VHMPID L0 trigger
Status report

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Data sample:
- pp@10 TeV, MB, B=0.5 T
- 1,5 Mevents

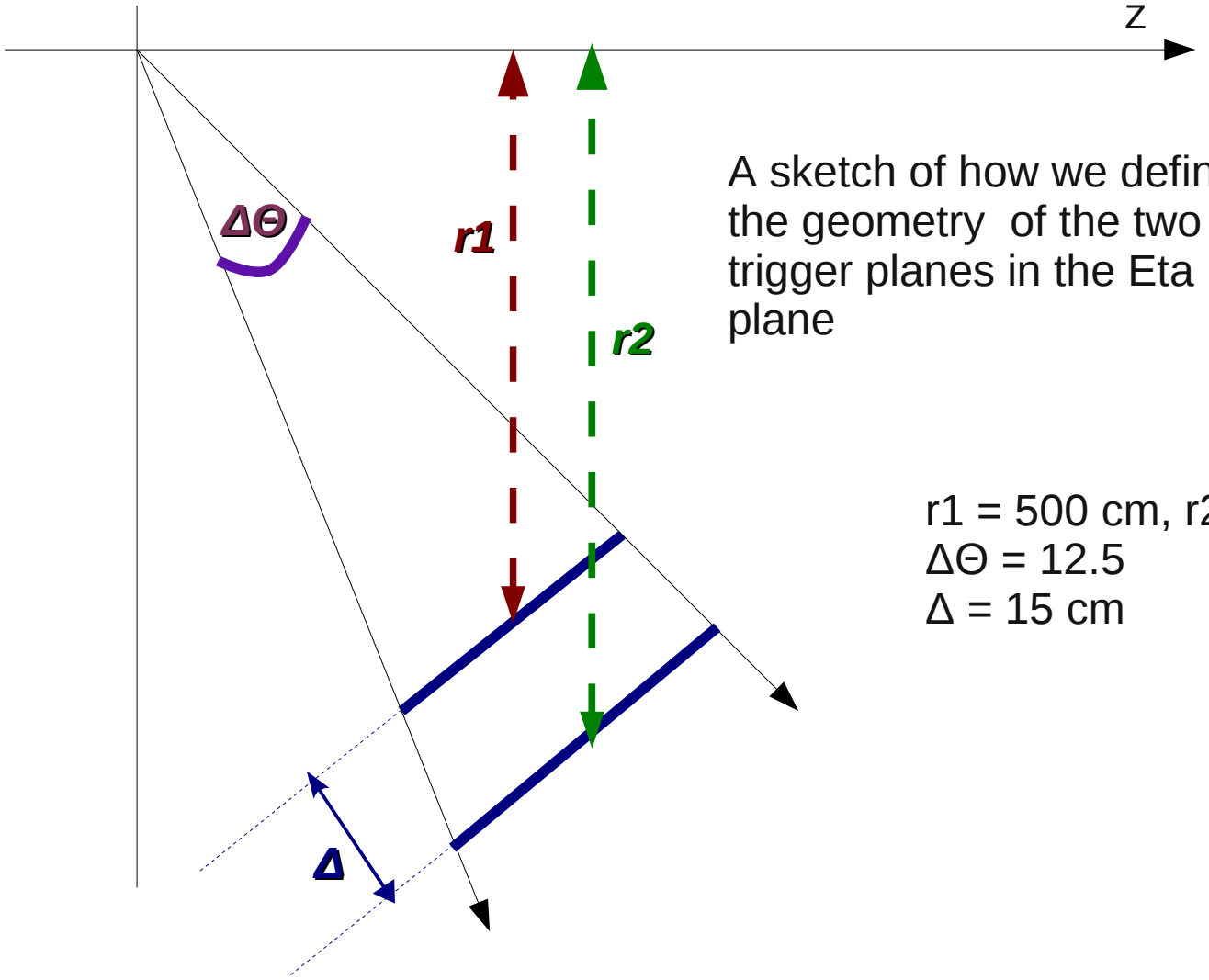
Track cuts:
- No kinks
- Only tracks from module's acceptance

Acceptance:
- Θ ~ 22.5
- Φ ~ 20.

Introduction

- Last time:
  - Study of particle properties inside acceptance of one module (Eta ~ 22.5, Phi ~ 20.)
  - Possible triggering strategy
    - #Hits > 0
    - Possibility to cut out low-momentum particles (p < 2 GeV/c)
- Task
  - Investigate the hit pattern on the planes situated in space

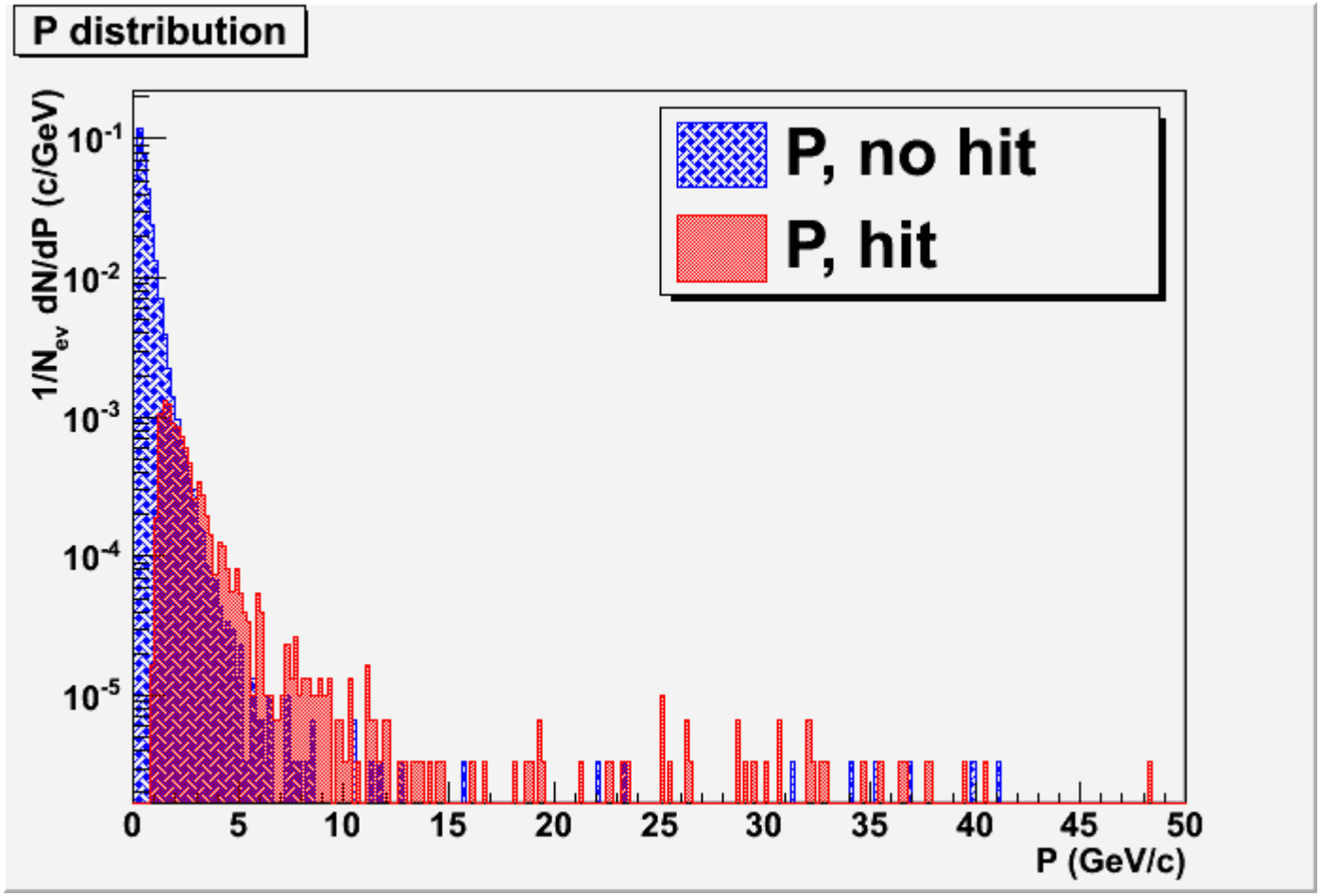
Geometry of the trigger



A sketch of how we define the geometry of the two trigger planes in the Eta plane

r1 = 500 cm, r2 = 514 cm
ΔΘ = 12.5
Δ = 15 cm

1 plane

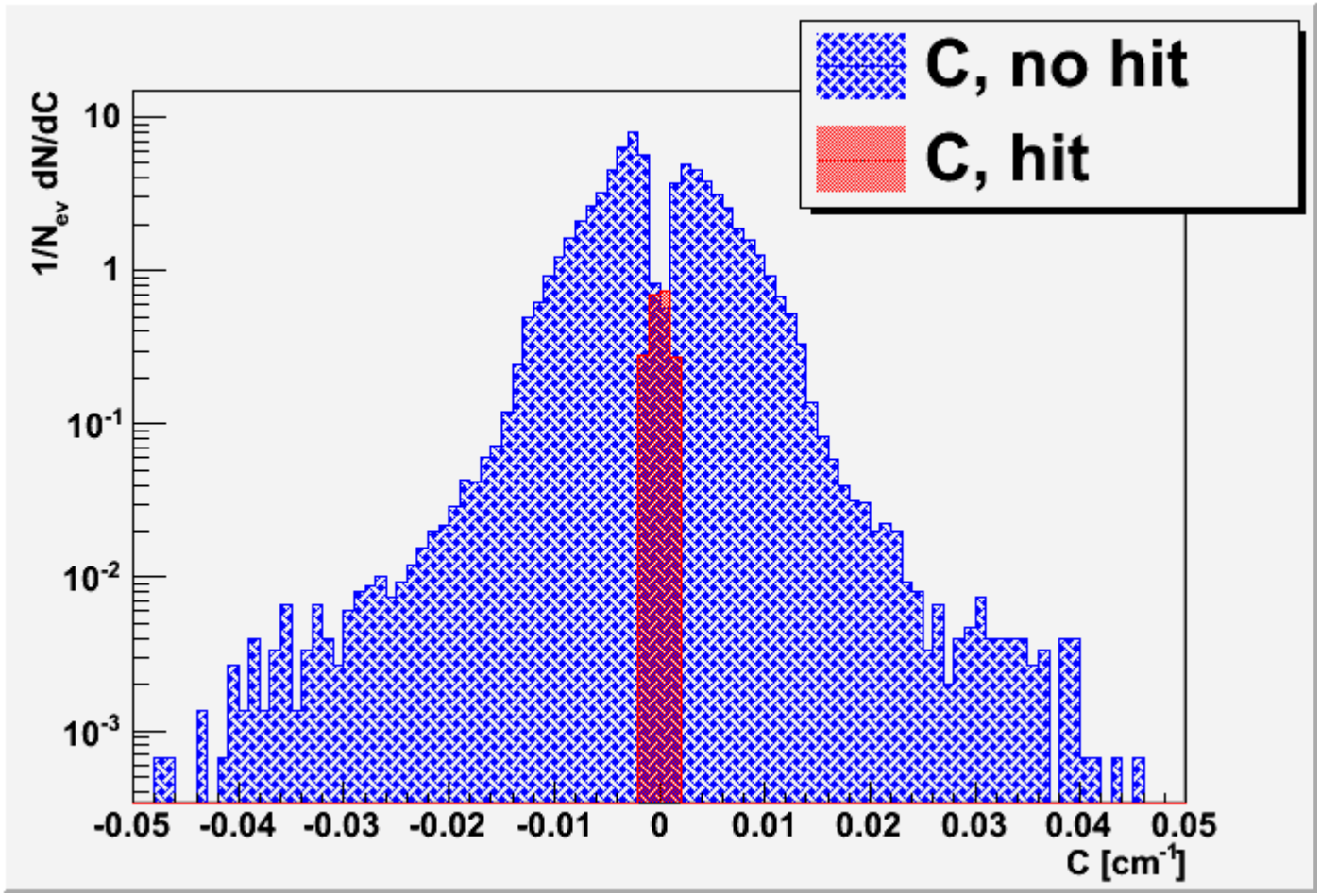


Momentum distribution of tracks inside the module acceptance, based on whether it is a “hit” or “no hit”.

We see that the “hit” flag selects tracks with *p > 1 GeV/c*

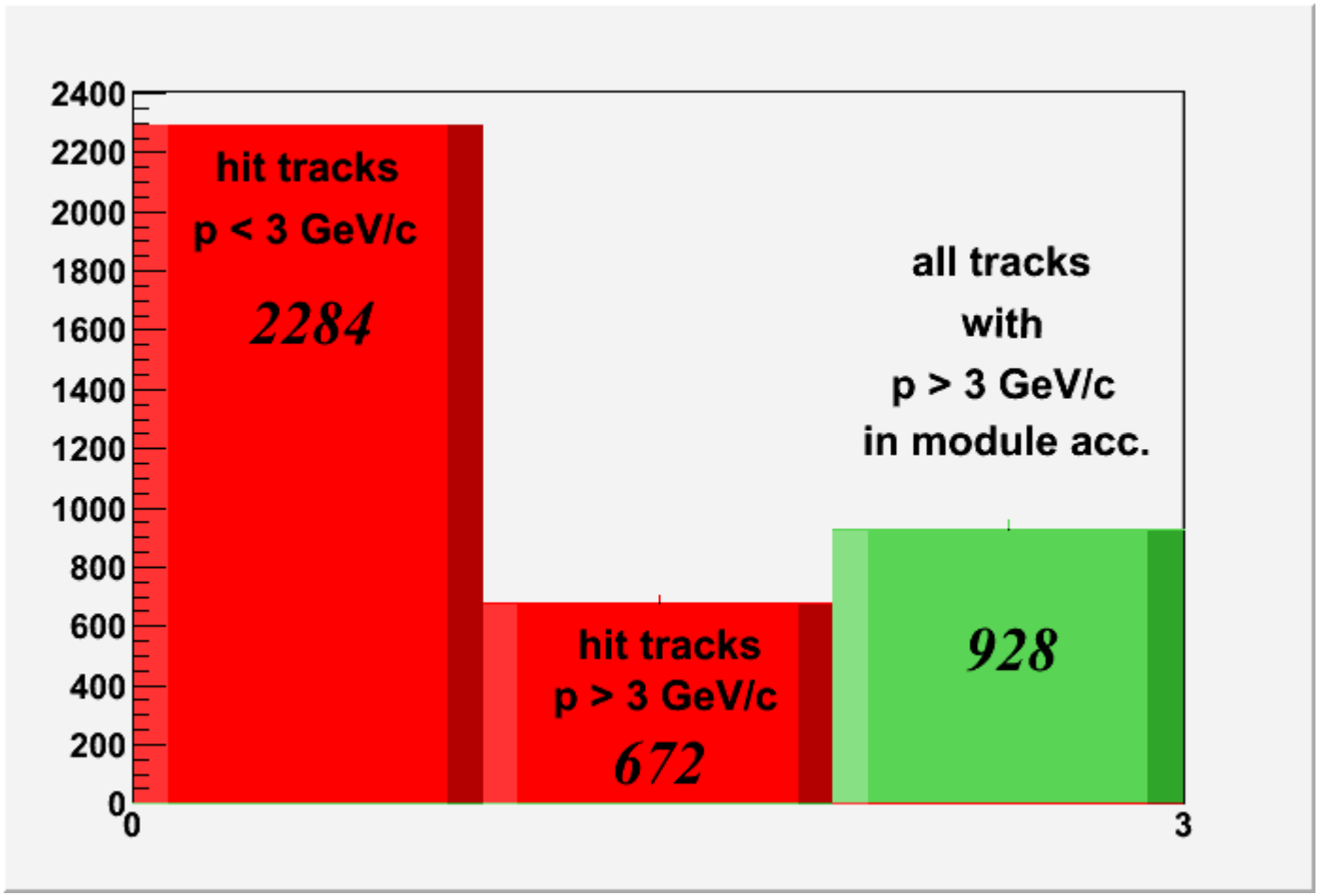
If a track hits the first plane - “hit” track.
If it does not leave the hit on the plane - “no hit” track.

Curvature of tracks



The curvature plot complements the momentum plot.

Purity and efficiency



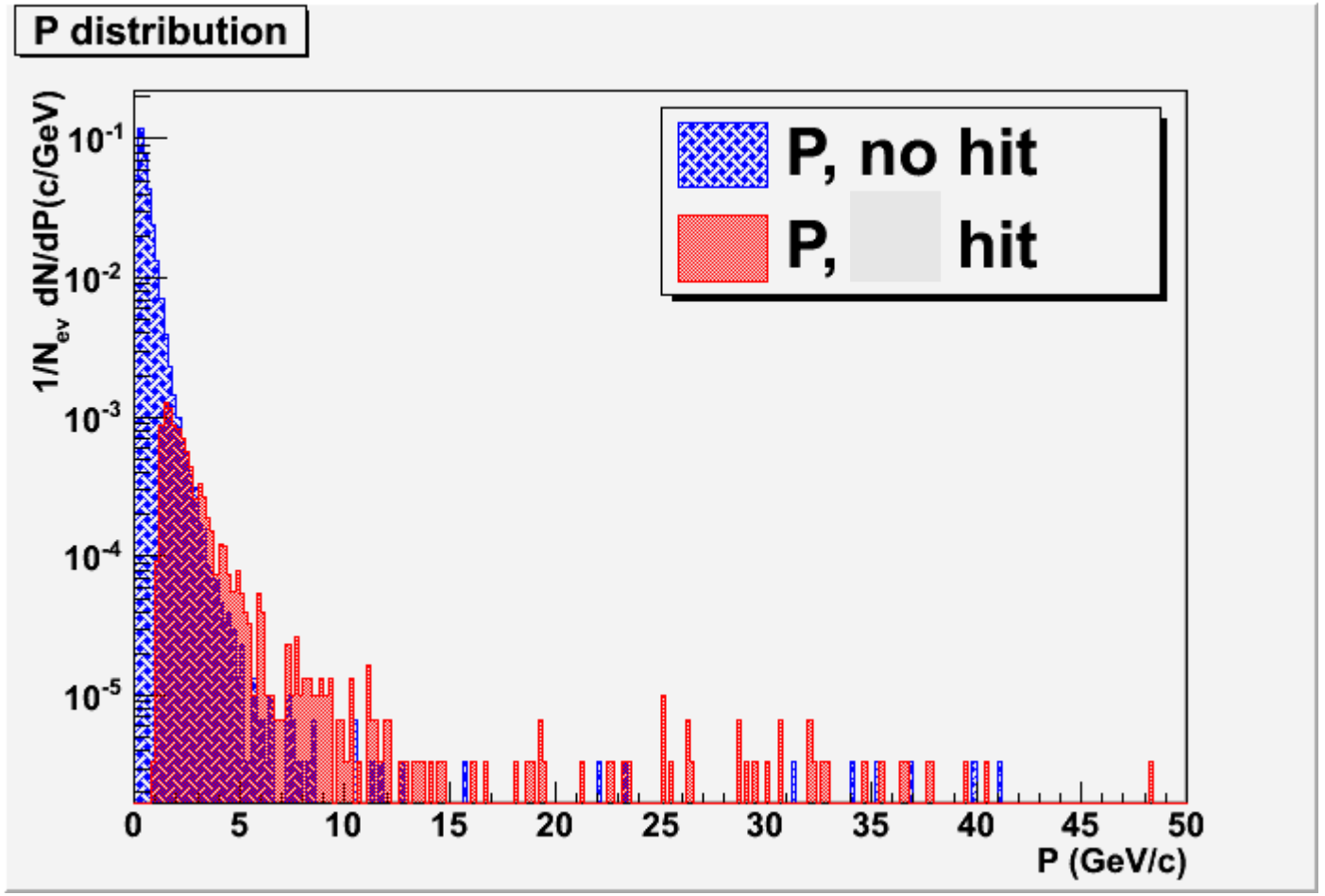
Purity: ~23%

Eff: 72 %

$$Purity = \frac{Number\ of\ tracks(p > 3\ GeV/c)}{Number\ of\ hit\ tracks}$$

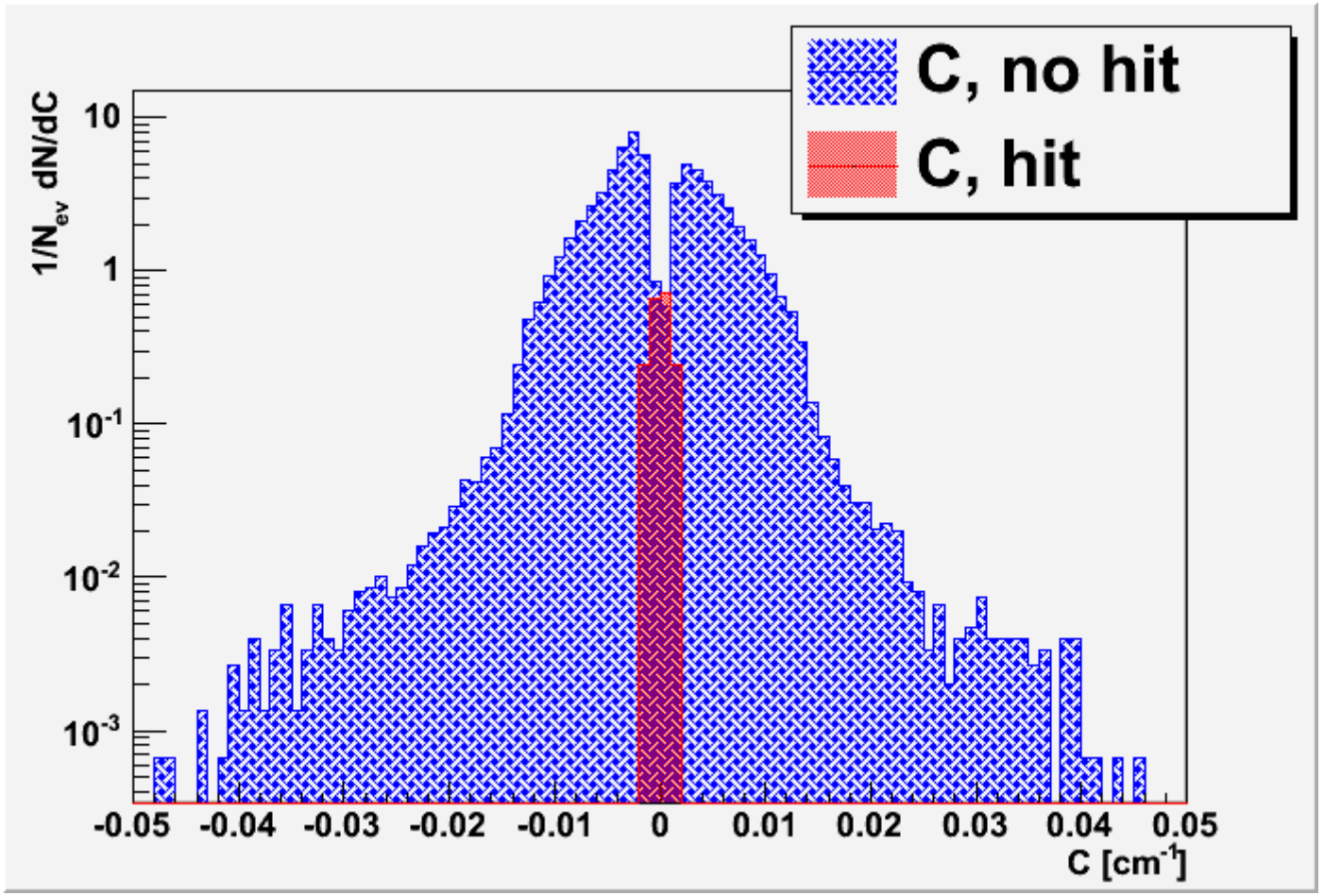
$$Efficiency = \frac{Number\ of\ hit\ tracks(p > 3\ GeV/c)}{Number\ of\ tracks(p > 3\ GeV/c)\ inside\ module's\ acceptance}$$

2 planes

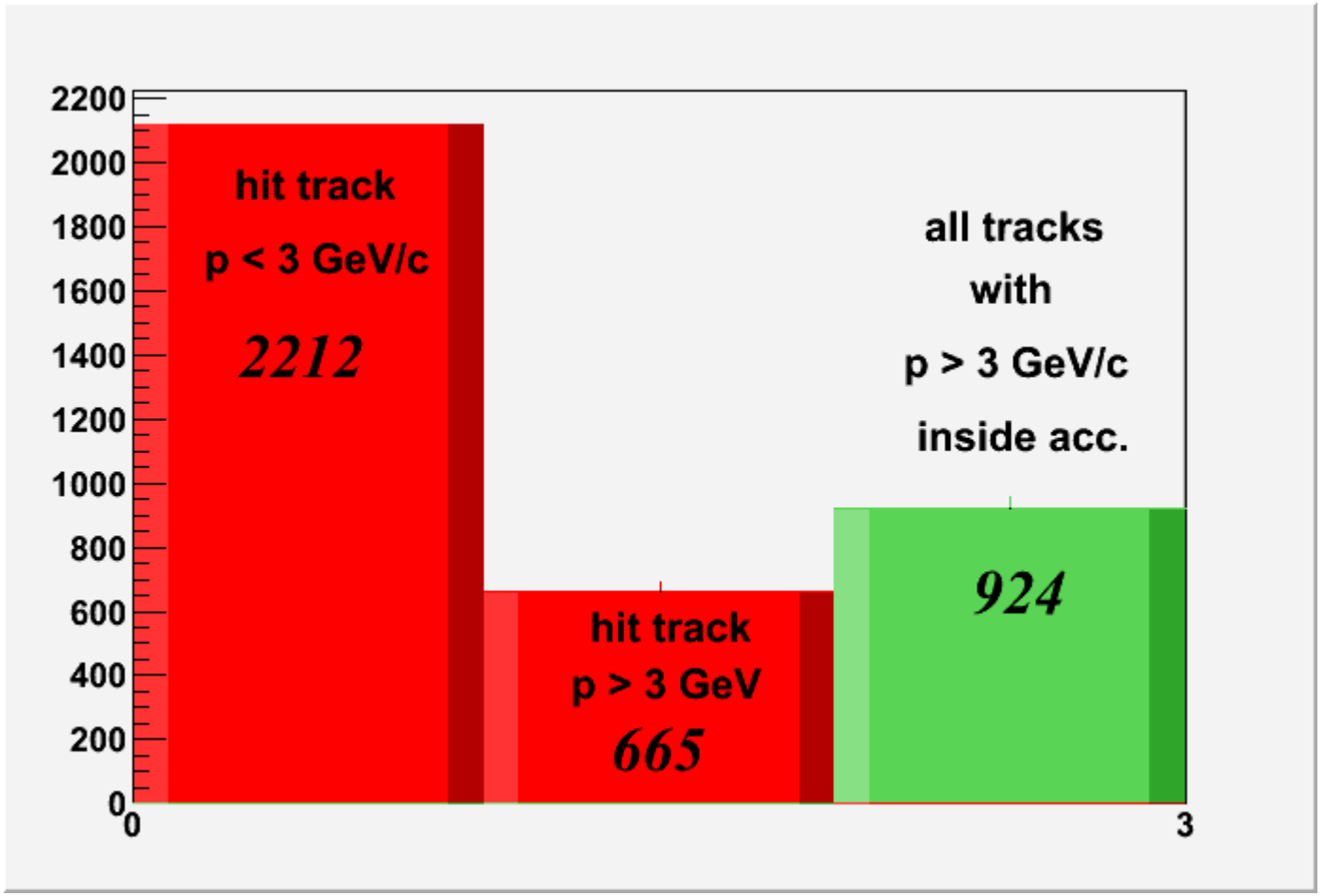


“hit” flag is given to a track that intersects both of the planes
“no hit” flag is given to a track that does not intersect either of the planes.

Curvature


C, no hit
C, hit
1/N_ev dN/dC
10
1
10^-1
10^-2
10^-3
-0.05
-0.04
-0.03
-0.02
-0.01
0
0.01
0.02
0.03
0.04
0.05
C [cm^-1]

Purity and efficiency



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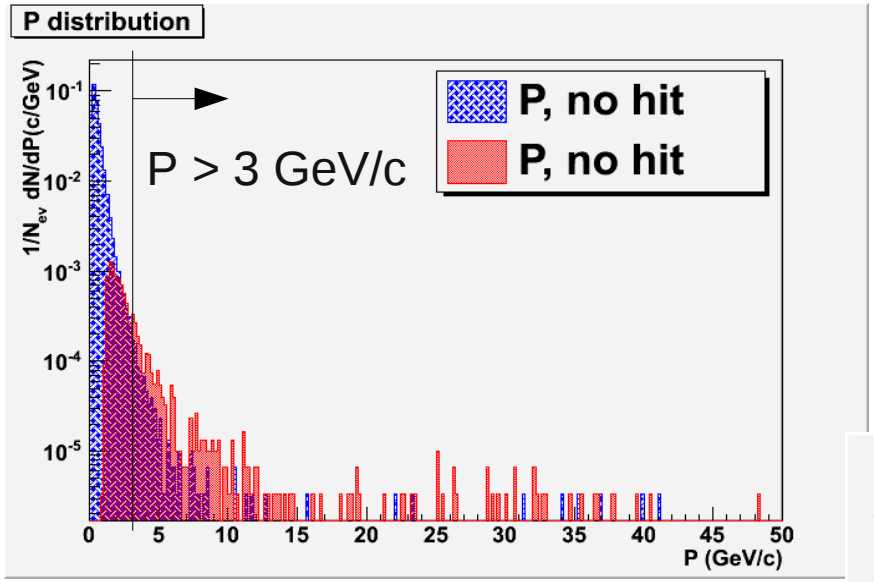
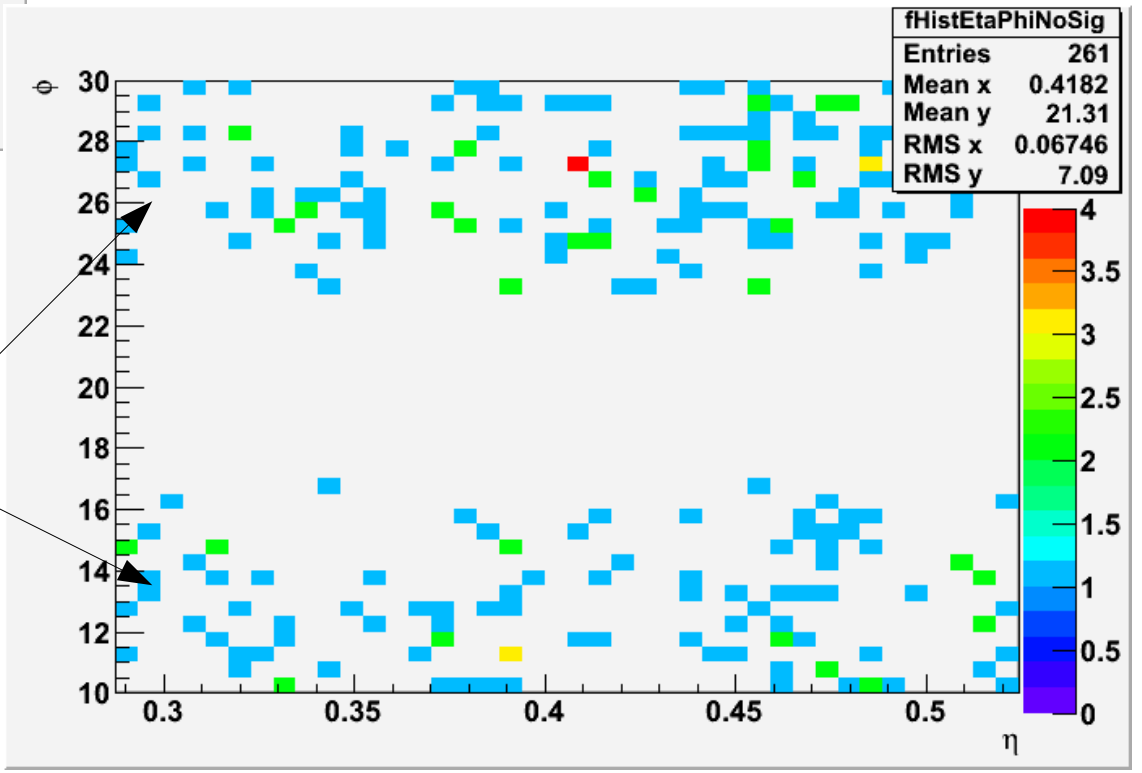
No-hit tracks, p > 3 GeV/c



There are tracks with p > 3 GeV/c that do not leave a hit in the detector

This is because they are at the edge of phi acceptance of the module



Summary and outlook

- Geometry introduction
  - L0; far from interaction point, low momentum tracks will not reach it
    - Distance – natural filter
    - Using only “hit” flag we achieved purity ~ 23 %
    - Purity does not depend on number of trigger planes
- Outlook
  - Design segmentation to be able to distinguish two hits from each other and see whether it can further improve the selection