PVDIS BAFFLES AND Q^2

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May 2016 SoLID Collaboration Meeting

Current “More1” baffles

Downstream vertex

Upstream vertex

Inner rings removed

Plate 1

Plate 3

Constriction limits downstream acceptance

r

ϕ

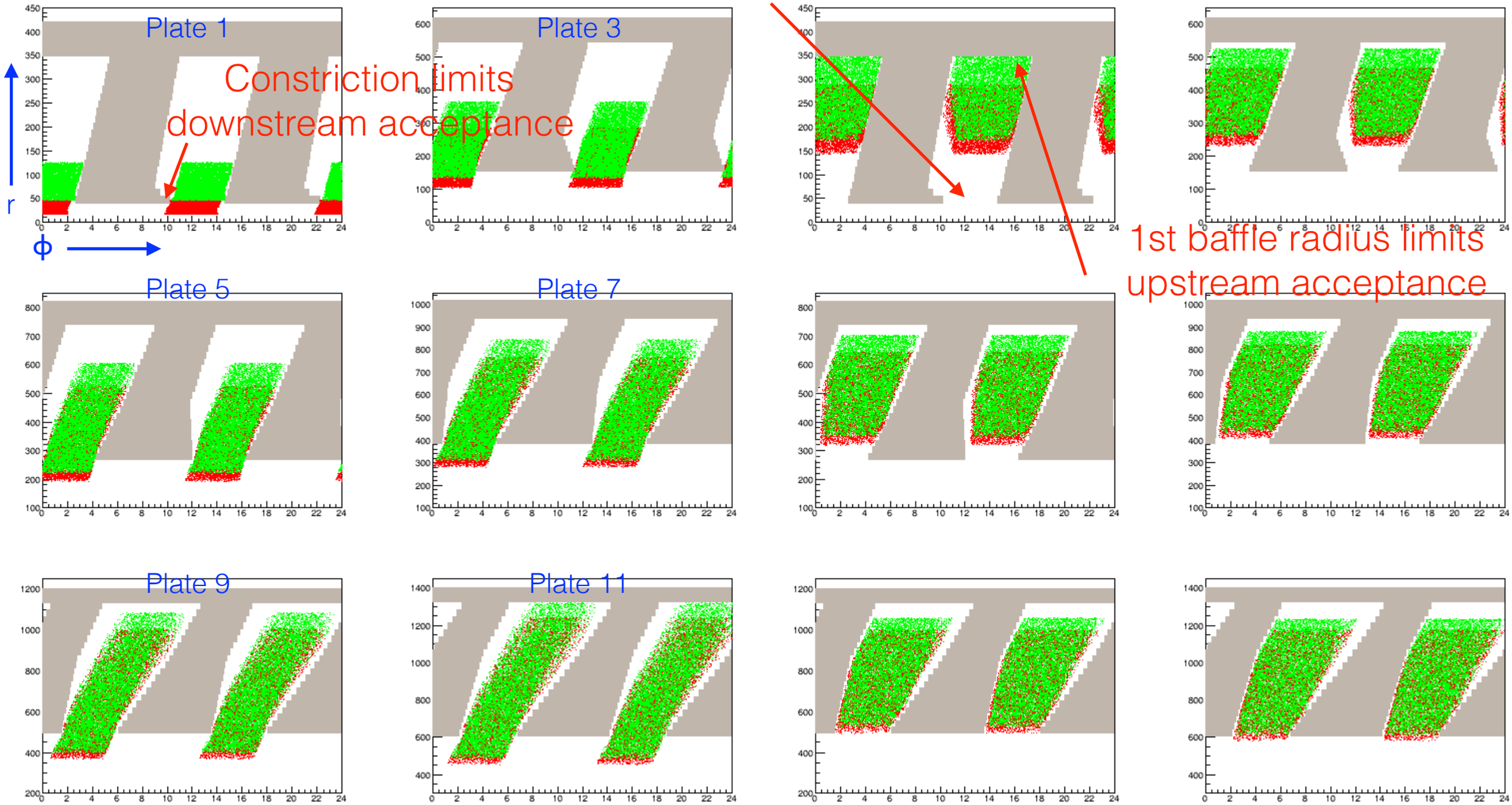
1st baffle radius limits upstream acceptance

Plate 5

Plate 7

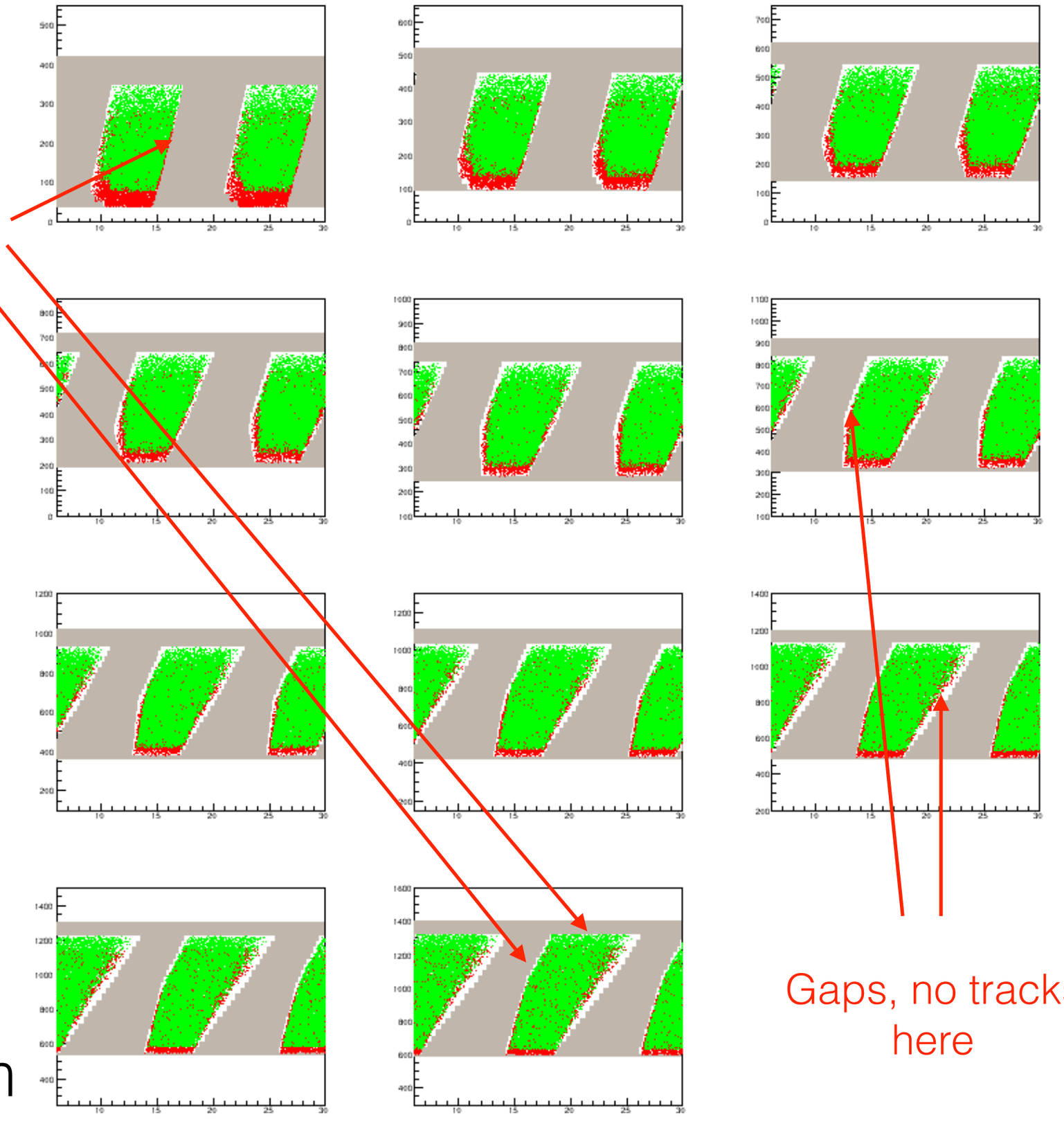
Plate 9

Plate 11



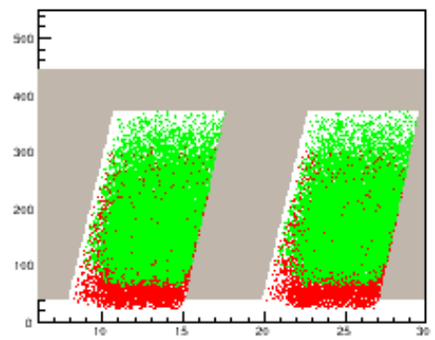
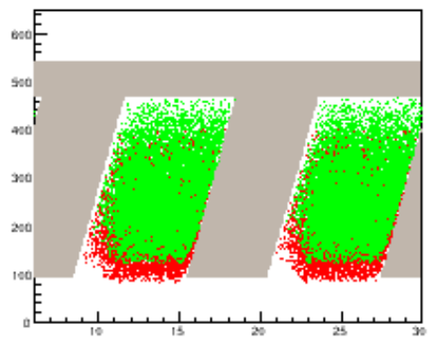
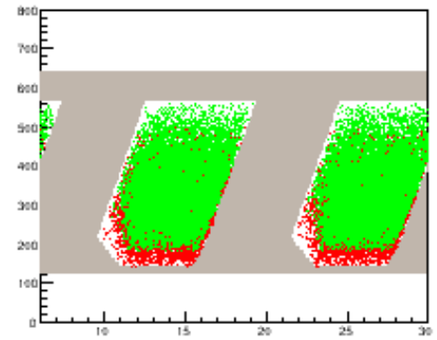
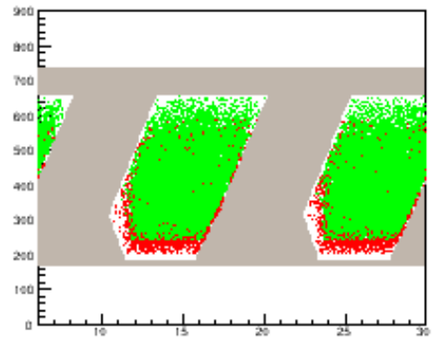
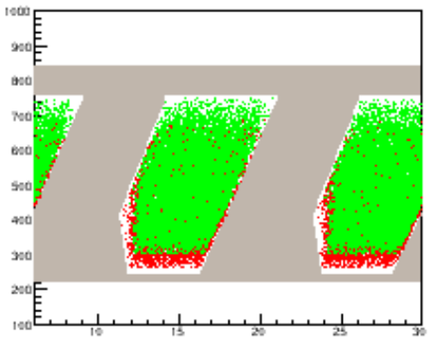
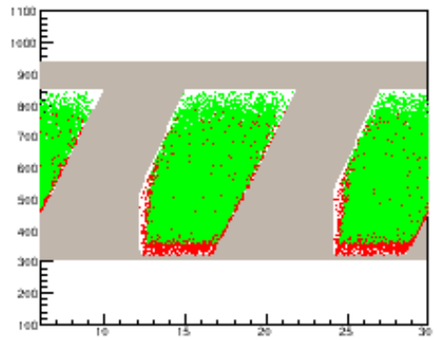
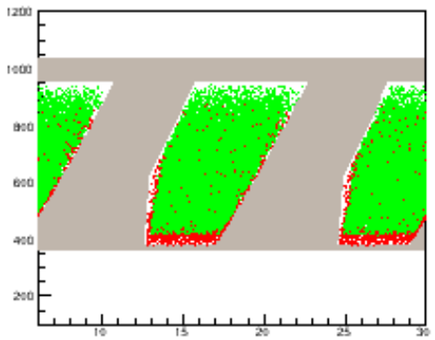
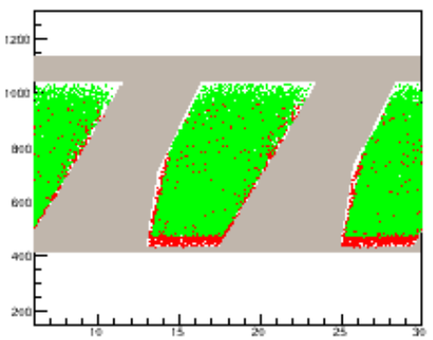
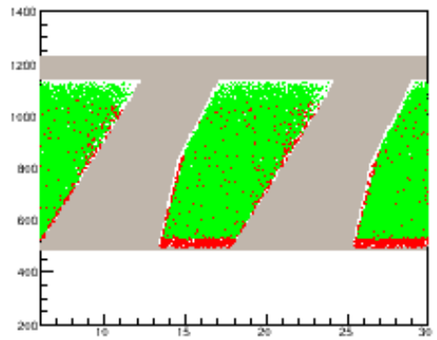
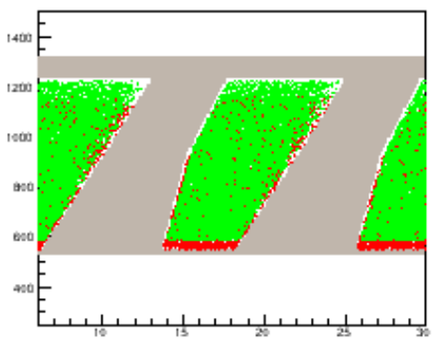
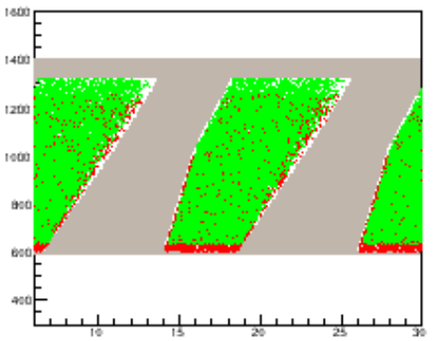
$p > 2$ GeV/c, $Q^2 > 6$ (GeV/c)^2, $W^2 > 4$ (GeV/c)^2, $x_{bj} > 0.55$

More1 with inner rings



- Keep limiting edges (~) fixed
- Adjust other edges to pass track with good kinematics
- Increase outer radii of upstream plates
- Remove inner rings and small radius constrictions upstream

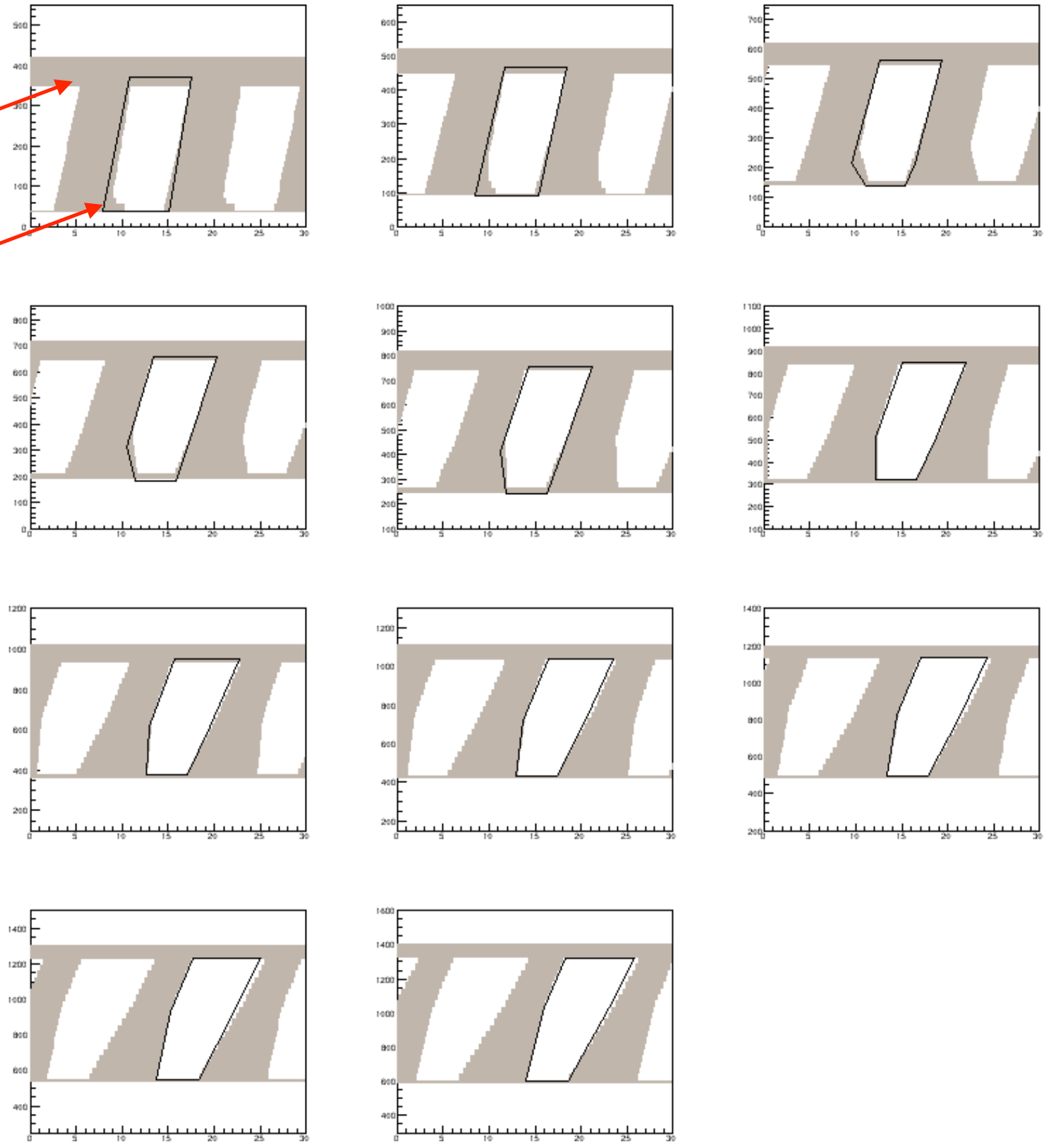
New with inner rings

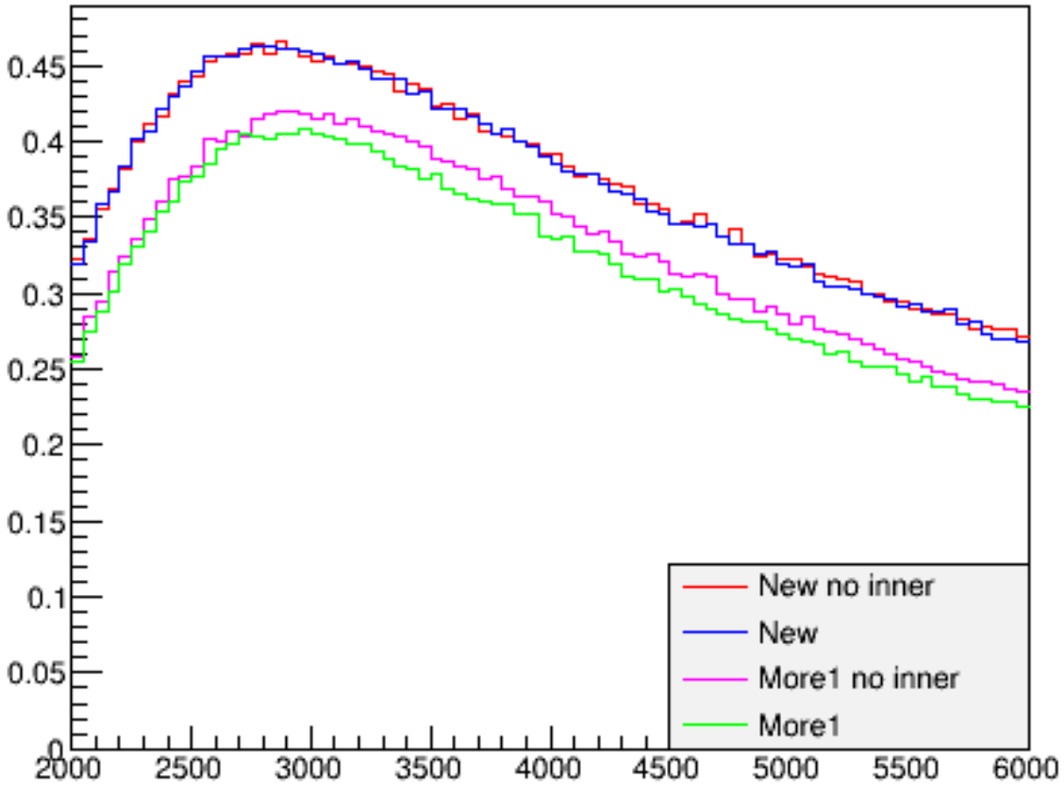
Slit comparison

More1

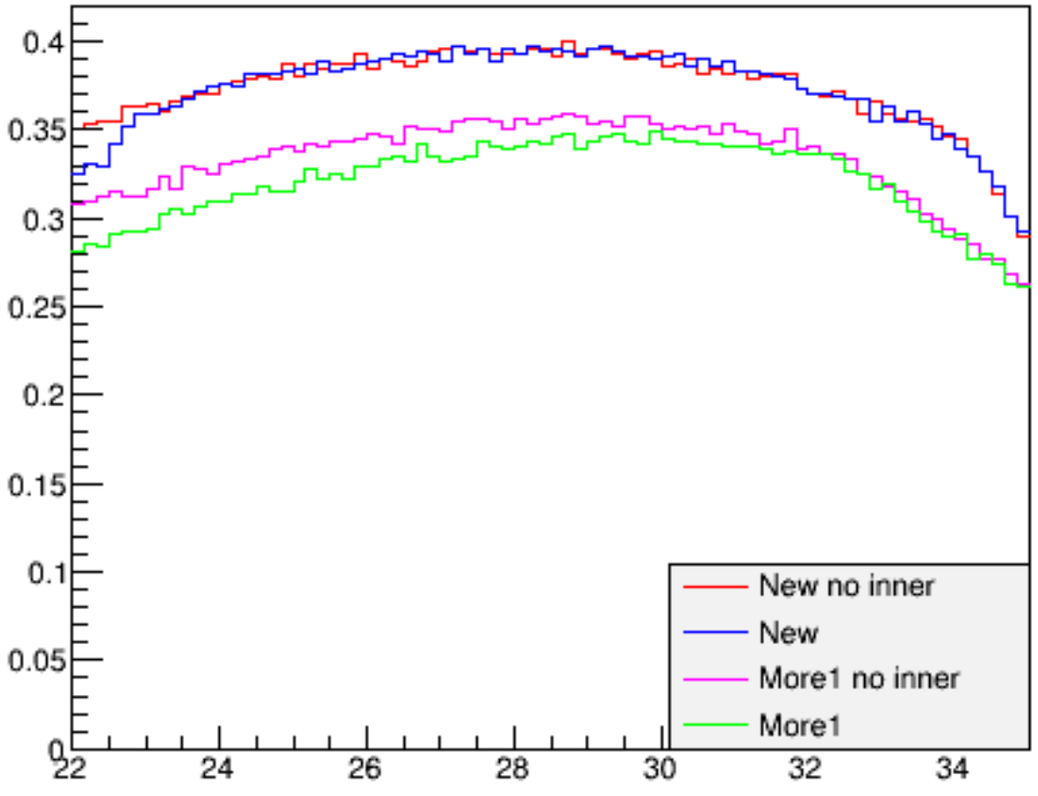
New



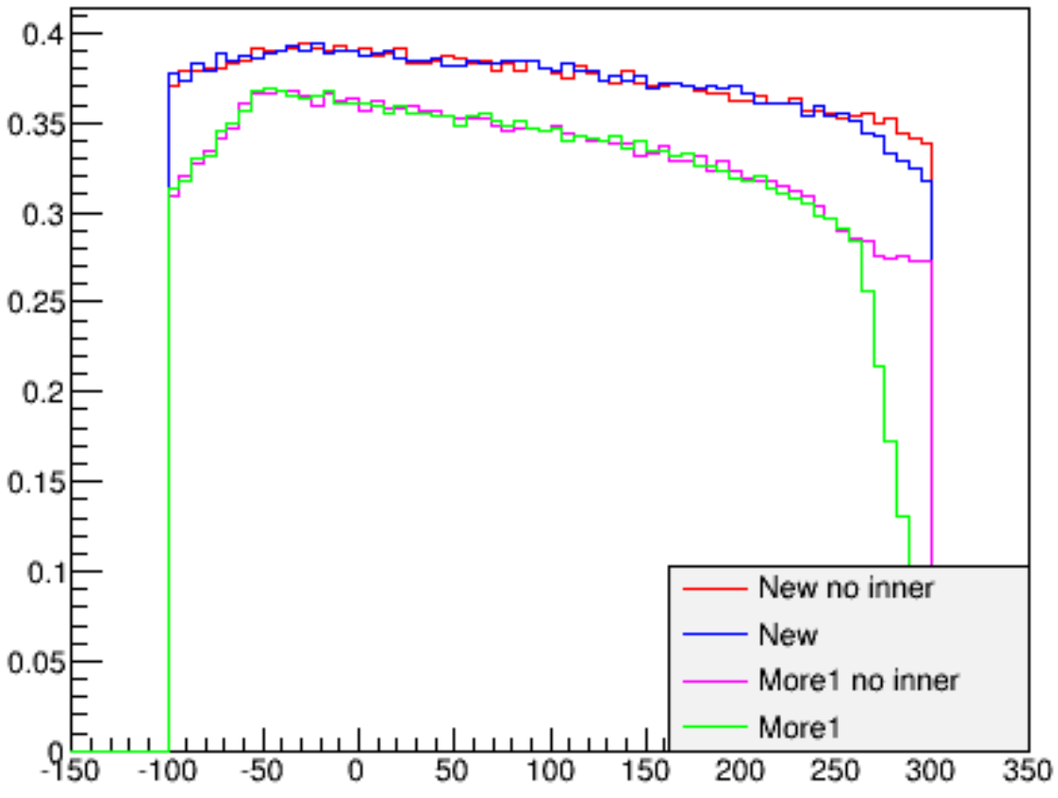
Acceptance vs p



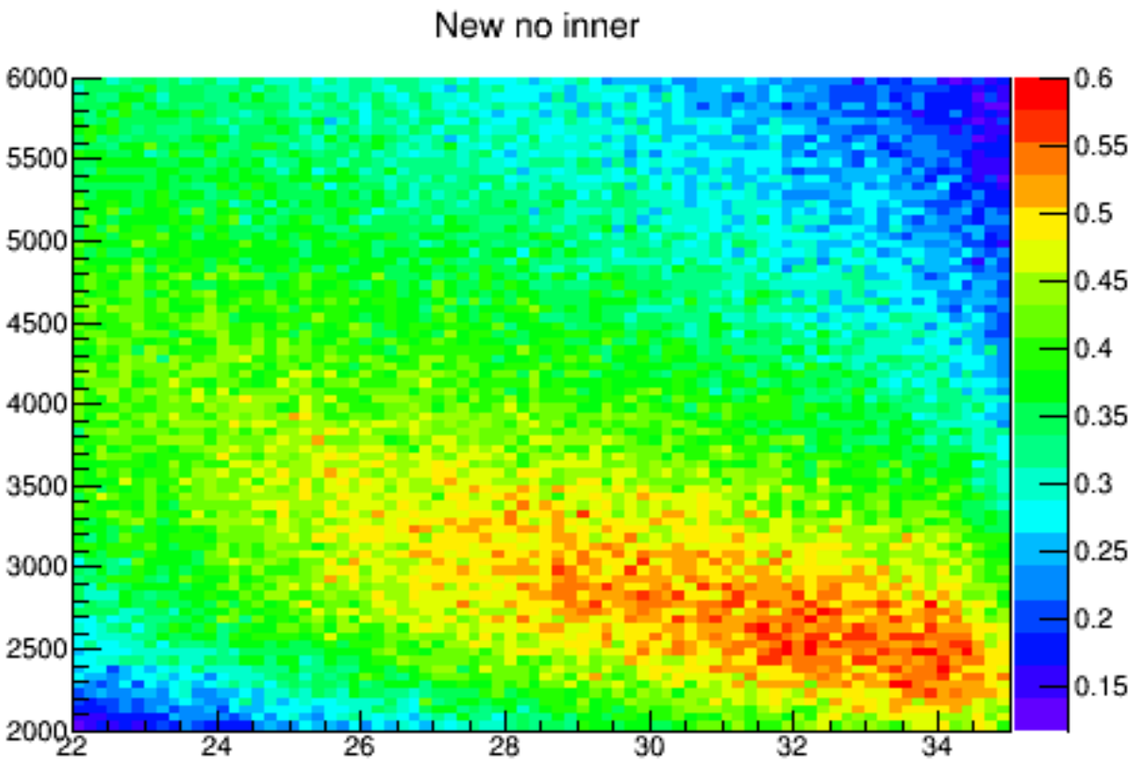
Acceptance vs theta

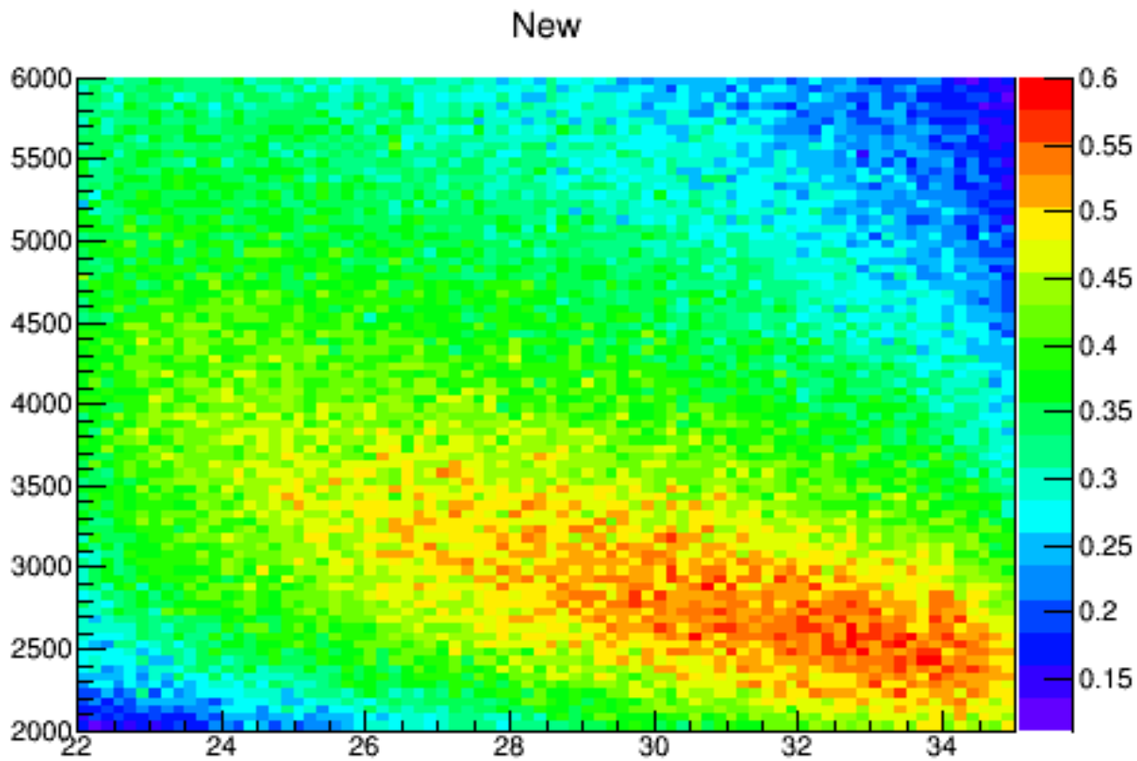


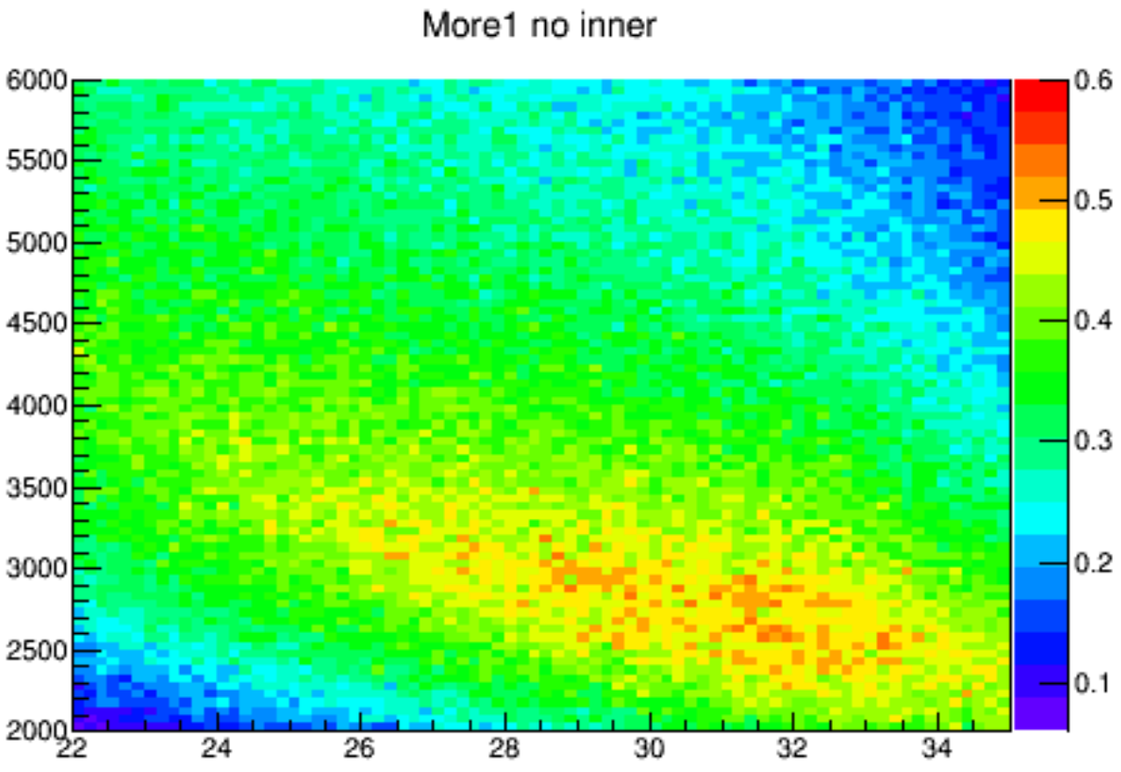
Acceptance vs z_v

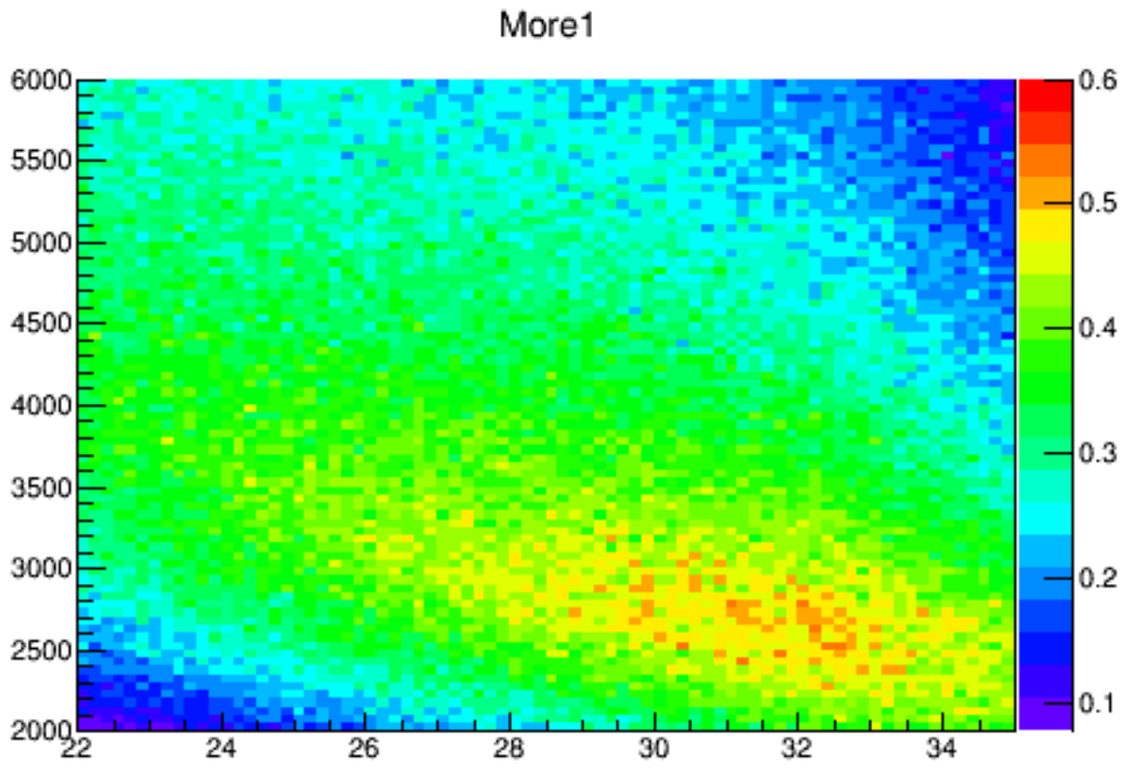


Acceptance vs p vs theta

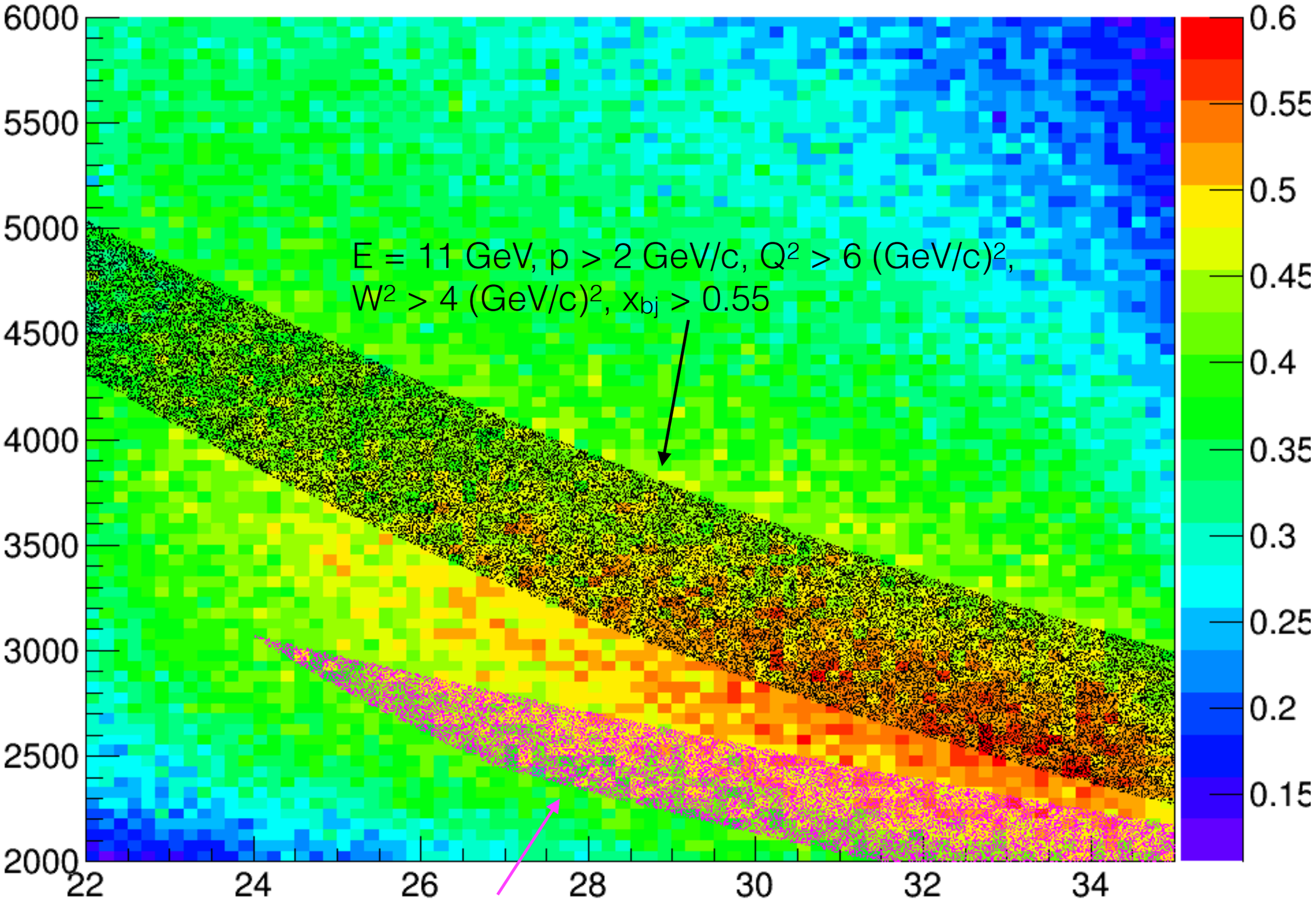




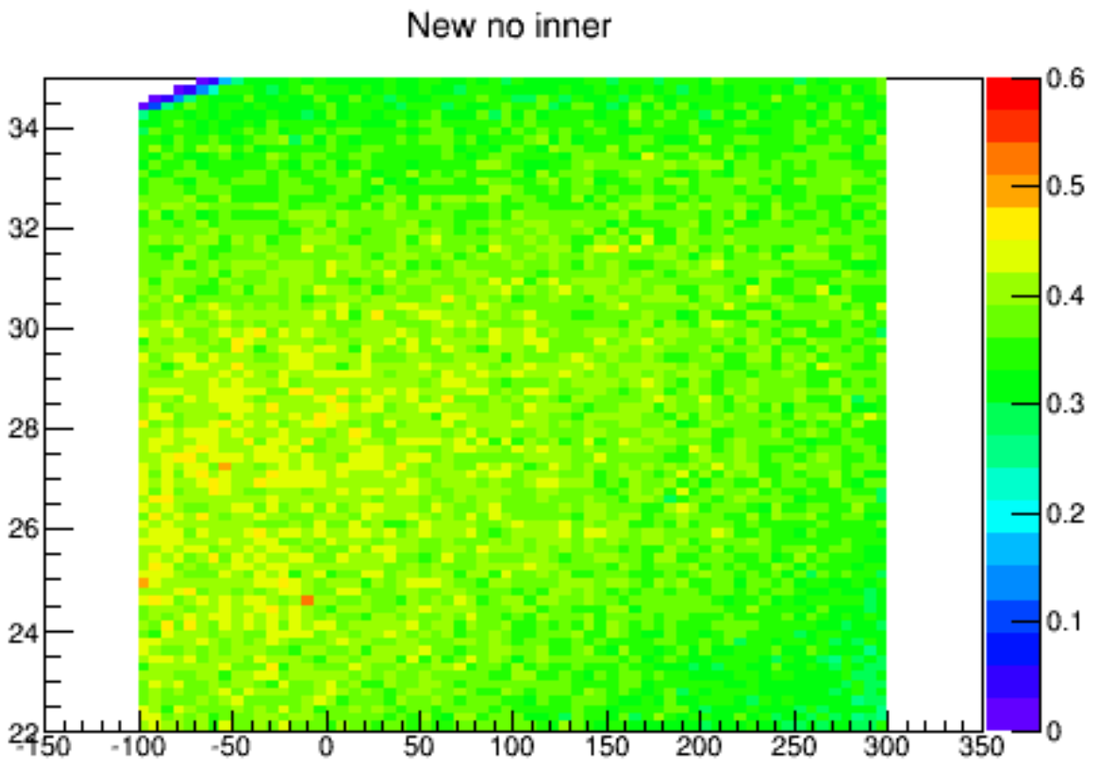


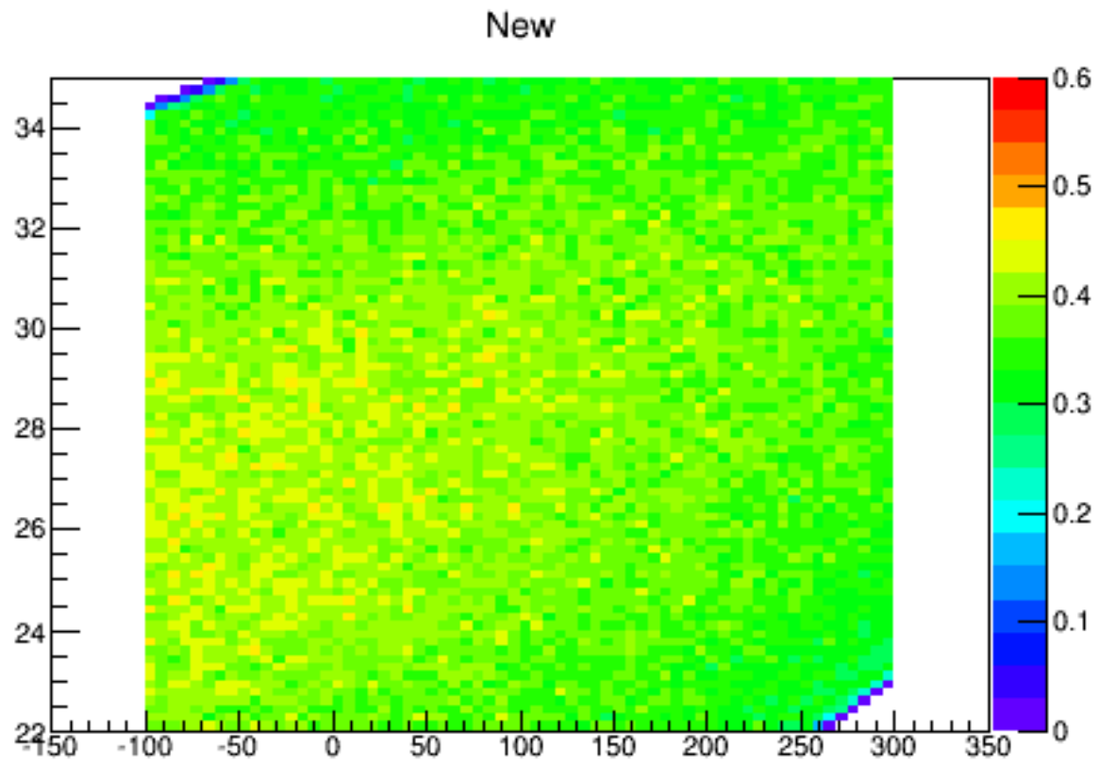


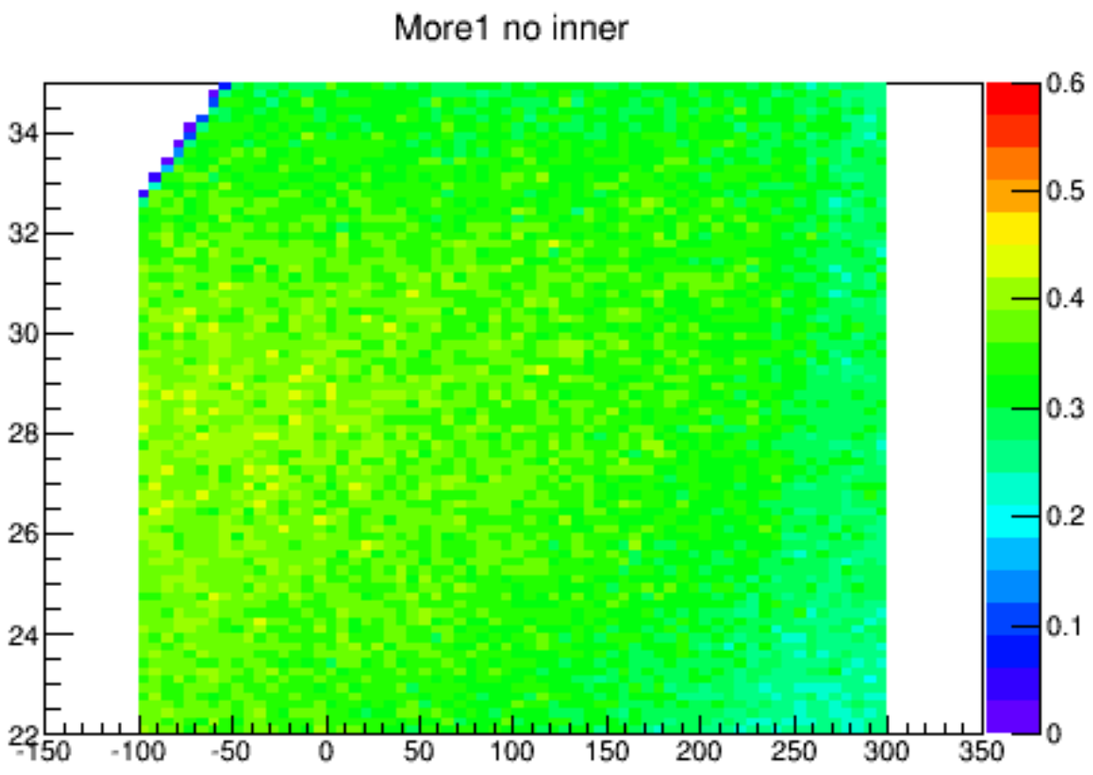
New

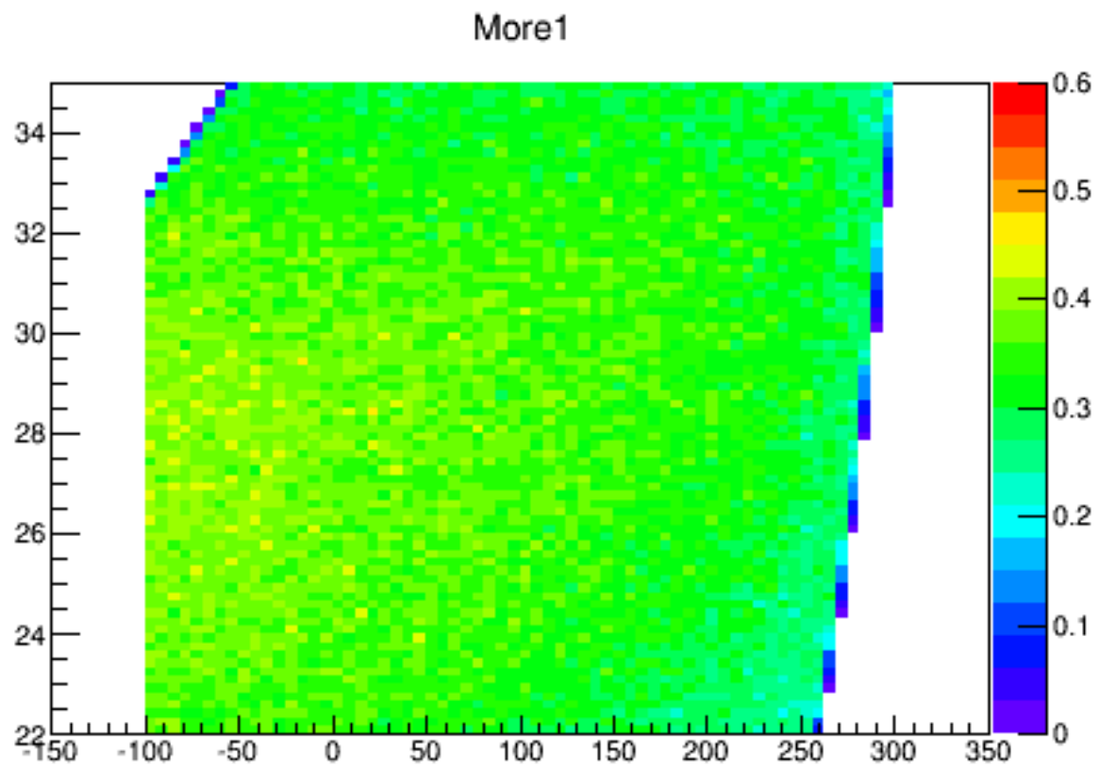

6000
5500
5000
4500
4000
3500
3000
2500
2000
22
24
26
28
30
32
34
0.6
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
E = 11 GeV, p > 2 GeV/c, Q² > 6 (GeV/c)²,
W² > 4 (GeV/c)², x_bj > 0.55
E = 6.6 GeV, p > 2 GeV/c, Q² > 3.5 (GeV/c)²,
W² > 4 (GeV/c)², x_bj > 0.45

Acceptance vs theta vs z_v

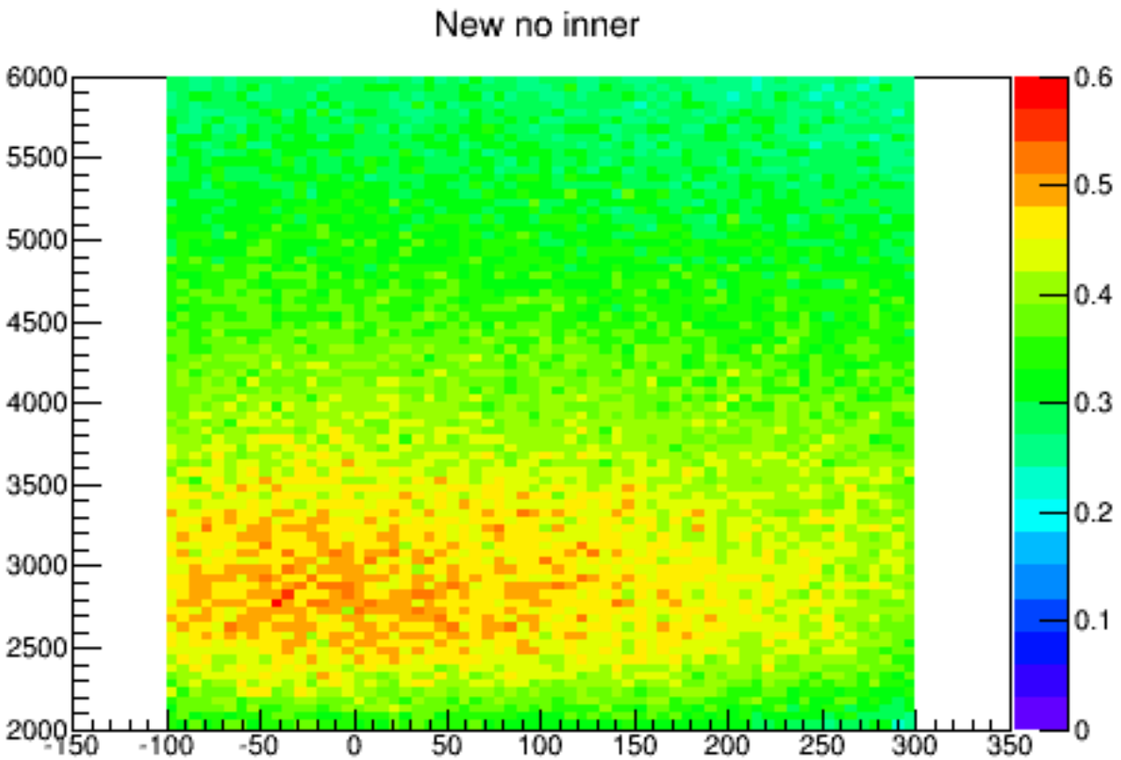


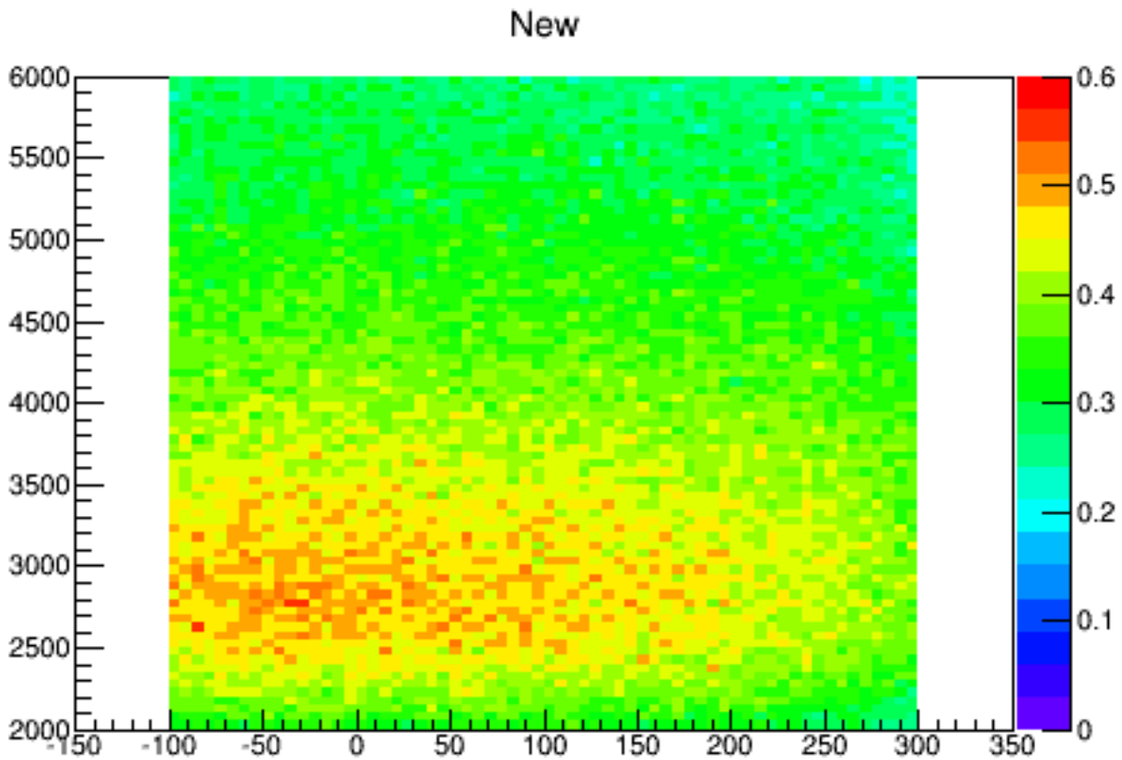


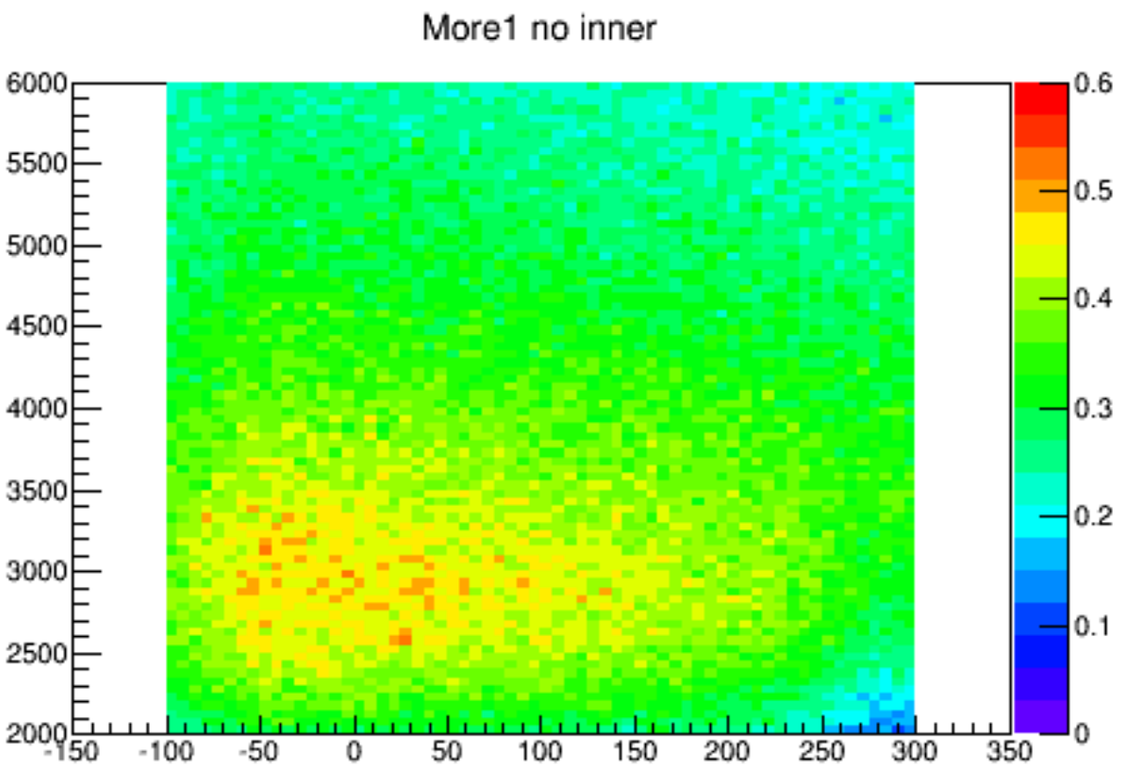


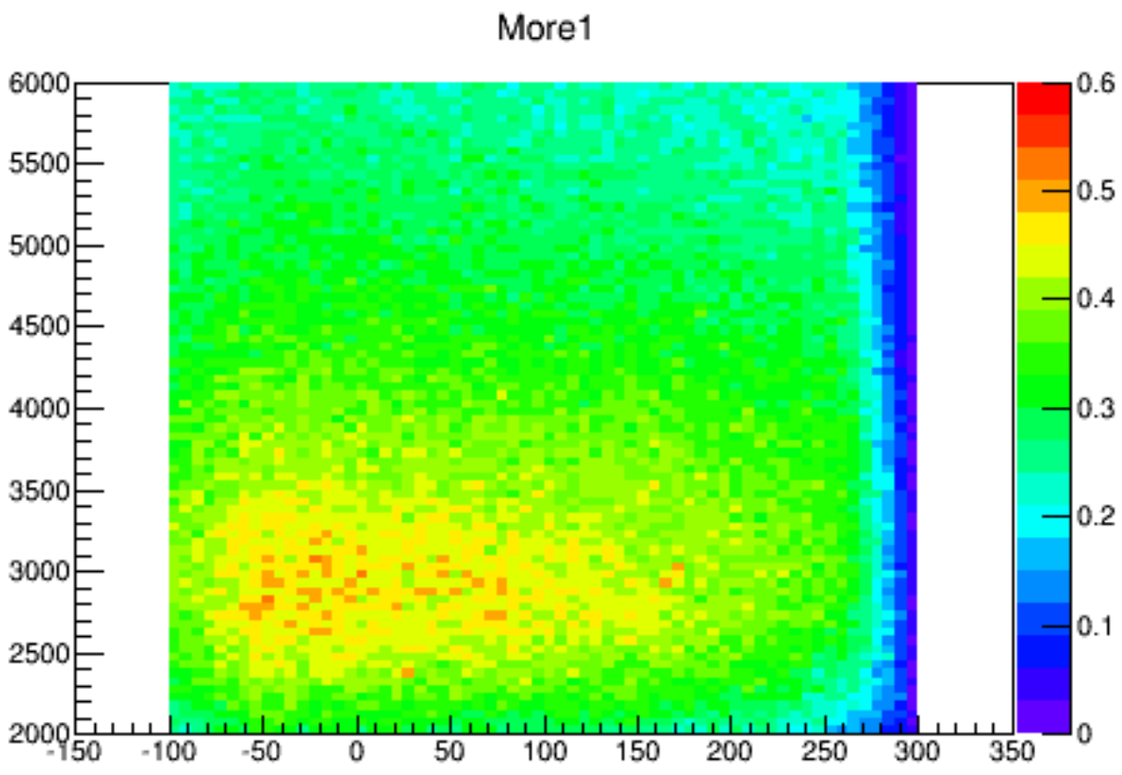


Acceptance vs p vs z_v

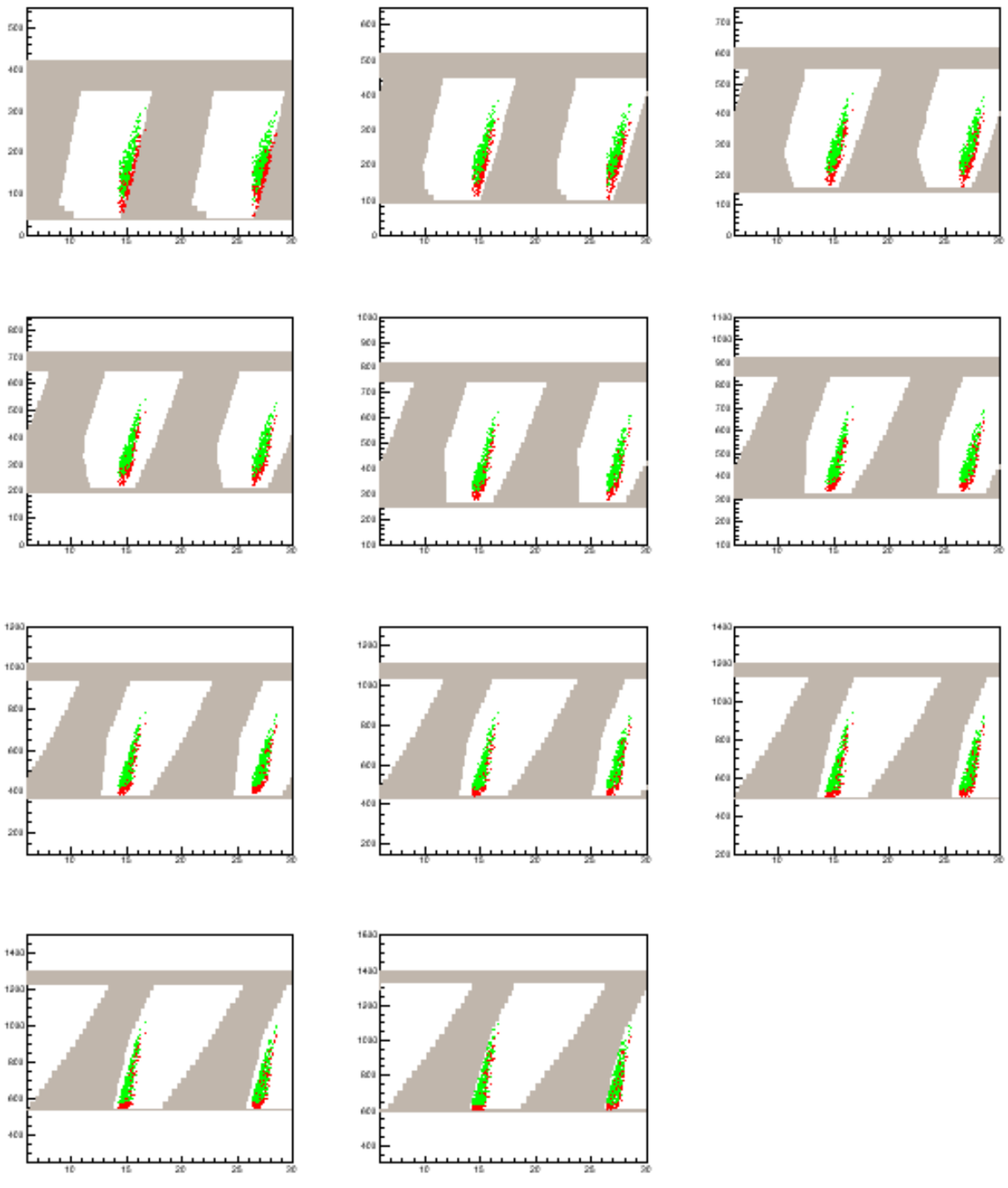




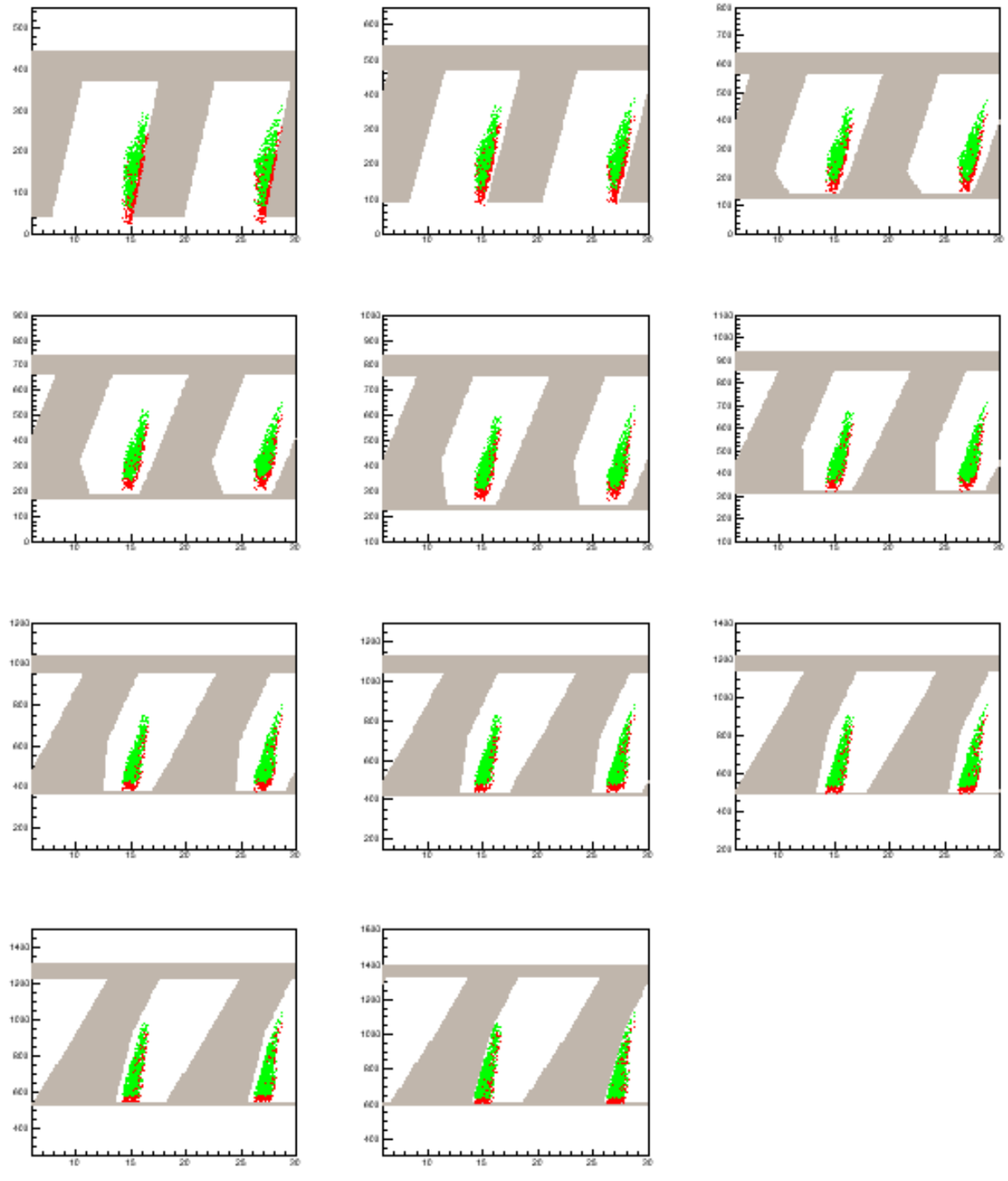


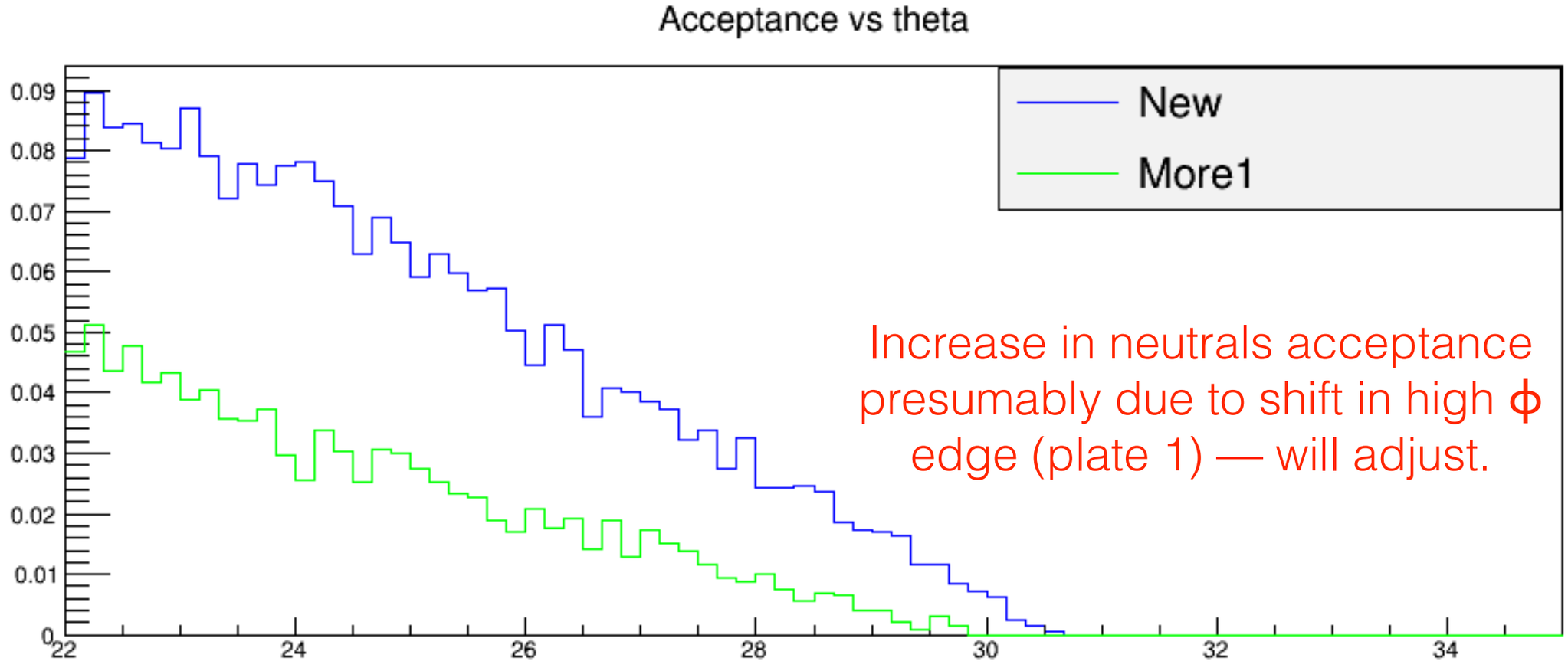


Neutrals - More1

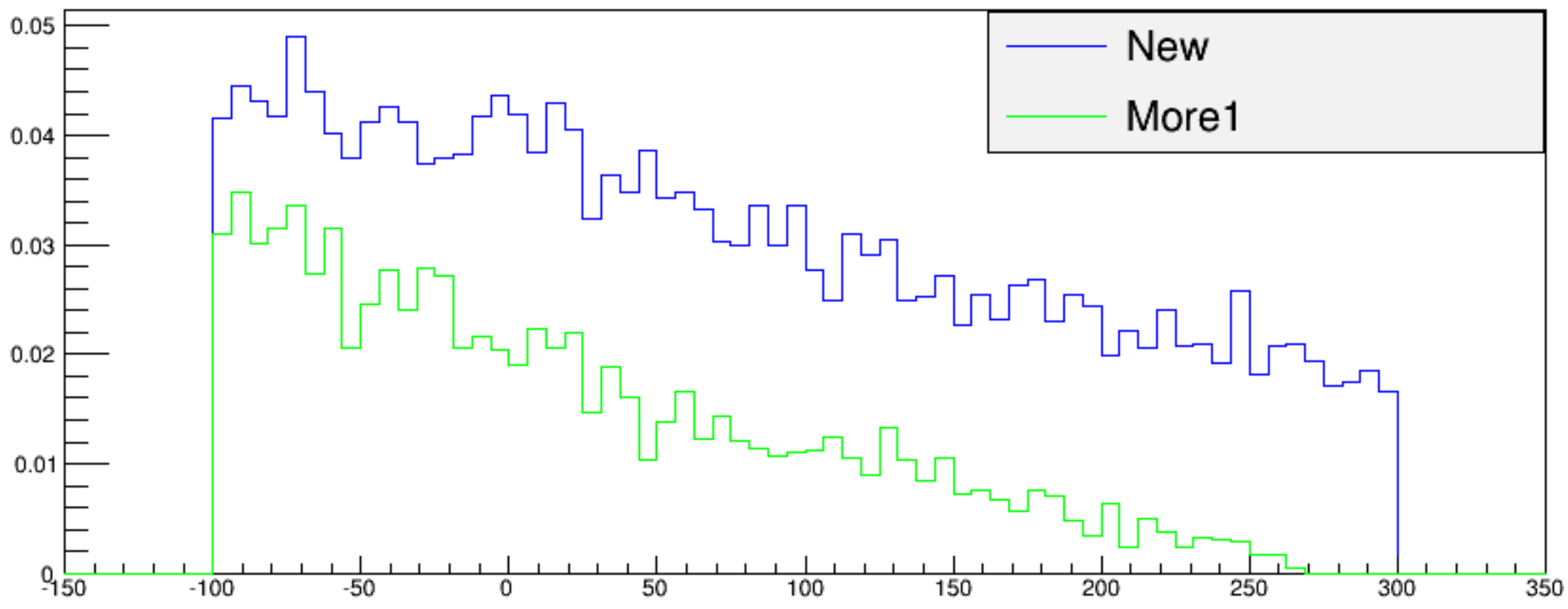


Neutrals - New





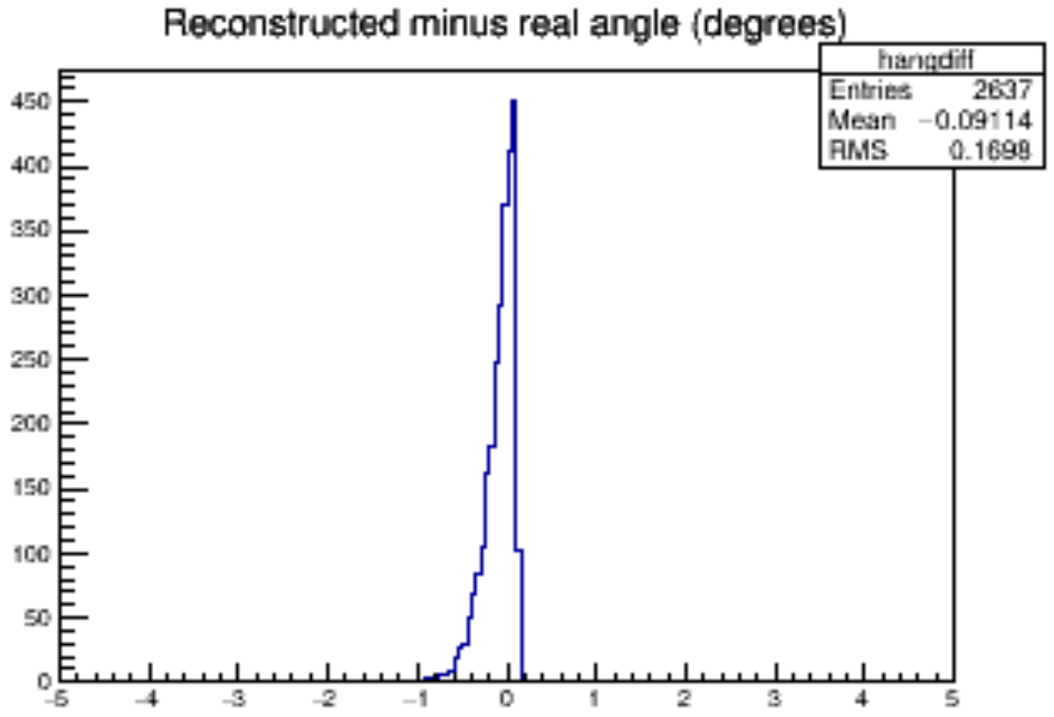
Increase in neutrals acceptance presumably due to shift in high ϕ edge (plate 1) — will adjust.

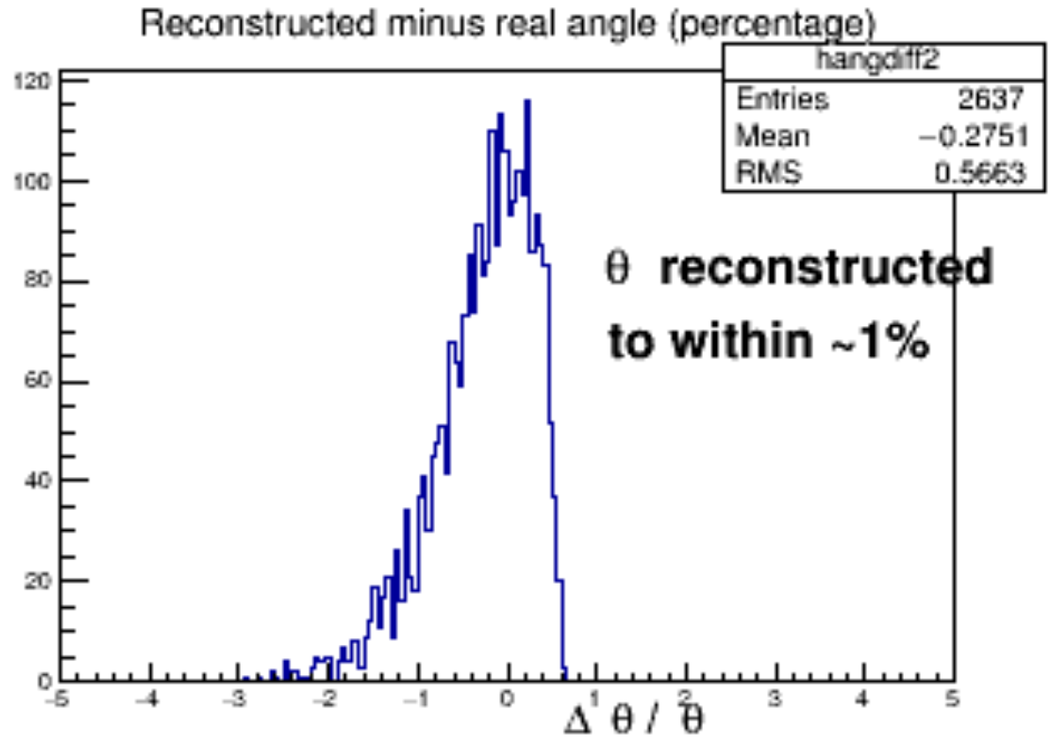


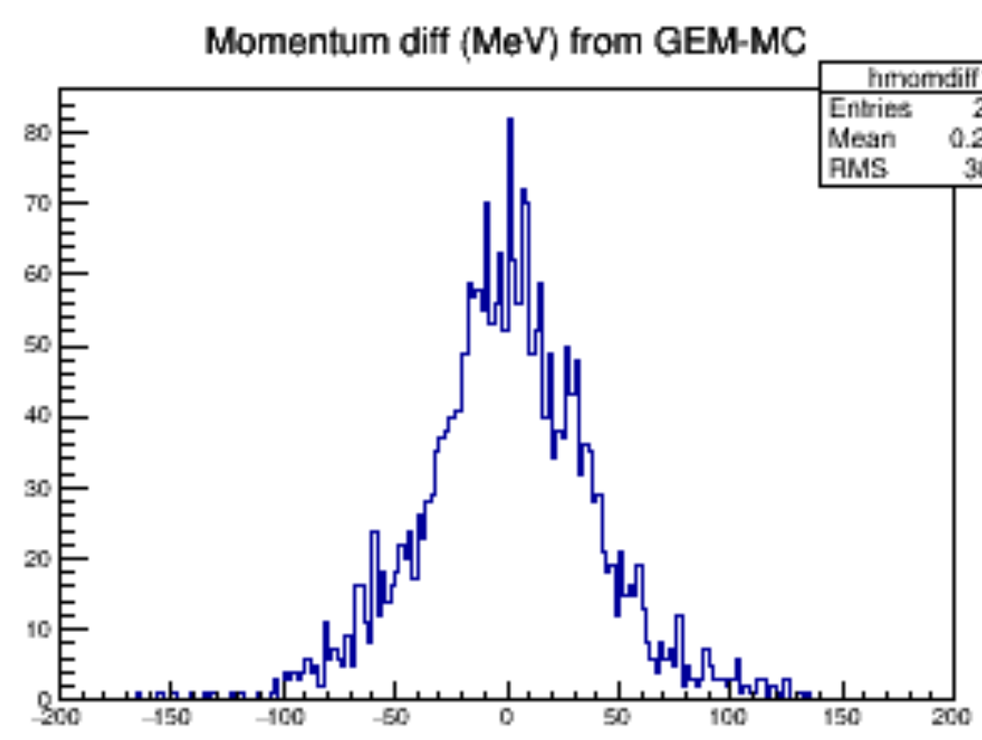
Q^2 and alignment

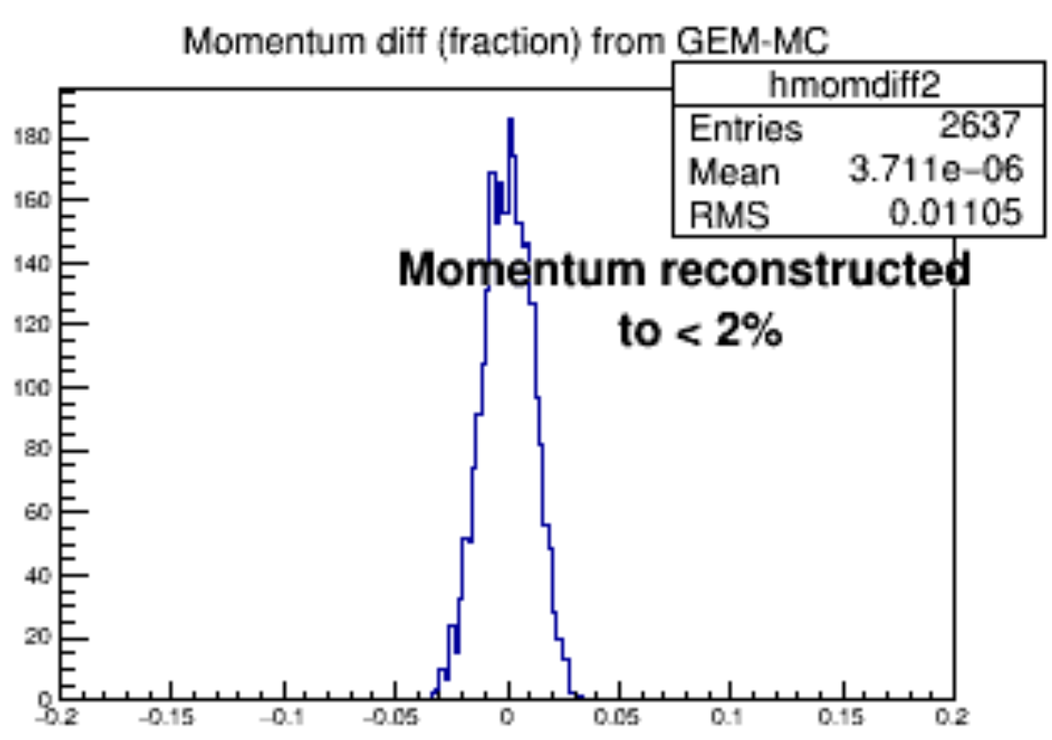
(Bob Michaels)

- GEM coordinates from Monte Carlo (GEMs 1, 4)
- Reconstruct θ, p from hits (truth values of hit coordinates — widths due to target/detector materials)
- Introduce position shifts and reconstruct θ, p again
- Study differences in θ, p with and without shifts

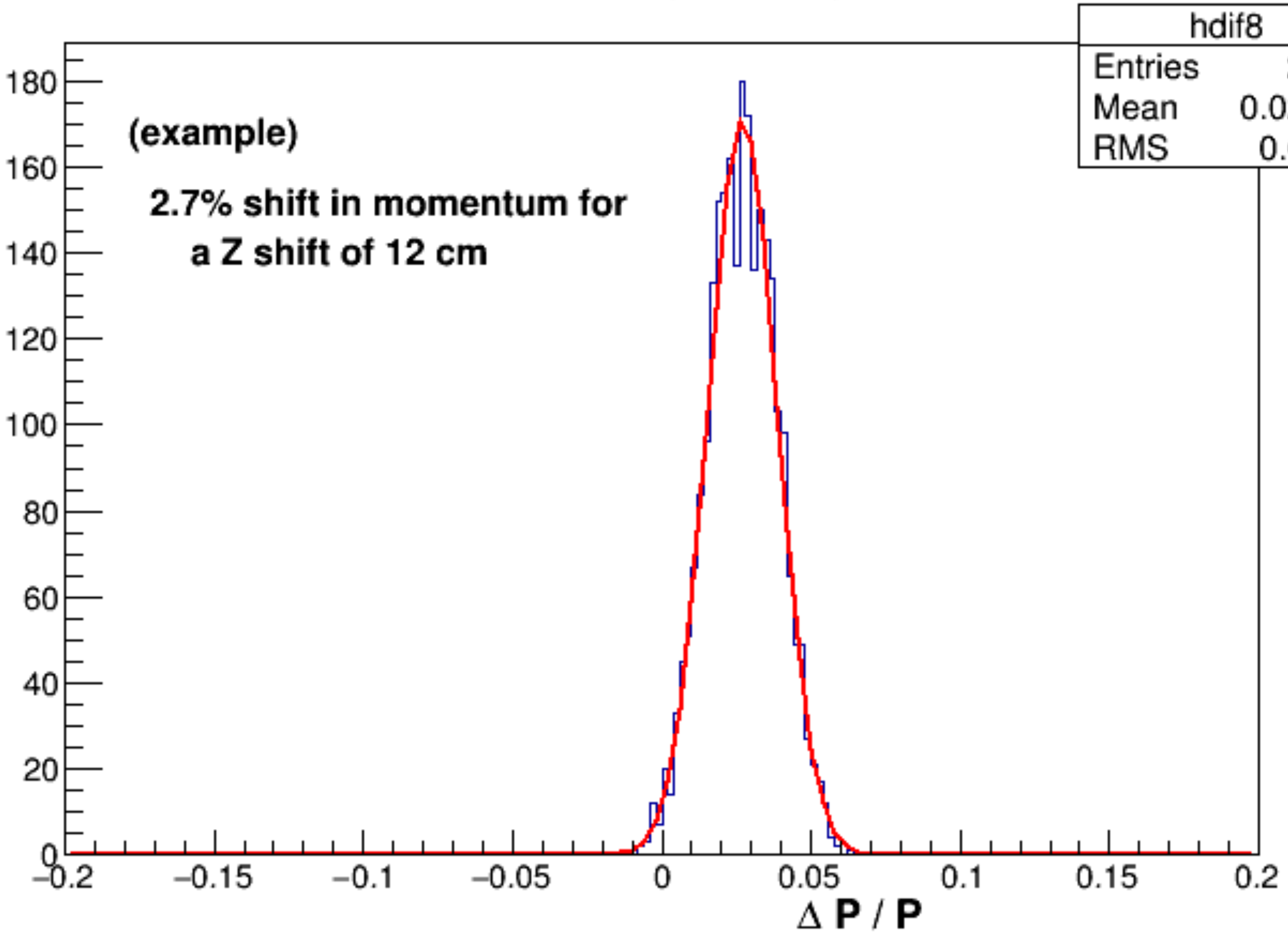

Reconstructed minus real angle (degrees)
hangdiff
Entries 2637
Mean −0.09114
RMS 0.1698


Reconstructed minus real angle (percentage)
hangdiff2
Entries 2637
Mean −0.2751
RMS 0.5663
θ reconstructed
to within ~1%
Δ θ / θ


Momentum diff (MeV) from GEM-MC
hmomdiff1
Entries 2637
Mean 0.2283
RMS 38.12


Momentum diff (fraction) from GEM-MC
hmomdiff2
Entries 2637
Mean 3.711e−06
RMS 0.01105
Momentum reconstructed
to < 2%

Momentum diff (fraction) shift 8



Momentum shift (%) vs Z shift of GEMs (cm)

For << 1% dp/p
need Z alignment to ~1 cm

% change in computed momentum

5
4
3
2
1
0
−1
−2

−5
0
5
10
15

Overall Z shift of GEMs 1 (cm)

Momentum width (%) vs X shift of GEMs (microns)

For <<1 % width
need < 200 μ m alignment

RMS width of momentum residual

3
2.5
2
1.5
1
0.5
0

0
500
1000
1500
2000

Transverse shift of GEM 1 (μ m)

- Incremental improvements to baffle acceptance are possible

- Still need to tweak

- Need to get DIS and background rates — check materials, zigzag geometry, etc.

- Acceptance for 6.6 GeV down ~20%

- Alignment requirements: 200 μm in x/y, 1 cm in z