Charged pion analysis

Simulation
- Acc. X Rec. efficiency w/o dead map

Korea Univ.
Jaehee Yoo

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Purpose

- $^{1}/_{\sqrt{Y}} \propto$ size of the error bar
- $Y_{\pi^{\pm}} = Y_{\pi^{0}} \times \frac{\varepsilon_{\pi^{\pm}}^{trig}}{\varepsilon_{\pi^{0}}^{trig}} \times \varepsilon_{\pi^{\pm}}^{track}$
- $\varepsilon_{\pi^{\pm}}^{track} = \varepsilon_{reco}^{DC} \times \varepsilon_{reco}^{PC3} \times \varepsilon_{reco}^{RICH}$

1. Single pi± generation

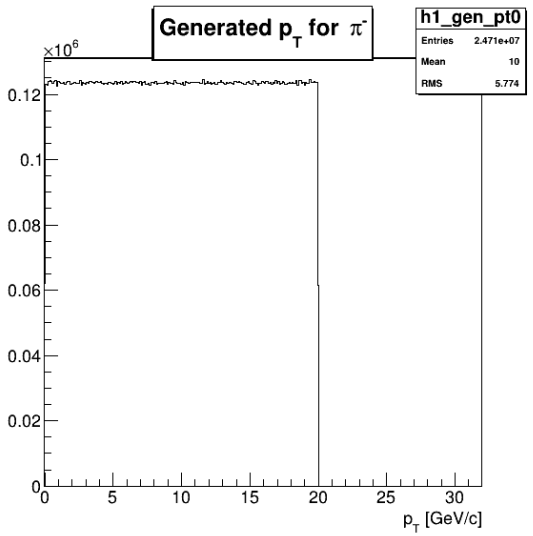
- Number of Pi± : 25,000,000 for each charge
- 0 < momentum < 20 GeV/c
- -0.5 < eta < 0.5
- 0 < pi < 2π
- Primary Vertex = (0,0,0)

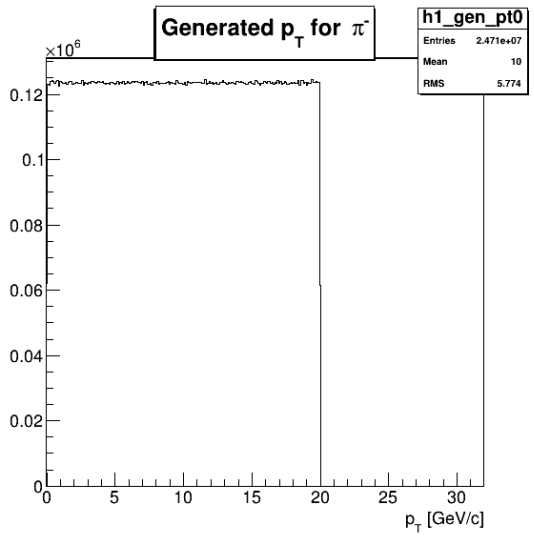
Using Run15 without dead channels of DC, PC, RICH for test

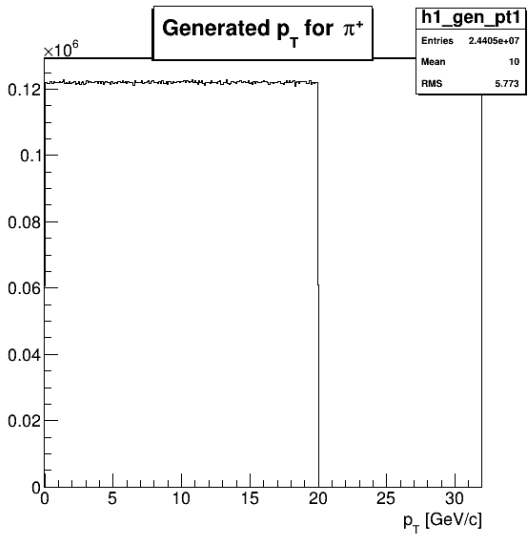
2. Detector setting for Run15

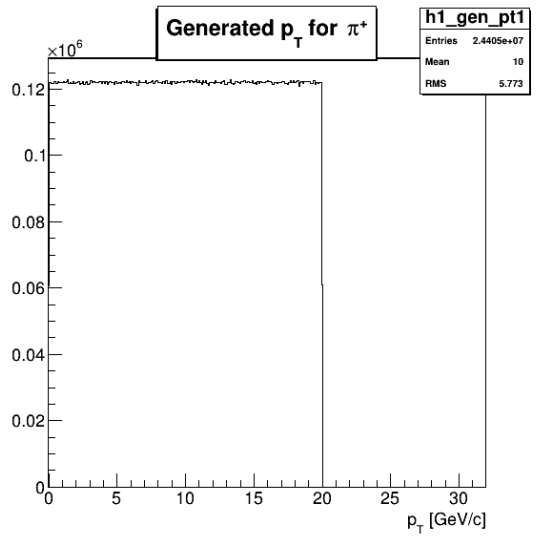
```
140
141 # Make links and copy files from afs
142 /afs/rhic.bnl.gov/phenix/PHENIX_LIB/simulation/run15/pisaLinker.csh
143
144 ln -sf ${TMPGENRUNDIR}/${genOutFileName} ${genOutFileName}
145
146 # Use private files
147 rm phnx.par
148 rm pisa.kumac
149 cp -a ${PISADIR}/phnx.par phnx.par
150 #cp -a ${PISADIR}/pisa_fieldoff.kumac pisa.kumac
151 cp -a ${PISADIR}/pisa_fieldpp.kumac pisa.kumac
152 #cp -a ${PISADIR}/pisa_fieldpp_novtx.kumac pisa.kumac
153
154 rm glogon.kumac
155 set glogonFile = "glogon.kumac"
156 echo pisafile ${pisaOutFileName}  >> ${glogonFile}
157 echo phpythia 1 ${genOutFileName} >> ${glogonFile}
158 echo nskip 0                      >> ${glogonFile}
159 echo ptrig ${nevent}              >> ${glogonFile}
160 echo exit                         >> ${glogonFile}
161
162 # Check files in current directory
163 ll
164
165 # Run pisa
166 echo pisa < pisa.input
167 pisa < pisa.input
168
169 # Check files in current directory
170 ll
171
172
173 ##############################################
174 #        Run Pisa to DST Reconstruction      #
175 ##############################################
176
177 echo
178 echo "----RUNNING PISA TO DST RECONSTRUCTION----"
179 echo
180
181 cd ${TMPDSTRUNDIR}
182 echo " Notice *** cd ${TMPDSTRUNDIR}"
183 echo
184
185 # Make links and copy files from afs
186 /afs/rhic.bnl.gov/phenix/PHENIX_LIB/simulation/run15/pisaToDSTLinker.csh
187
188 ll -thr
189 echo "Jae"
190
191 rm fieldIntegral.dat
192
193 ll -thr
194 echo "eee"
195
196 ln -sf /afs/rhic.bnl.gov/phenix/software/calibration/run2004/fieldIntegral++.dat.run04 fieldIntegral.dat
197
198 ll -thr
199 echo "Jaehee"
200
201 ln -sf ${TMPPISARUNDIR}/${pisaOutFileName} ${pisaOutFileName}
202
203 # Use private files
```

- Setting change to run15
- Dead maps of DC, PC, RICH were not applied.









- $\pi^{\pm}$ 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

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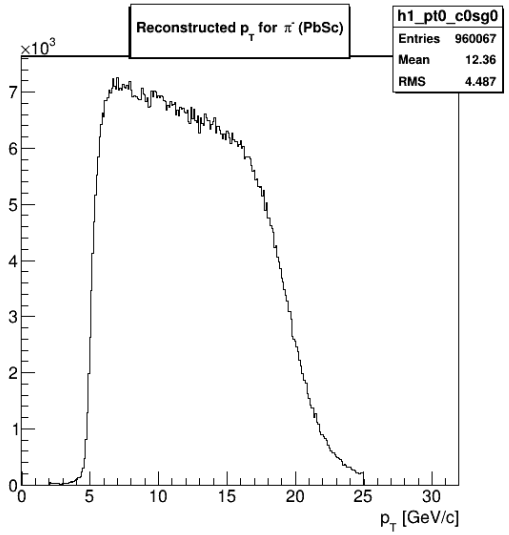
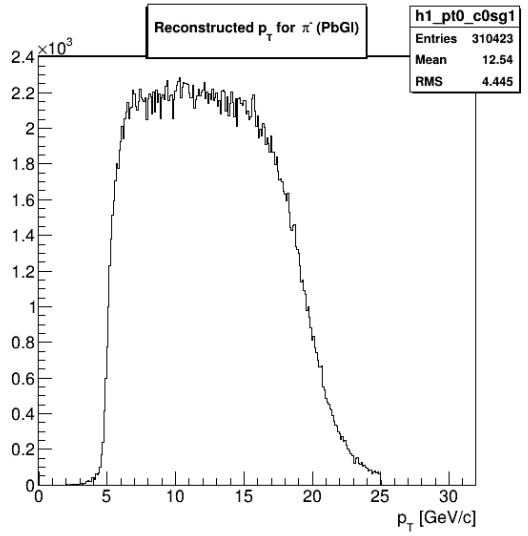
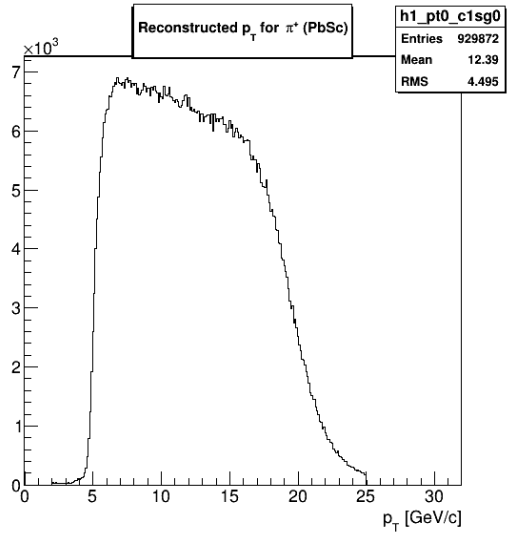
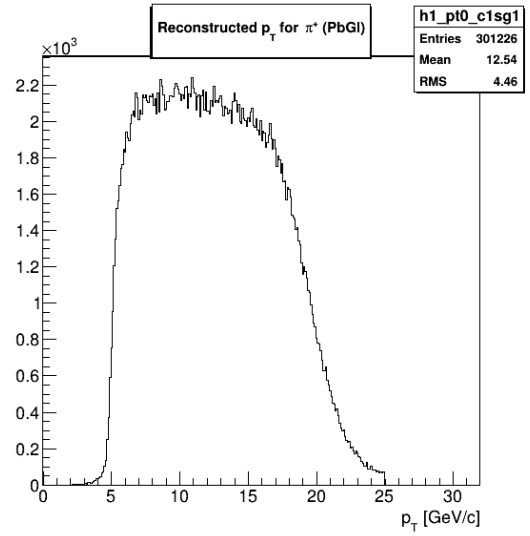
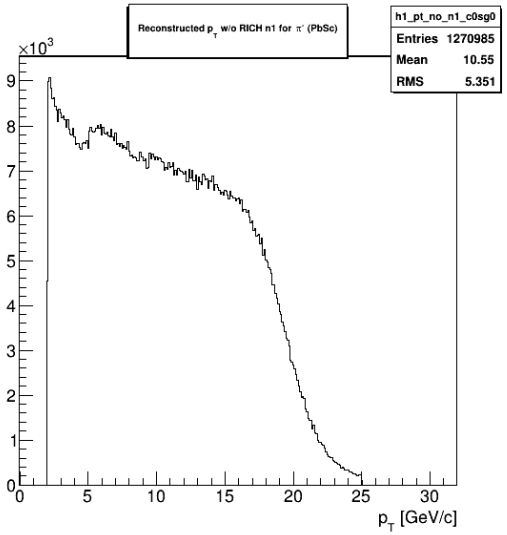
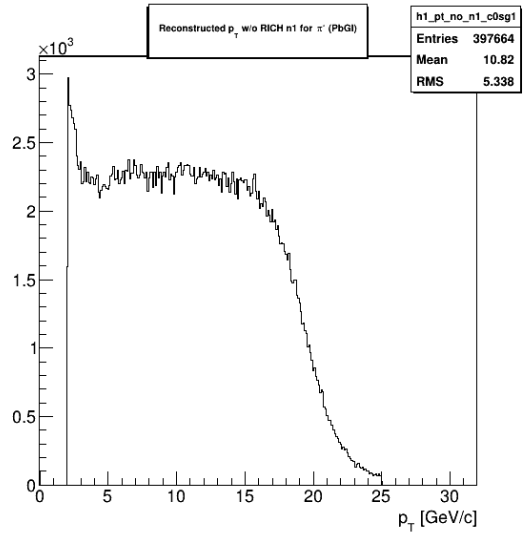

Reconstructed p_T for π^- (PbSc)
h1_pt0_c0sg0
Entries 960067
Mean 12.36
RMS 4.487
p_T [GeV/c]

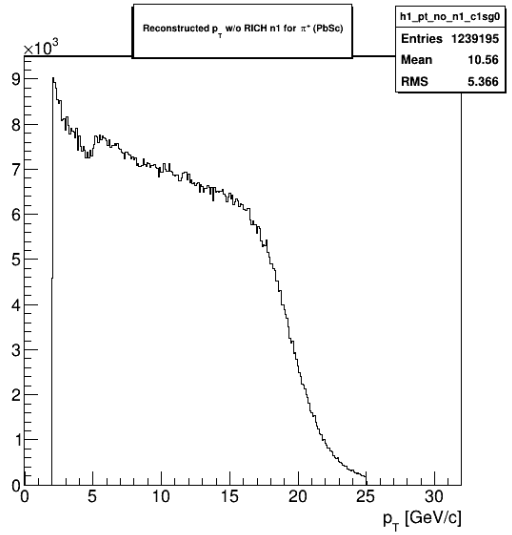

Reconstructed p_T for π^- (PbGl)
h1_pt0_c0sg1
Entries 310423
Mean 12.54
RMS 4.445
p_T [GeV/c]

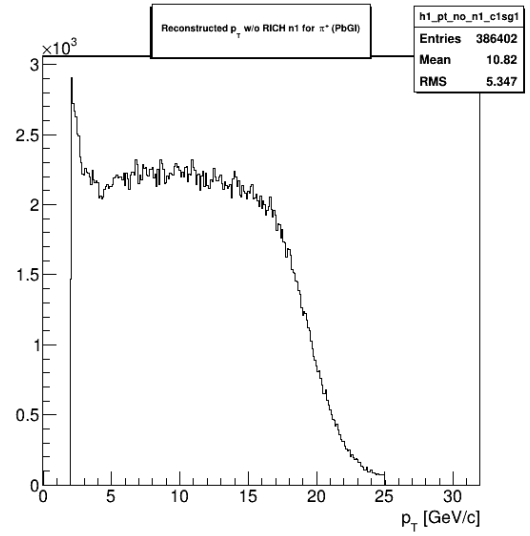

Reconstructed p_T for π^+ (PbSc)
h1_pt0_c1sg0
Entries 929872
Mean 12.39
RMS 4.495
p_T [GeV/c]

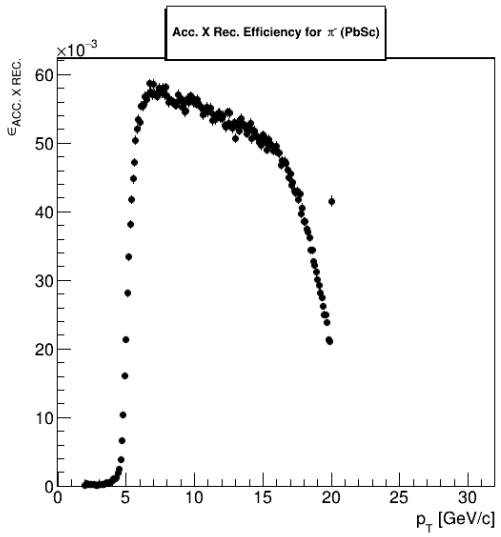

Reconstructed p_T for π^+ (PbGl)
h1_pt0_c1sg1
Entries 301226
Mean 12.54
RMS 4.46
p_T [GeV/c]

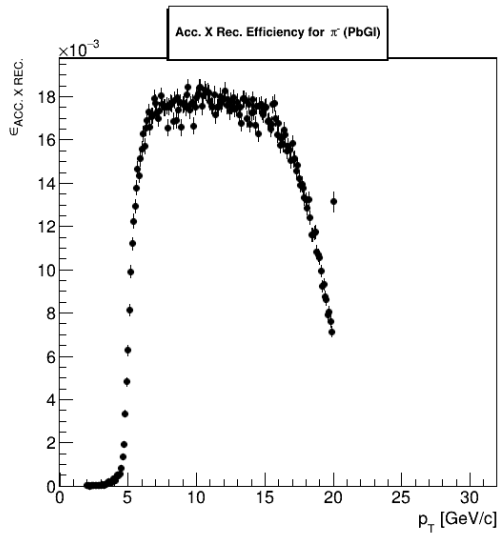

Reconstructed p_T w/o RICH n1 for π^- (PbSc)
h1_pt_no_n1_c0sg0
Entries 1270985
Mean 10.55
RMS 5.351
p_T [GeV/c]

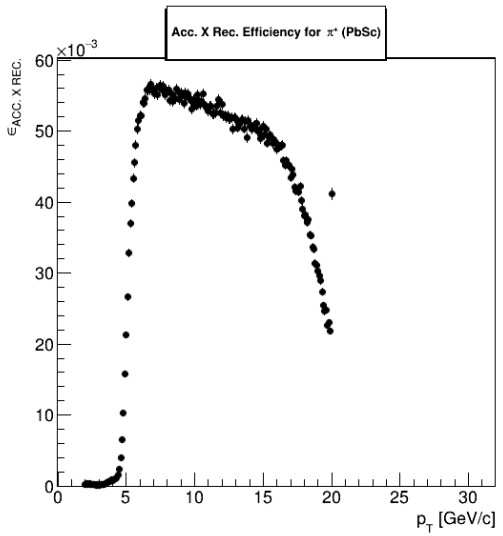

Reconstructed p_T w/o RICH n1 for π^- (PbGl)
h1_pt_no_n1_c0sg1
Entries 397664
Mean 10.82
RMS 5.338
p_T [GeV/c]

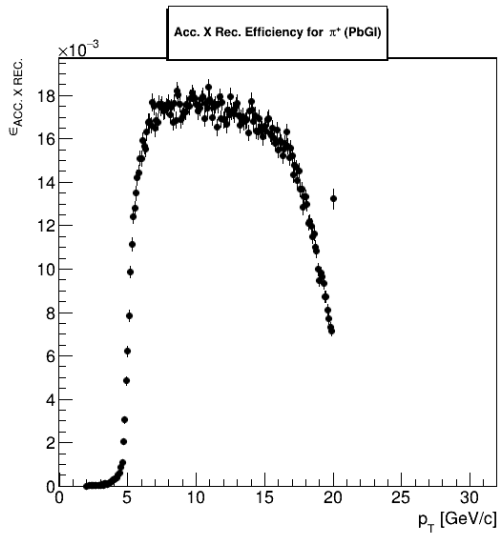

Reconstructed p_T w/o RICH n1 for π^+ (PbSc)
h1_pt_no_n1_c1sg0
Entries 1239195
Mean 10.56
RMS 5.366
p_T [GeV/c]

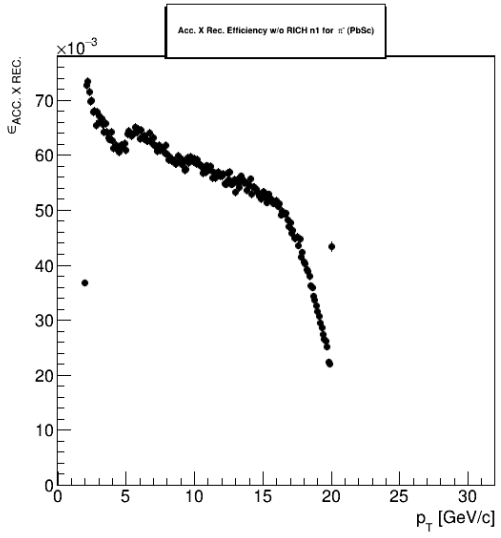

Reconstructed p_T w/o RICH n1 for π^+ (PbGl)
h1_pt_no_n1_c1sg1
Entries 386402
Mean 10.82
RMS 5.347
p_T [GeV/c]

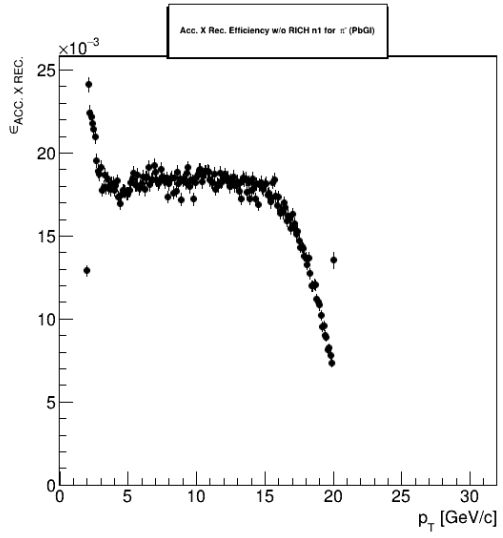

Acc. X Rec. Efficiency for π⁻ (PbSc)
×10⁻³
ε_ACC. X REC.
p_T [GeV/c]

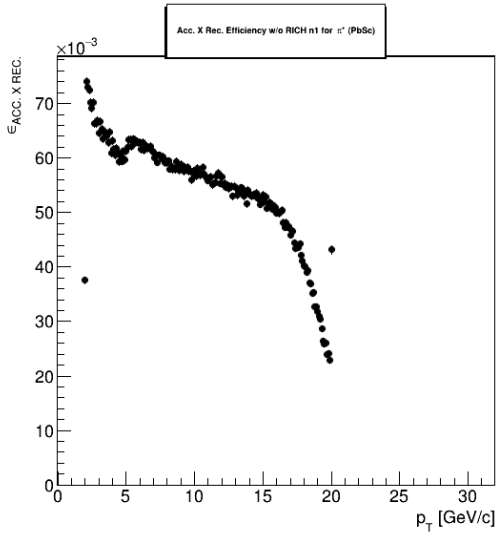

Acc. X Rec. Efficiency for π⁻ (PbGl)
×10⁻³
ε_ACC. X REC.
p_T [GeV/c]


Acc. X Rec. Efficiency for π⁺ (PbSc)
×10⁻³
ε_ACC. X REC.
p_T [GeV/c]


Acc. X Rec. Efficiency for π⁺ (PbGl)
×10⁻³
ε_ACC. X REC.
p_T [GeV/c]


Acc. X Rec. Efficiency w/o RICH n1 for π⁻ (PbSc)
×10⁻³
ε_ACC. X REC.
p_T [GeV/c]


Acc. X Rec. Efficiency w/o RICH n1 for π⁻ (PbGl)
×10⁻³
ε_ACC. X REC.
p_T [GeV/c]


Acc. X Rec. Efficiency w/o RICH n1 for π⁺ (PbSc)
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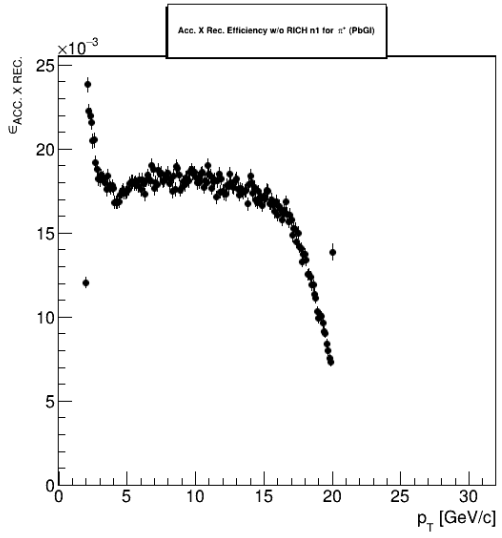
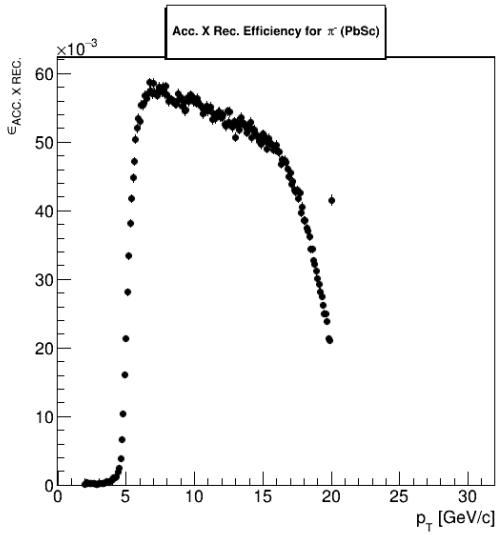
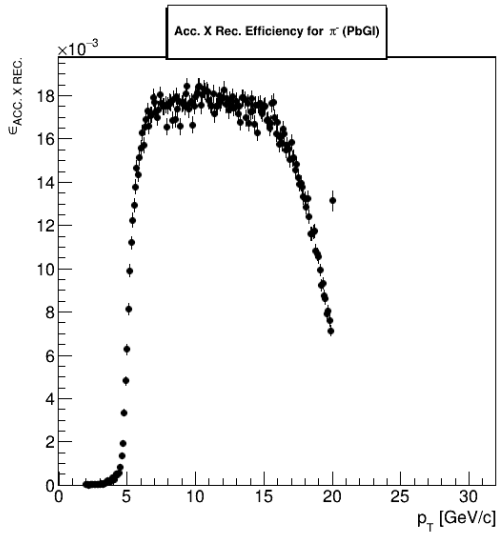
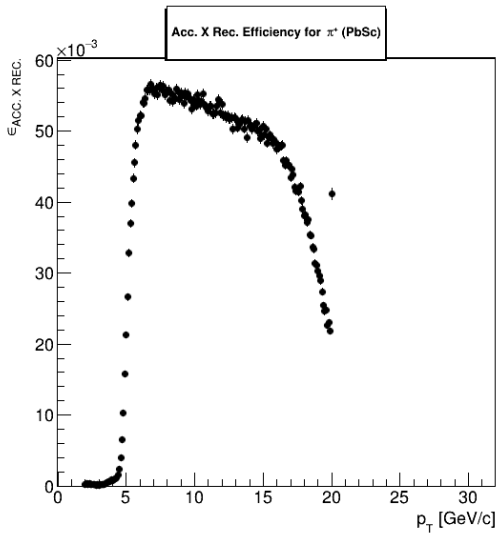
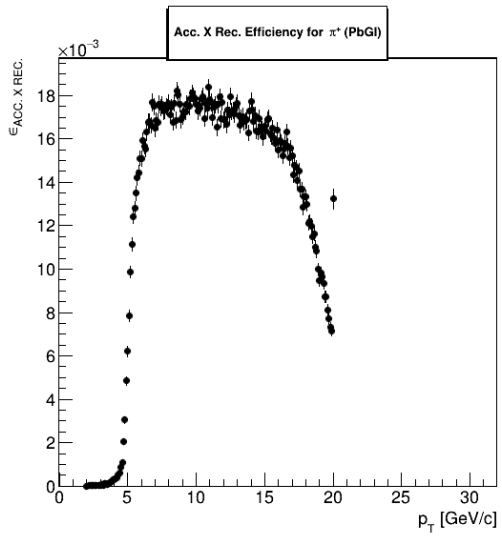

Acc. X Rec. Efficiency w/o RICH n1 for π⁺ (PbGl)
×10⁻³
ε_ACC. X REC.
p_T [GeV/c]



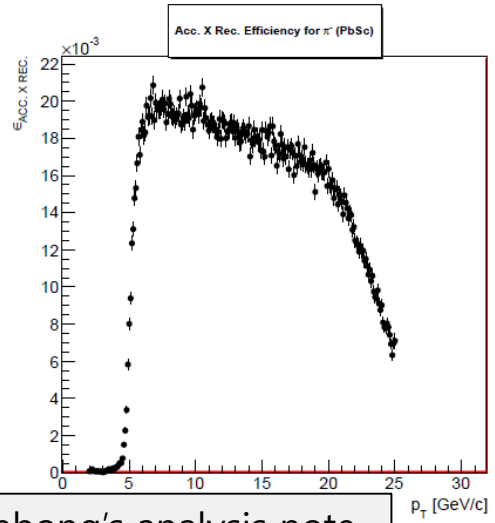


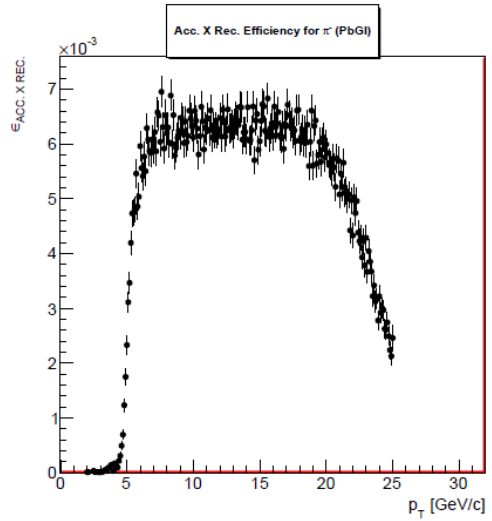
Run 15

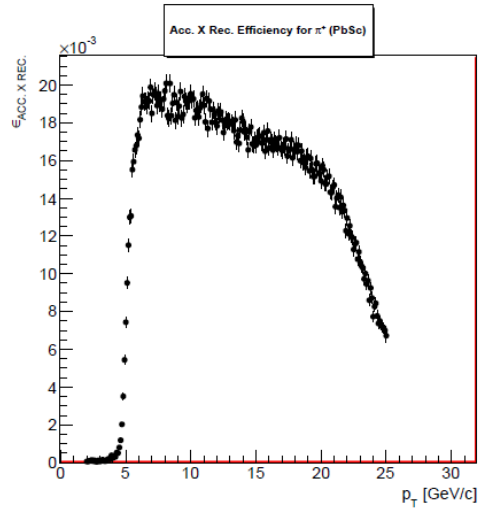


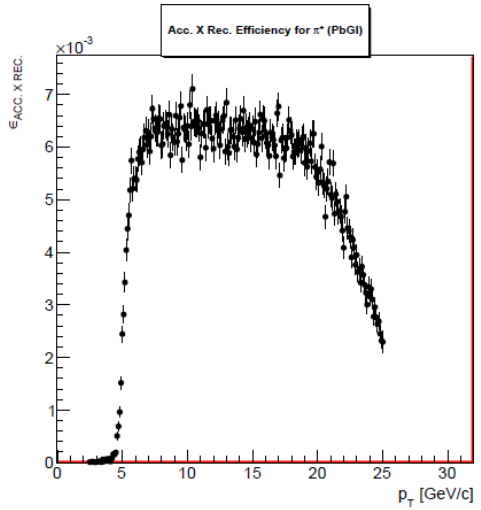


Run 13





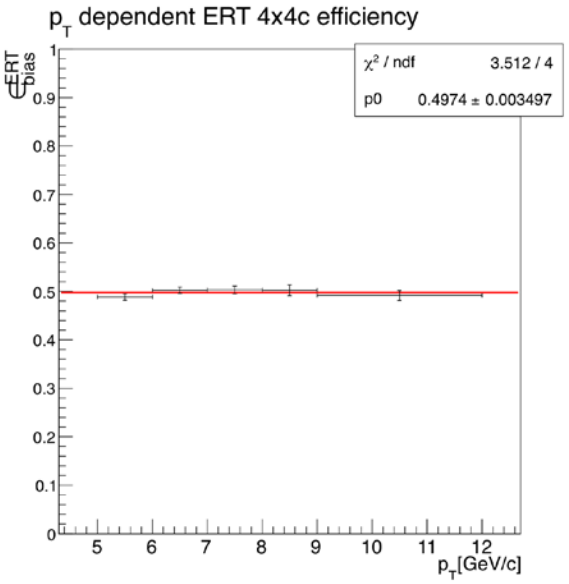




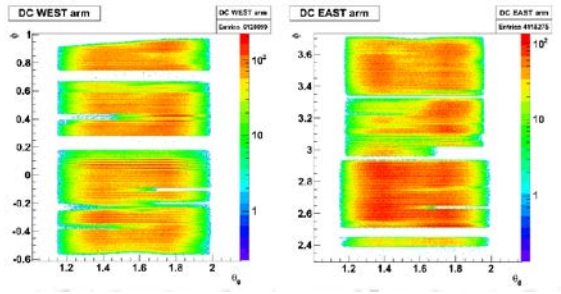
Taebong's analysis note

Progress & Next step

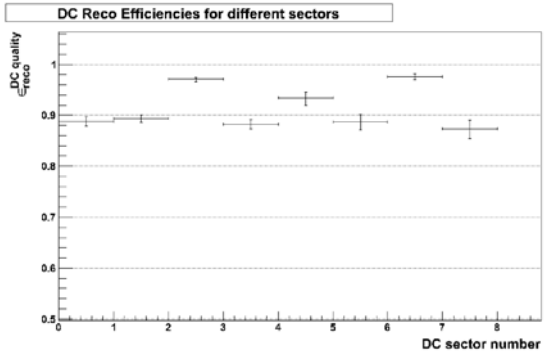
Geo.acc

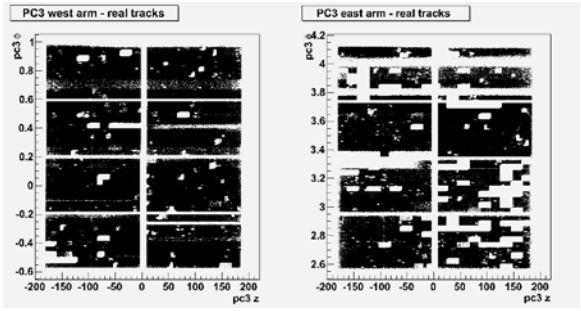


Trigger



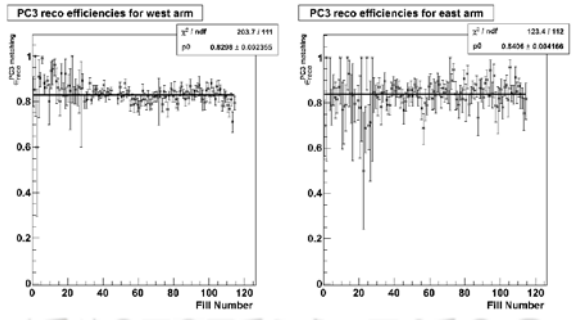
DC

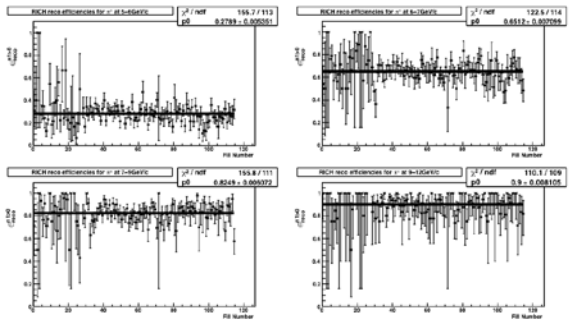




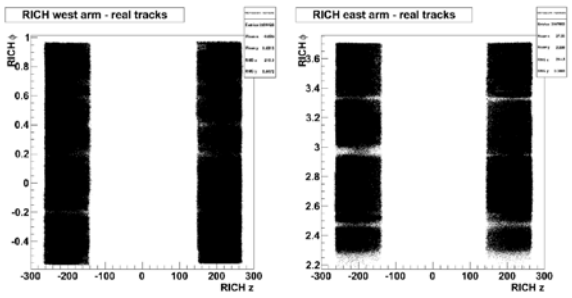
PC

Simulation





recon.eff



RICH

Sook Hyun's Thesis

Thank you.

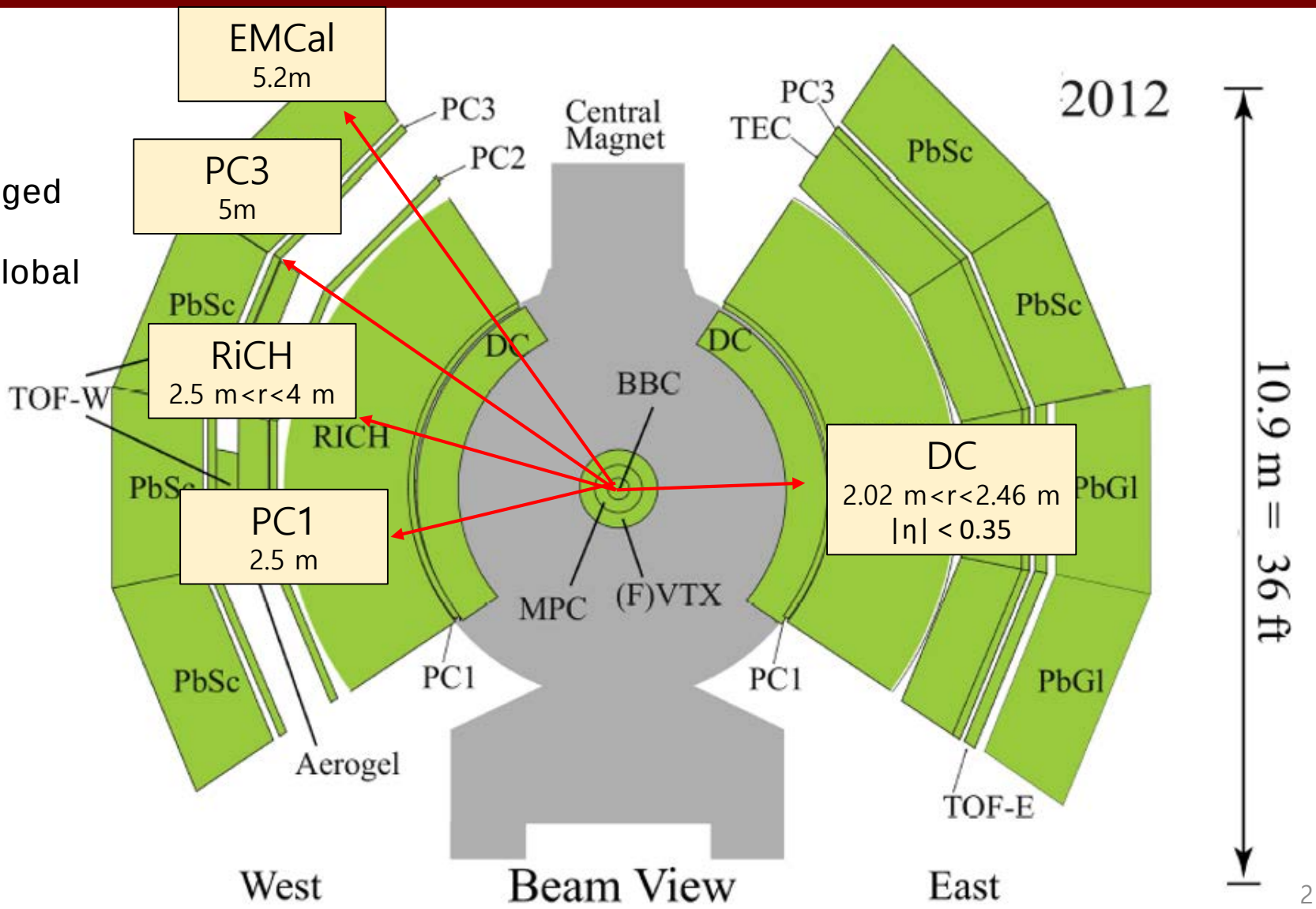
Back up

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

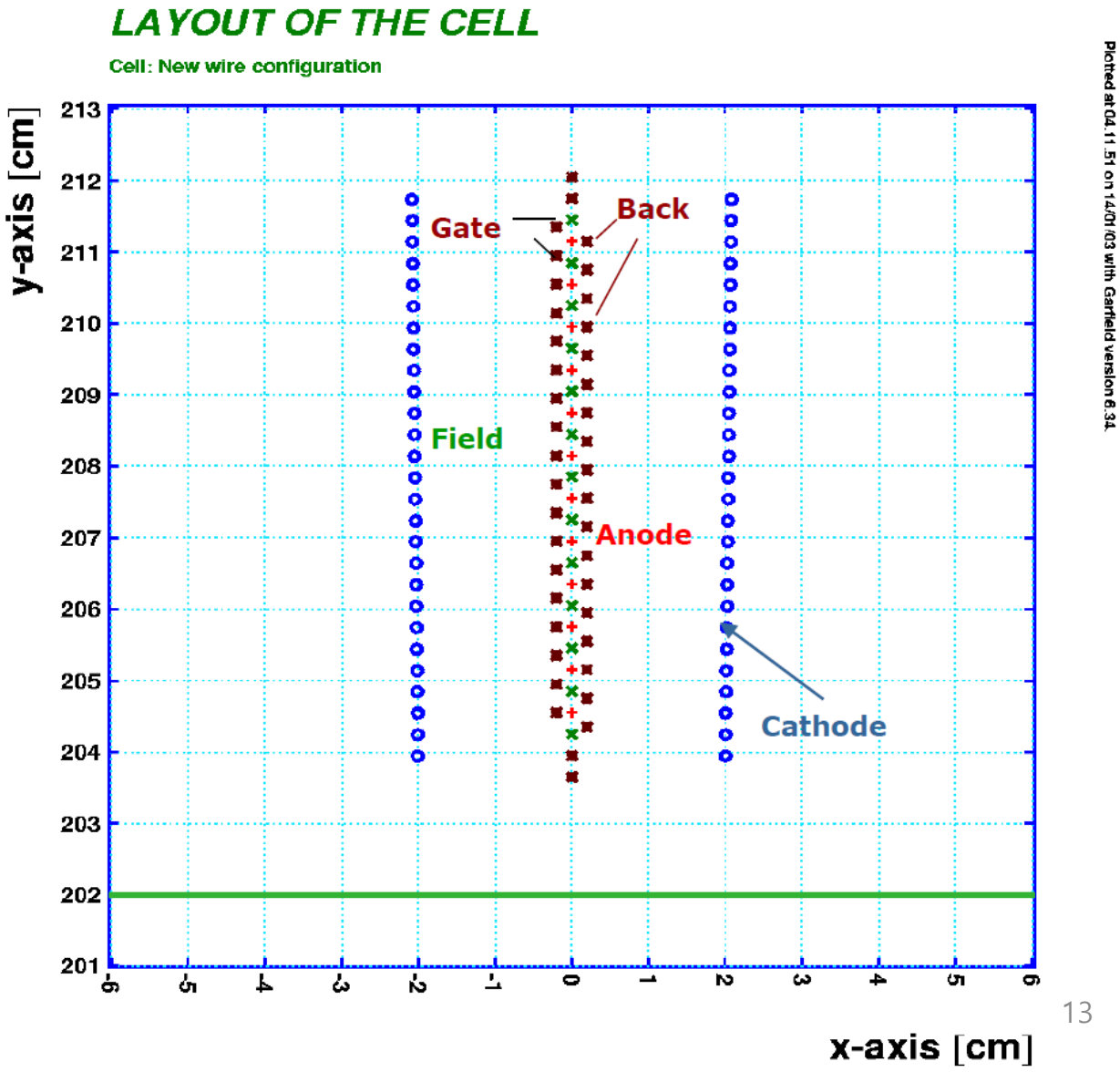
- Location:
  - Radial :2.02<R<2.48 m
  - Angular:
    - West: $-34° < \phi < 56°$
    - East : $125° < \phi < 215°$



Drift field configuration

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

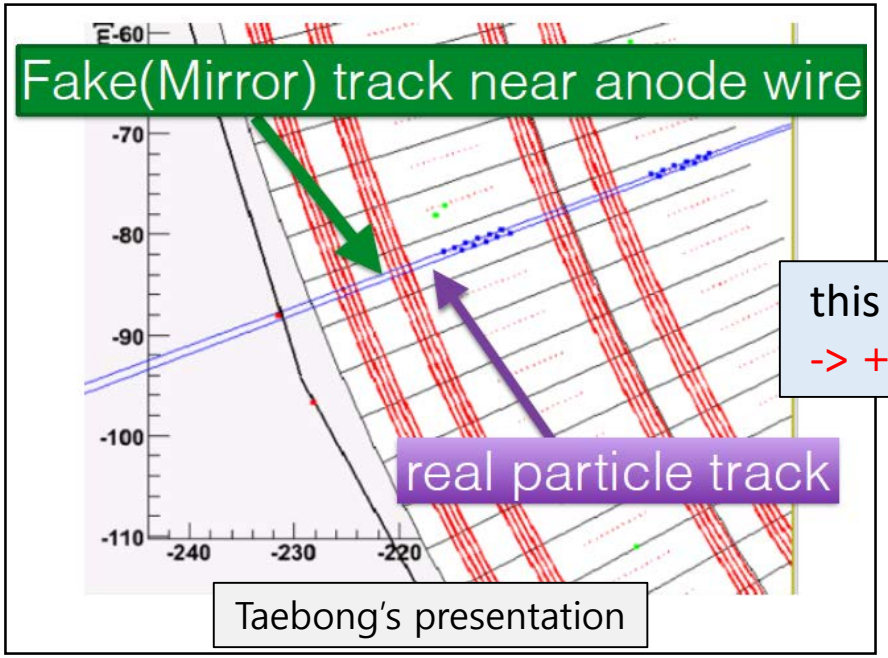
- **Cathode Wires** – Create uniform drift field between anode and cathode
- **Field Wires** – Create high electric field strength near the anode wire
- **Back Wires** – Stop drift from one side of the anode wire
- **Gate Wires** – Also create high field near the anode wire, Localize the drift region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



Drift Field Configuration

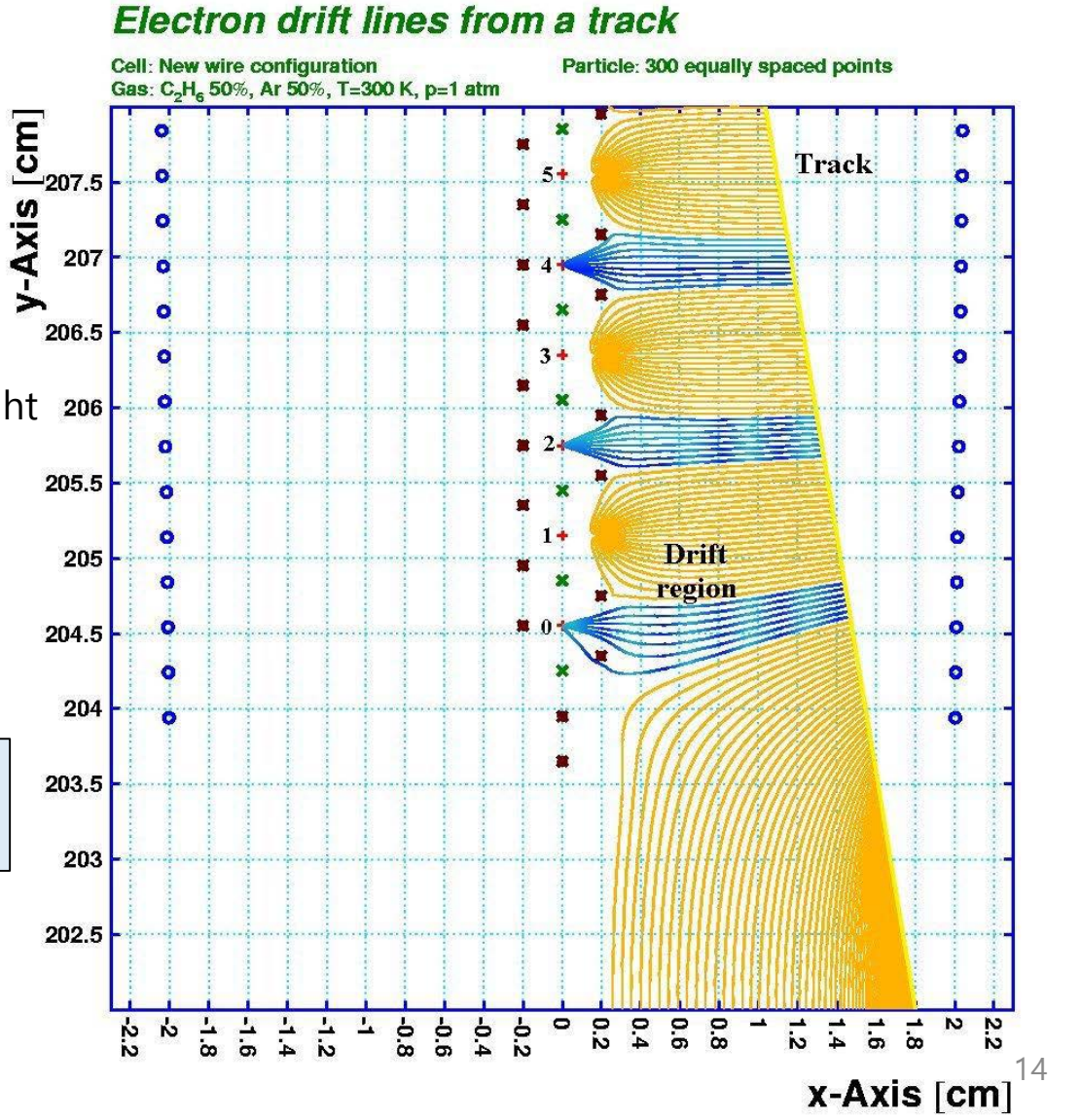
- Here is what happens when the charged particle passes through the wire cell
- Note that only even wires collect charge due to the **back wires** that block the odd anode wires !
- Back wires solves left-right ambiguity problem

-> 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.

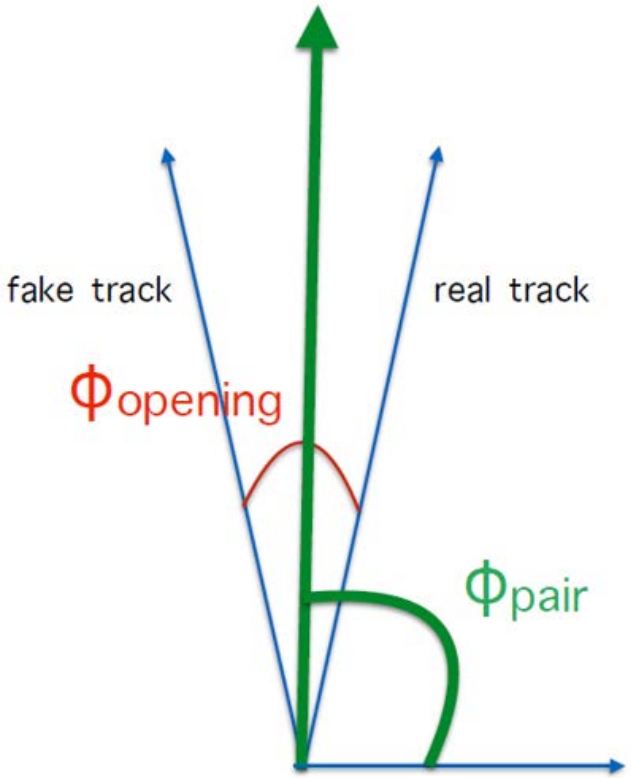
-> we can know anode wire position if drawing ϕ_{pair} distribution.

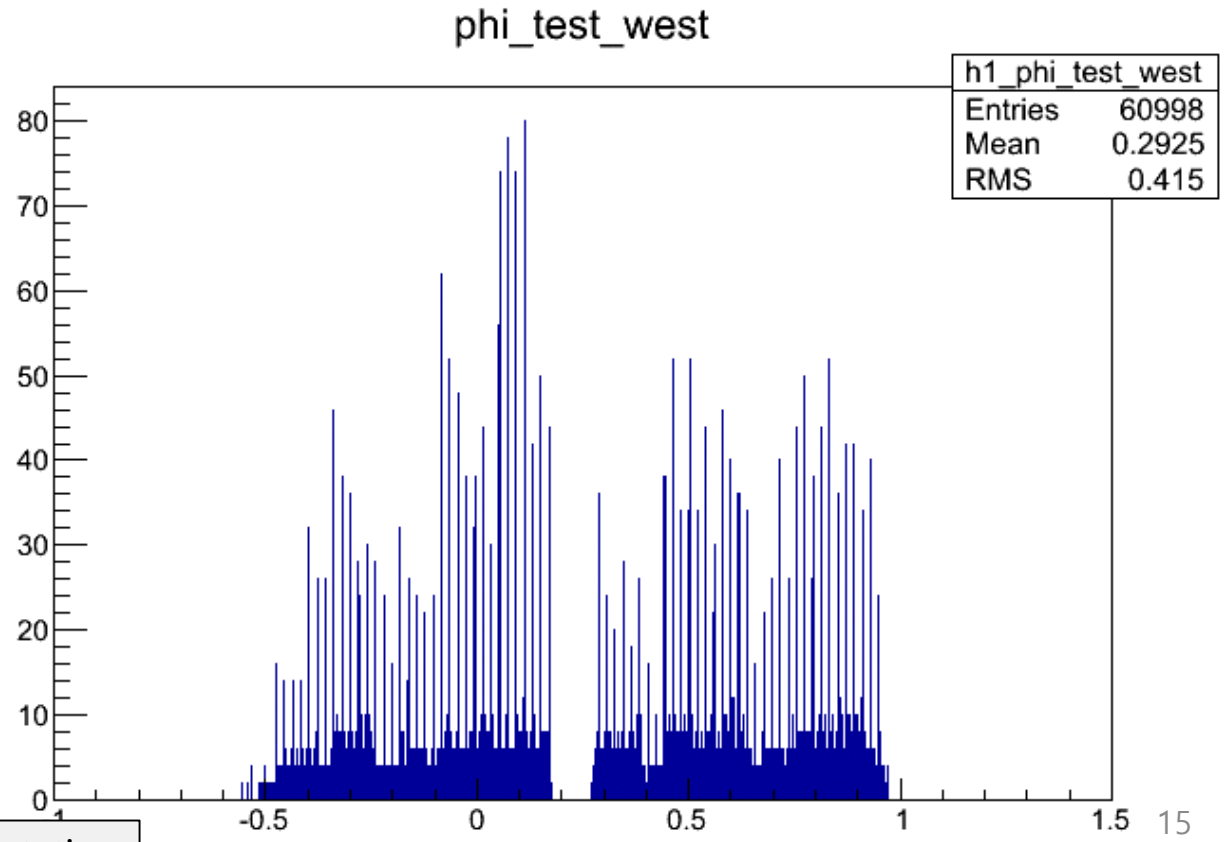
- Pair cuts

- 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