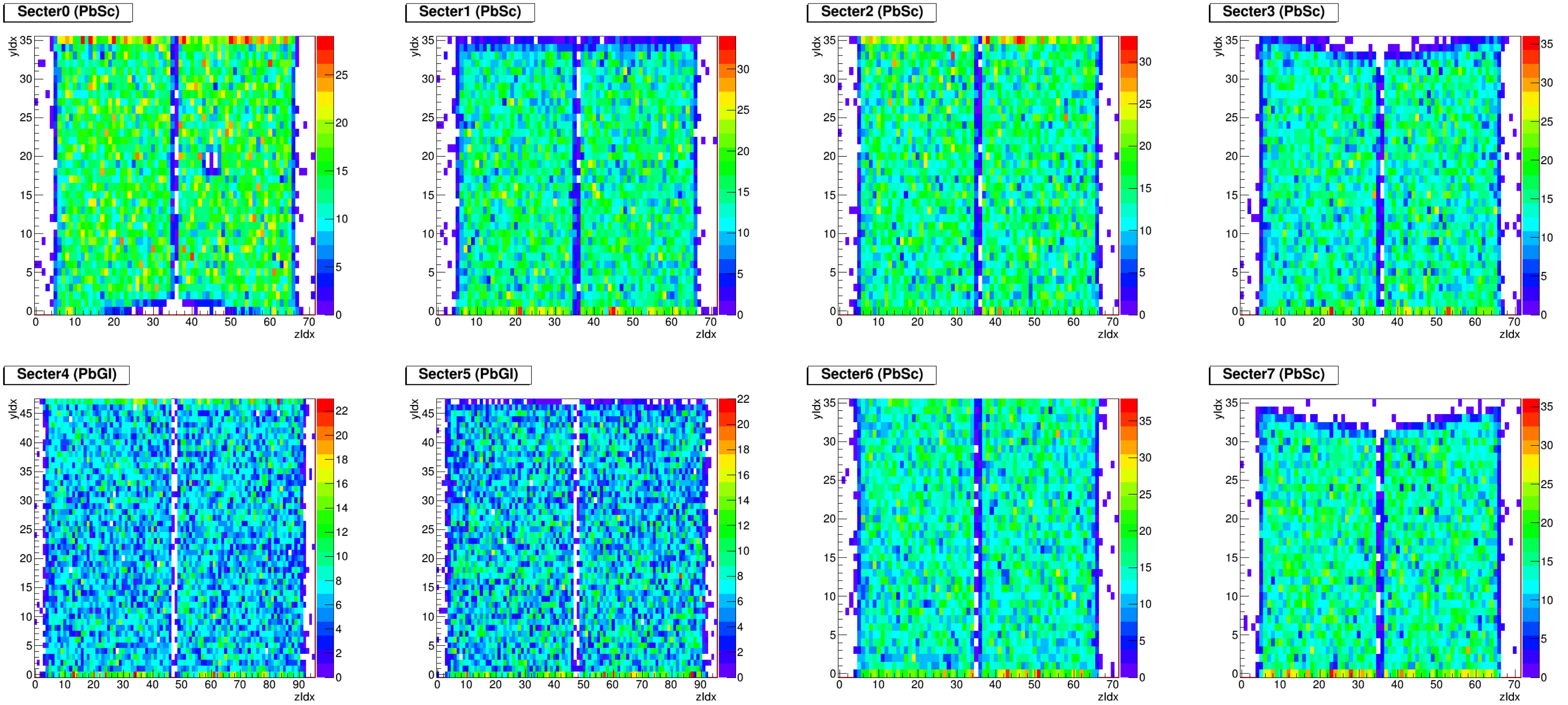
EMCal Warnmap Check



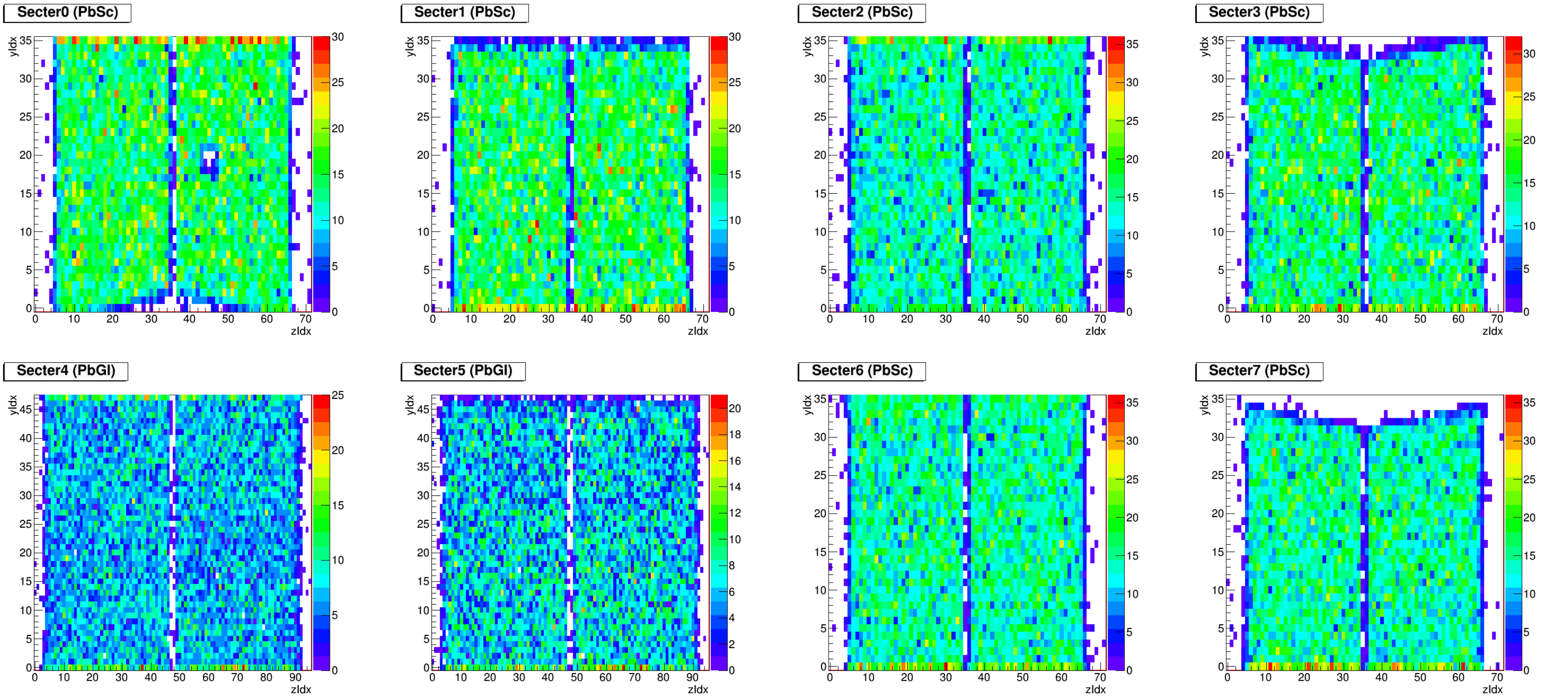
EMCal hit distribution for Simulation



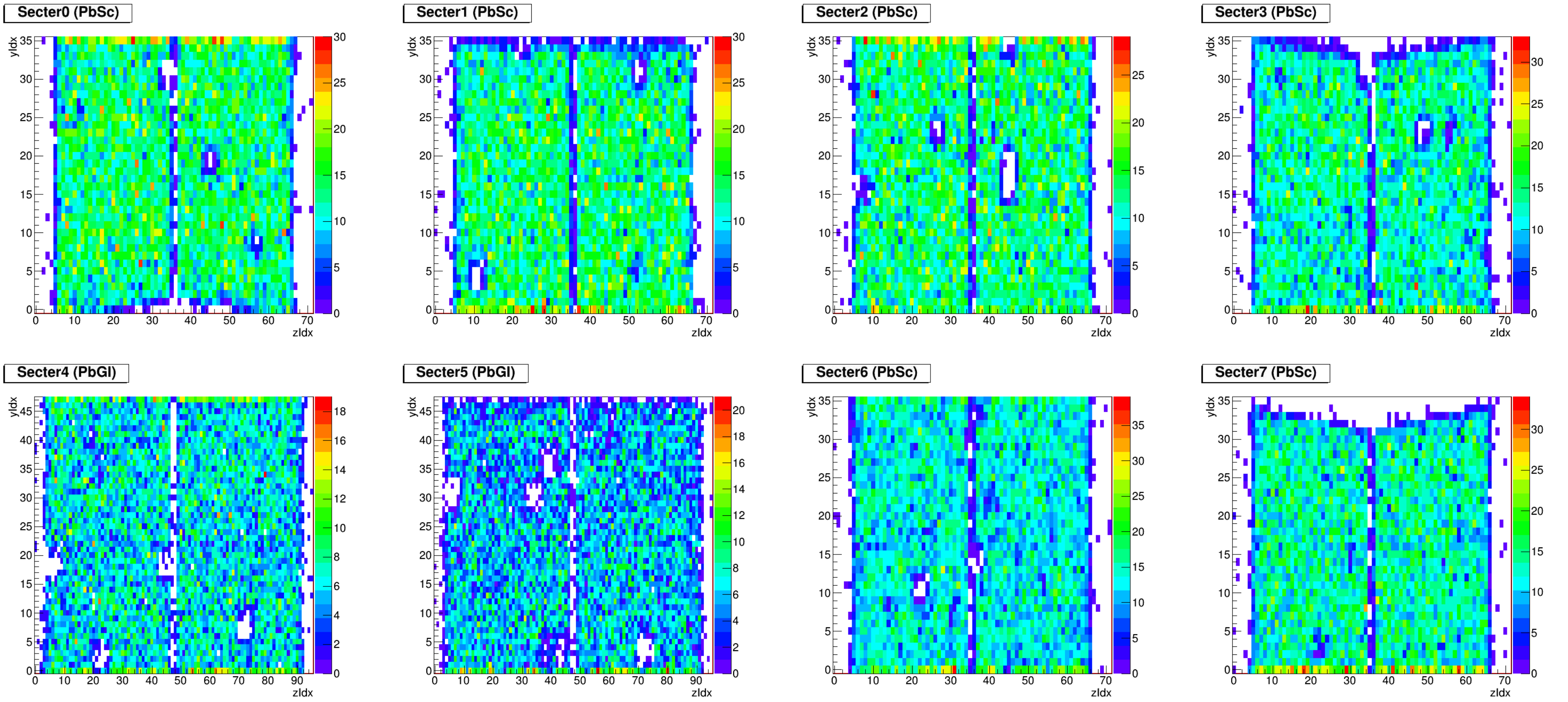
EMCal hit distribution for Simulation without deadmap



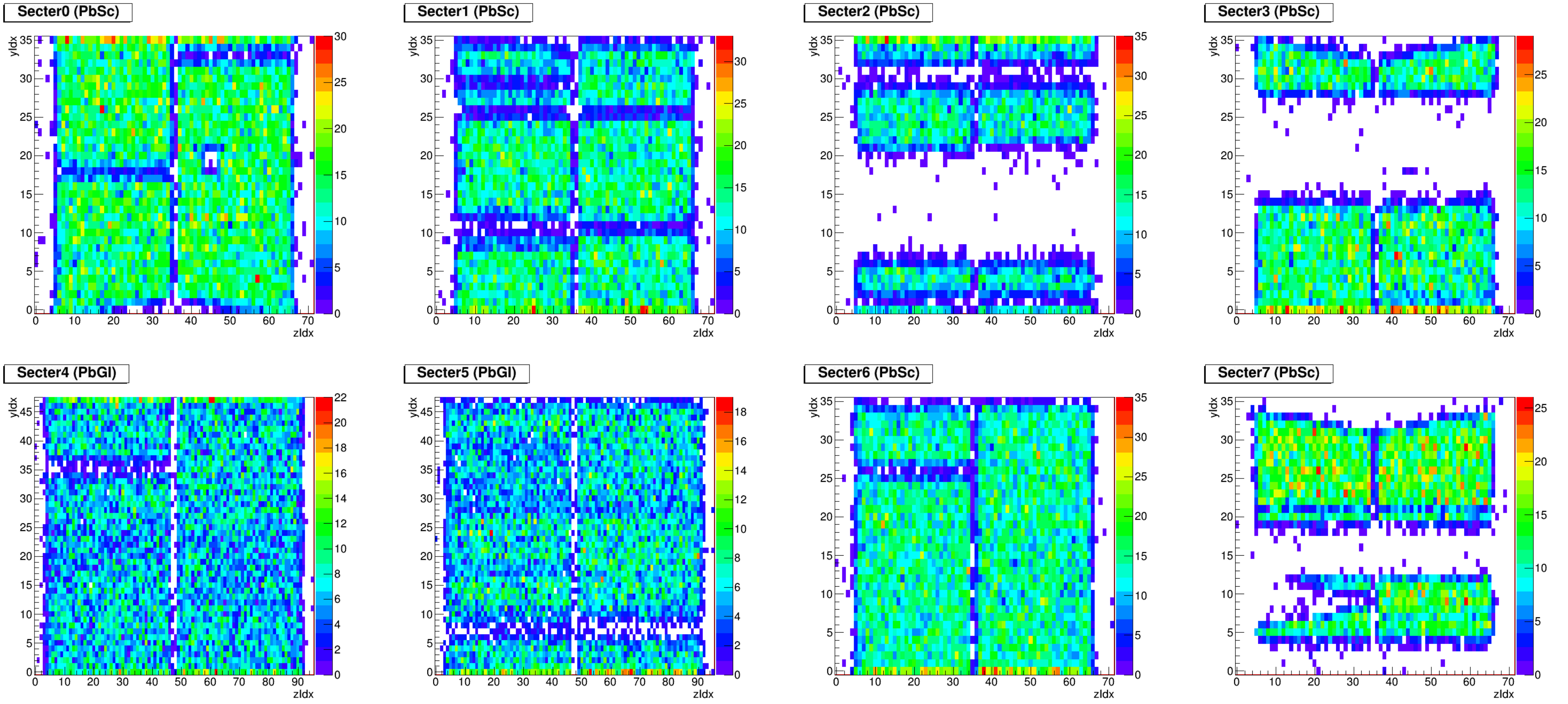
EMCal hit distribution for Simulation with RICH deadmap



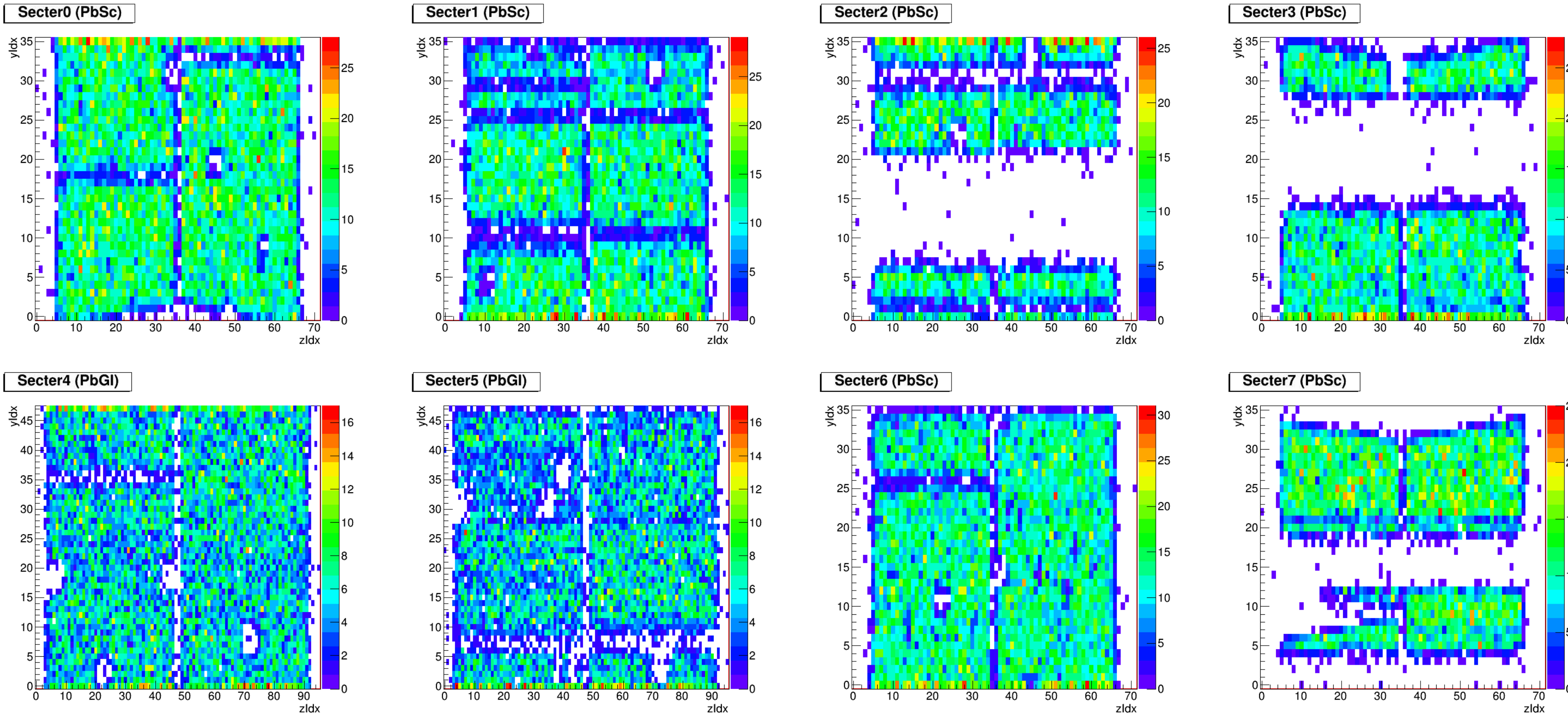
EMCal hit distribution for Simulation with PC deadmap



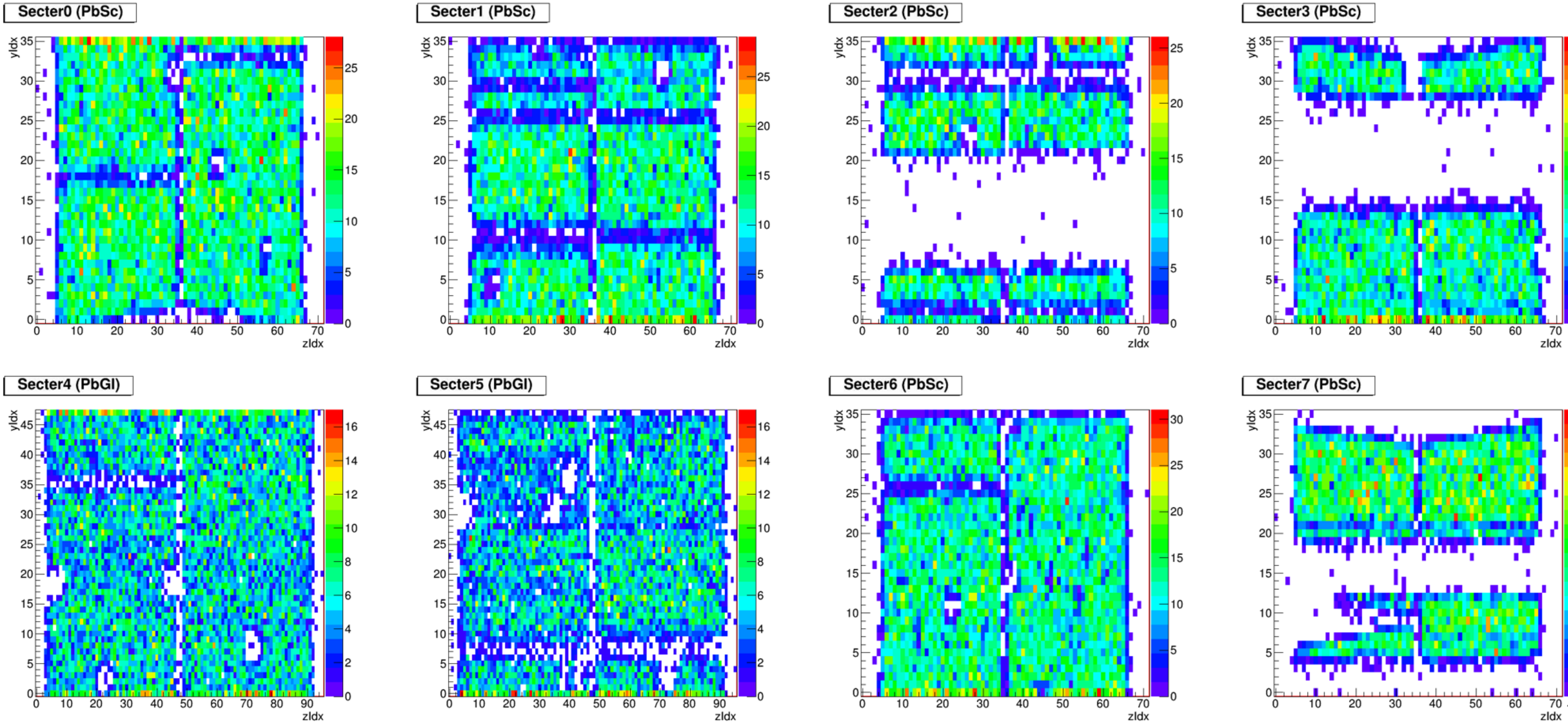
EMCal hit distribution for Simulation with DC deadmap



EMCal hit distribution for Simulation with DC, PC deadmap



EMCal hit distribution for Simulation with deadmap(DC, PC, RICH)



Acc. X Rec. efficiency

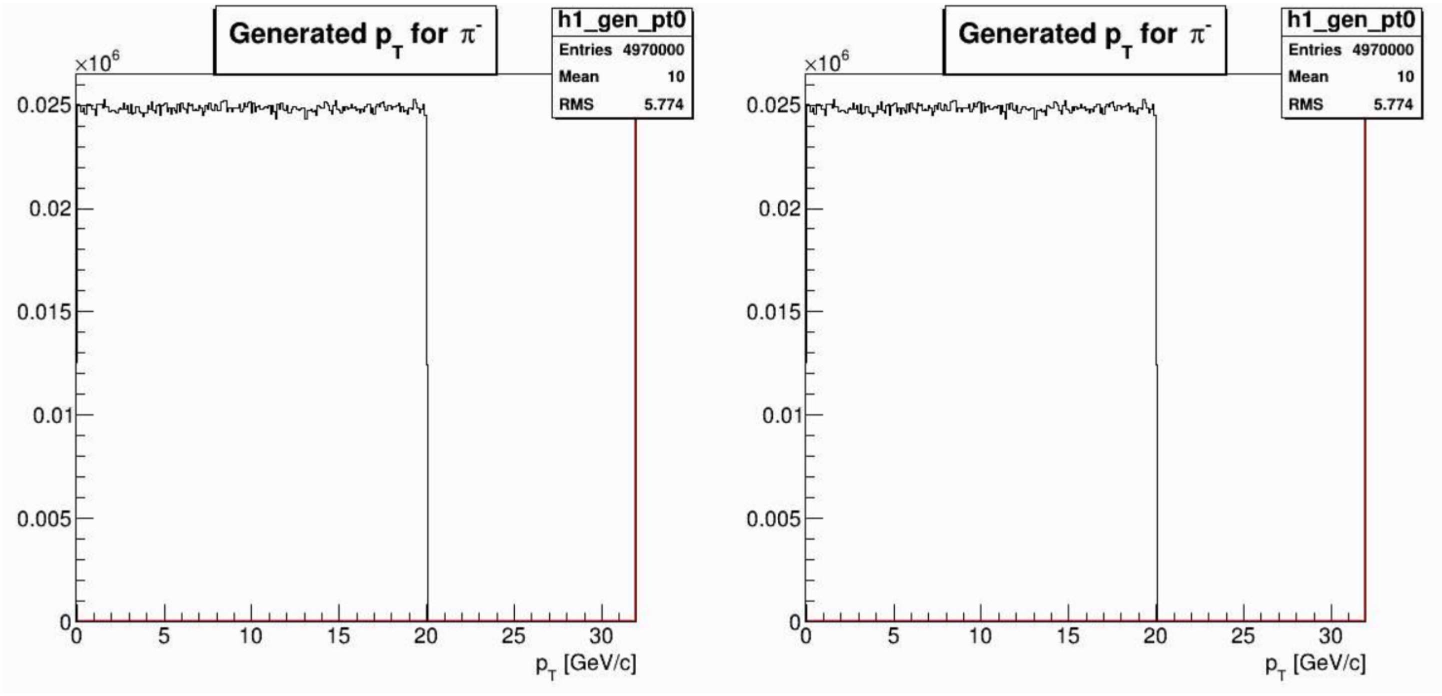
Without EMCal warnmap & Fiducial cut

1. Single pi± generation

- Number of Pi± : 5,000,000 for each charge
- 0 < momentum < 20 GeV/c
- -0.5 < eta < 0.5
- 0 < pi < 2π
- Primary Vertex = (0,0,0)

Using Run15 without dead channels of DC, PC, RICH for test

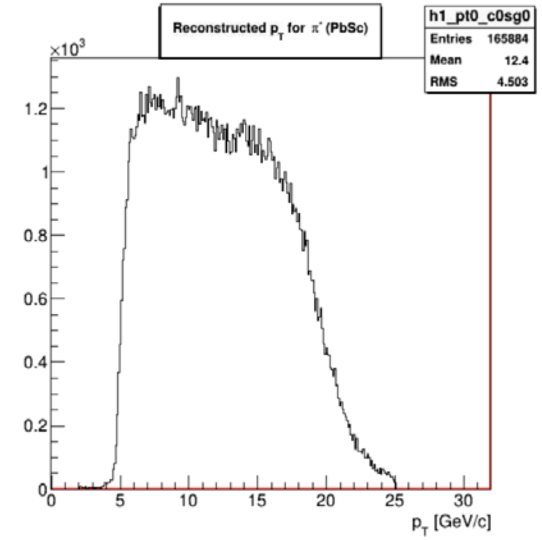
2. Generated pions

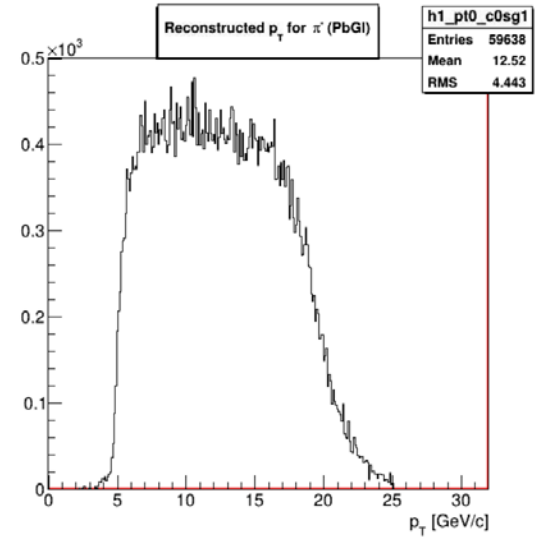


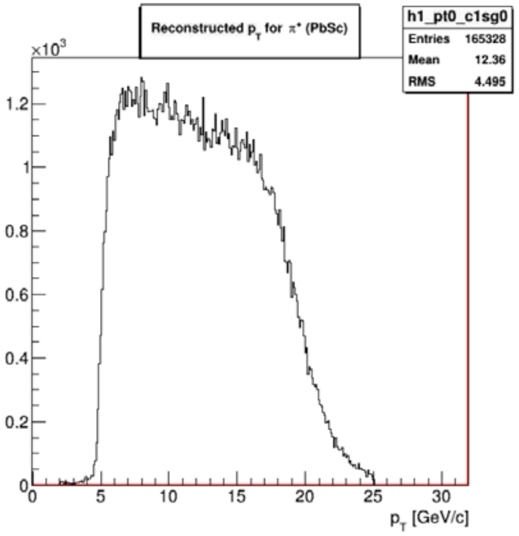
- $\pi^{\pm}$ Identication Cuts

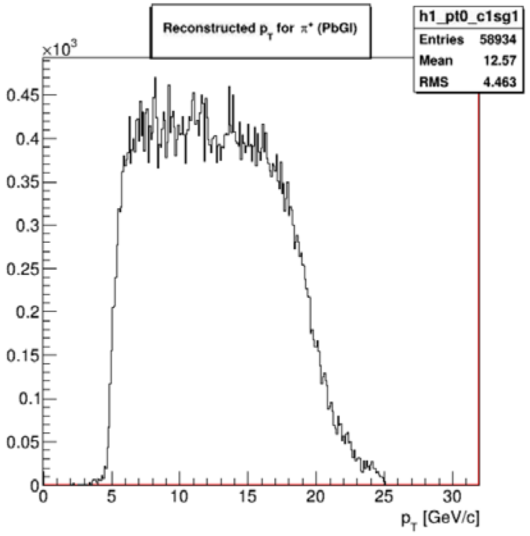
I. 2 < pT < 25 (GeV/c)
II. quality == 31 or 63
III. n1 >0
IV. $|BBCZ|<30\ (cm)$
V. $|DCZed|\ <\ 70\ (cm)$
VI. $Shower\ shape\ (prob)\ <\ 0.1$
VII. 0.2 < $emce/p$ < 0.8 sect > -9000

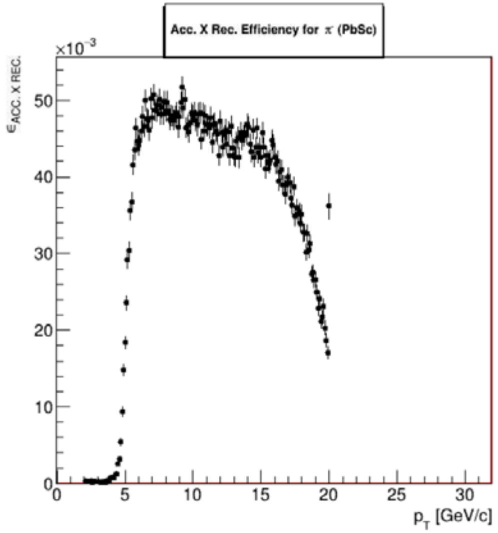
3. Reconstructed pions

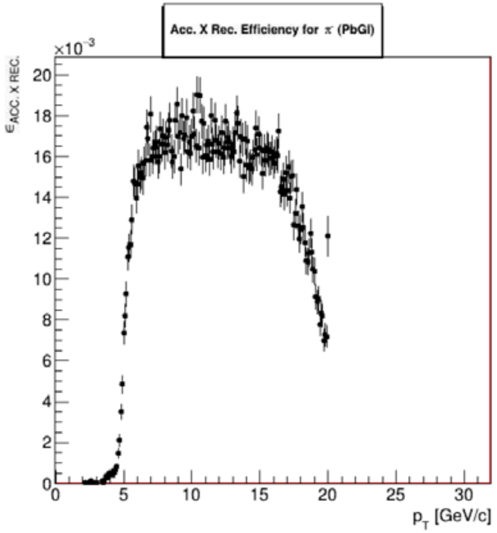


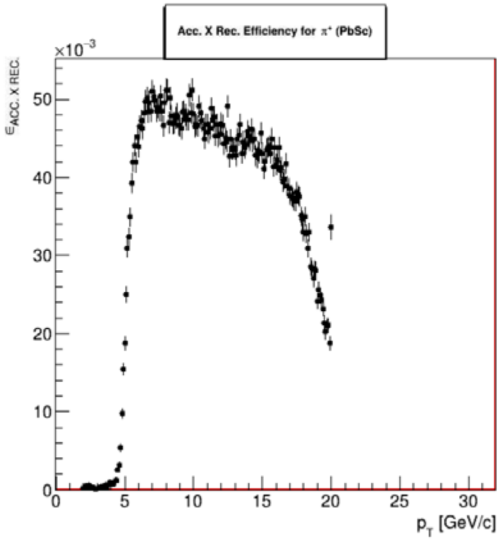


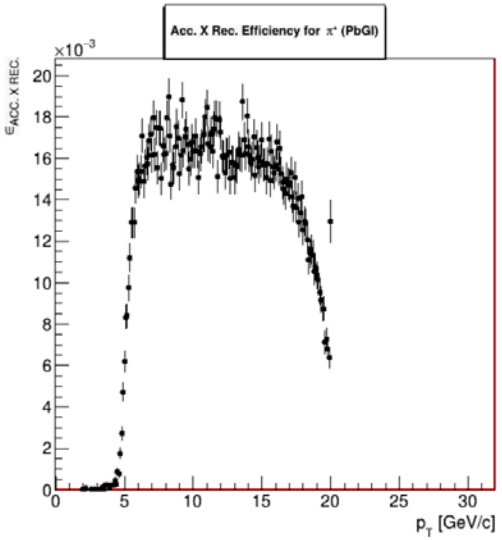




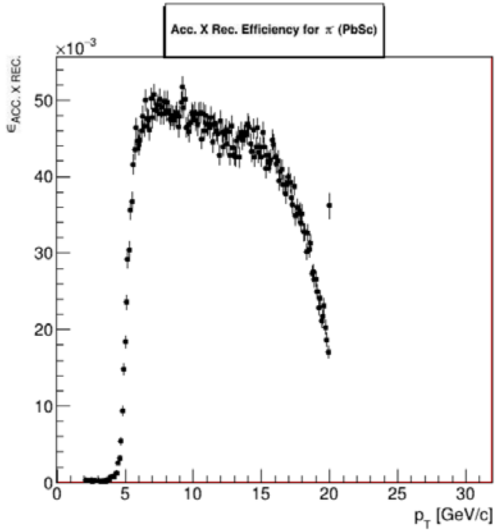


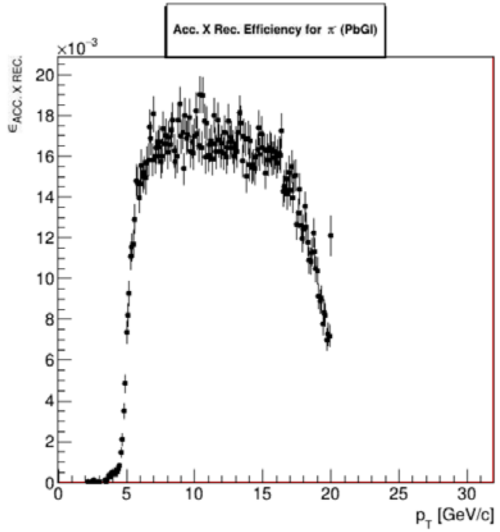




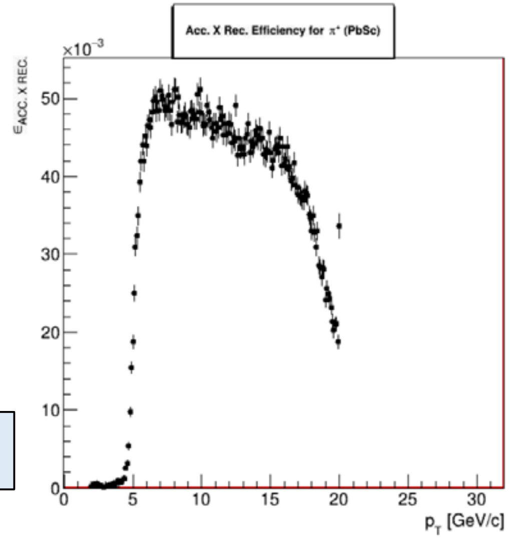


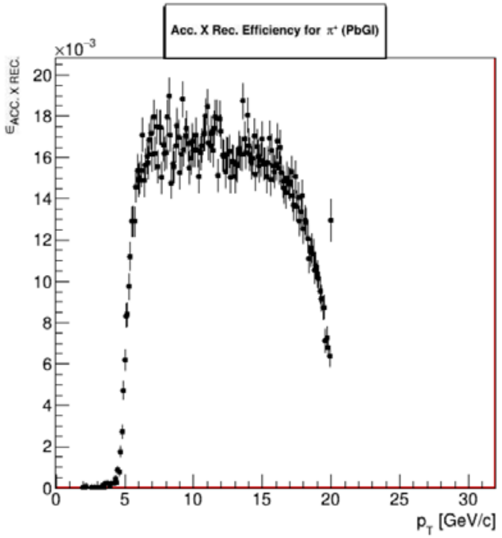
4. Compare with run13.



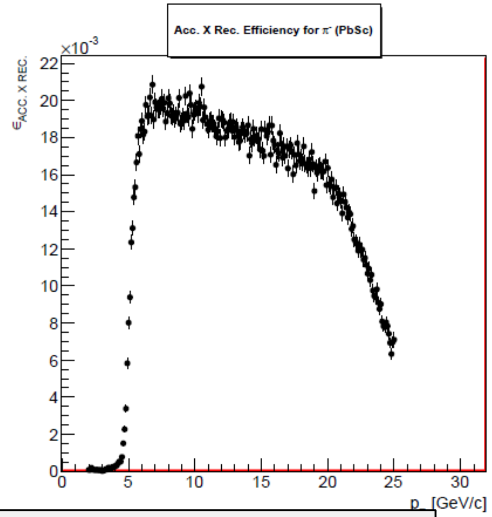


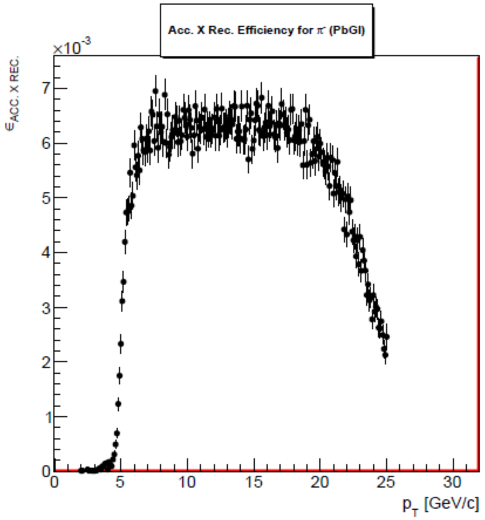
Run 15

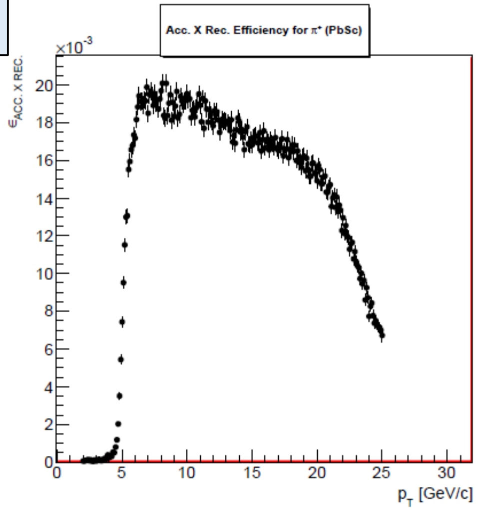


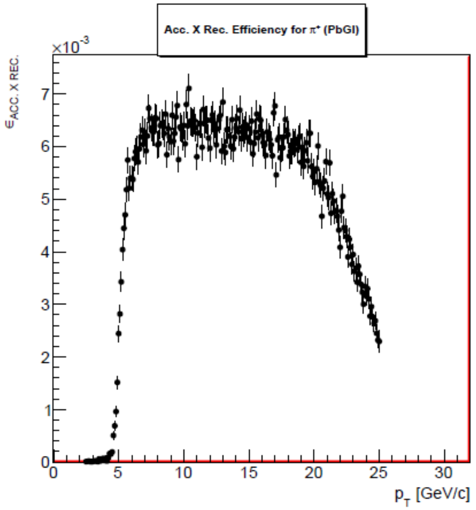


Run 13



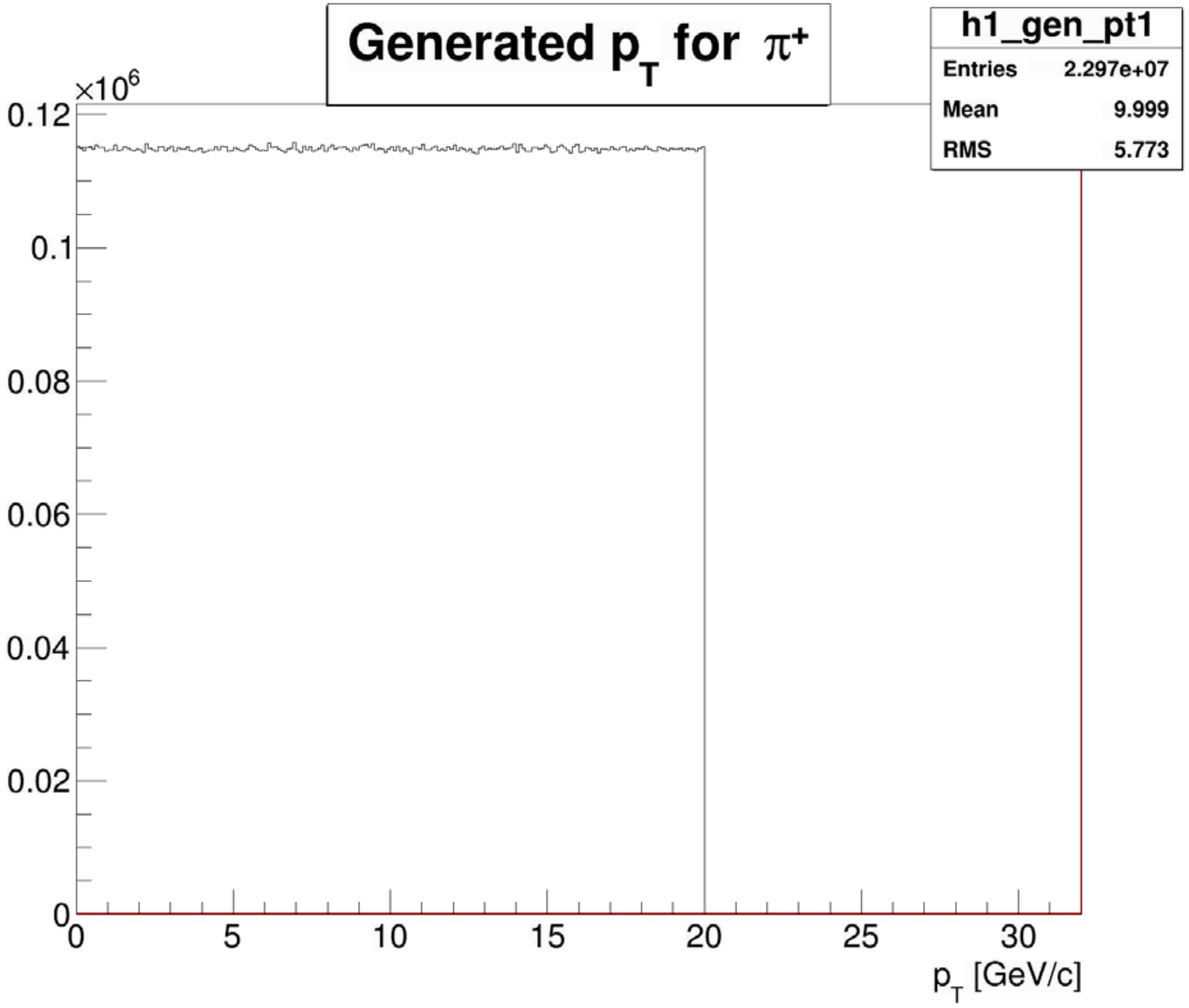




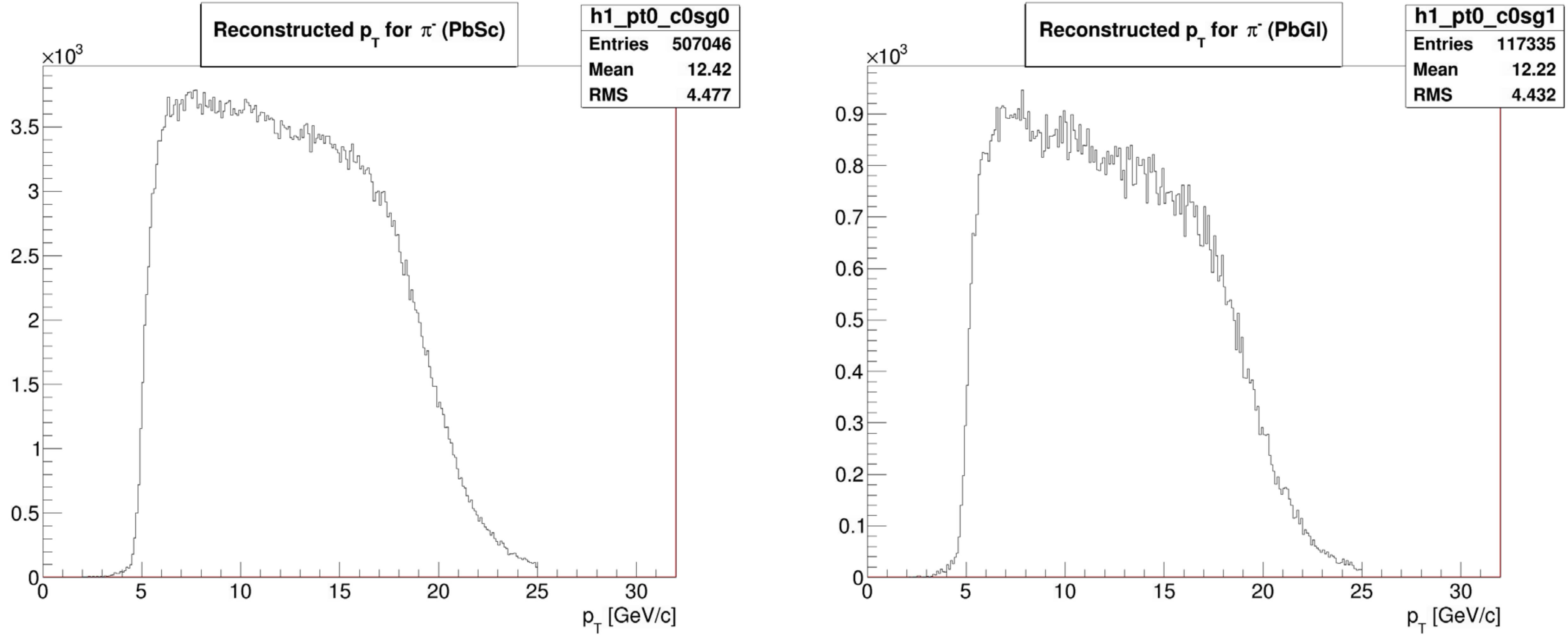


Taebong's analysis note

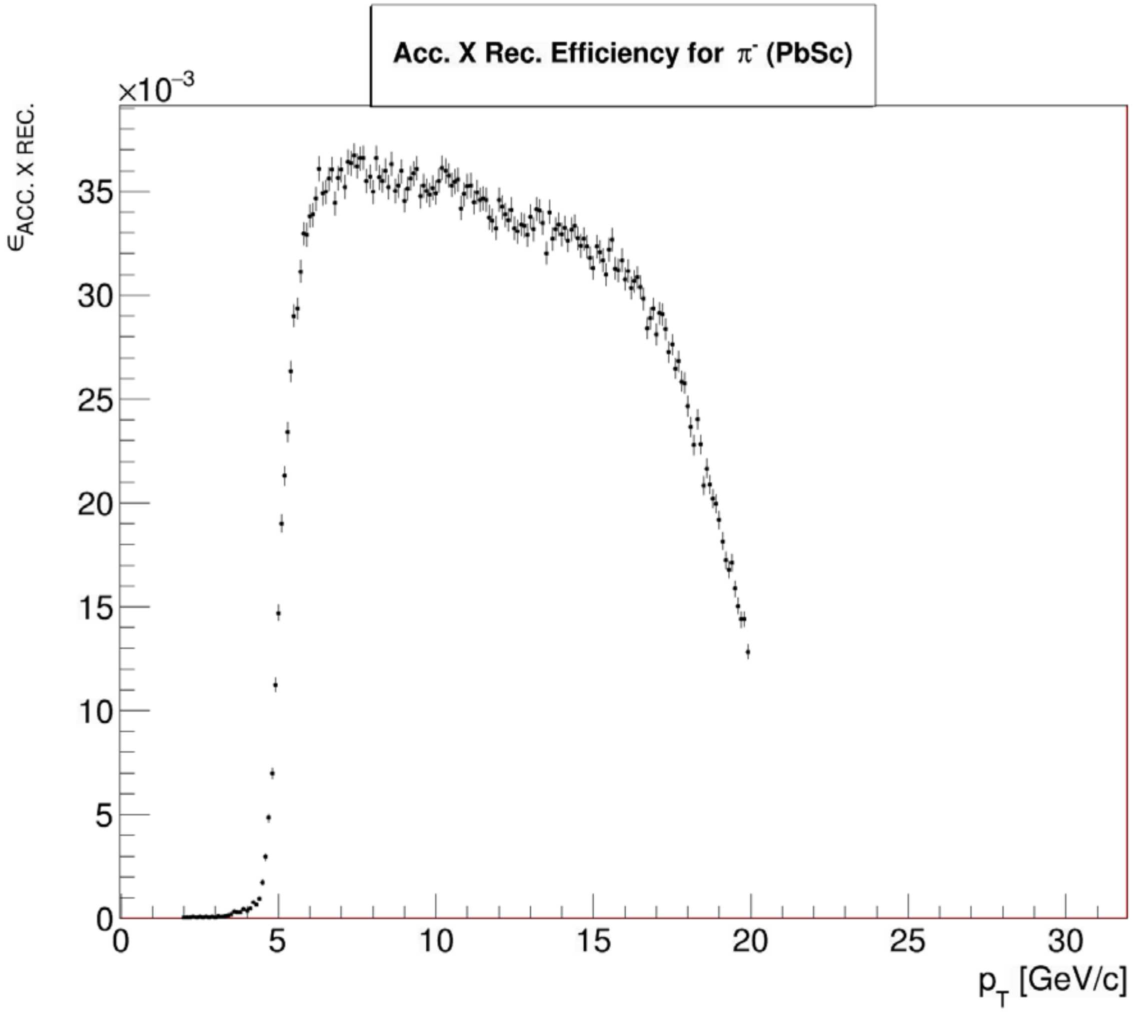
Generated pions

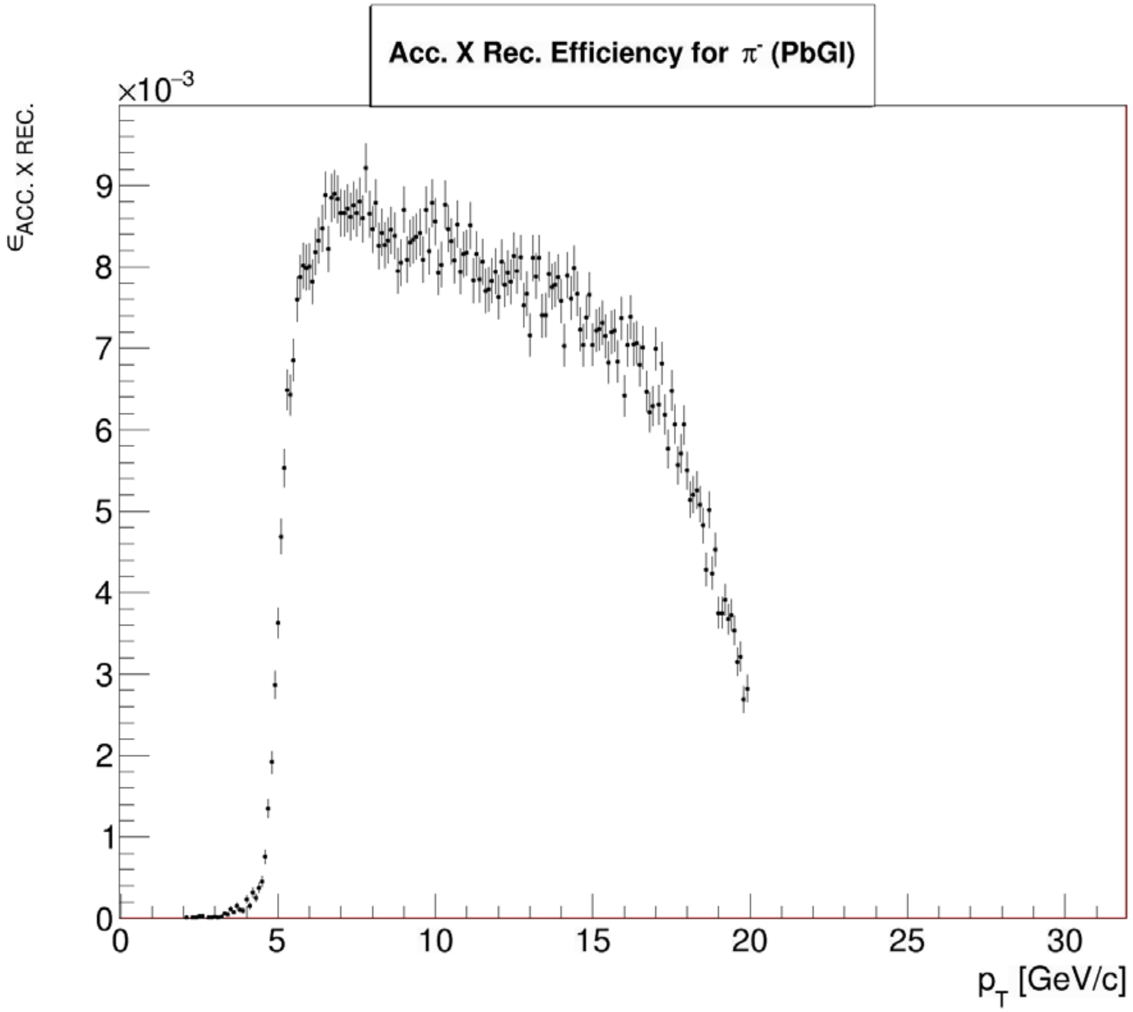


Reconstructed π^-

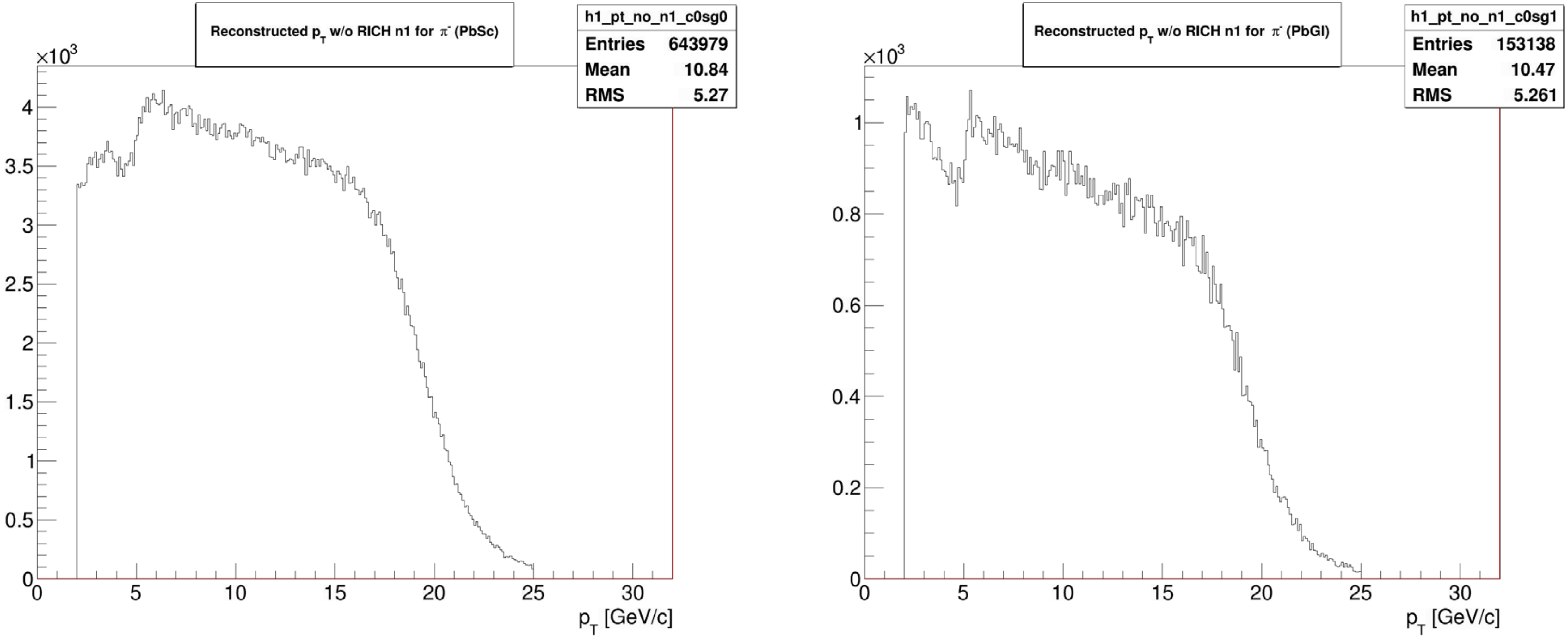


Acc. X Rec. efficiency for π^-

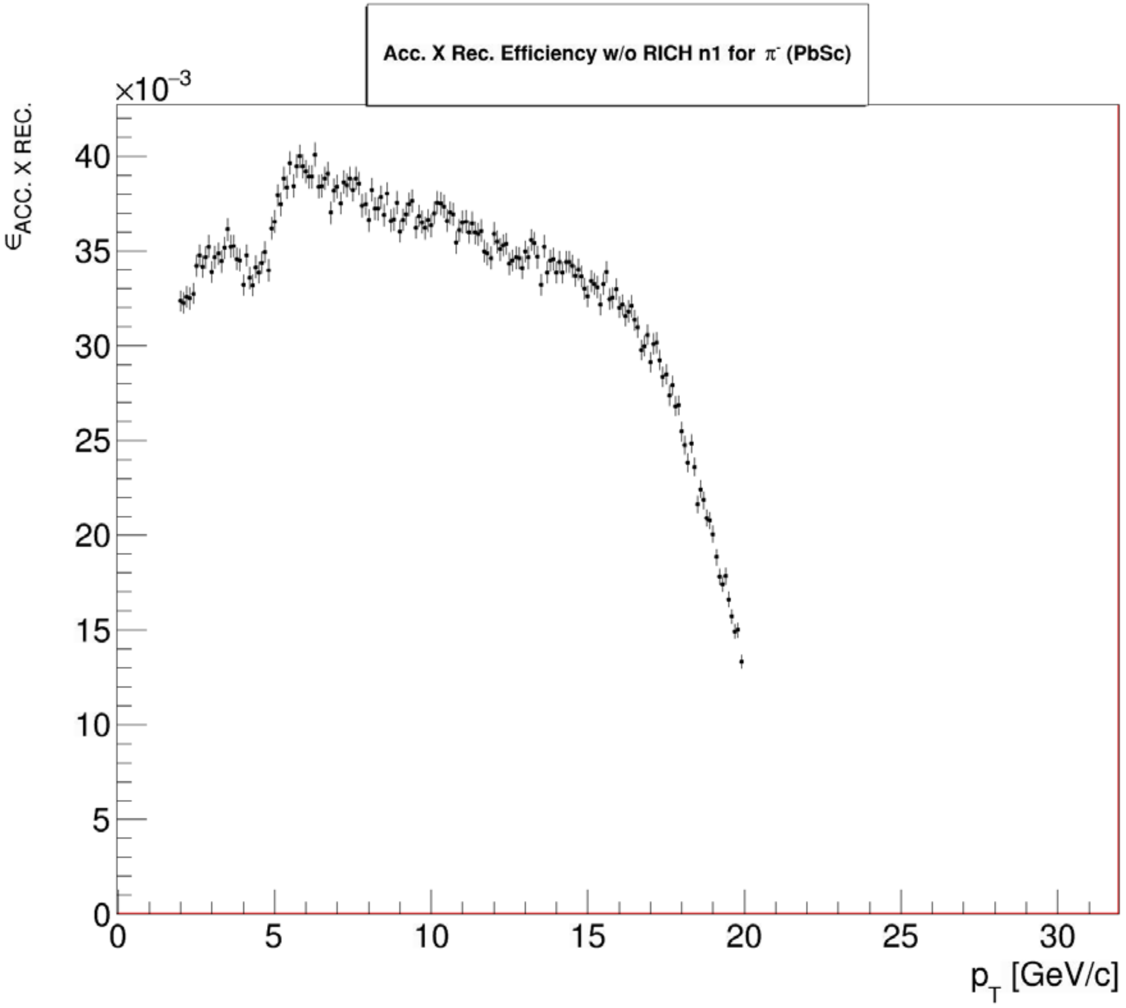


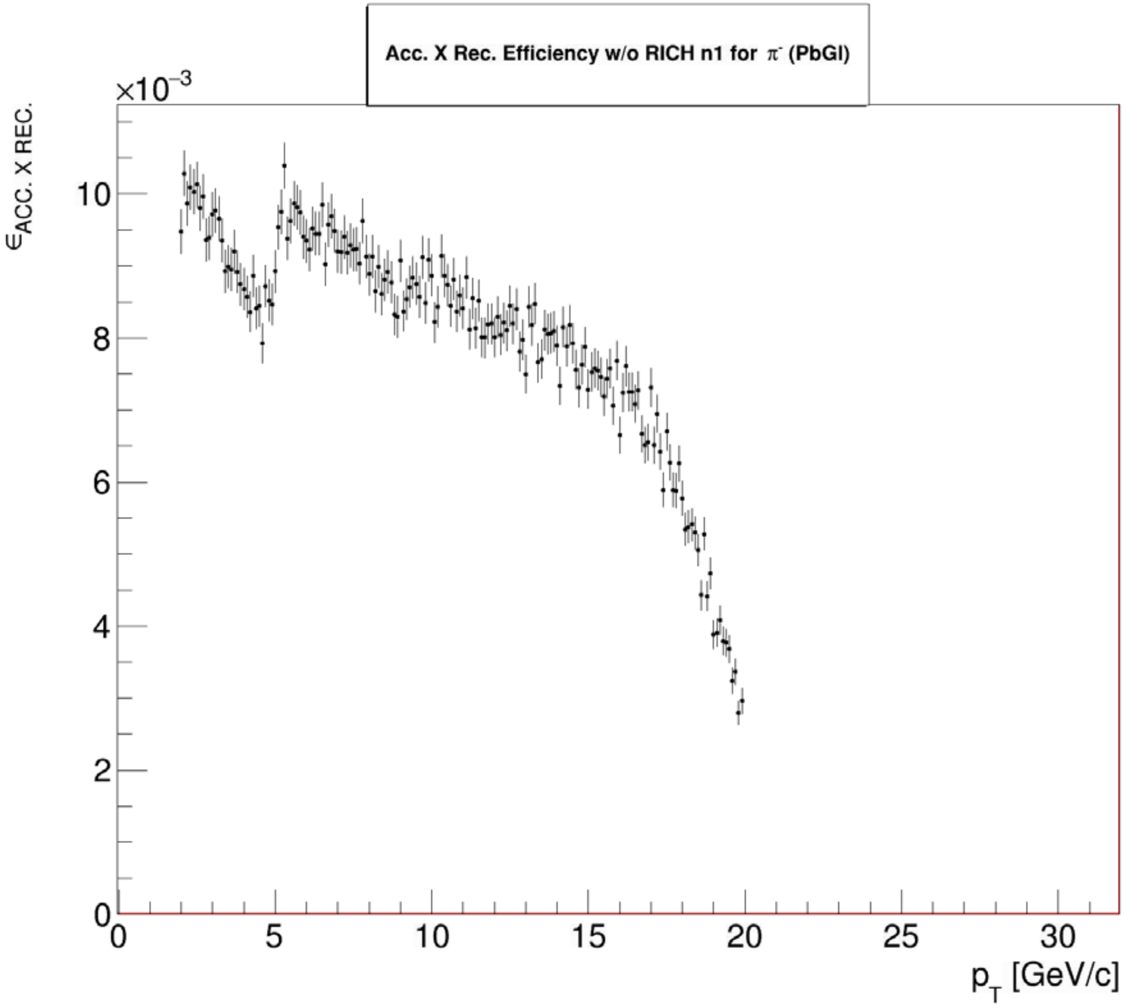


Reconstructed π^- without RICH n1 cut

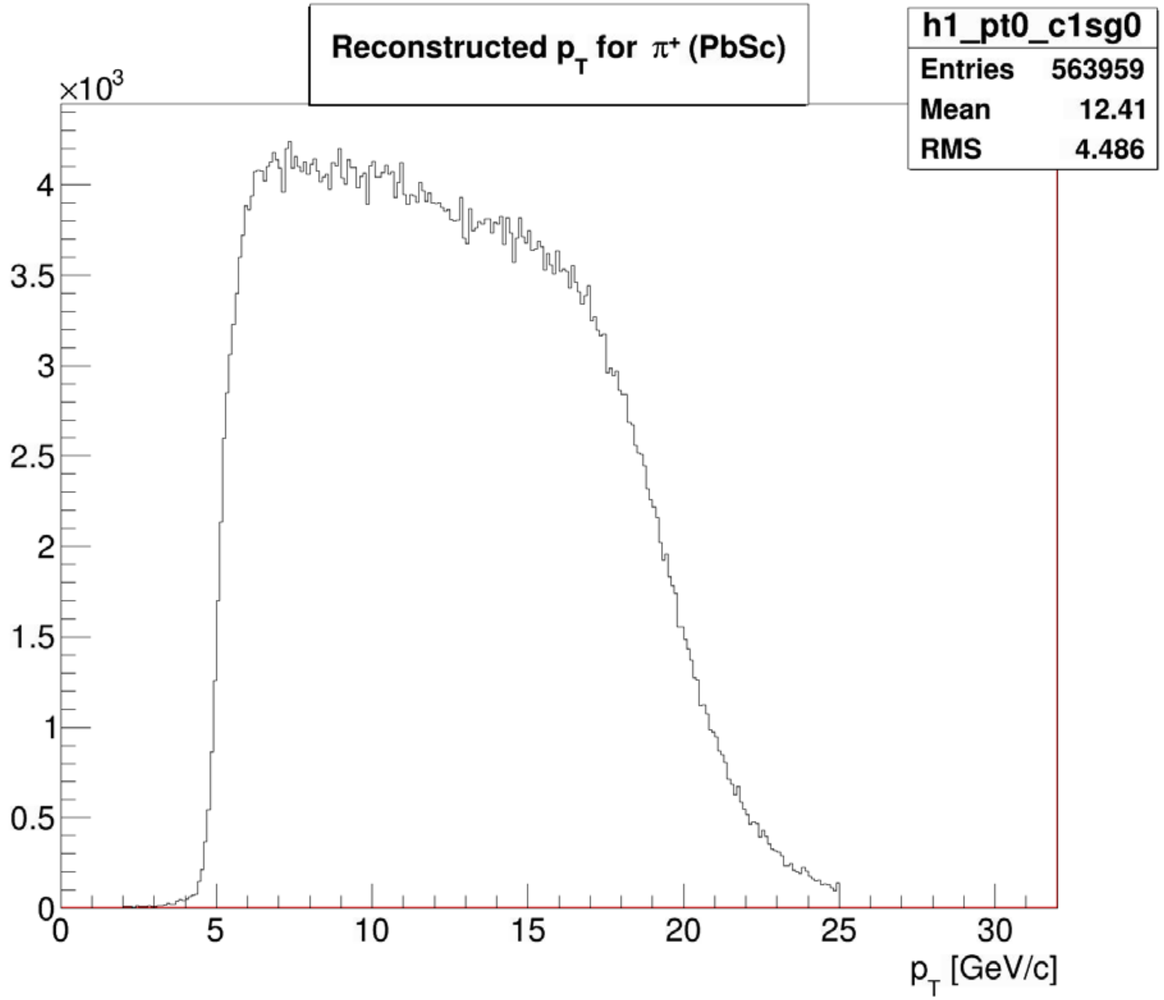


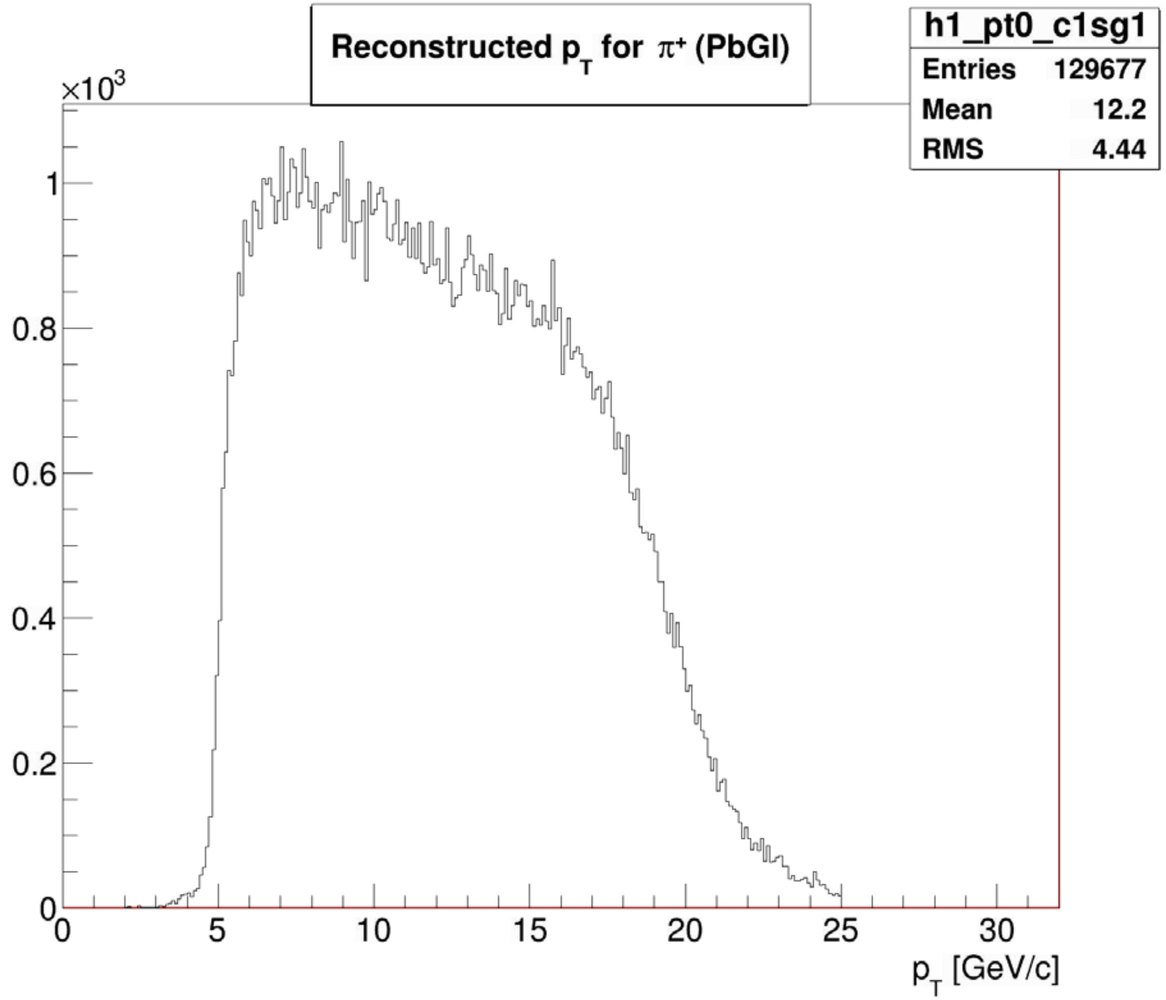
Acc. X Rec. efficiency for π⁻ without RICH



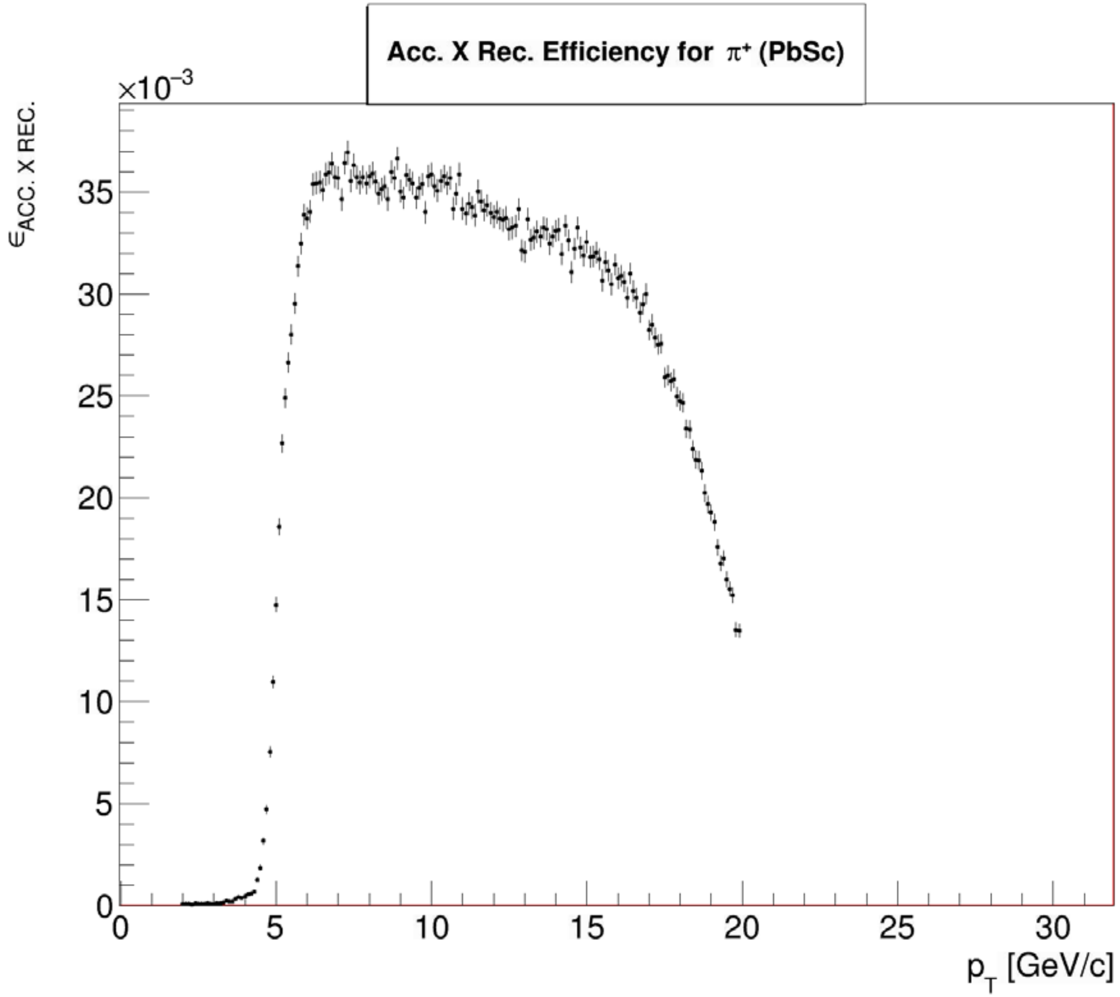


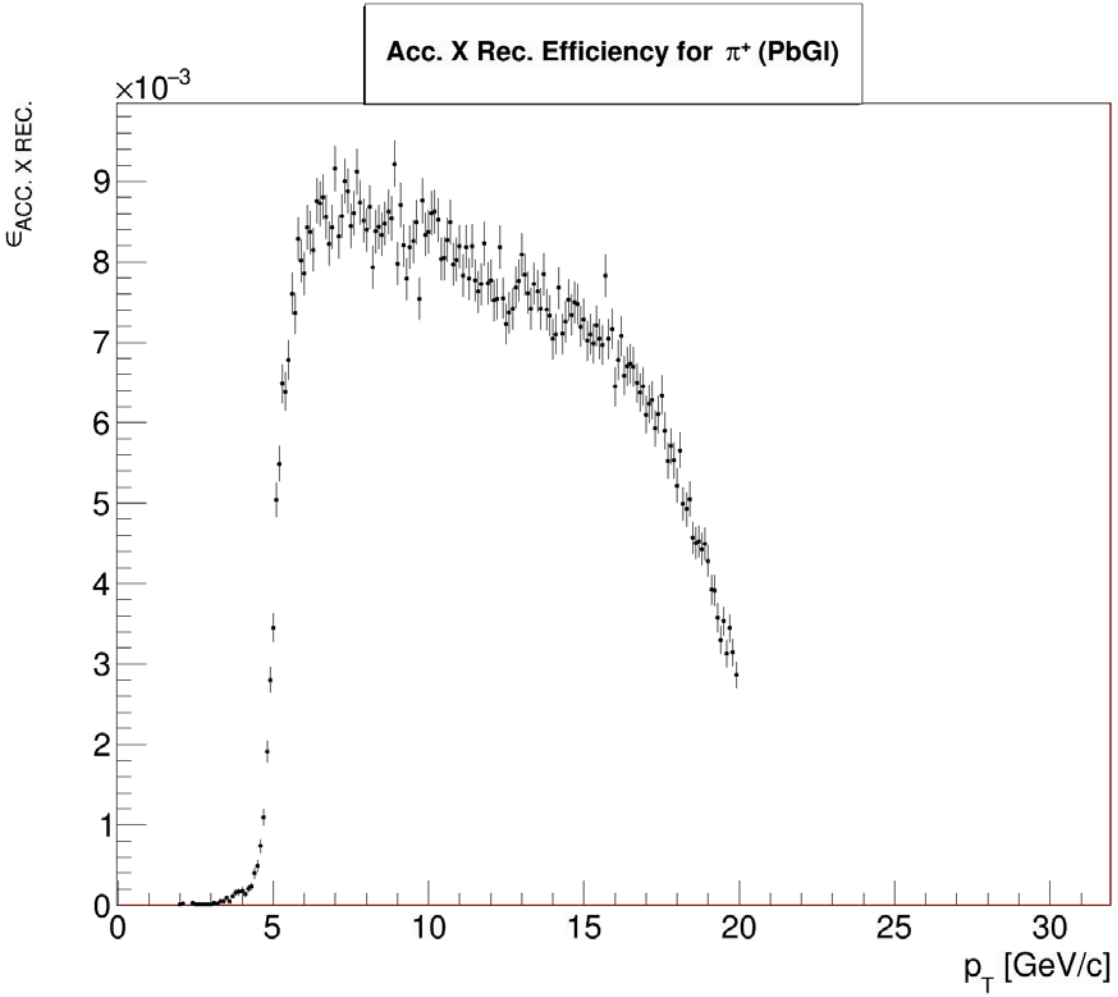
Reconstructed π^+



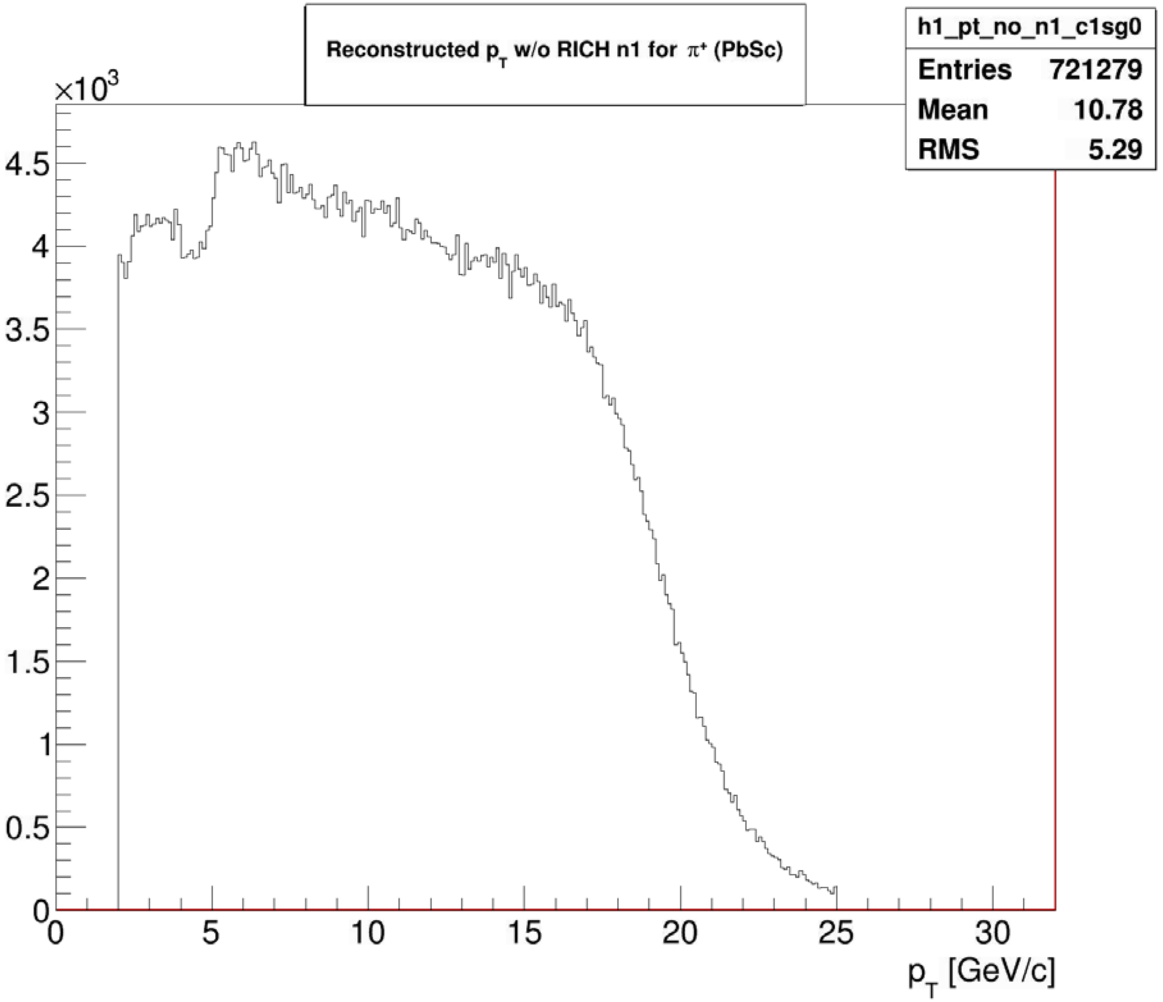


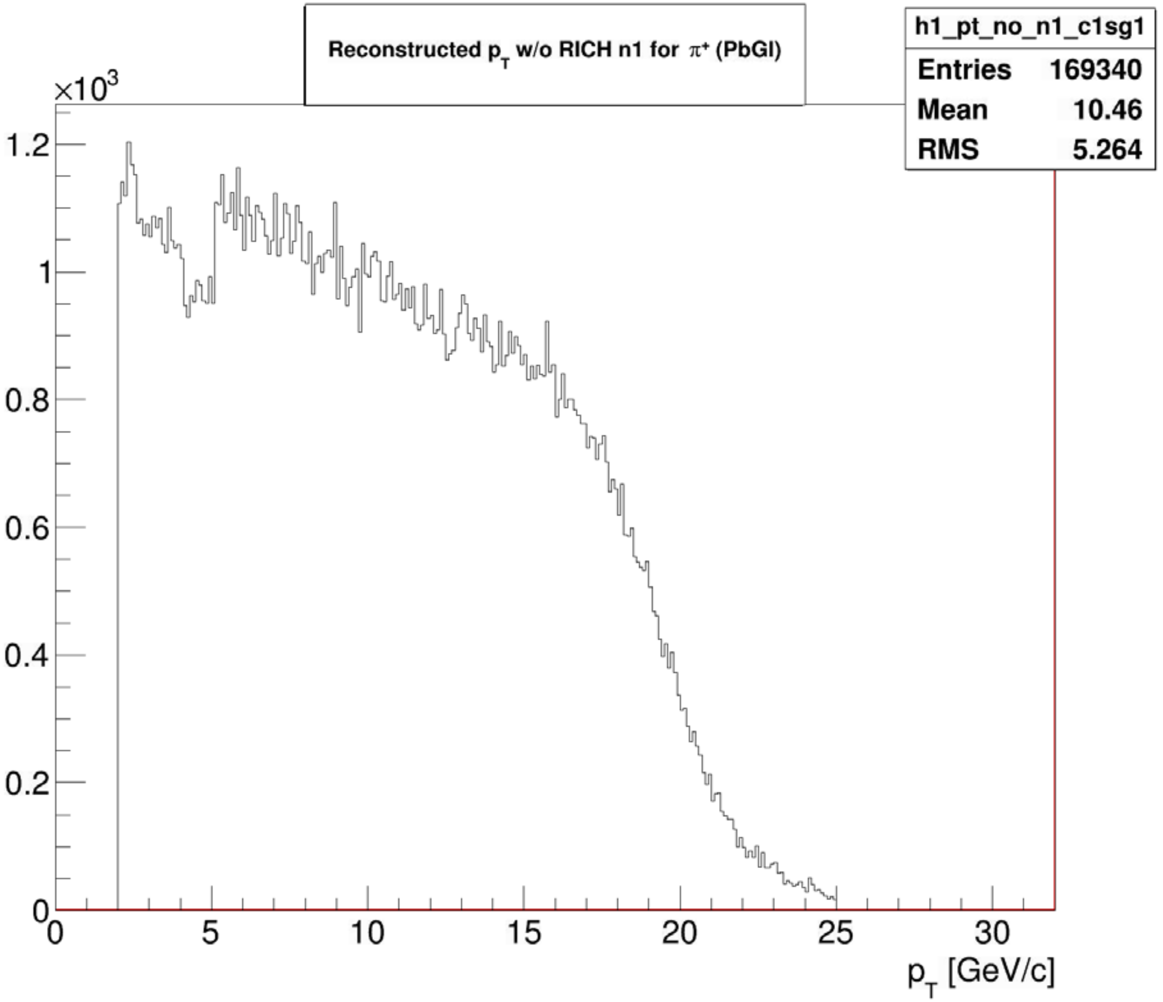
Acc. X Rec. efficiency for π^+



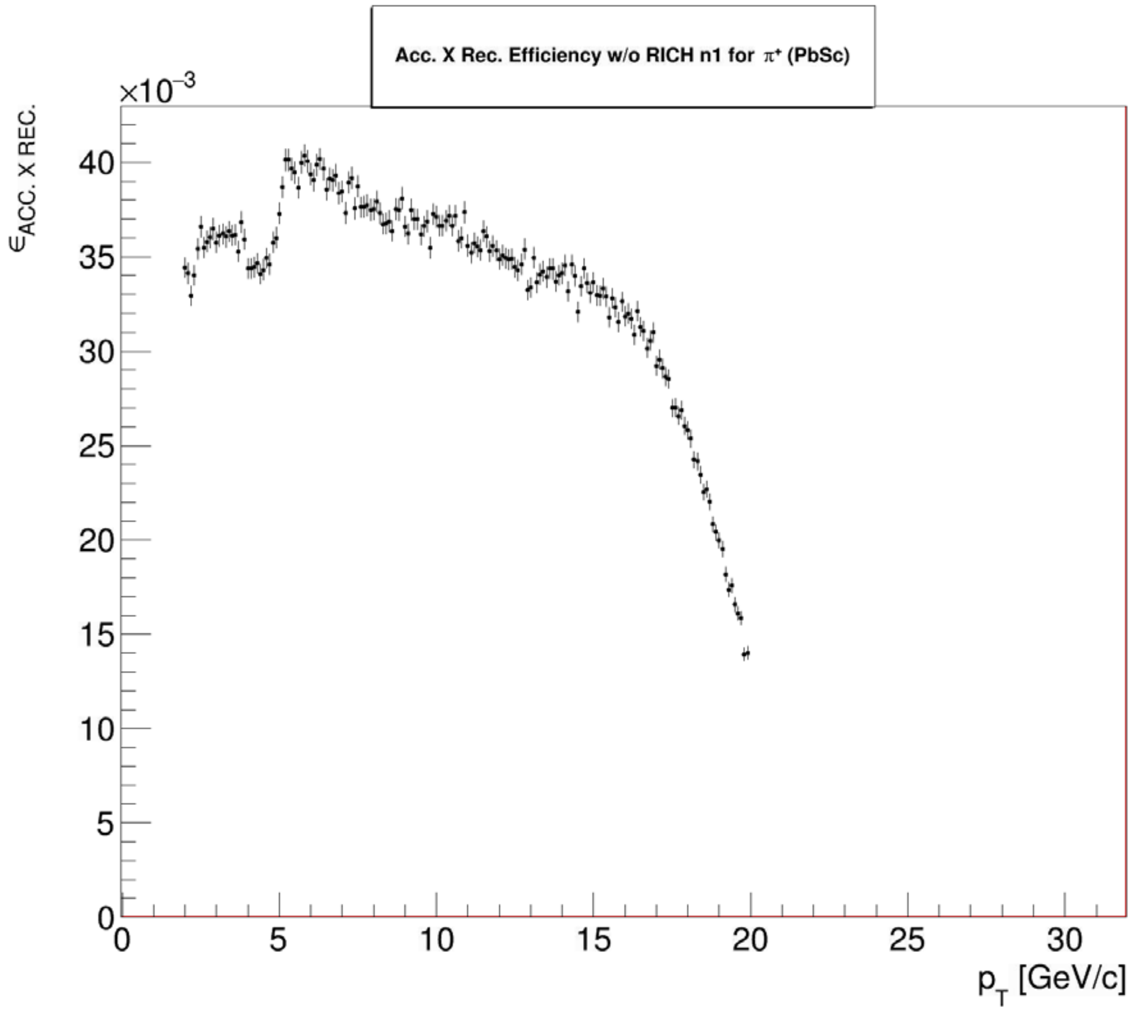


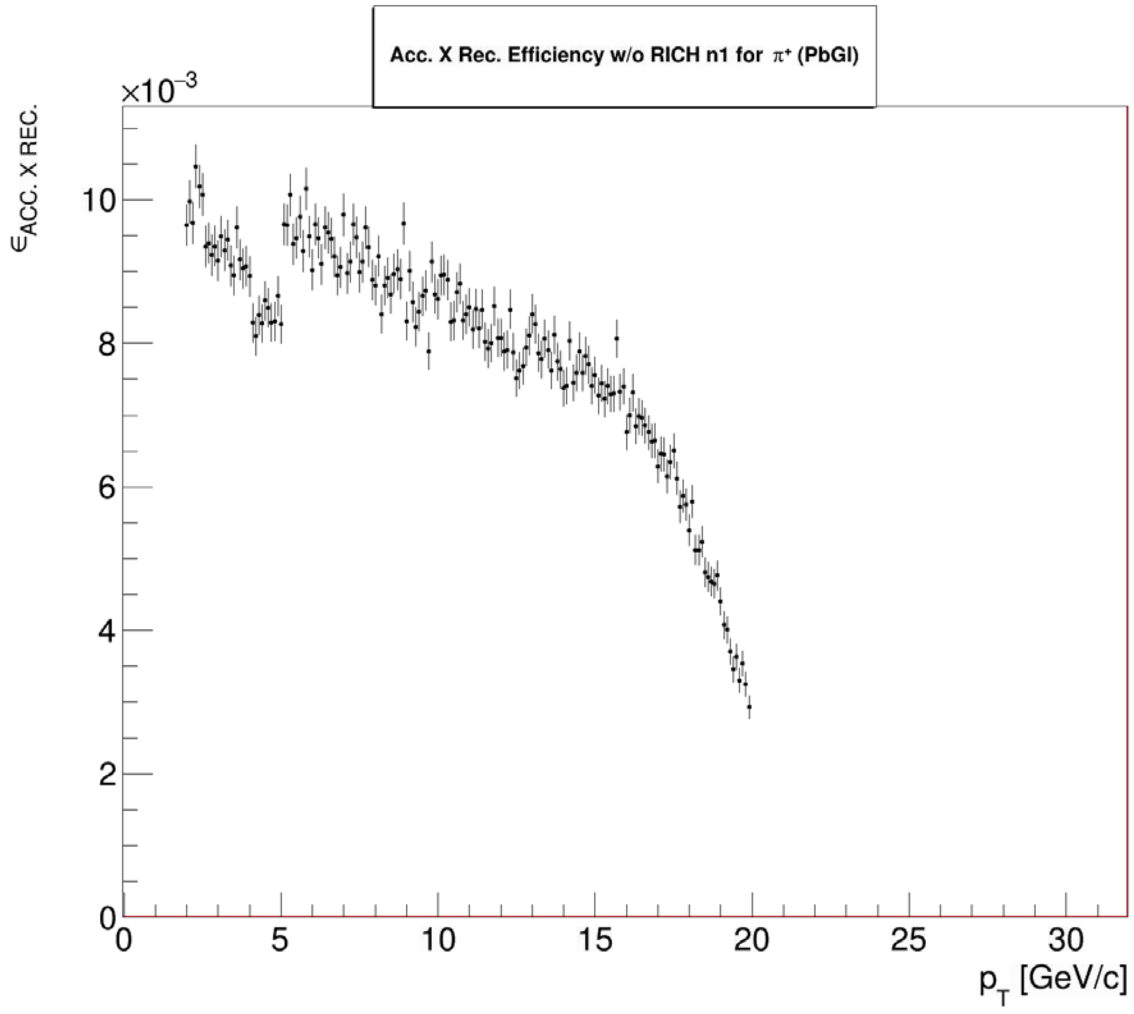
Reconstructed π^+ without RICH n1 cut





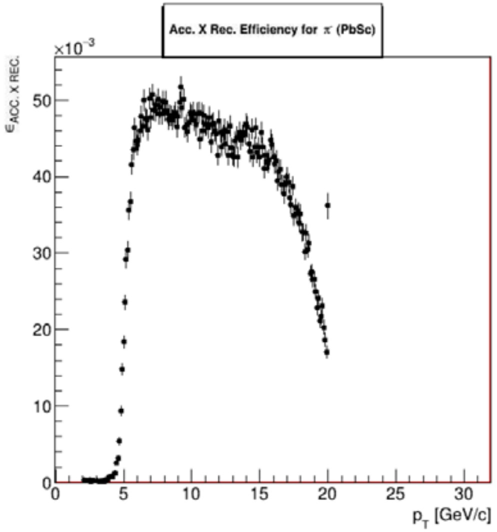
Acc. X Rec. efficiency for π^+ without RICH

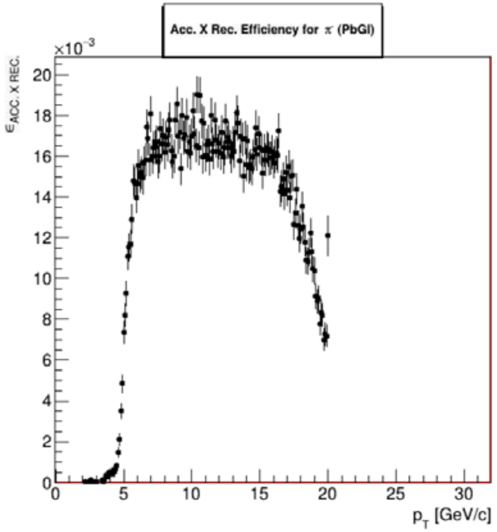


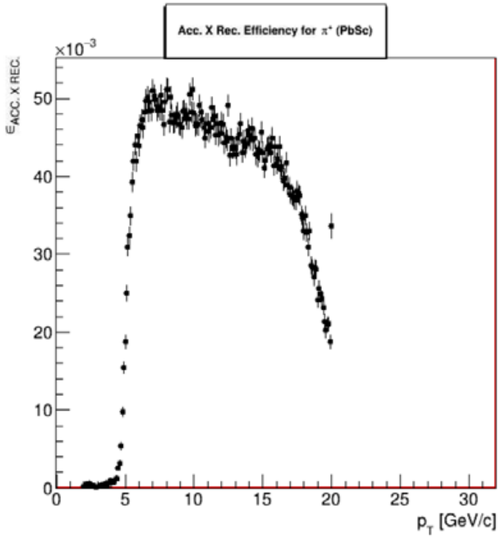


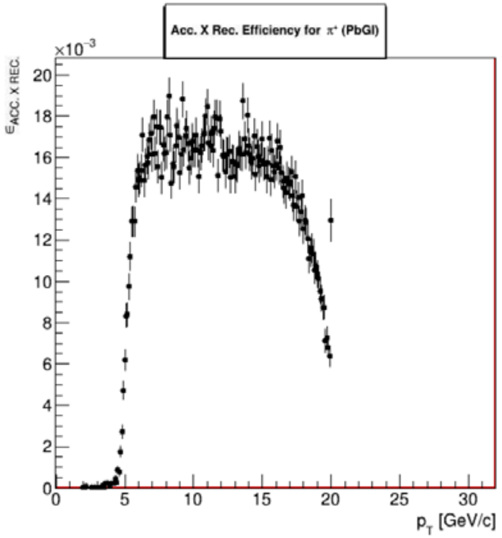
Comparision of masked EMCal warnmap or not

Without Warnmap

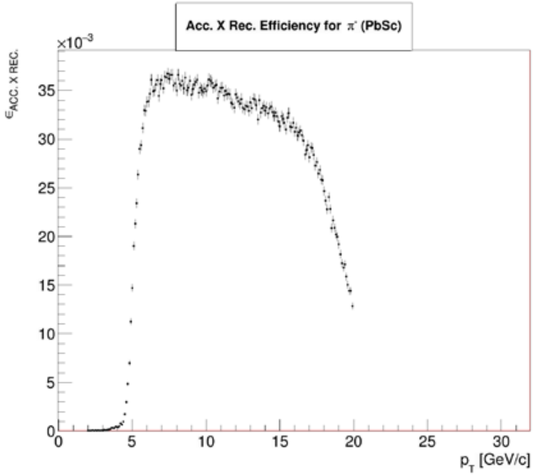


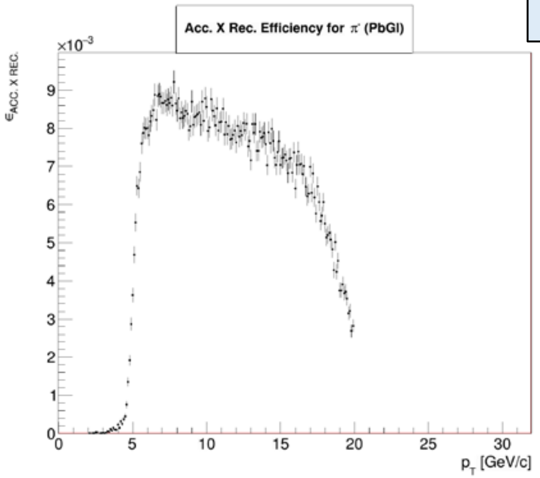


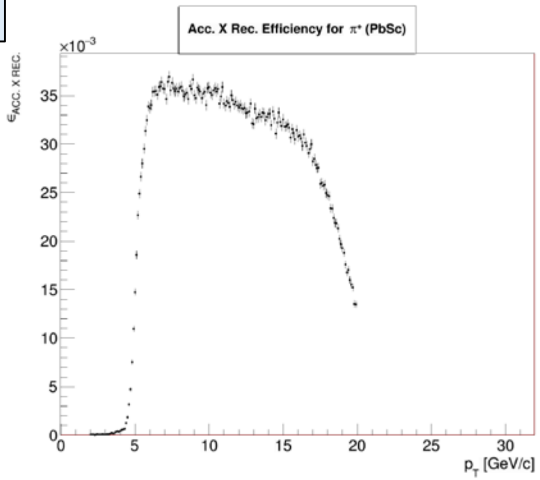


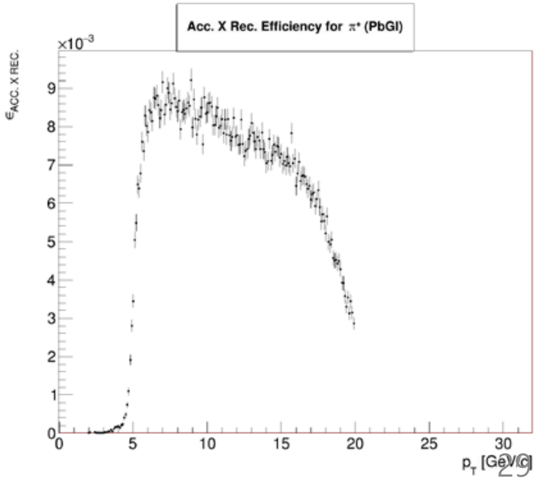


Applied Warnmap



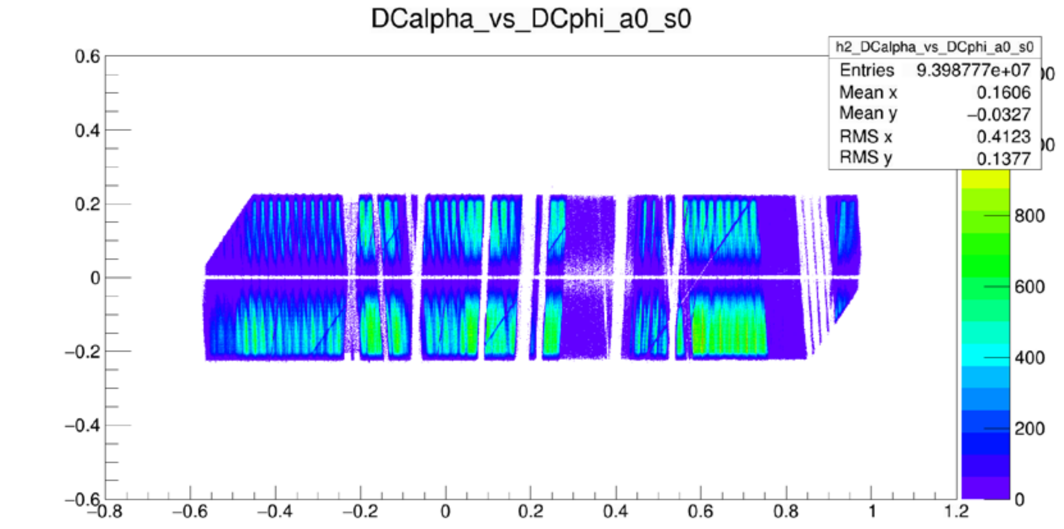


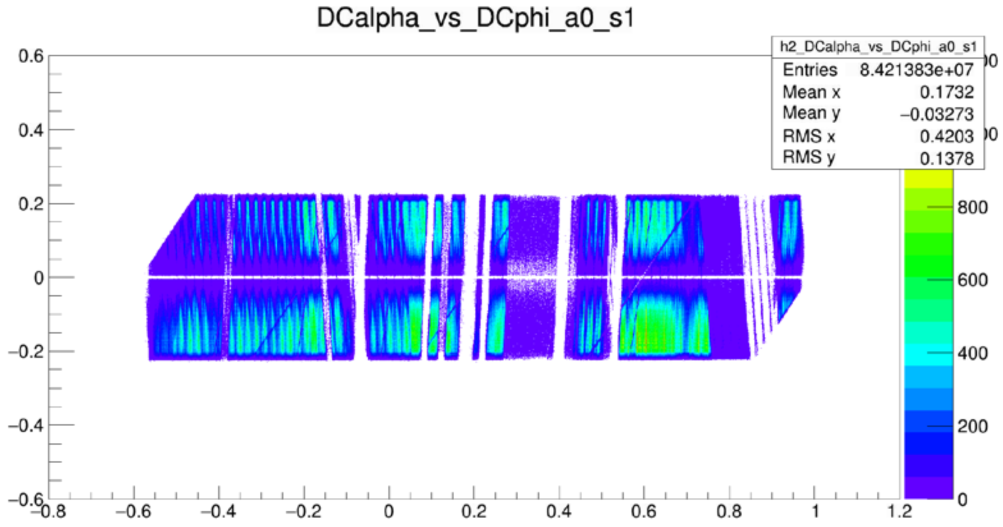




Fiducial cut

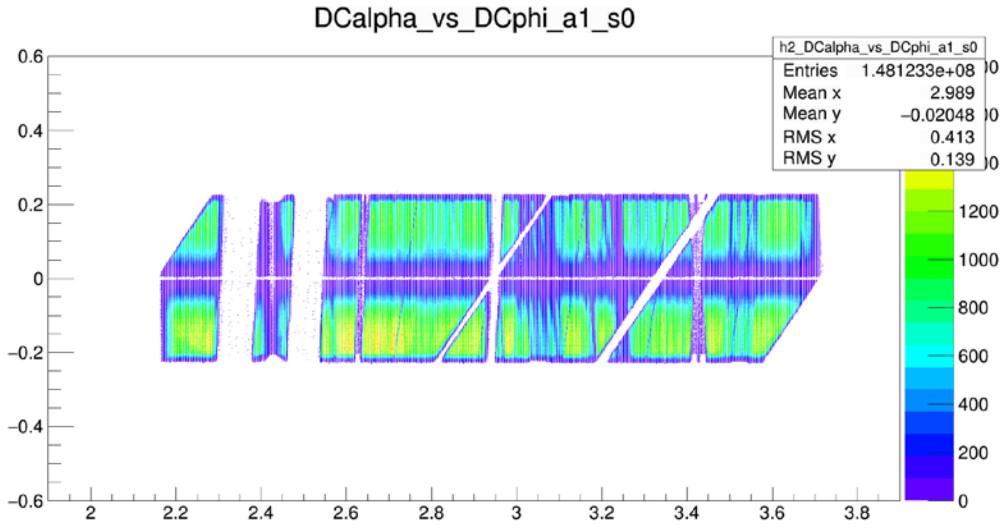
Comparision of masked EMCal warnmap or not

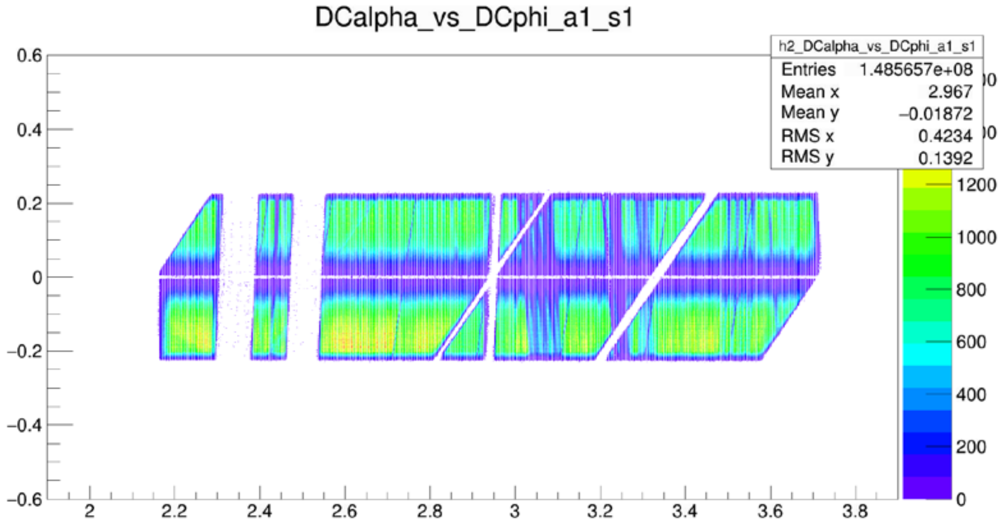




West

East





plan

1. Run QA	
2. calribration - EMCal gain matching (carried norbert) - PC calibration -	
3. Event selection - Convincing evidences of each cuts.	
4. Suvival rate true events Background rejection power	
4.1 trigger efficeiency calculation	
4.2 Simulation and recon_eff	12.01 ~ 05.07
5. Luminosity study	05.07 ~ 05.14
6. Cross section as function of pT compare with π^0	05.14 ~ 06.14
7. A_N spin anaysis +-	06.14 ~ 08.14
8. Systematic error	08.14 ~ 09.14
9. Preliminary	???

Thank you.

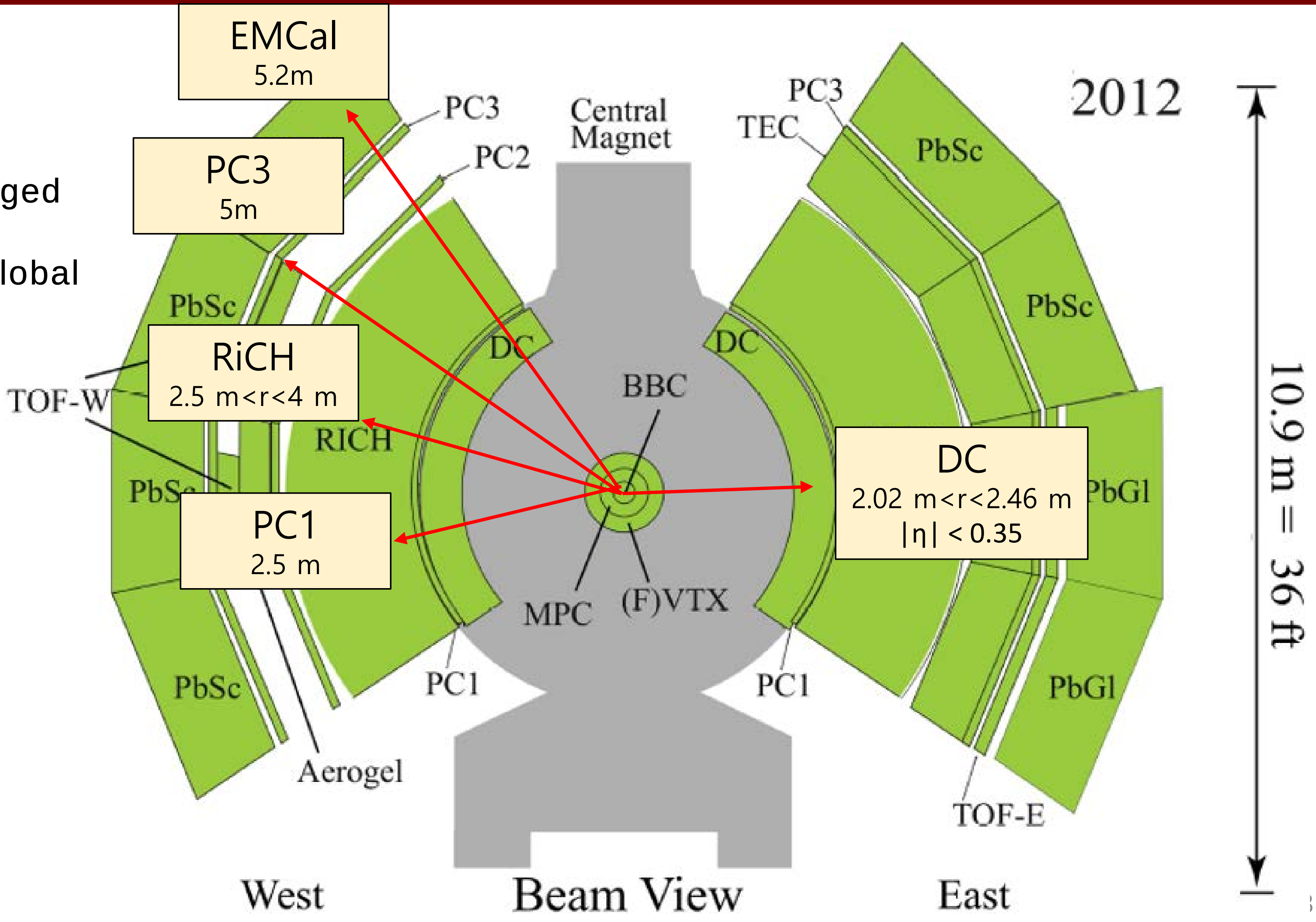
Back up

Drift Chamber for PHENIX

- **Main purpose:**
  - Precise measurement of the charged particle's momentum
  - Gives initial information for the global tracking in PHENIX

- **Acceptance:**
  - 2 arms 90° in ϕ each
  - ± 90 cm in Z
  - 0.7 units of η

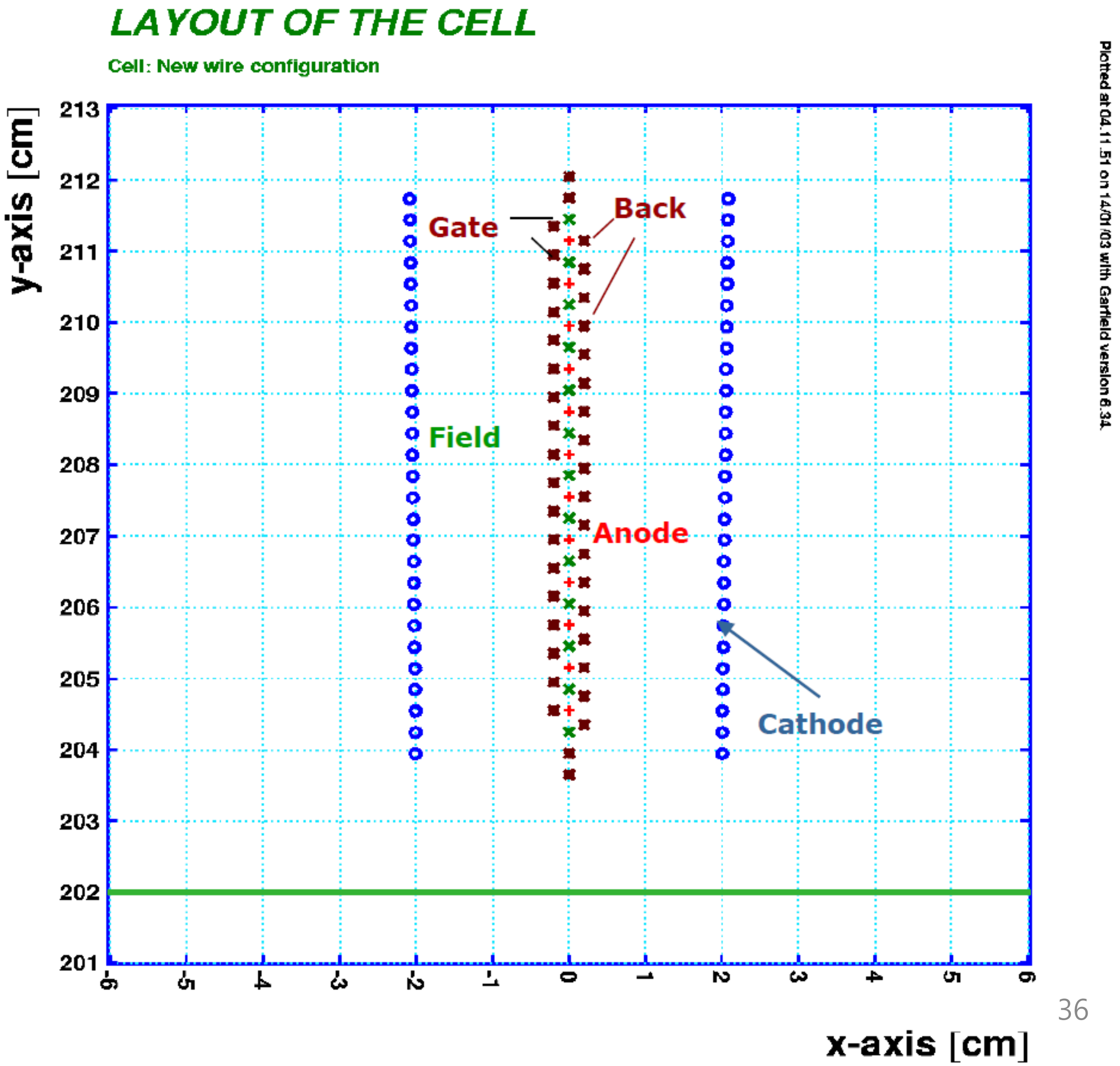
- **Location:**
  - Radial : $2.02 < R < 2.48$ m
  - Angular:
    - West: $-34^{\circ} < \phi < 56^{\circ}$
    - East : $125^{\circ} < \phi < 215^{\circ}$



Drift field configuration

Specific field configuration around **anode wire** called drift region is created by "field forming" wires:

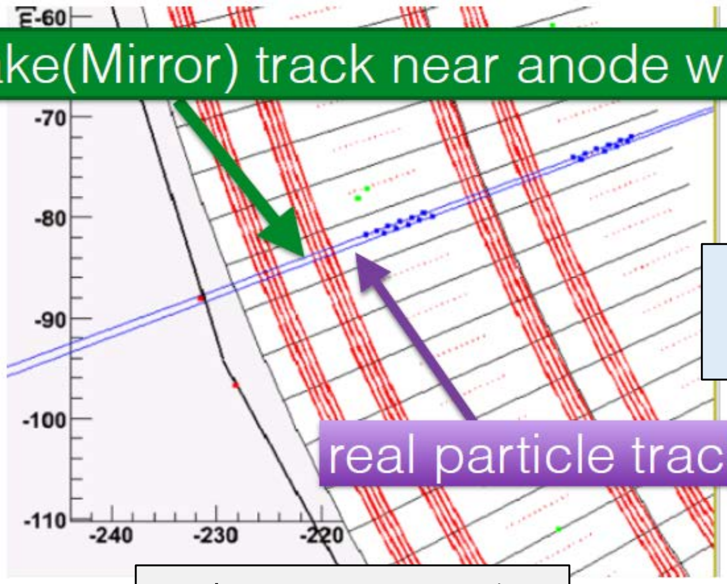
- **Cathode Wires** – Create uniform drift field between anode and cathode
- **Field Wires** – Create high electric field strength near the anode wire
- **Back Wires** – Stop drift from one side of the anode wire
- **Gate Wires** – Also create high field near the anode wire, Localize the drift region width



Drift Field Configuration

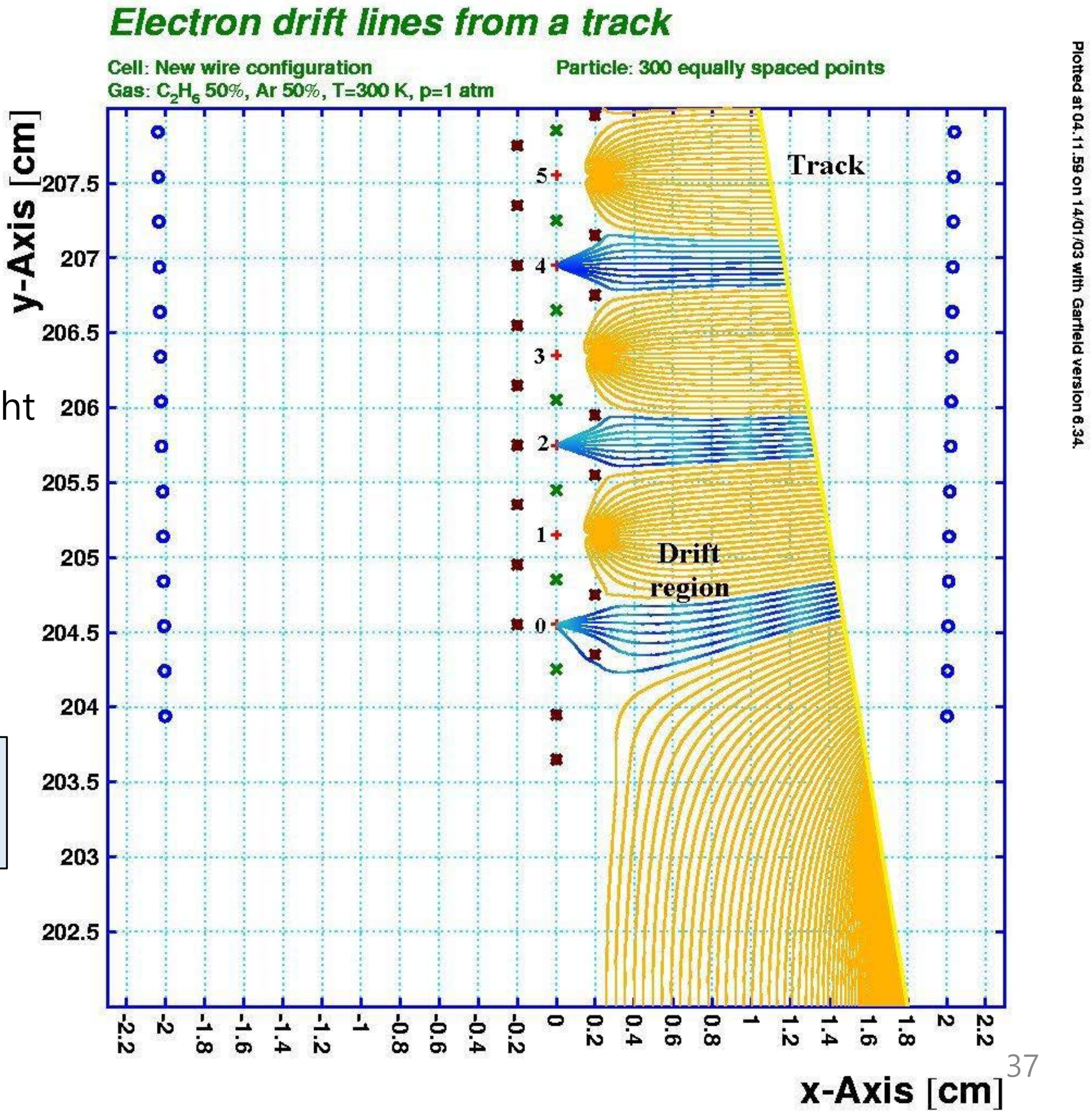
- Here is what happens when the charged particle passes through the wire cell
- Note that only even wires collect charge due to the **back wires** that block the odd anode wires !
- Back wires solves left-right ambiguity problem

-> But if High pT particle going through near anode wire region, left right ambiguity one more (fake) track might be reconstructed.



Taebong's presentation

this region should be masked
-> +-2mm from anode wire



Anode wire region

- define ϕ_{pair} angle

- If we require very narrow $\phi_{opening}$ angle of track pair and opposite sign, pair by fake and real track will survive.

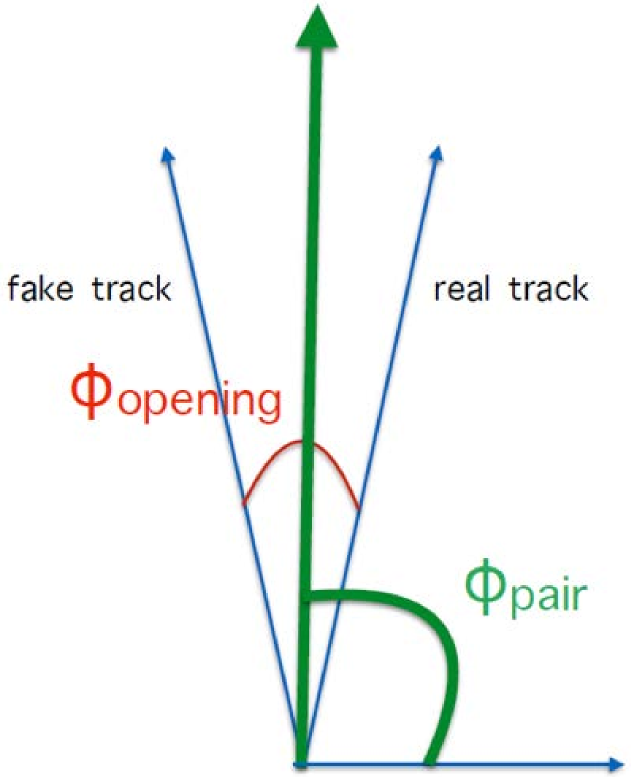
-> we can know anode wire position if drawing ϕ_{pair} distribution.

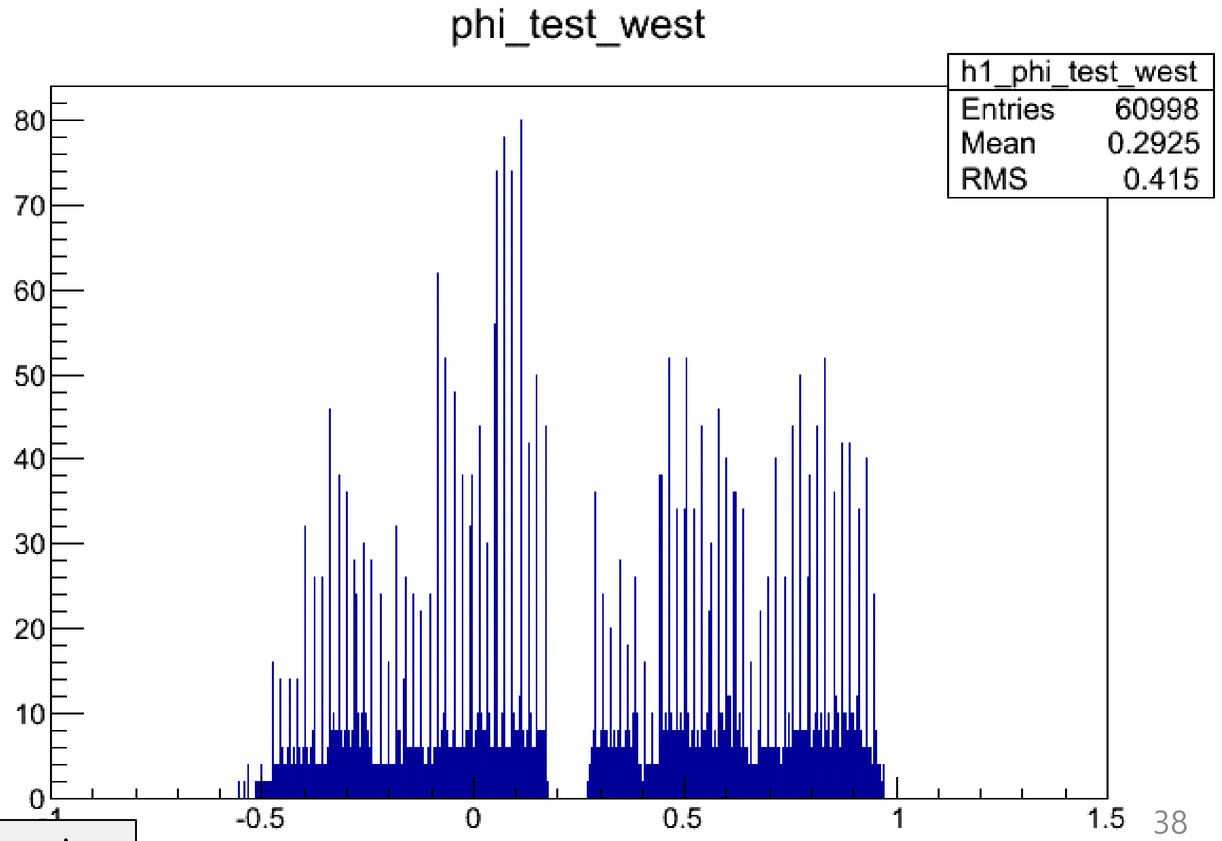
- Pair cuts

- opposite signed tracks in pair

- opening angle in phi < 0.002 [rad]

- DC track qualities in pair = 31 or 63 pT for each track in pair > 0.5 [GeV/c]





Taebong's presentation