TRD-efficiency

determination of TRD-efficiencies using ESD from simulated data

Outline

- **motivation**
- **analysis**
- **geometry**
- **angular transformation**
- **results**
    - o P_T cut = 0 GeV
    - o P_T cut = 1 GeV
    - o P_T cut = 1 GeV – 4 supermoduls
- **TRD efficiency**
- **compendium**
- **open questions**

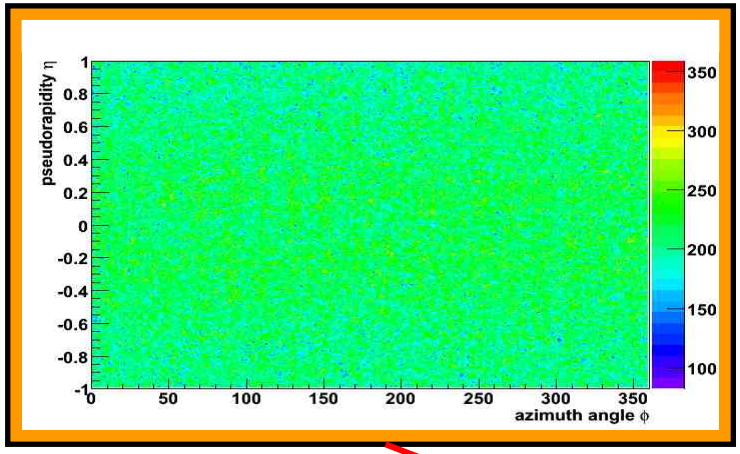
Motivaion

Determination of the efficiency …

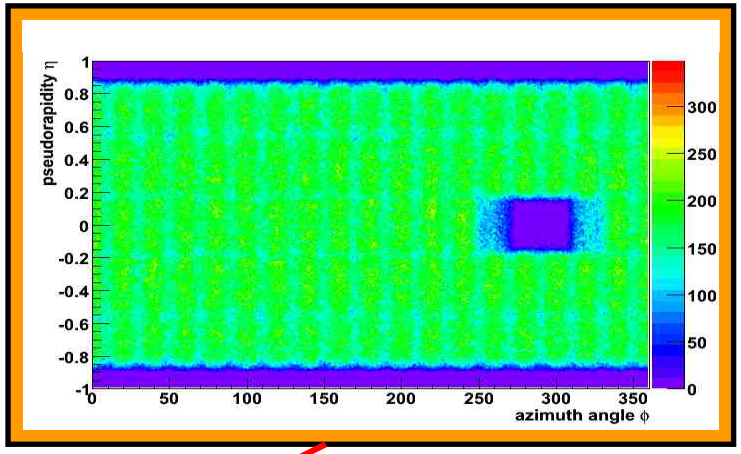
- **… of the TRD (transition radiation detector) for such regions of the detector, where the geometrical acceptance is maximized**
- **… of the TRD using the status bins TPCout and TRDrefit**
- **… differential in pseudorapidity and azimuth angle (η–ϕ–plane)**

Analysis

how to determine the efficiency

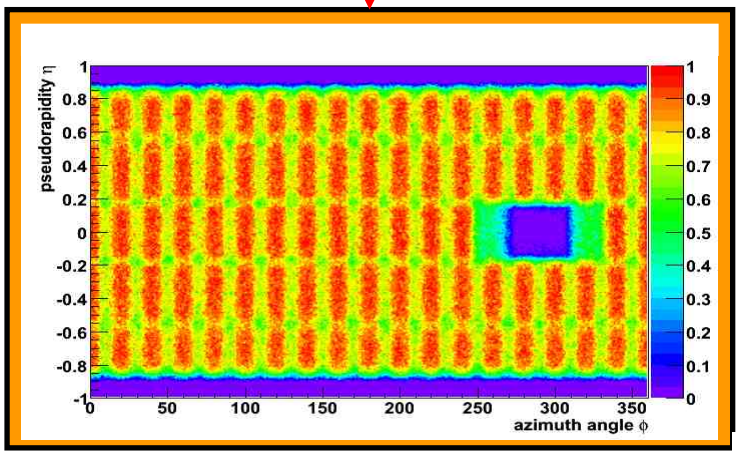


MergeHistoTPC



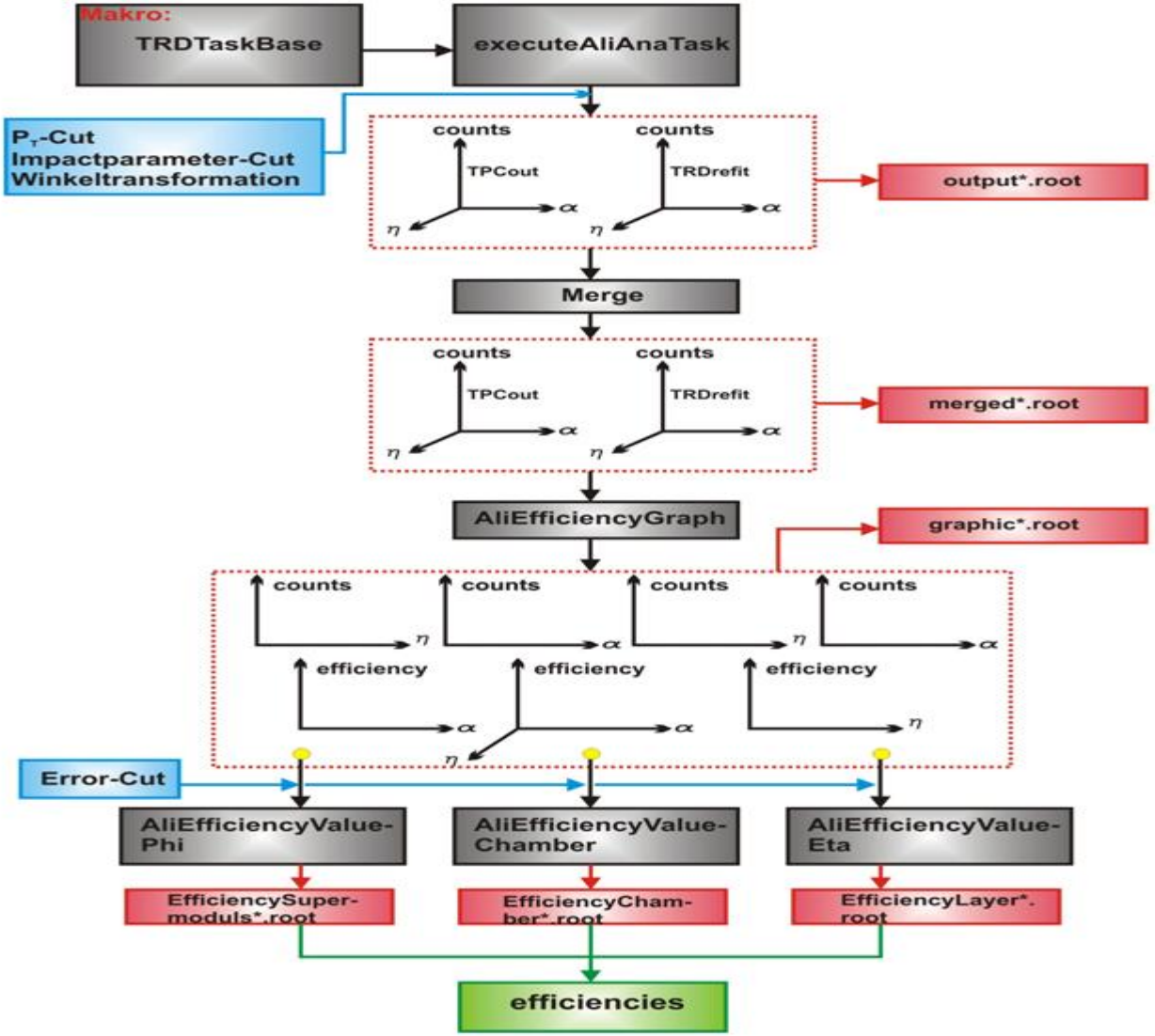
MergeHistoTRD

divide

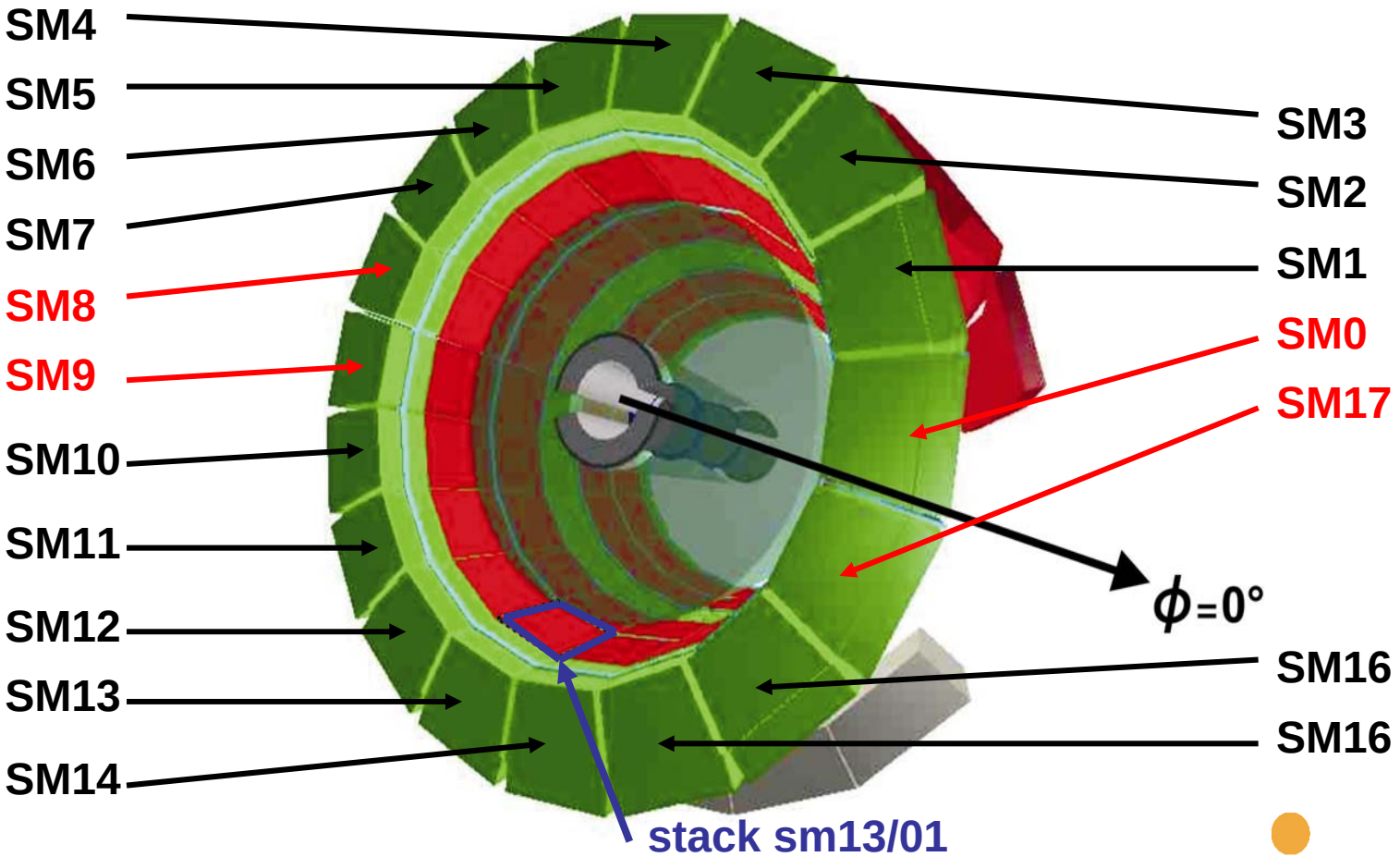


EfficencyTRD

Analysis

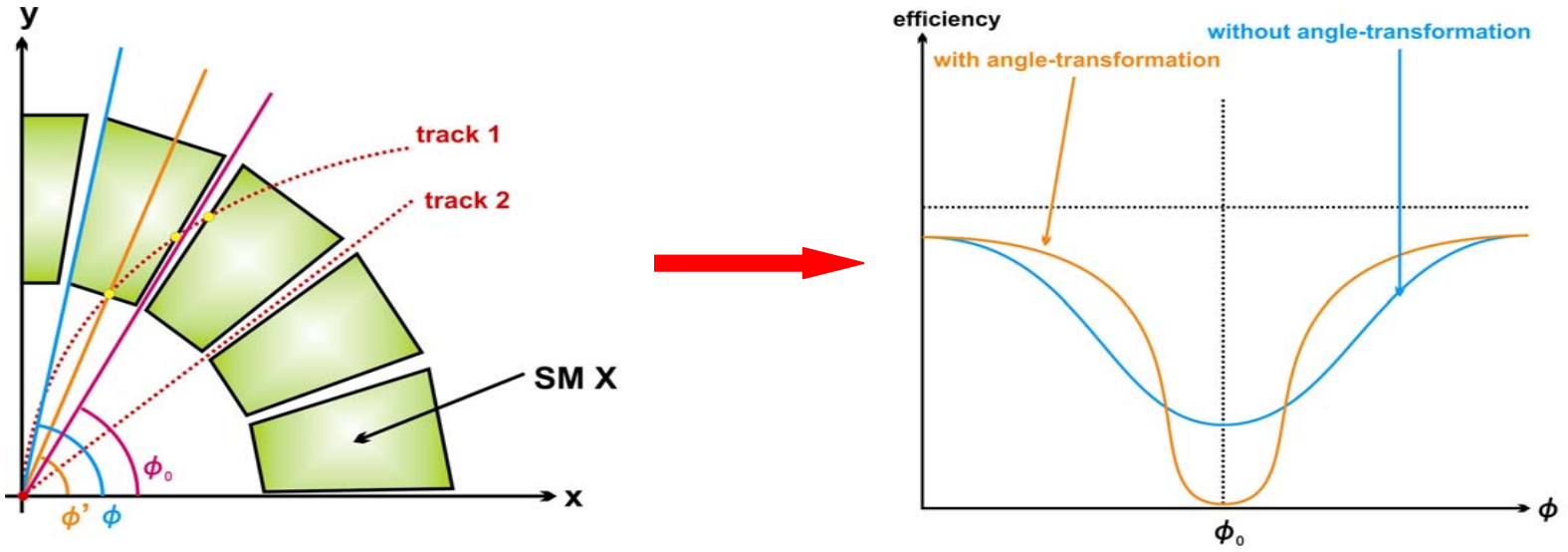

Makro:
TRDTaskBase
executeAliAnaTask
P_T-Cut
Impactparameter-Cut
Winkeltransformation
counts
TPCout
counts
TRDrefit
output*.root
Merge
merged*.root
AliEfficiencyGraph
graphic*.root
efficiency
Error-Cut
AliEfficiencyValue-Phi
AliEfficiencyValue-Chamber
AliEfficiencyValue-Eta
EfficiencySuper-moduls*.root
EfficiencyCham-ber*.root
EfficiencyLayer*.root
efficiencies

Geometry


SM4
SM5
SM6
SM7
SM8
SM9
SM10
SM11
SM12
SM13
SM14
SM3
SM2
SM1
SM0
SM17
ϕ=0°
SM16
SM16
stack sm13/01

Angular transformation

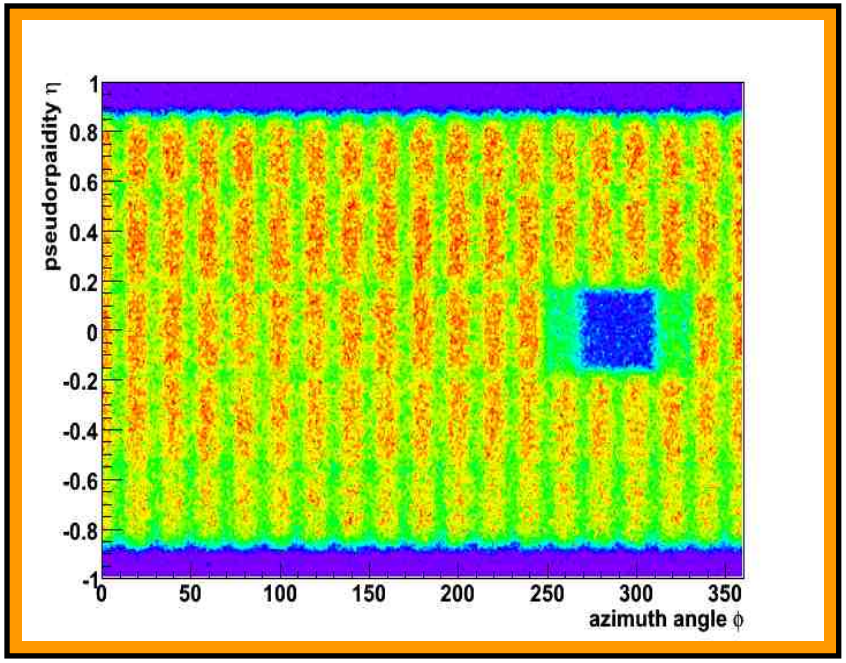
motivation for the angular transformation



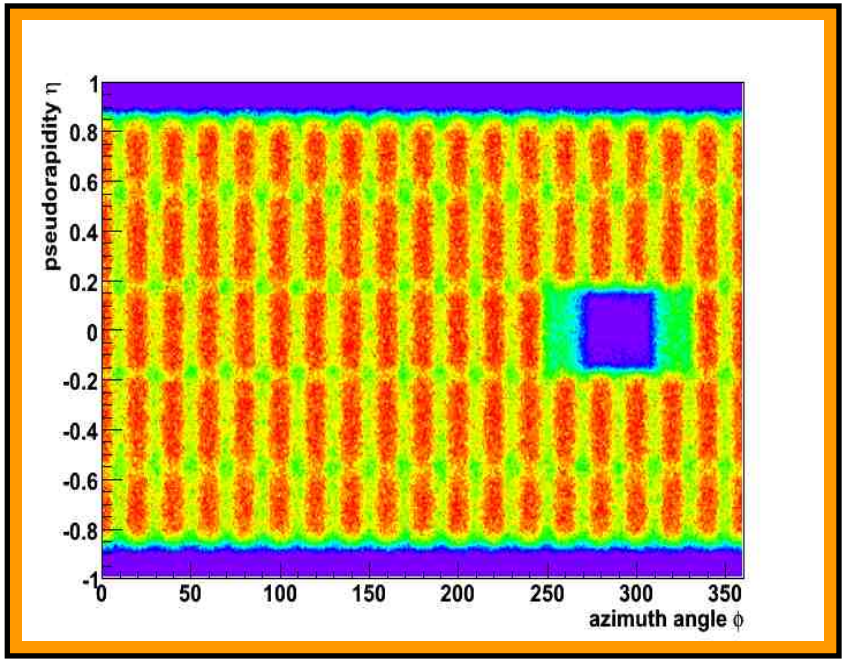
→ **To get a better resolution, we use …**

1. **high P_T-cut**
2. **angular transformation**

Angular transformation



without angular transformation

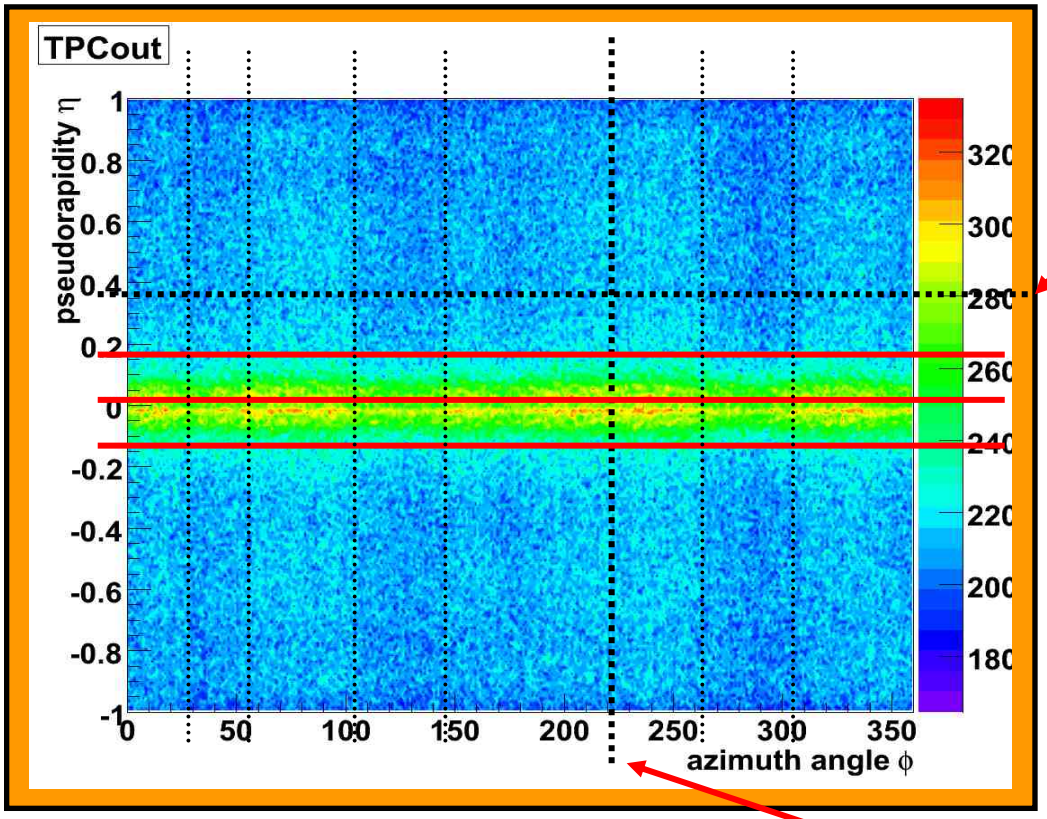


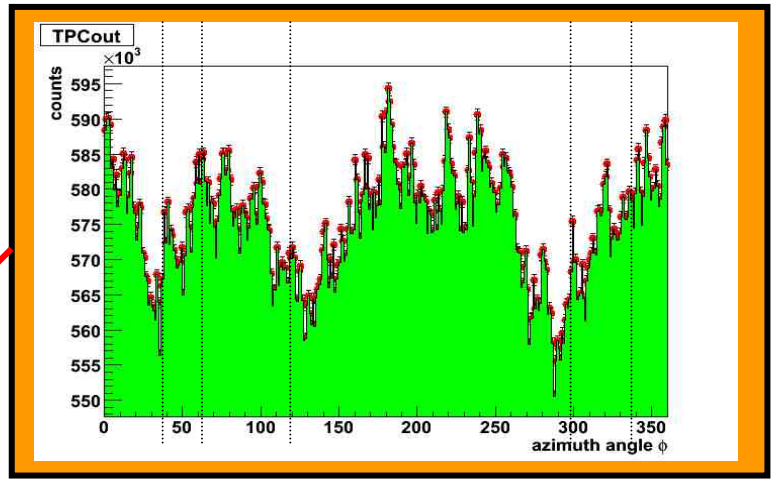
with angular transformation

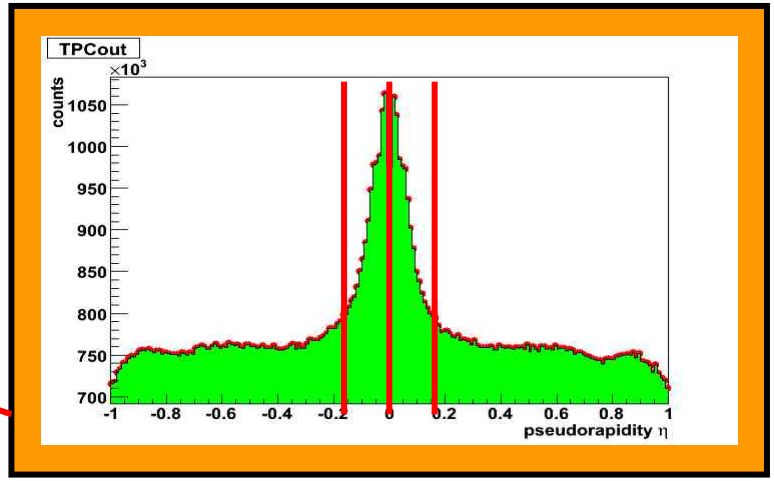
the effect of the P_T cut you can imaging on the next slices

P_T-cut = 0 GeV

status bin – TPCout



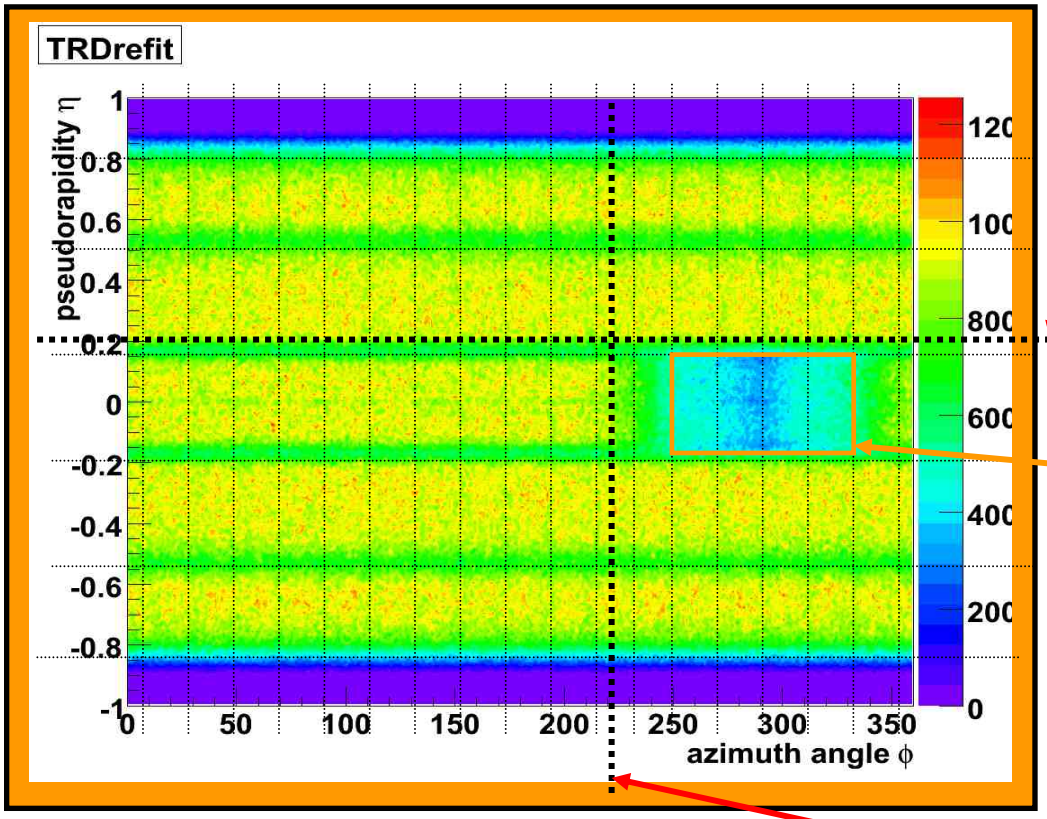


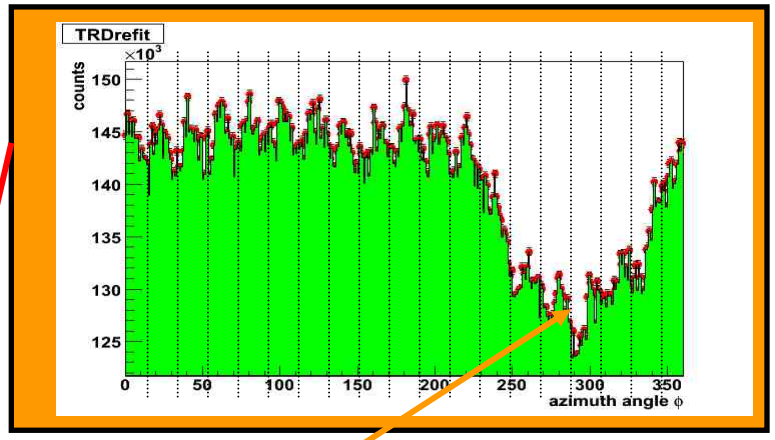


- some interesting structures not yet explained !!!
- distribution of the status bin TPCout peakes at midraipidty

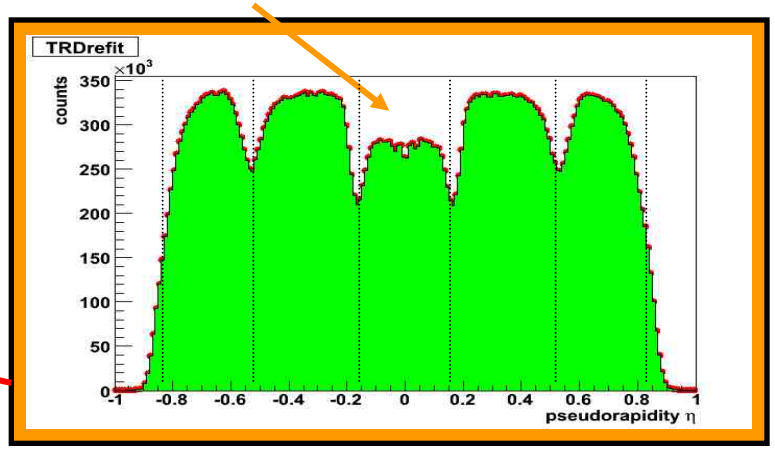
P_T-cut = 0 GeV

status bin – TRDrefit





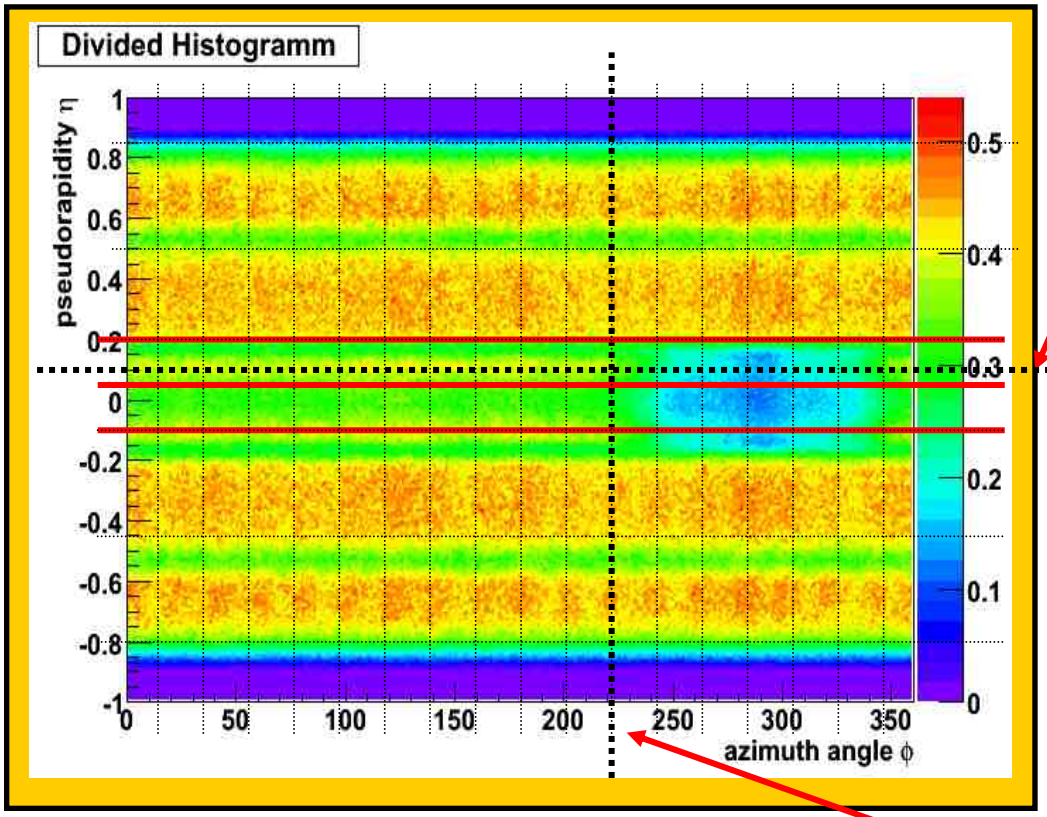
PHOS hole

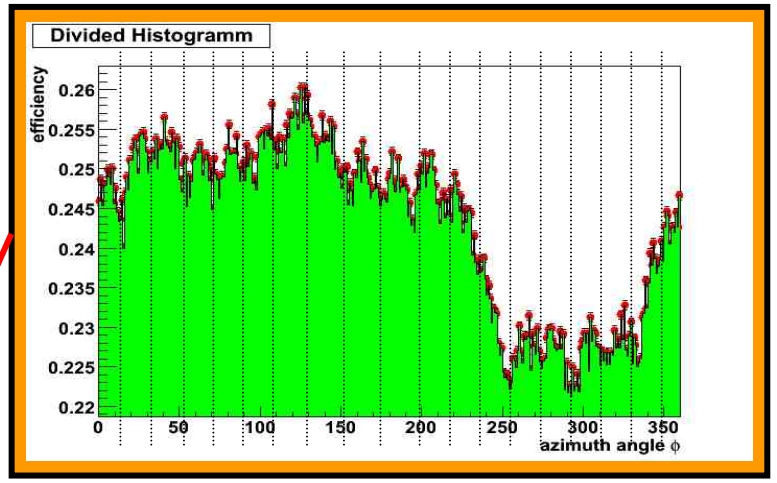


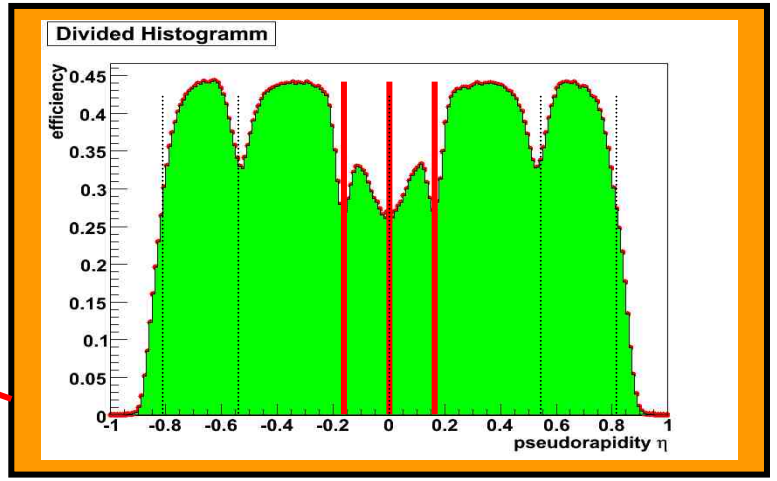
- one can imaging the five stacks (pseudorapidity) and the eighteen supermoduls (azimuth angle)
- the PHOS hole is clearly visible

P_T-cut = 0 GeV

divided histogram - efficiency

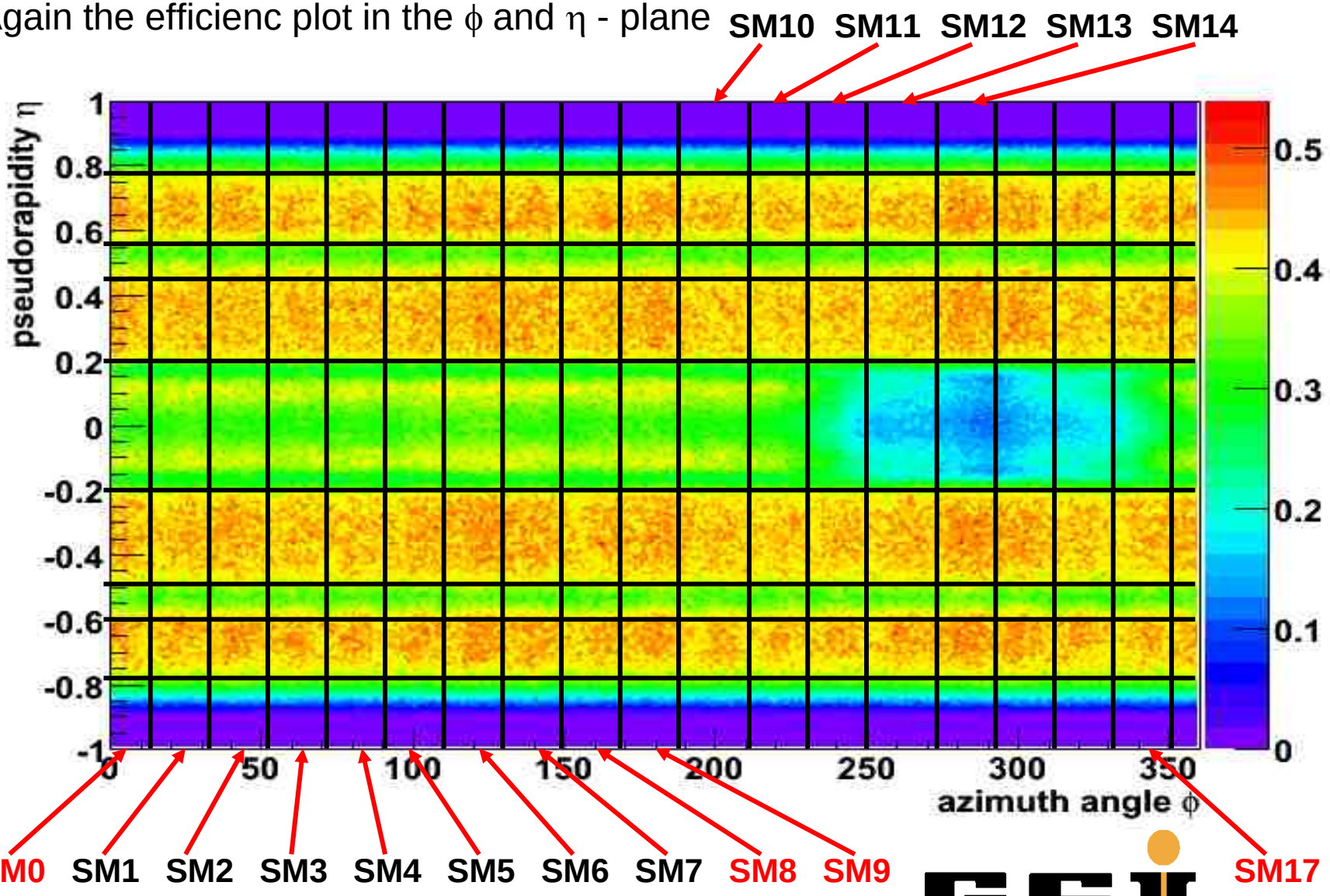






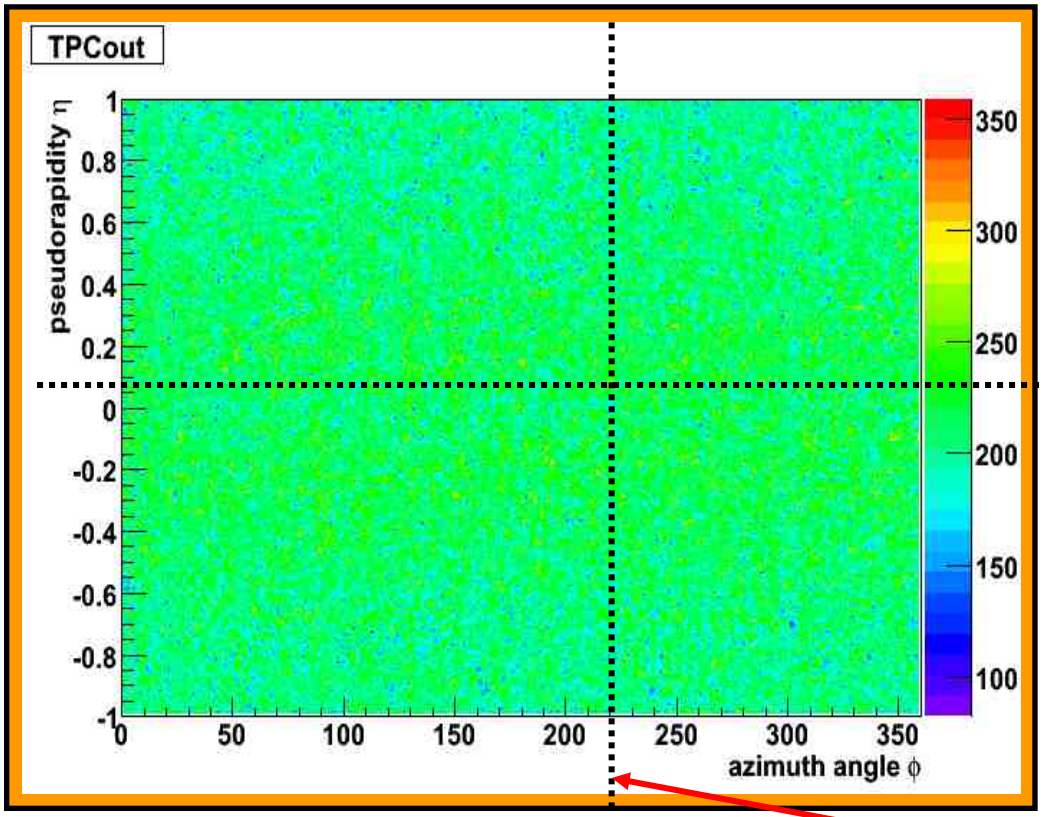
P_T-cut = 0 GeV

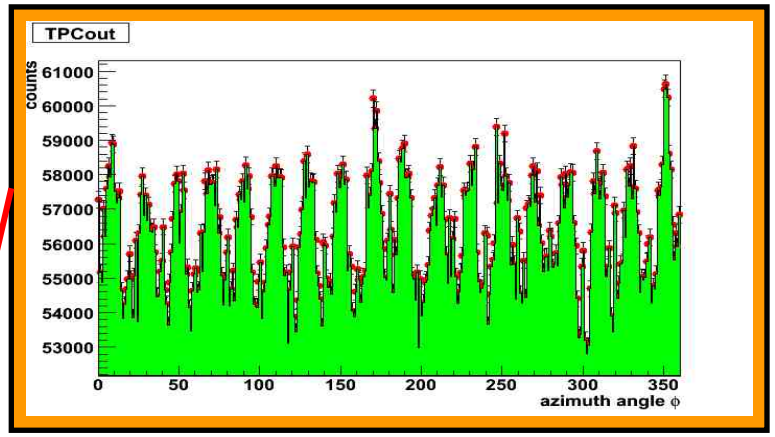
Again the efficienc plot in the ϕ and η - plane

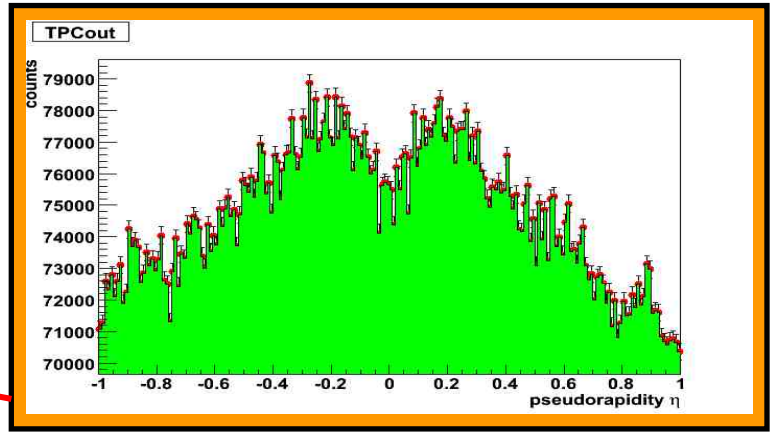


P_T-cut = 1 GeV

status bin – TPCout

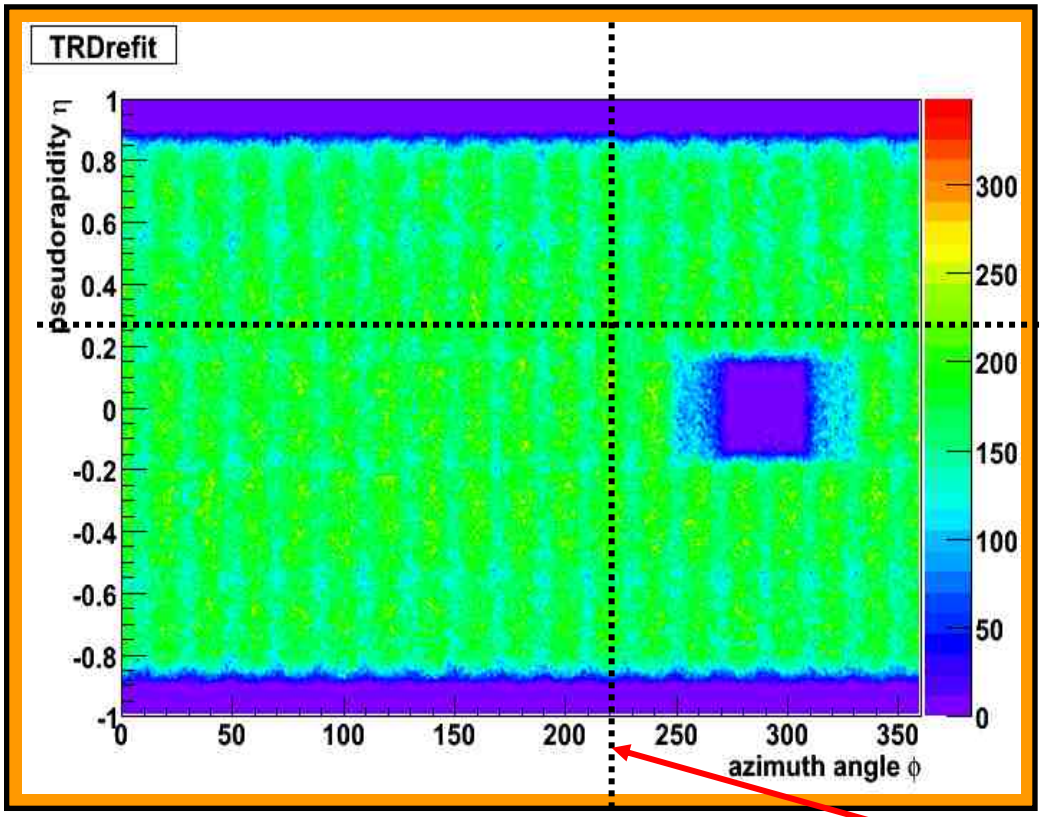


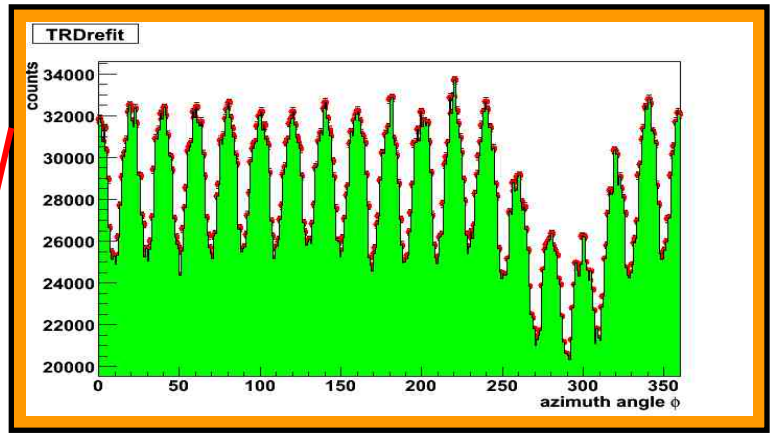


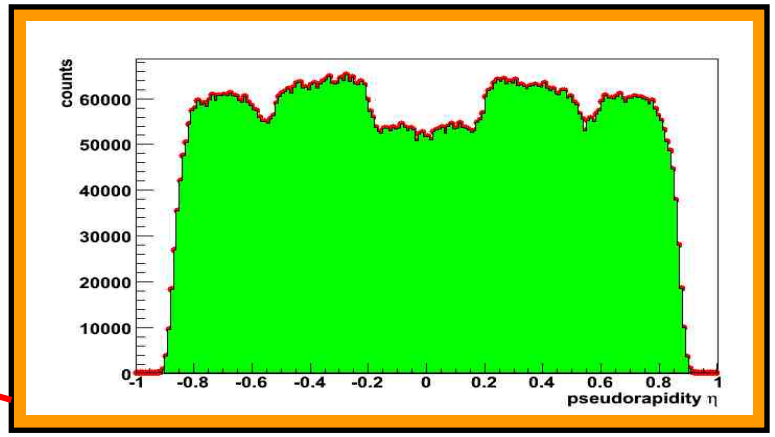


P_T-cut = 1 GeV

status bin – TRDrefit

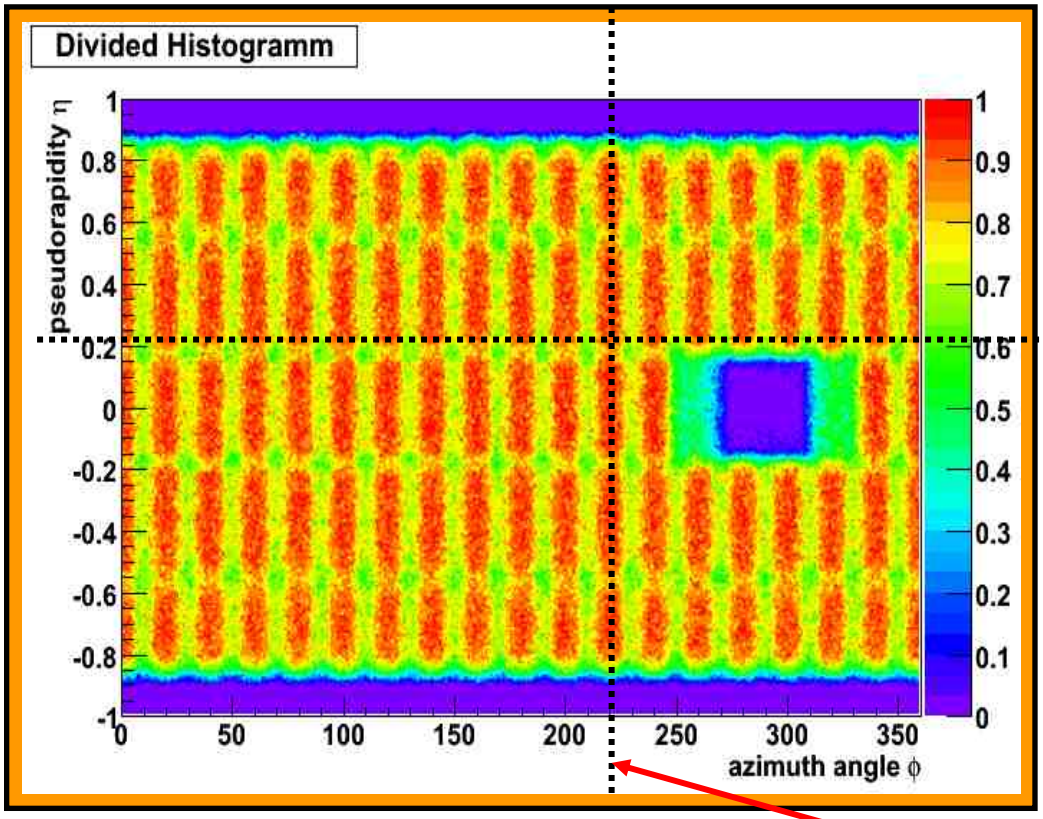


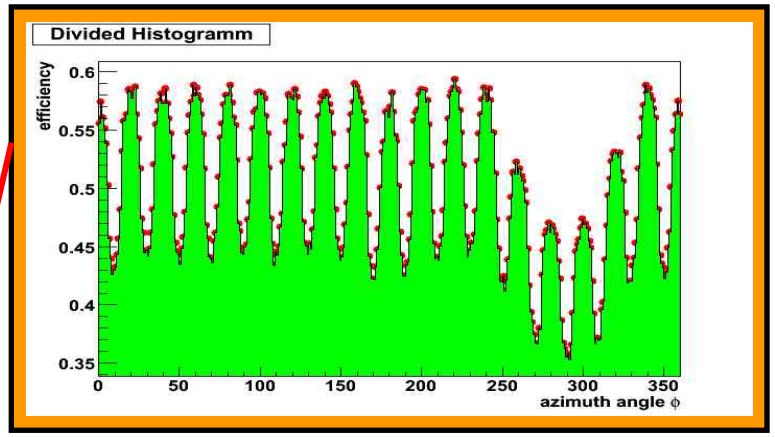


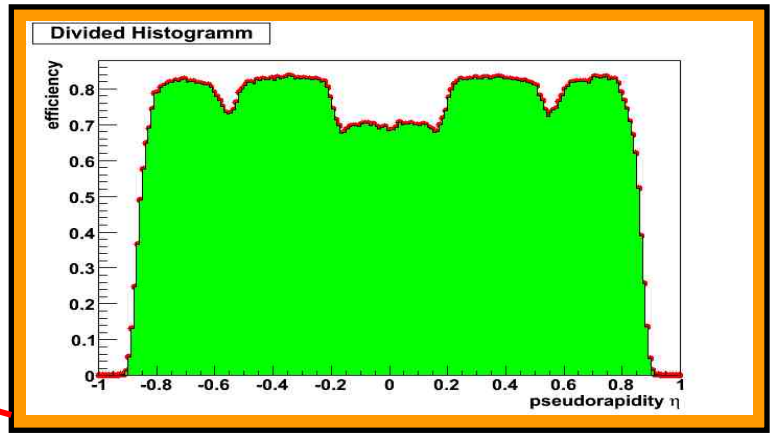


P_T-cut = 1 GeV

divided histogram - efficiency



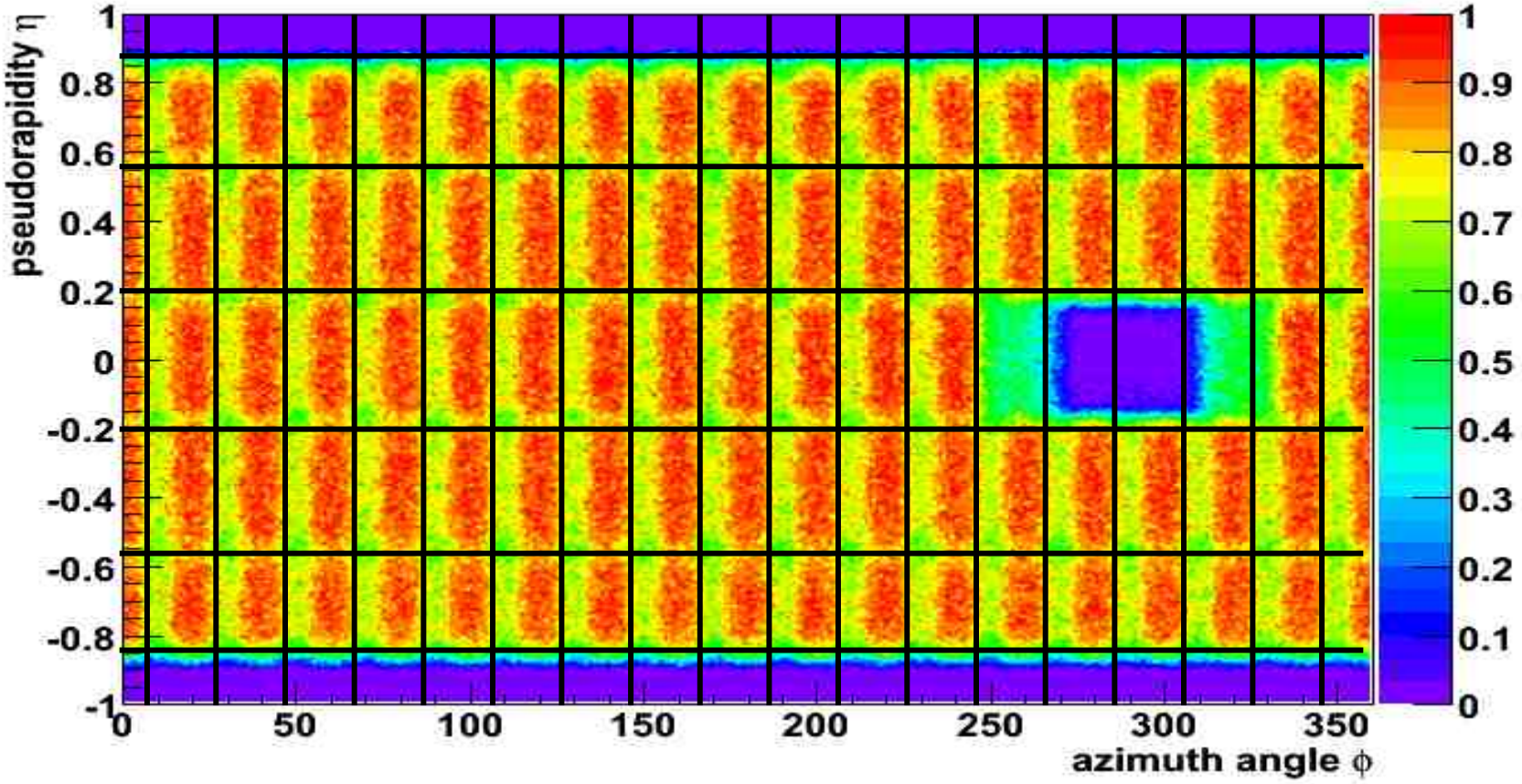




- the structure of the TRD is very good in sight
- 18 supermoduls
- 5 stacks

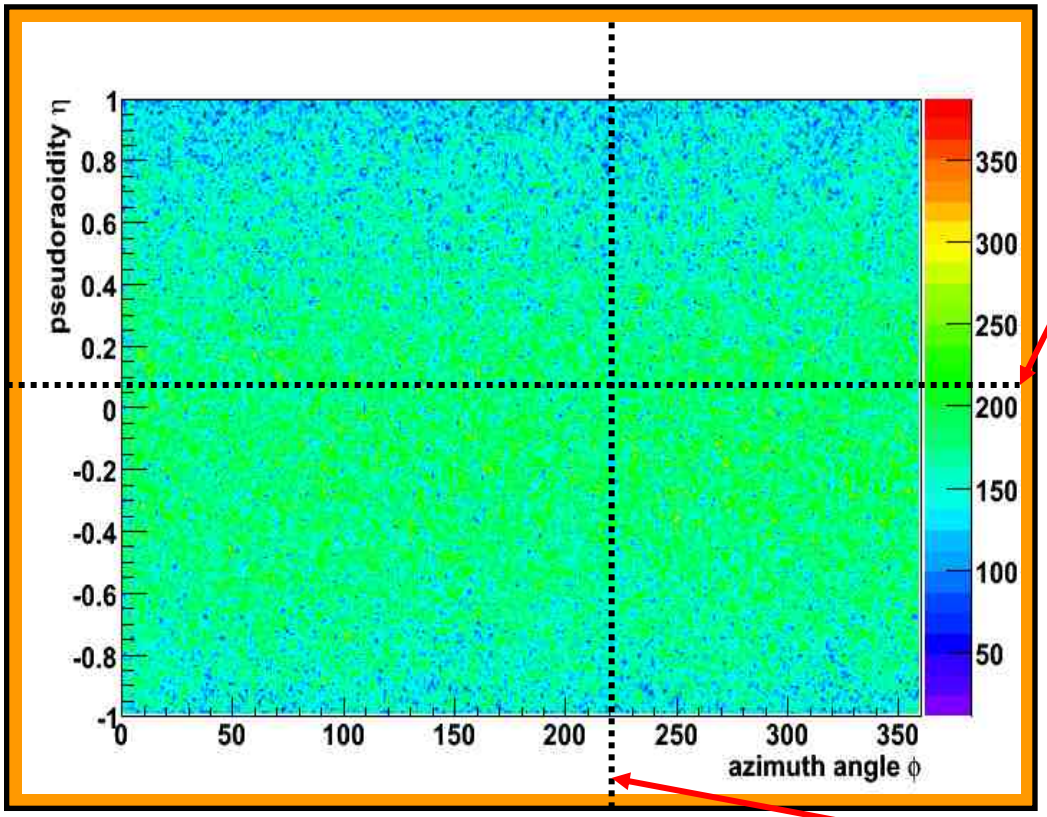
P_T-cut = 1 GeV

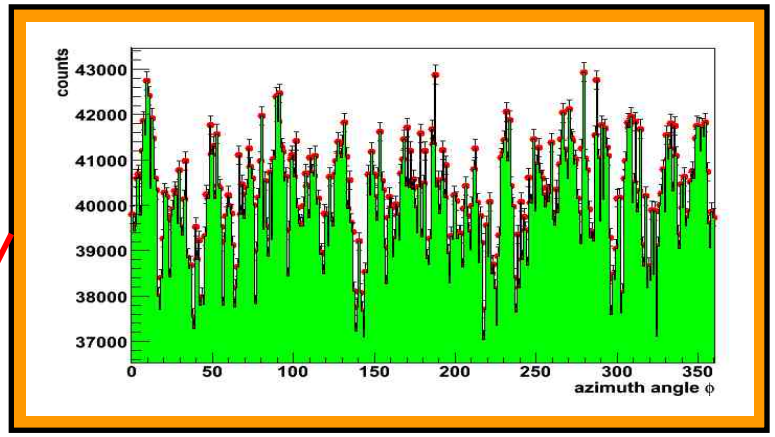
Again the efficienc plot in the ϕ and η - plane

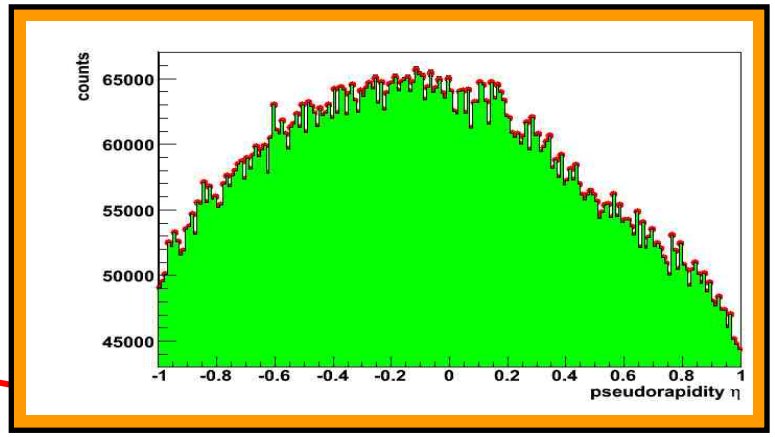


P_T-cut = 1 GeV – 4 supermoduls

status bin – TPCout

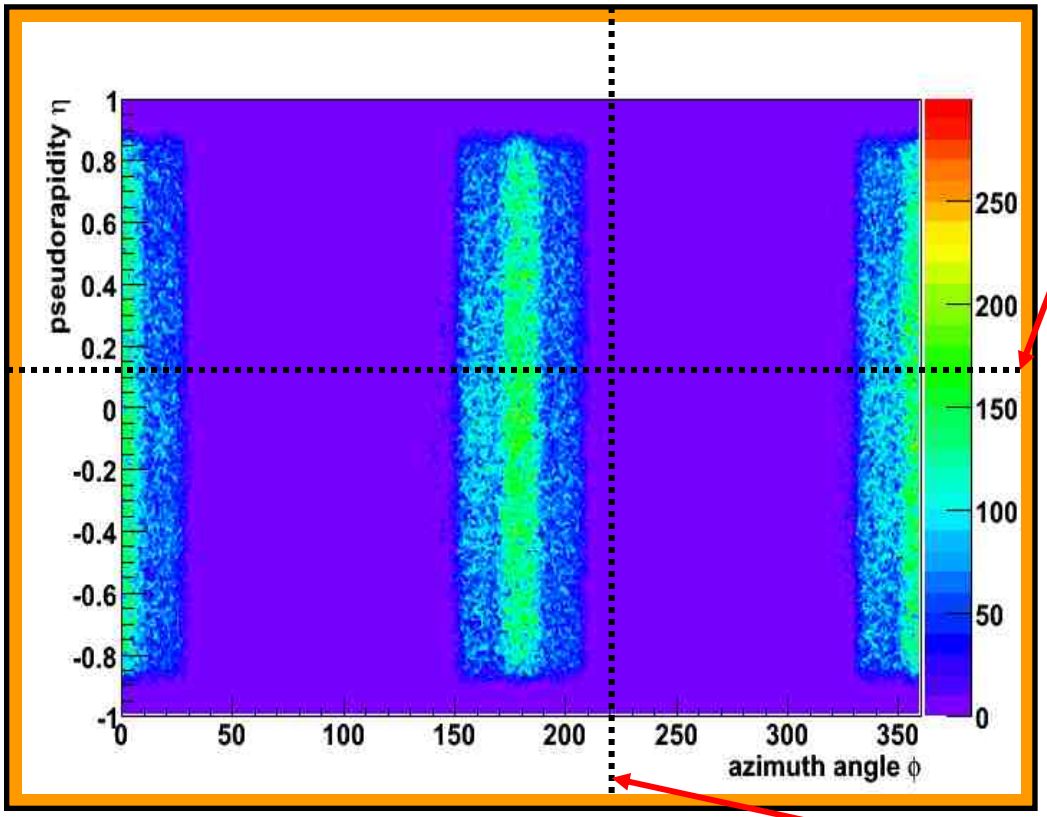


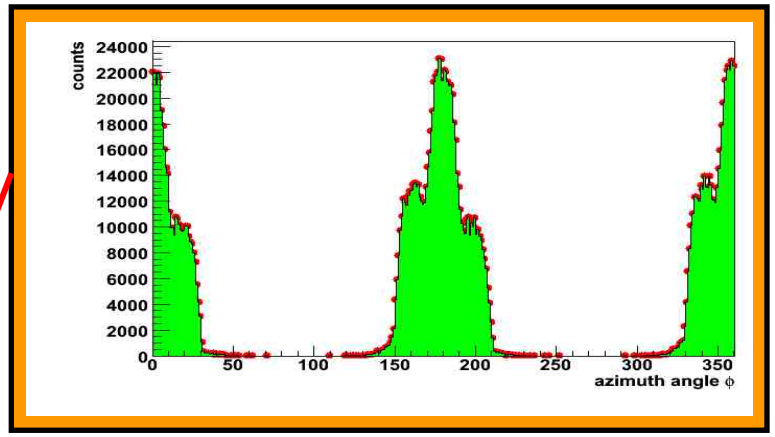


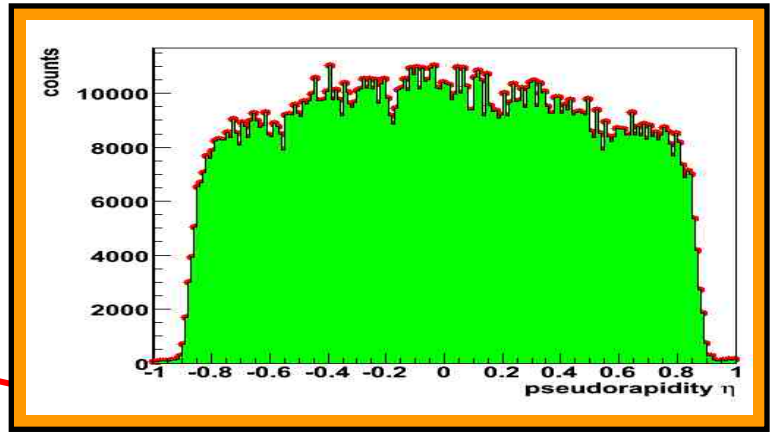


P_T-cut = 1 GeV – 4 supermoduls

status bin – TRDrefit

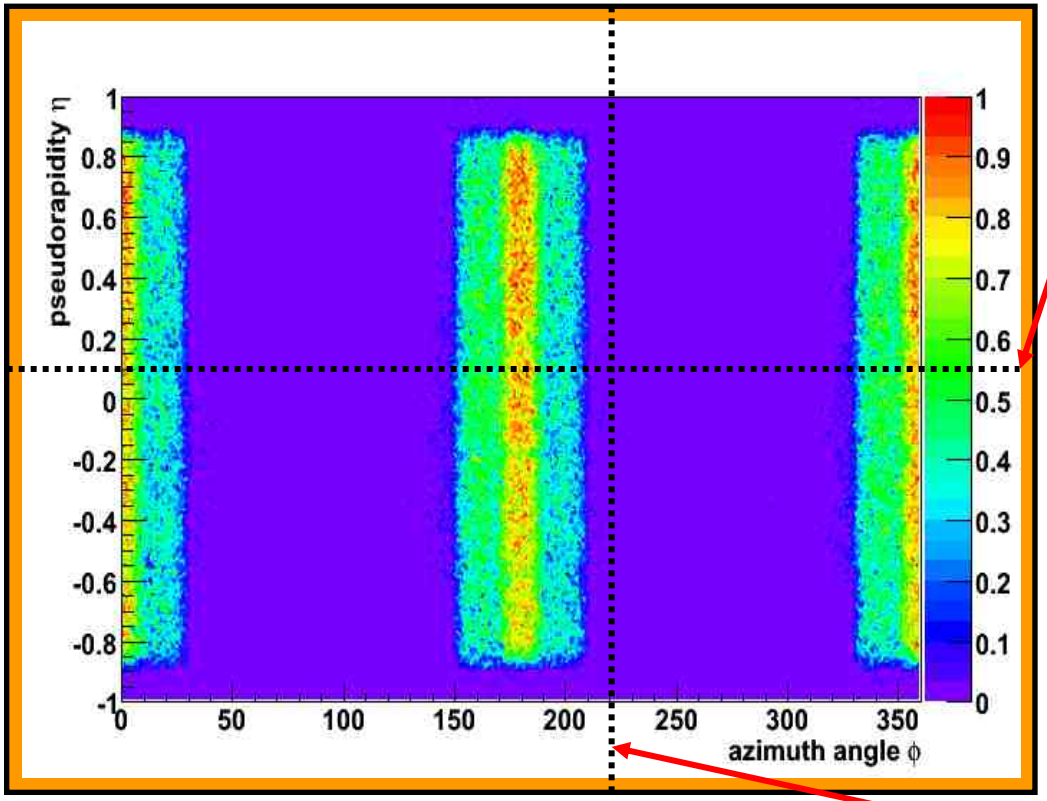


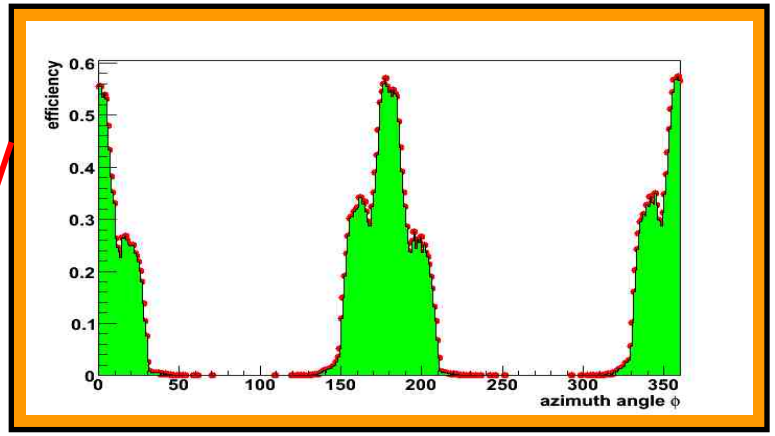


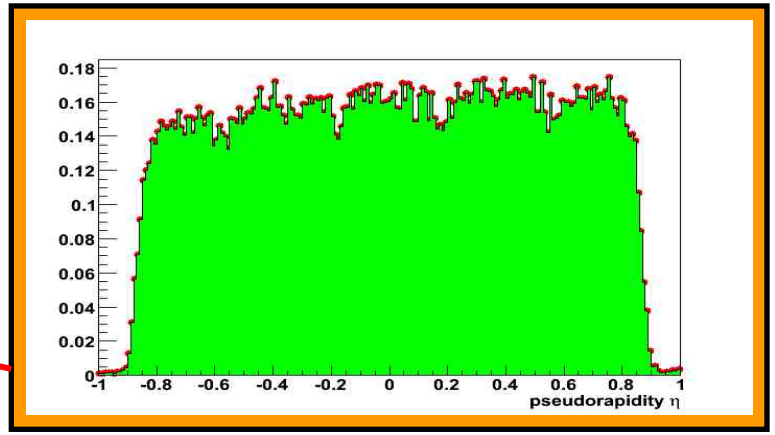


P_T-cut = 1 GeV – 4 supermoduls

divided histogram - efficiency





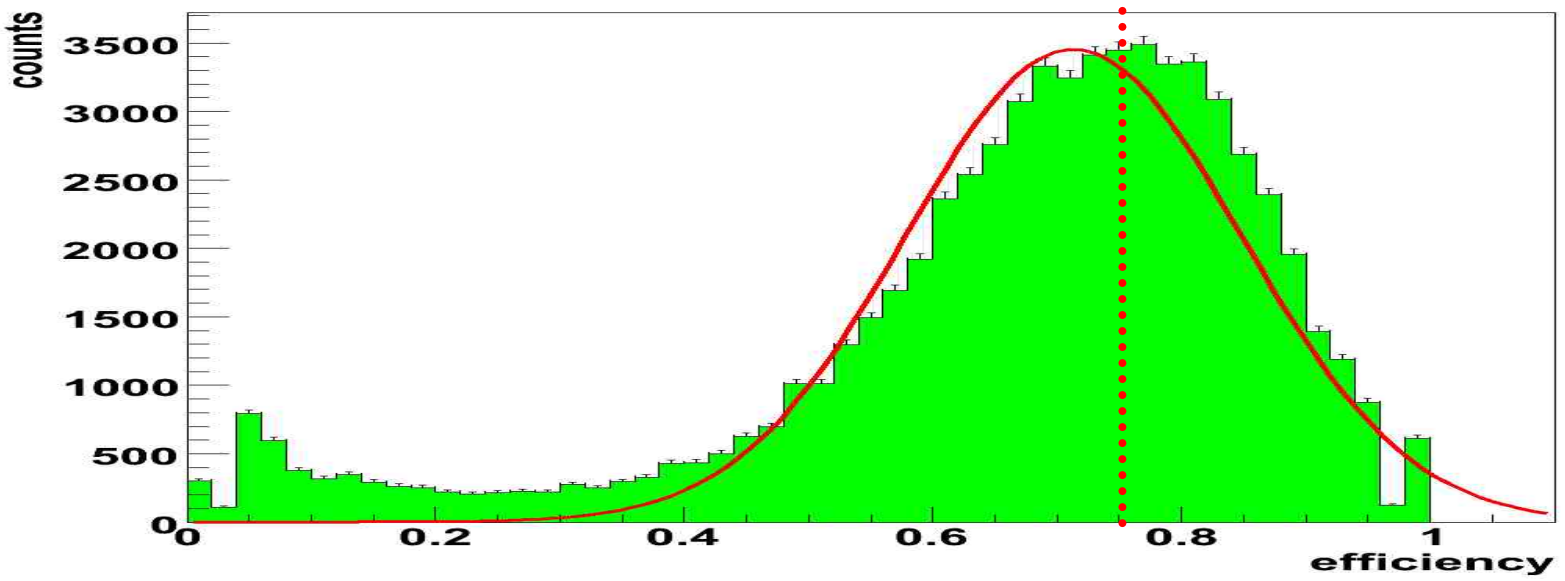


TRD efficiency

Method 1:

Creating a histogram containing the counts for every efficiency from 0 to 1 and fitting this curve with a gaussian (efficiency determination)

→ the mean value of the gaussian indicates the efficiency of the whole TRD

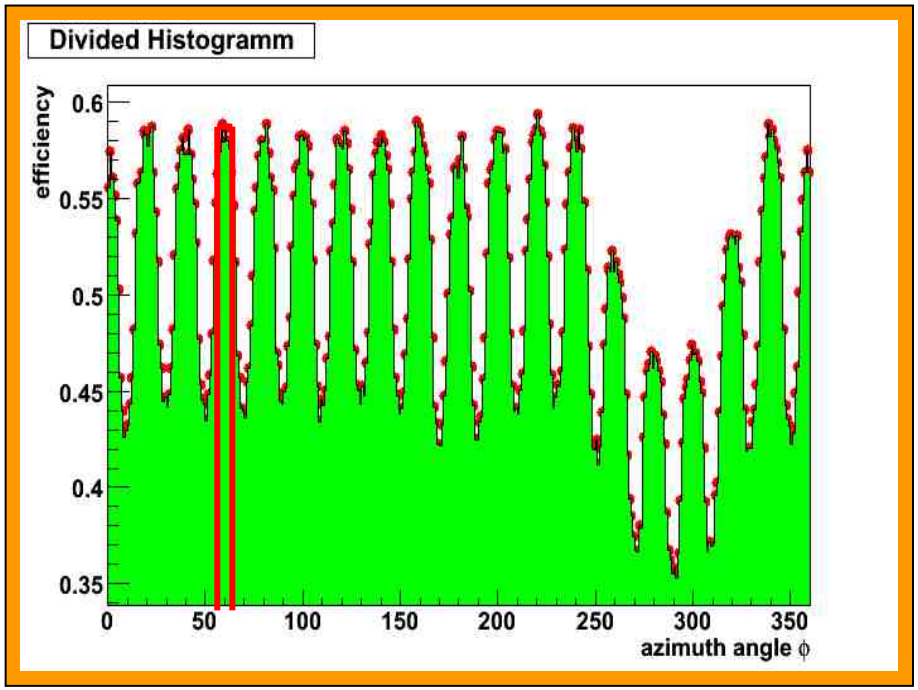


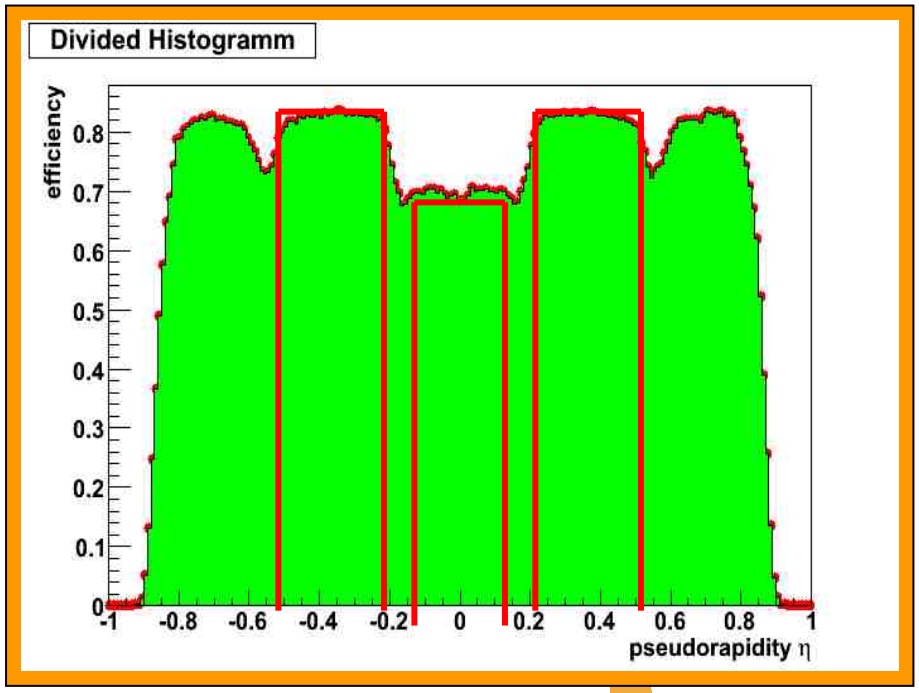
TRD efficiency

Method 2:

Binning of the stacks (dynamic binning) an determination of the efficiencies

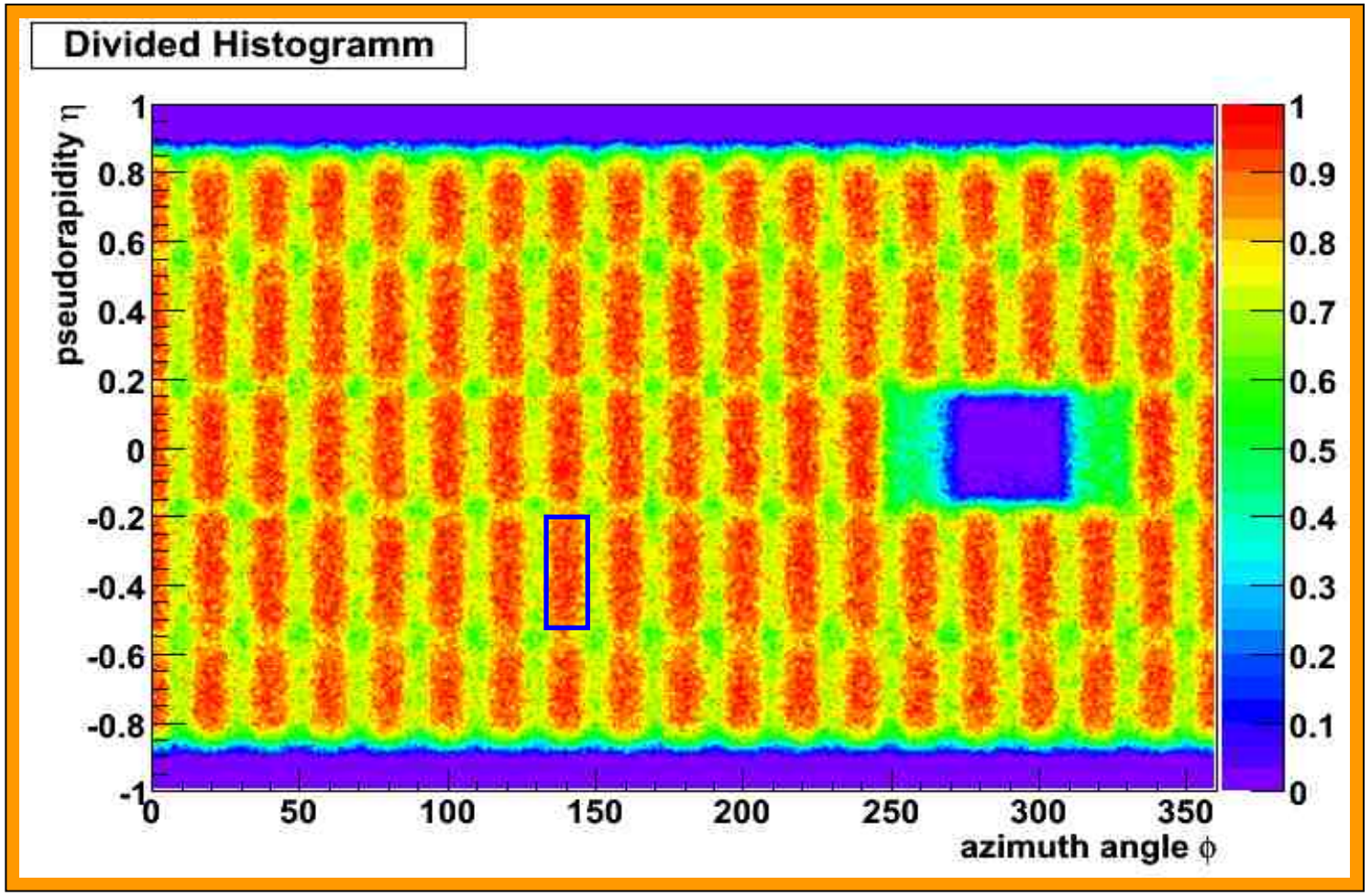
- **efficiency of the whole detector**
- **efficiency of the supermoduls**
- **efficiency of the stacks**





TRD efficiency

Method 2:



TRD efficiency

P_T cut = 0 GeV

- method 1 : efficiency TRD : 0,39
- method 2 : efficiency TRD : 0,45 *

P_T cut = 0 GeV

- method 1 : efficiency TRD : 0,77
- method 2 : efficiency TRD : 0,95 *

P_T cut = 2 GeV

- method 1 : efficiency TRD : 0,83
- method 2 : efficiency TRD : 0,99 *

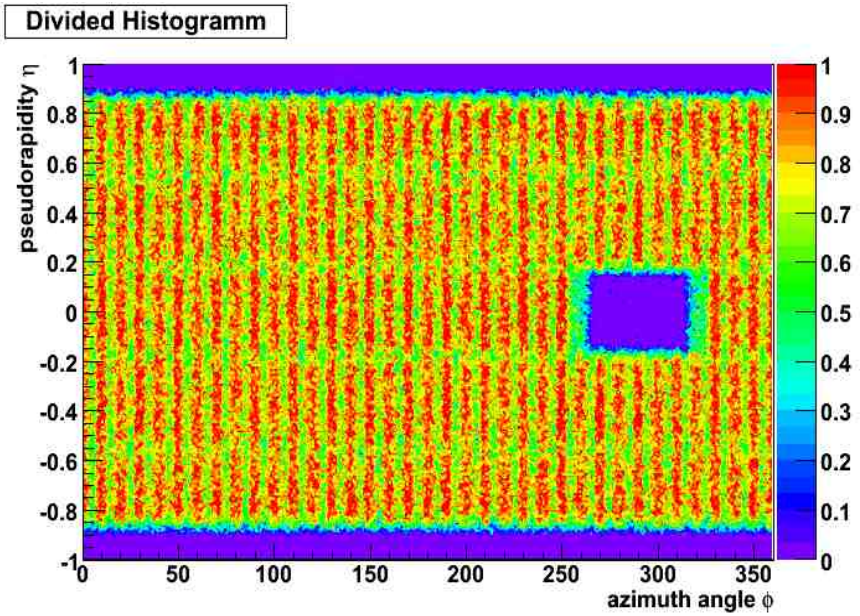
*** depends on cut**

Compendium

for the future:

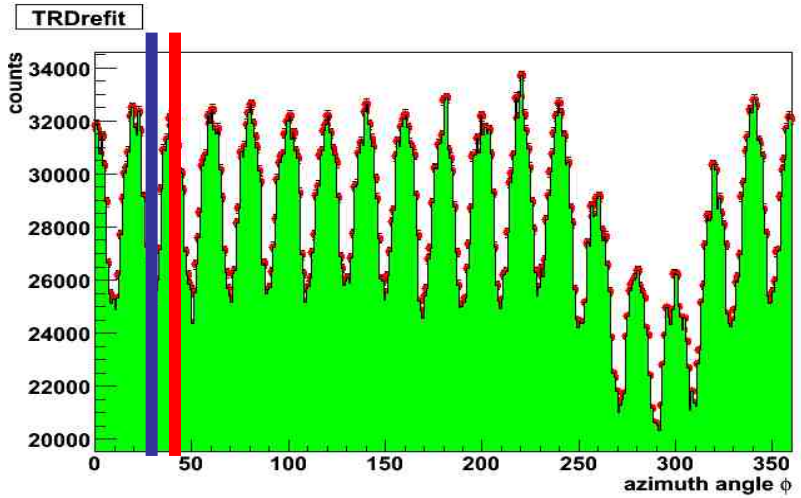
- **improvement of gaussian fit procedure**
- **analysis of cosmics**
- **alignment (changing in the position of the chambers)**

Open questions



P_T cut = 2 GeV

Why this structure – seems like 36 supermoduls ???



P_T cut = 1 GeV

Wrong peak positions

The end

Thank you!!!

Motivaion (backup)

Determination of the efficiency …

- **… of the TRD (transition radiation detector) for such regions of the detector, where the geometrical acceptance is maximized**
- **… of the TRD using the status bins TRDout and TPCrefit**
- **… differentiell in pseudorapidity and azimuth angle ($\eta-\phi-$plane)**

Comparisson of the efficiency …

- **… of the supermoduls (sm0 – sm17)**
  - **18 supermoduls using simulated data**
  - **4 supermoduls using cosmics (not yet!)**
- **…of the stacks (stack smX0 – stack smX4 (X = 1-17))**
  - **90 stacks shaping 18 supermoduls**
  - **every stack consists of 5 TRD-chambers (= 450)**

Analysis (backup)

- **educing of the status bins TPCout and TRDrefit out of the ESD tracks and filling of histograms**
  - o HistogrammAlignementTPCout
  - o HistogrammAlignementTPCrefit

  → **output*.root**
- **merging of the output files – for a better statistic**
  - o MergeHistoTPC
  - o MergeHistoTRD

  → **merged*.root**
- **graphical evaluation of the merged histograms**

>>

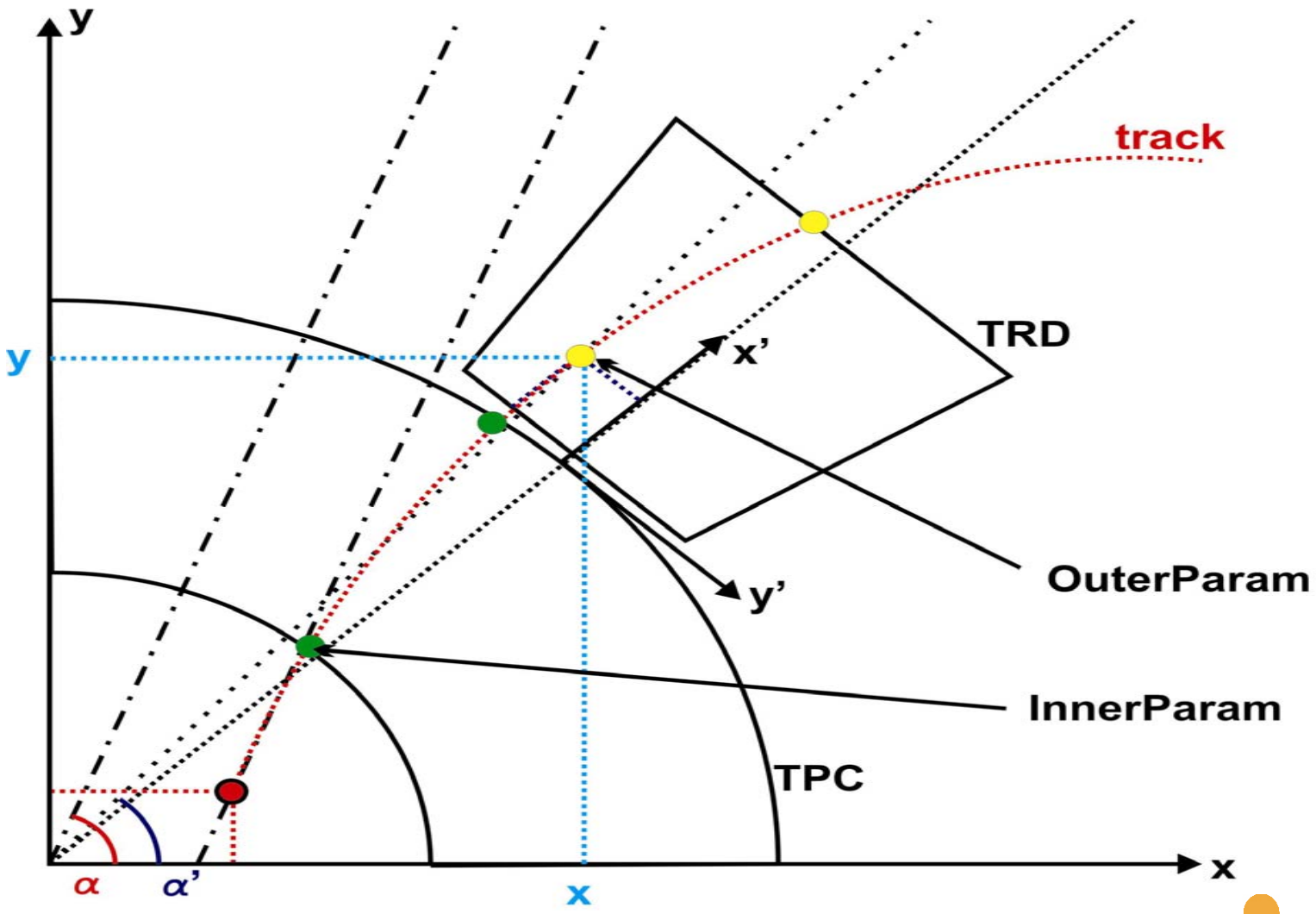
Analysis (backup)

>>

- o ProjectHistoTPCoutAzimuth → **graphic*.root**
- o ProjectHistoTPCoutPseudorap
- o ProjectHistoTRDrefitAzimuth
- o ProjectHistoTRDrefitPseudorap
- o EfficiencyAzimuth
- o EfficiencyPseudorap
- o EfficiencyTRD

- **determination of the efficiency of the complete detector, of the individual supermoduls and of the stacks**
  - o EfficiencySM* (* - 1 - 18) → **EfficiencySupermodul*.root**
  - o EfficiencyStack* (* - 1 -90) → **EfficiencyStack*.root**
  - o EfficiencyTRD → **EfficiencyTRD*.root**

Angular transformation (backup)



Angular transformation (backup)

Compendium (backup)

- **determination of the efficiency of the TRD using status bins TPCout and TRDrefit**
- **better resolution using P_T-cut and angular transformatio**
- **the structure of the TRD (supermoduls and stacks) is clearly identifiable**
- **the detemined efficiencies increase with the P_T-cut (more tracks which come up to the TRD)**
- **efficiencies in the region of 0,43 (PT-cut = 0 Gev) up to 0,98 (PT-cut = 2 Gev)**

for the future:

- **improvement of gaussian fit procedure**
- **analysis of cosmics**
- **alignment (changing in the position of the chambers)**