Baffle work

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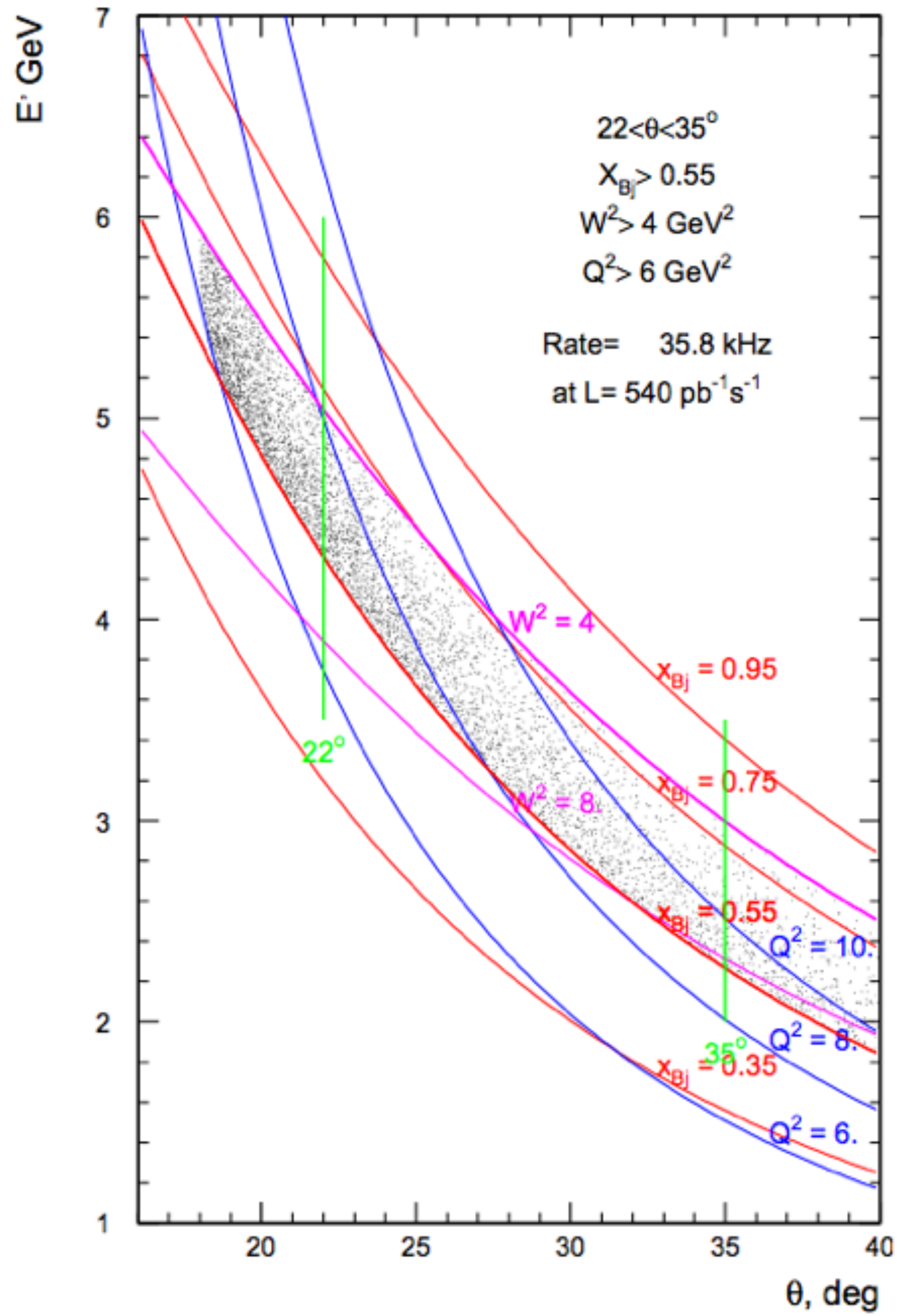
- Current baffles ("More1") are based on ones designed for BaBar solenoid
- Never optimized for CLEO
- Limits imposed by current baffles not well understood
- Program: Study acceptances of baffles to see where improvements are possible

Geometric acceptance

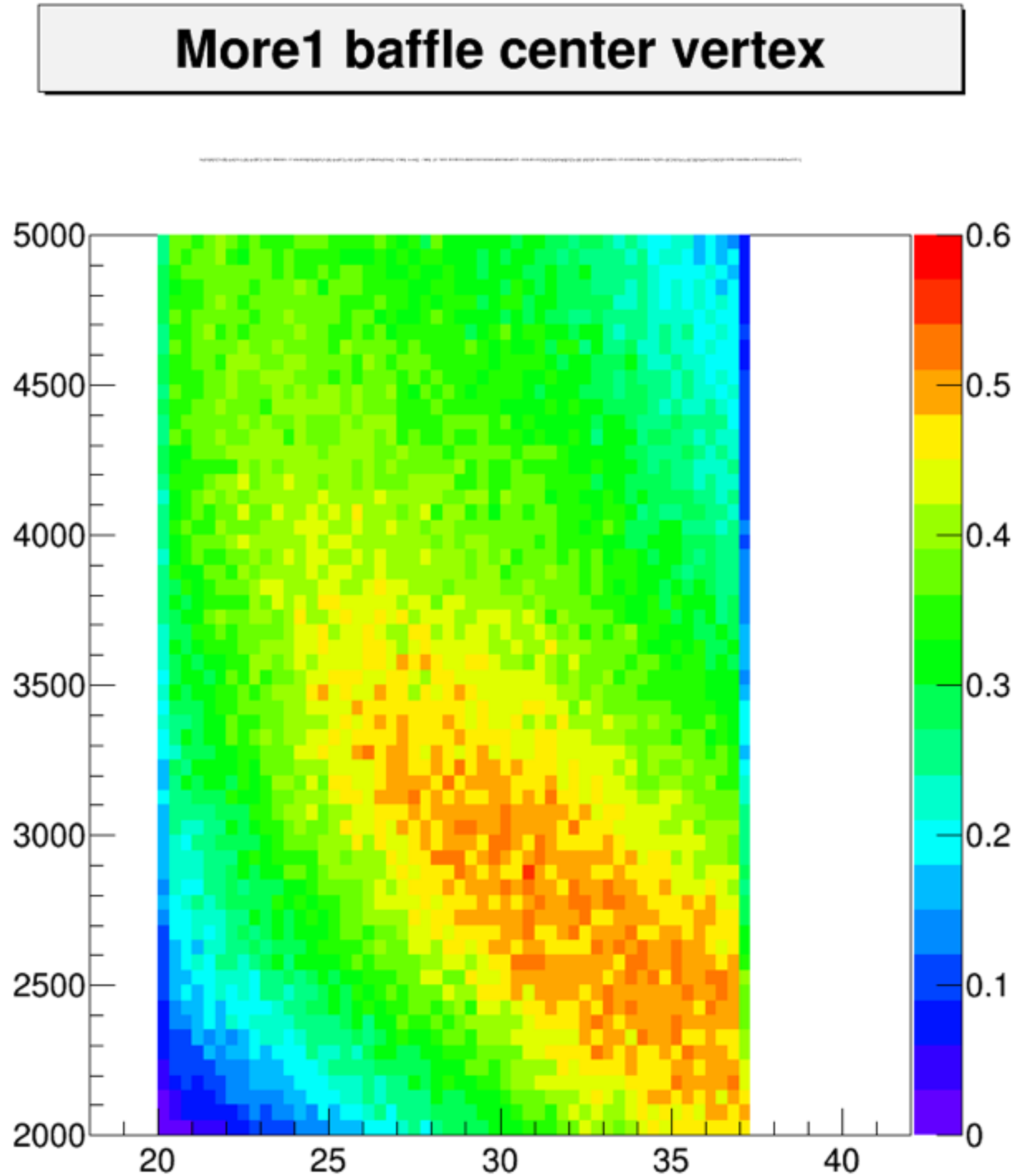
- Generate e^- in 2 GeV < p < 6 GeV and 10° < θ < 50°.
    - Note there is acceptance for electron momenta down to about 1.3 GeV
- Vertex positions are target center, ends, and between.
- Plots are ratios of tracks passing through Kryptonite baffle to tracks produced in bins of p, θ.

Physics interest

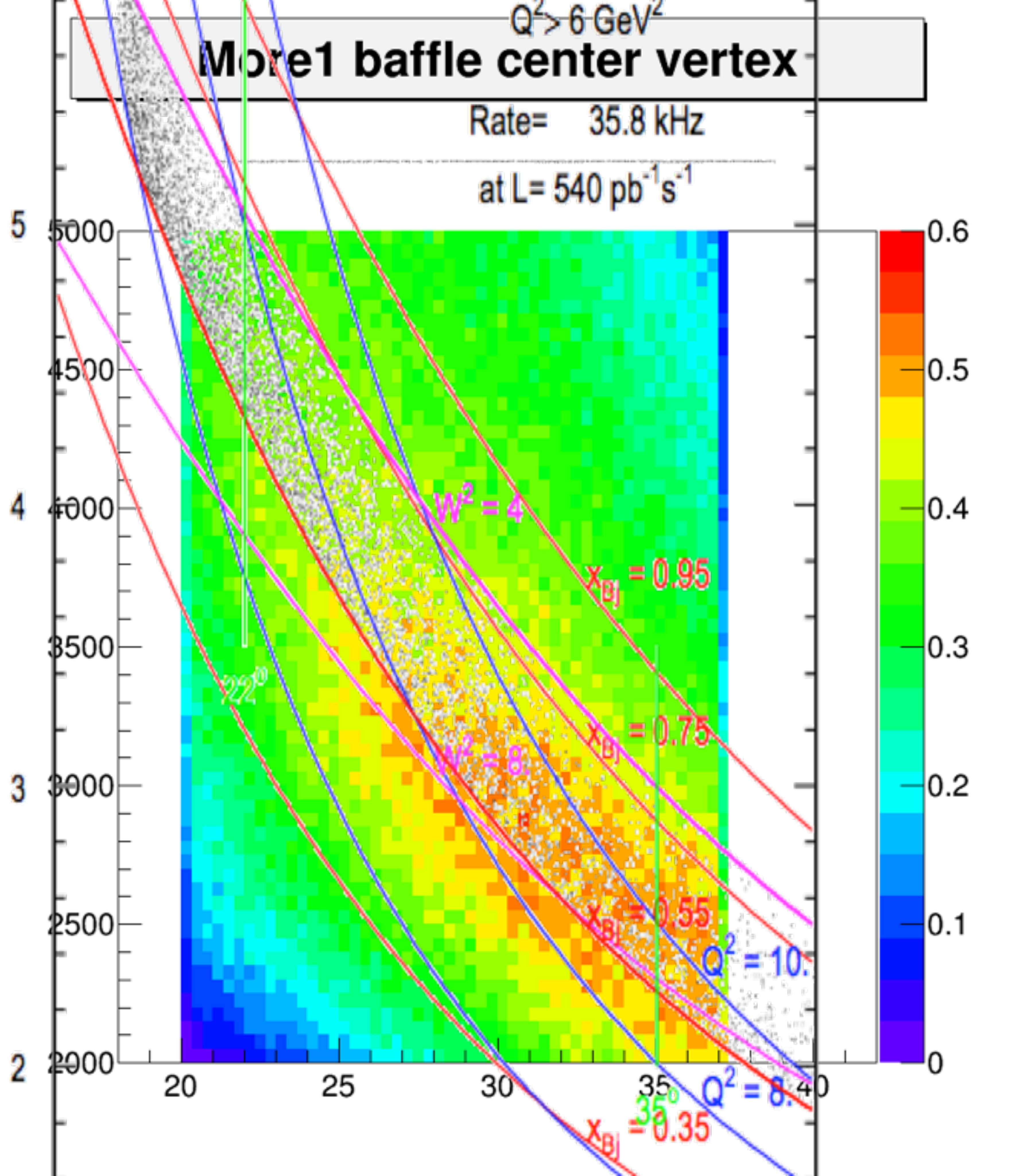
- From proposal: Useful kinematics $22° < \theta < 35°$, $x_{Bj} > 0.55$, $W^2 > 4$ GeV^2, $Q^2 > 6$ GeV^2 defines this stripe in p/θ space.

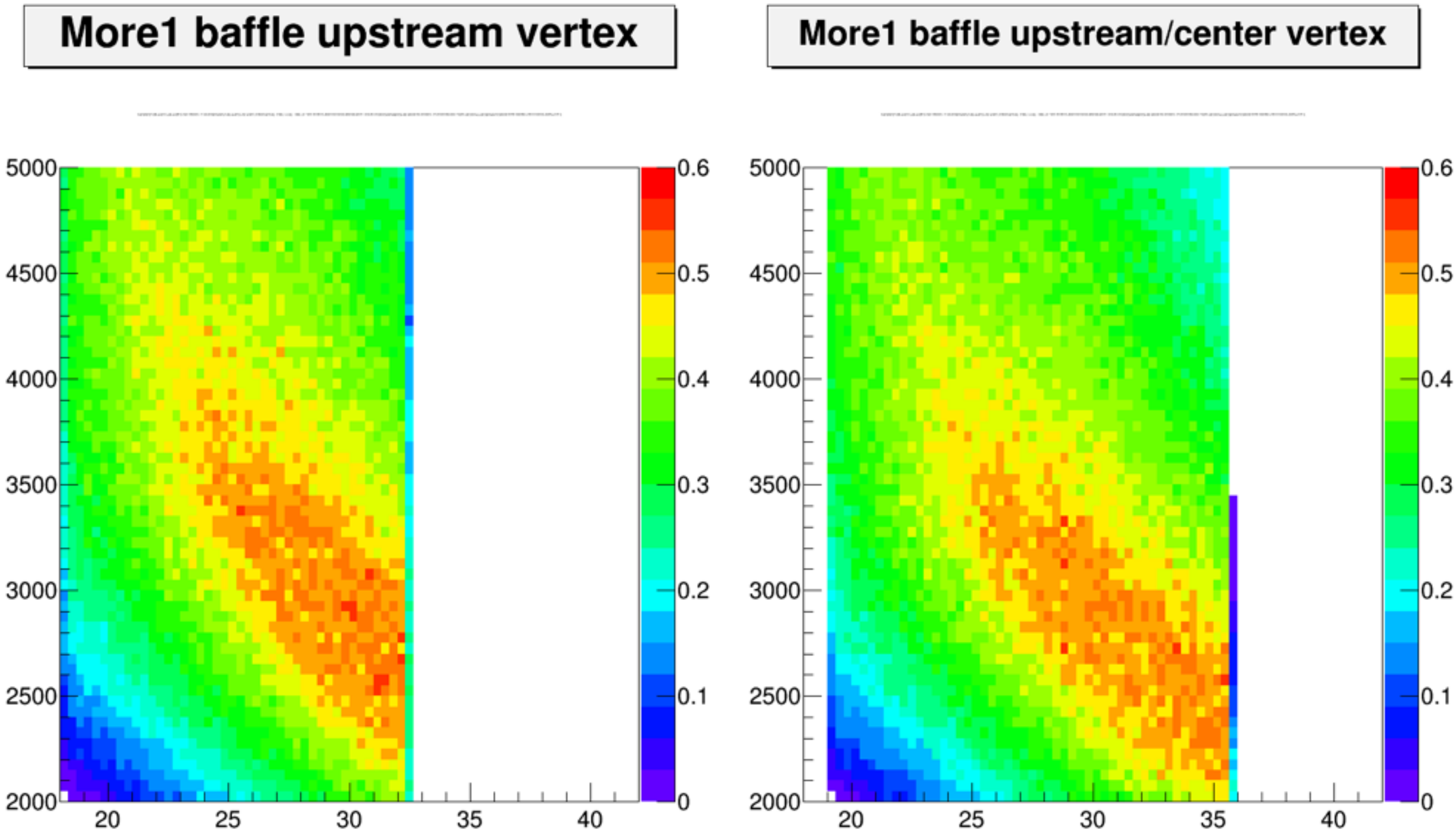


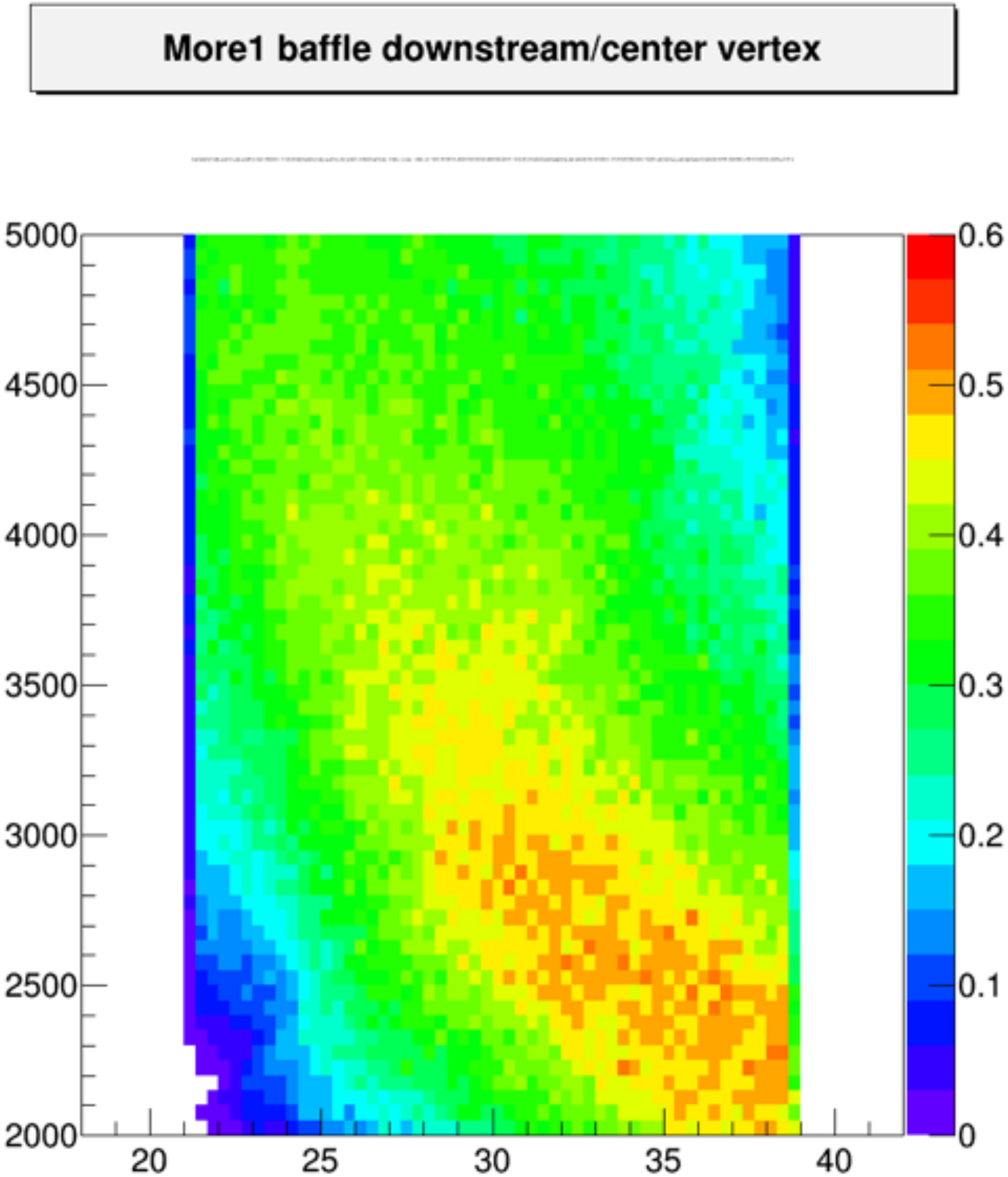
- More1 e$^-$ acceptance (target center) is reasonably well matched to kinematics.

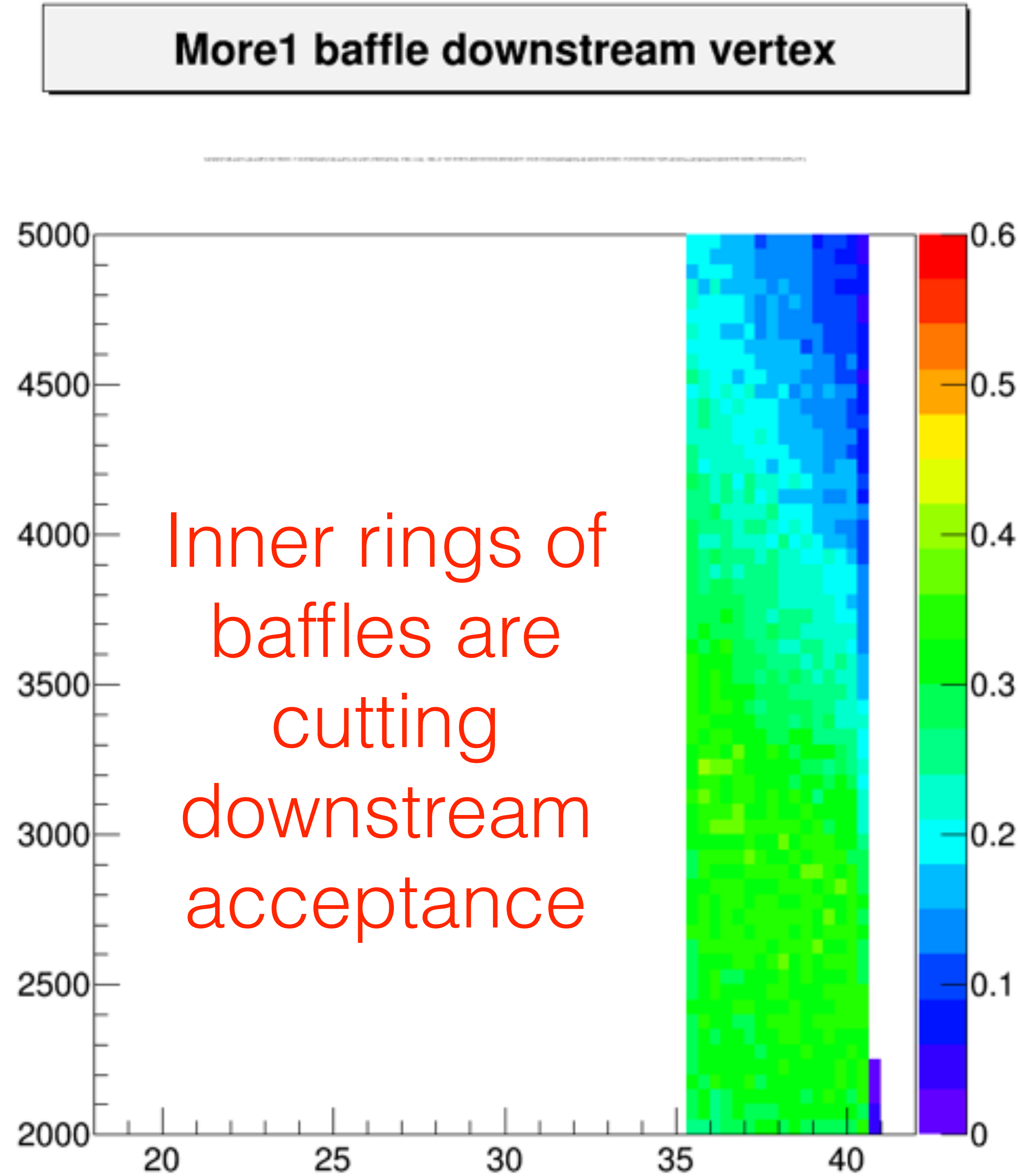


- More1 e$^-$ acceptance (target center) is reasonably well matched to kinematics.



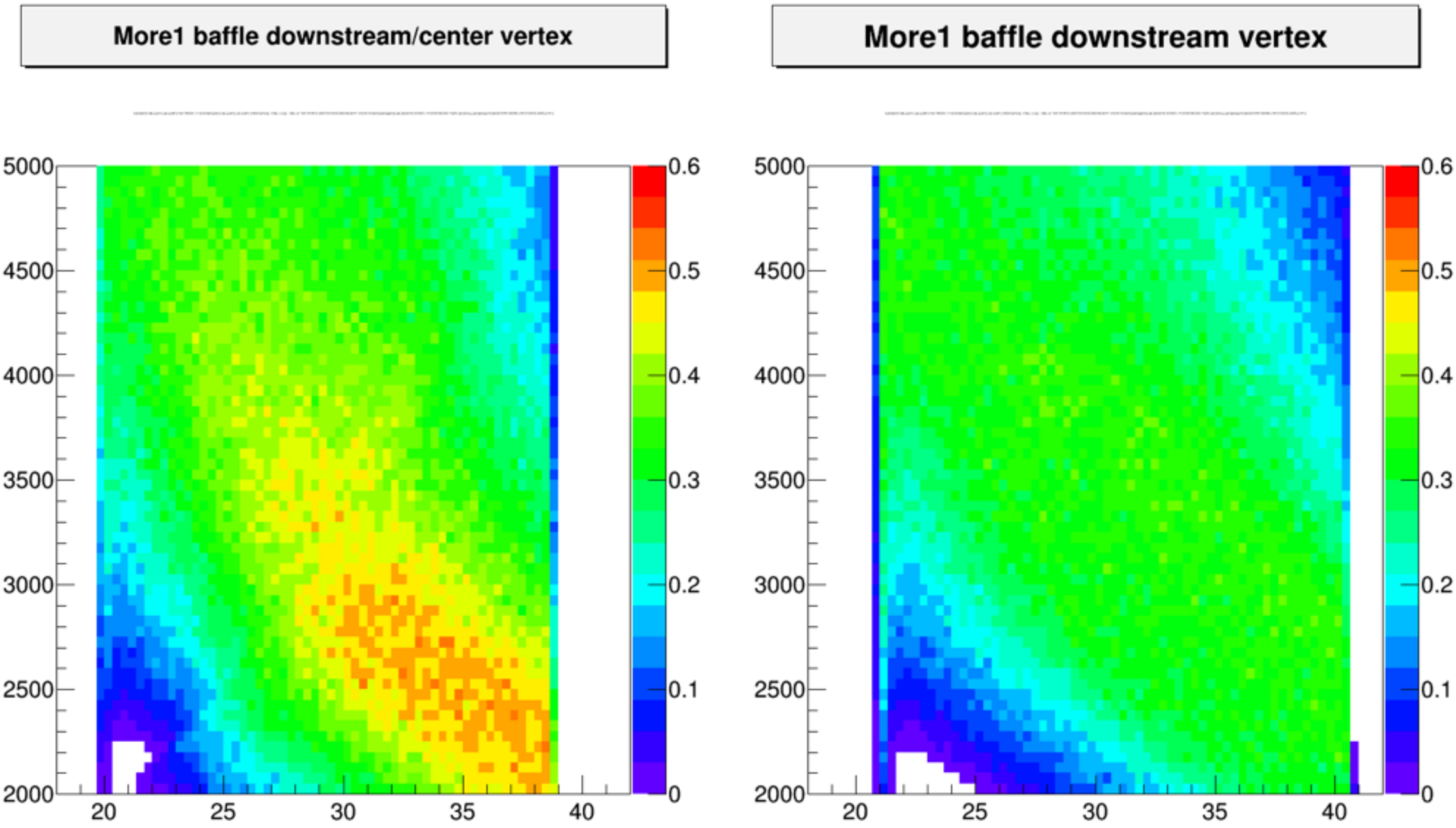

More1 baffle upstream vertex
More1 baffle upstream/center vertex
5000
4500
4000
3500
3000
2500
2000
20
25
30
35
40
0.6
0.5
0.4
0.3
0.2
0.1
0


More1 baffle downstream/center vertex
5000
4500
4000
3500
3000
2500
2000
20
25
30
35
40
0.6
0.5
0.4
0.3
0.2
0.1
0


More1 baffle downstream vertex
5000
4500
4000
3500
3000
2500
2000
20
25
30
35
40
0.6
0.5
0.4
0.3
0.2
0.1
0
Inner rings of baffles are cutting downstream acceptance

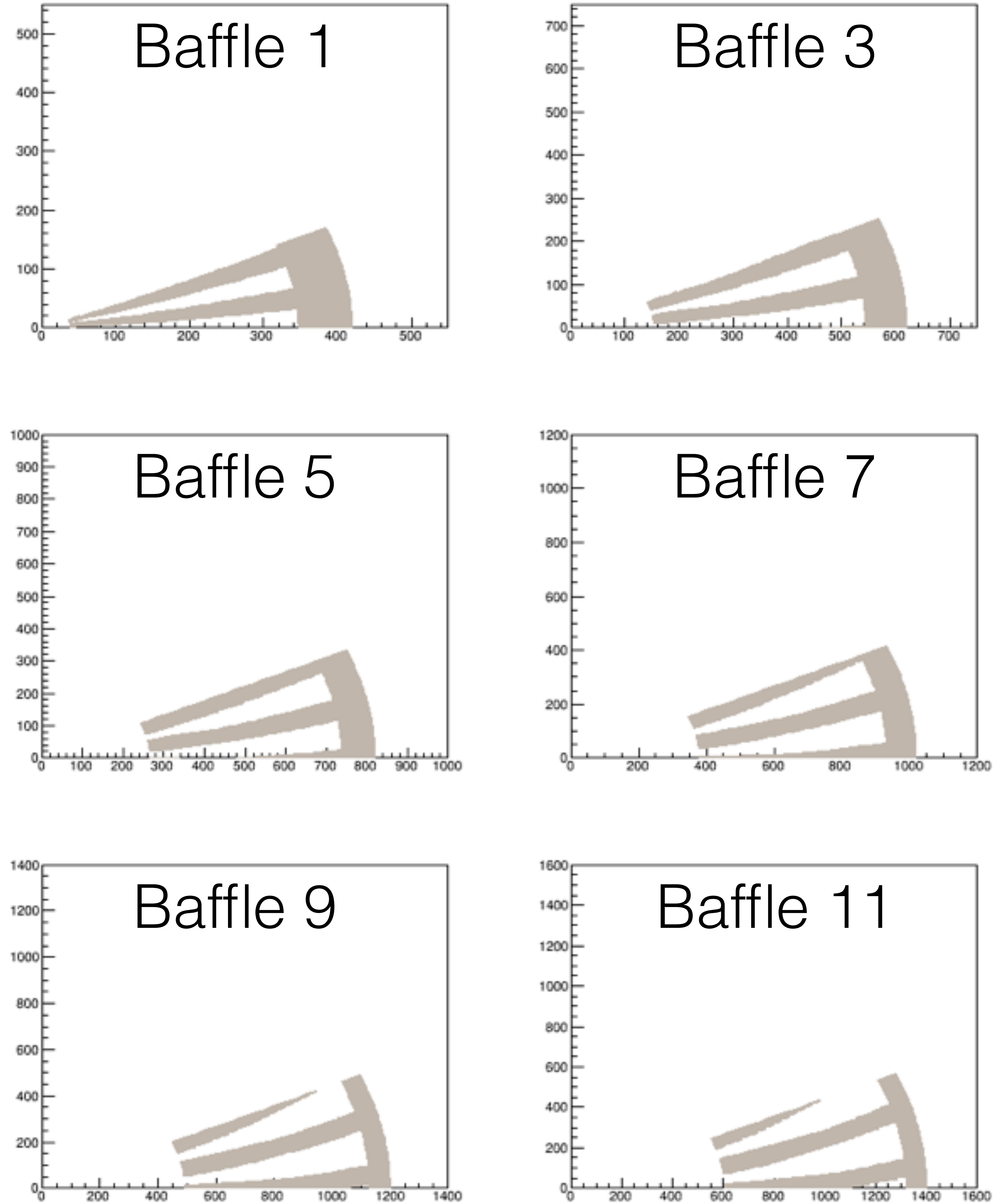
- Quick fix: Eliminate inner rings on all baffles
- Probably could keep inner rings on all but most upstream baffles
- Better to extend slits/blocks inward (with careful choice of extended slit geometry)

Without inner rings



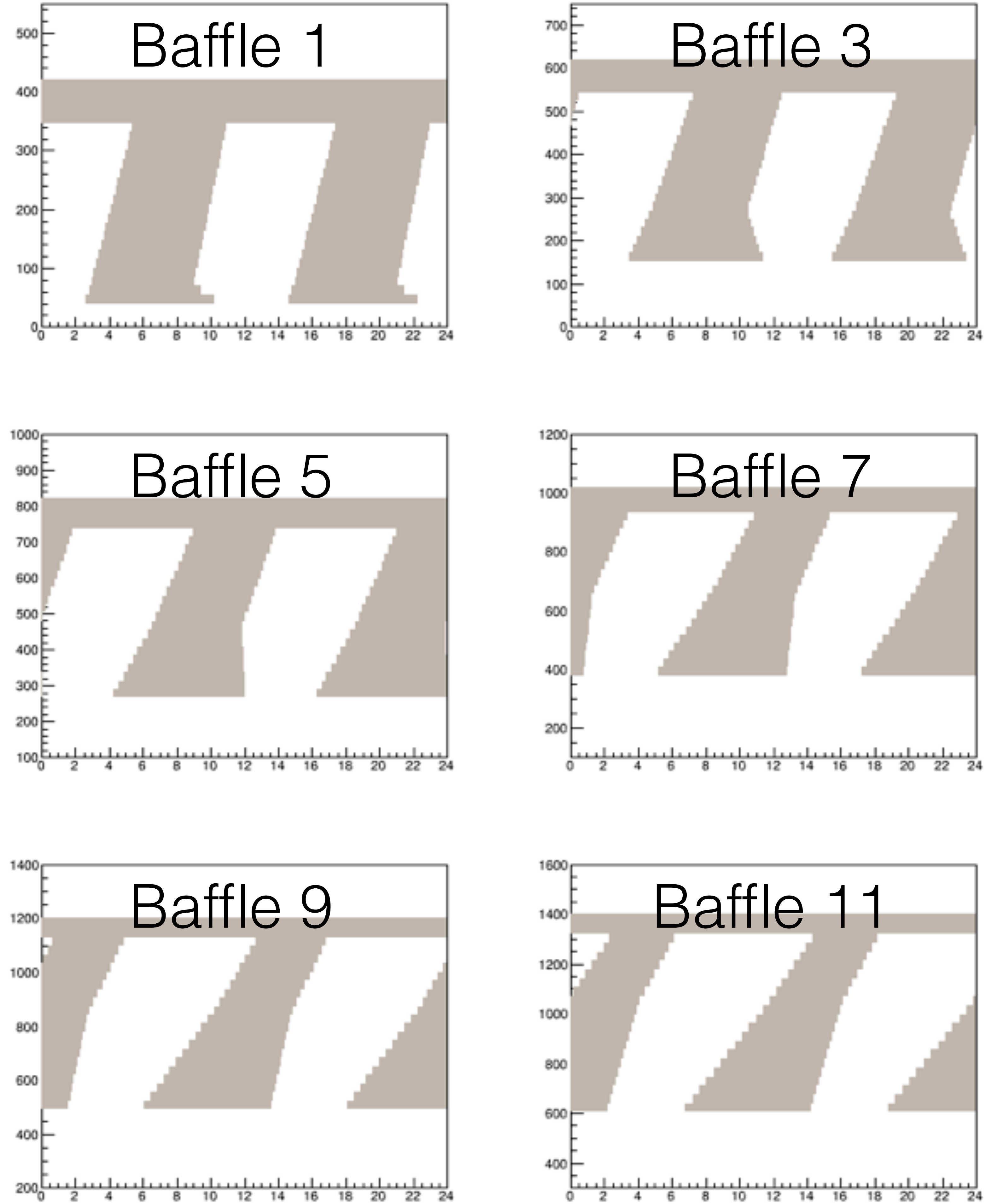
Shapes of odd numbered baffles
$0° < \phi < 24°$
No inner rings

Horizontal (vertical) axis is *x* (*y*) coordinate



Shapes of odd numbered baffles
$0° < \phi < 24°$
No inner rings

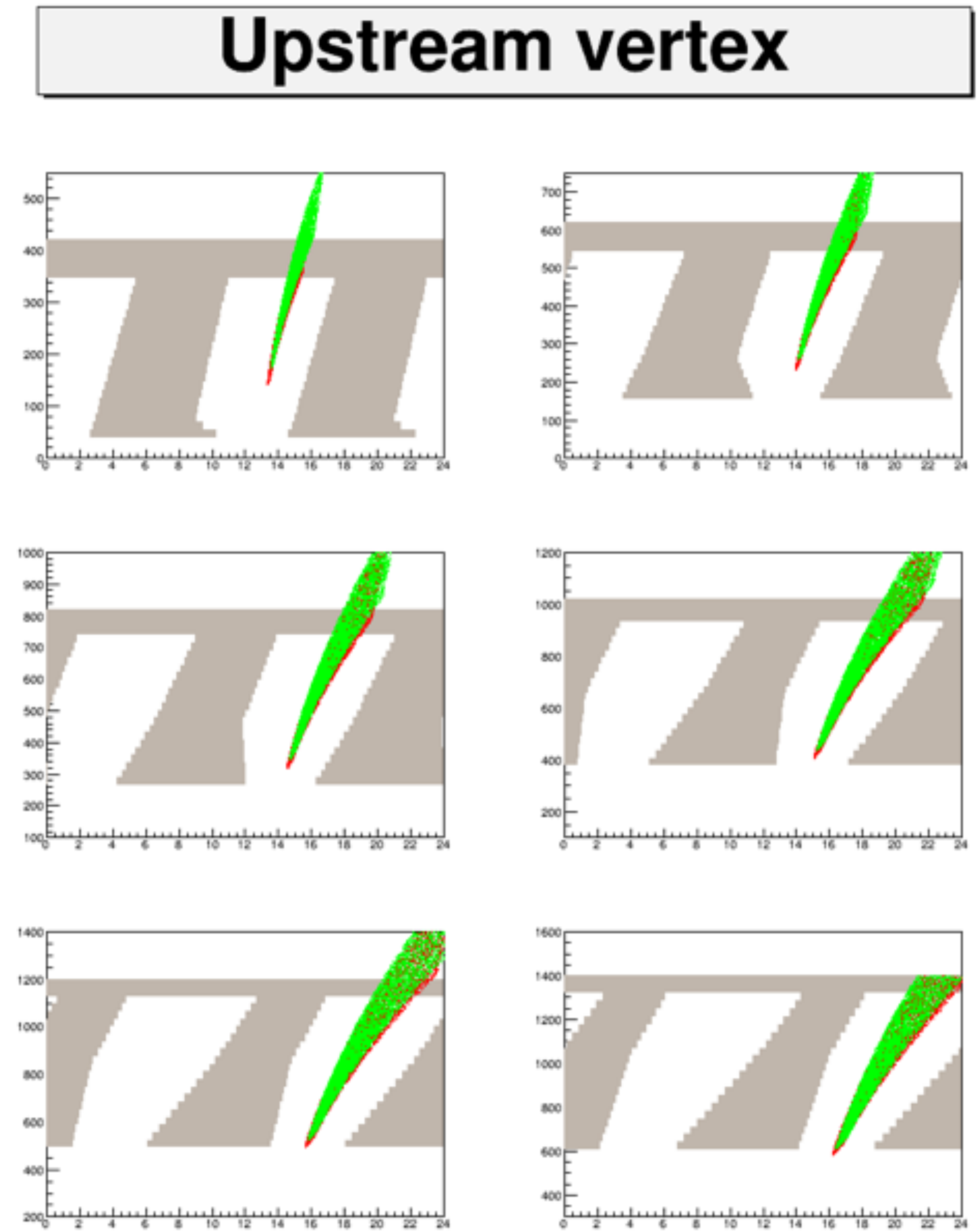
Horizontal (vertical) axis is ϕ (r) polar coordinate



e^- tracks generated uniform in p and θ with ϕ fixed (at 12°)

Cuts imposed:
$x_{Bj} > 0.55$, $W^2 > 4$ GeV^2, $Q^2 > 6$ GeV^2, $p > 2$ GeV/c^2

Plotted points are positions at z corresponding to front (red) and back (green) of each baffle plane
(NO baffle actually present)

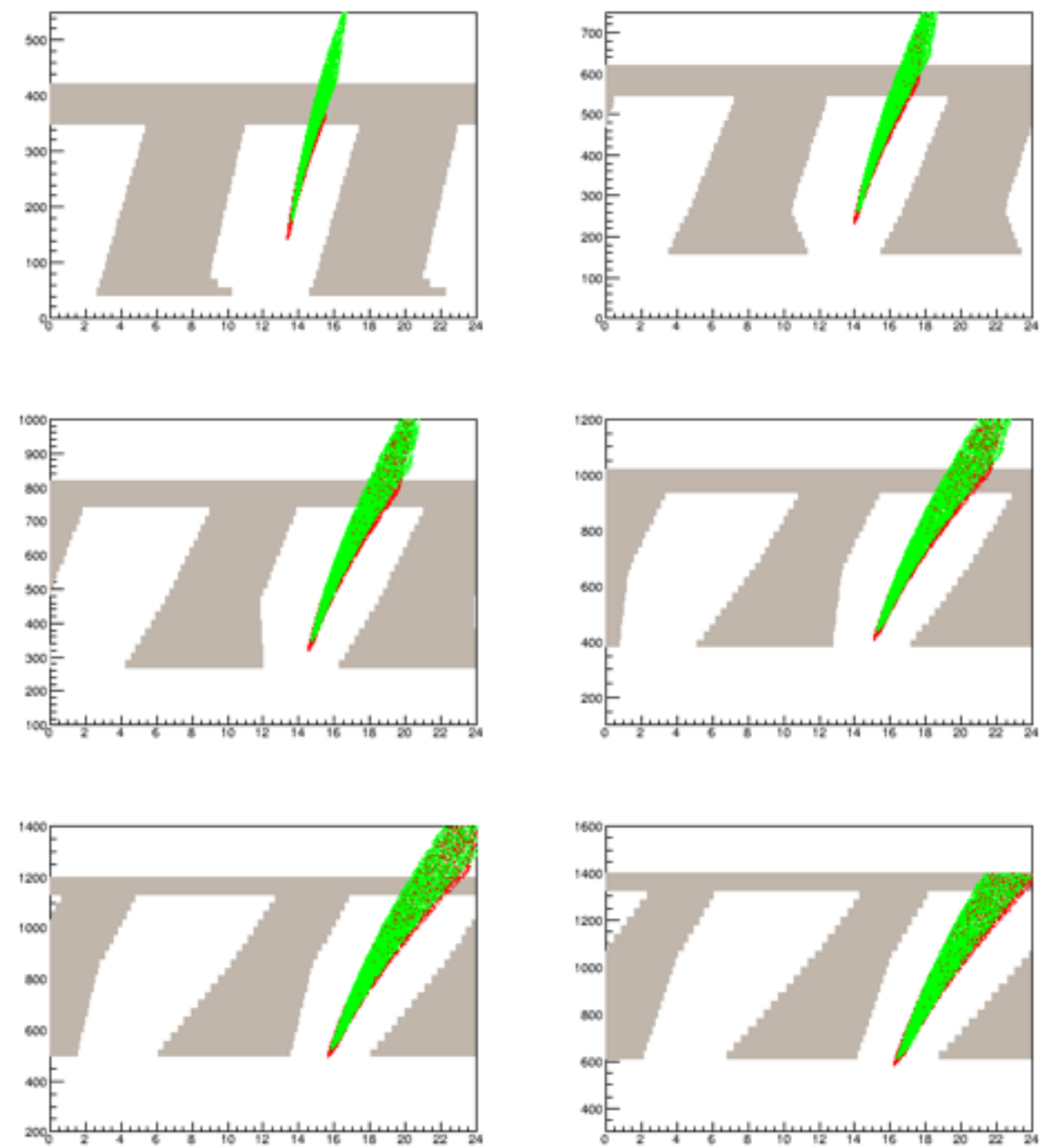


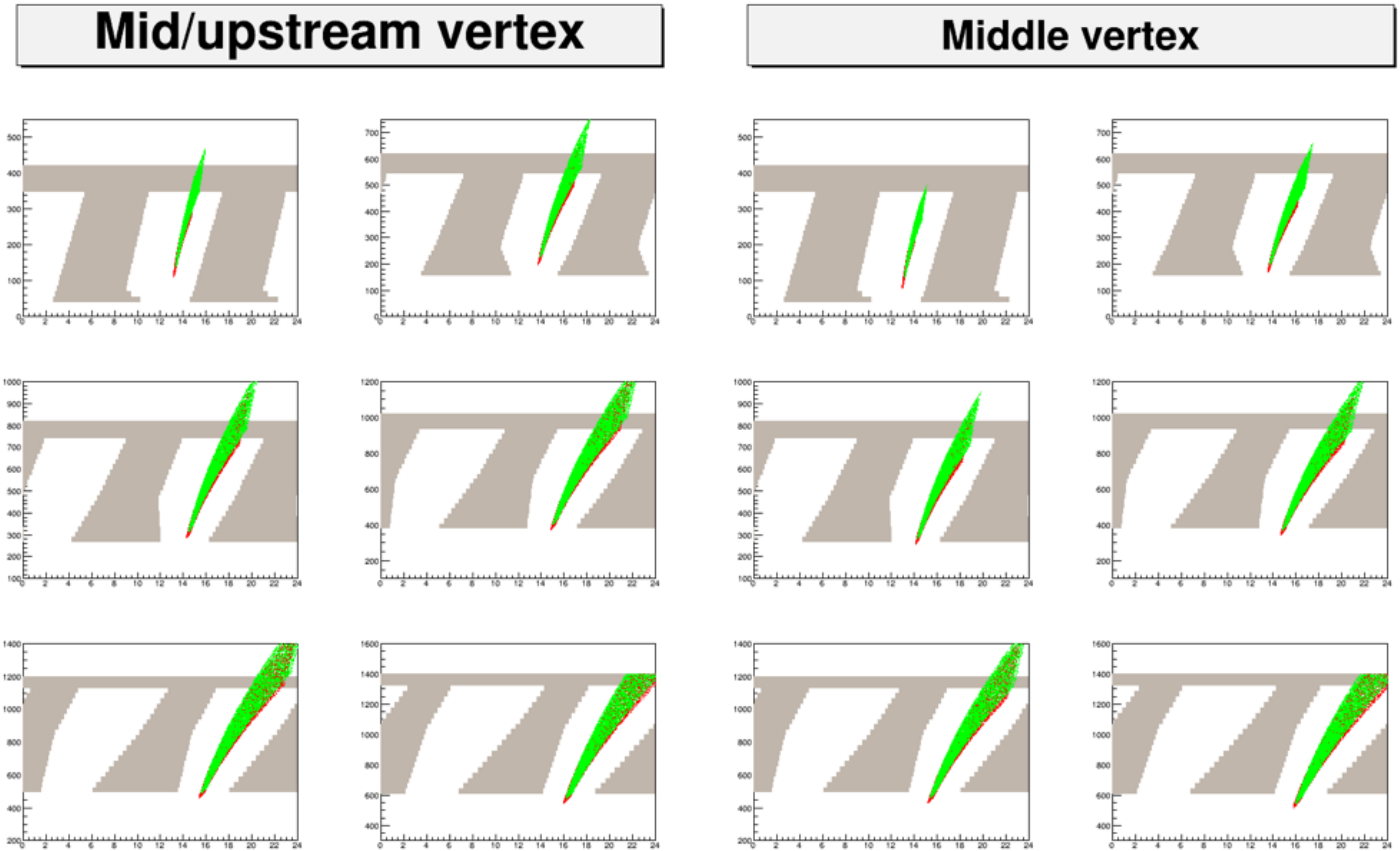
e^- tracks generated uniform in p and θ with ϕ fixed (at 12°)

Cuts imposed:
$x_{Bj} > 0.55$, $W^2 > 4\ \mathrm{GeV}^2$, $Q^2 > 6\ \mathrm{GeV}^2$, $p > 2\ \mathrm{GeV/c}^2$

Plotted points are positions at front (red) and back (green) of each baffle plane

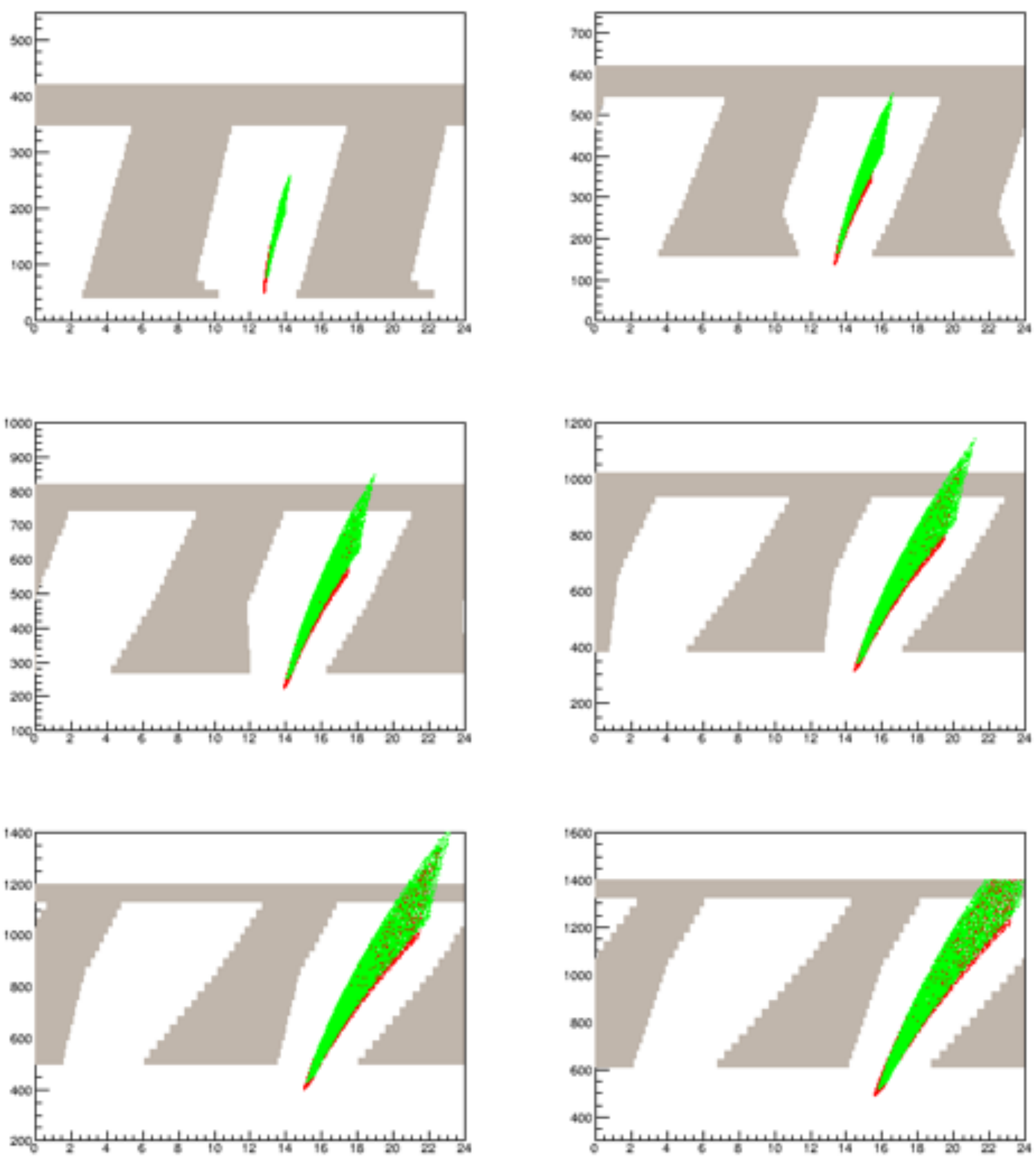
Upstream vertex



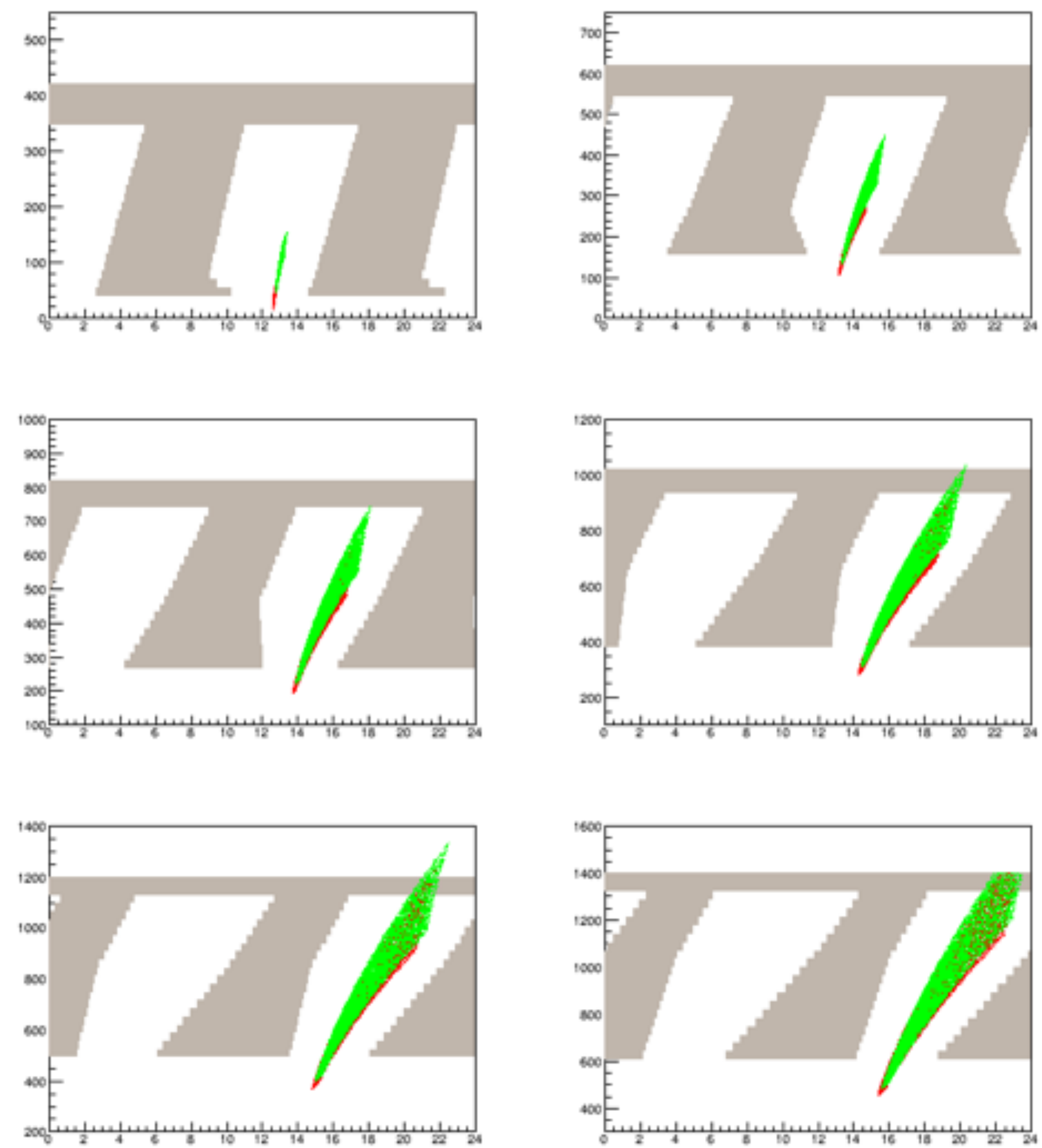


Shapes of slits for large θ look reasonable to give ~50% acceptance for good events. At small θ, cuts into acceptance.

Mid/downstream vertex



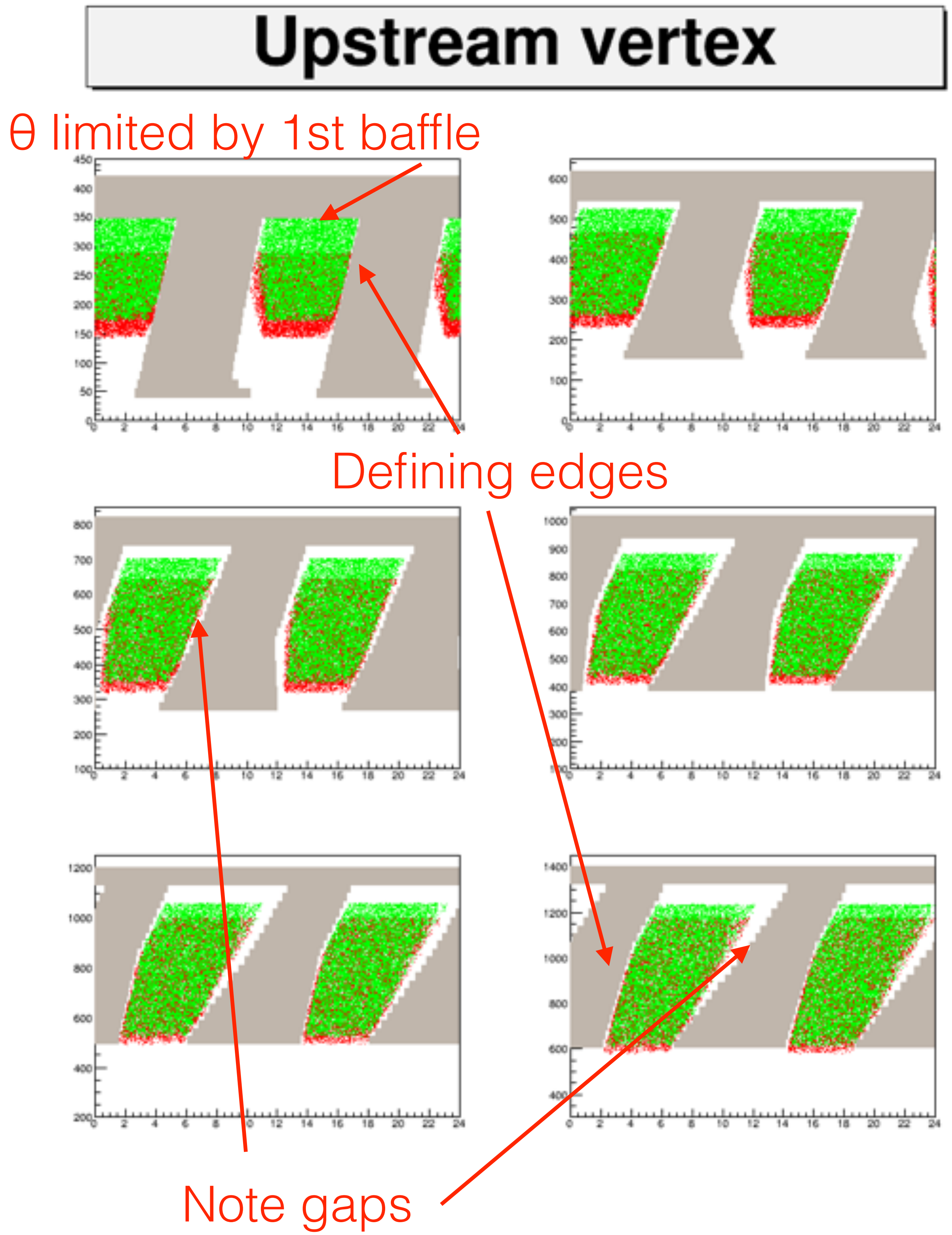
Downstream vertex



For these plots, e^- tracks generated uniform in p, θ, and ϕ

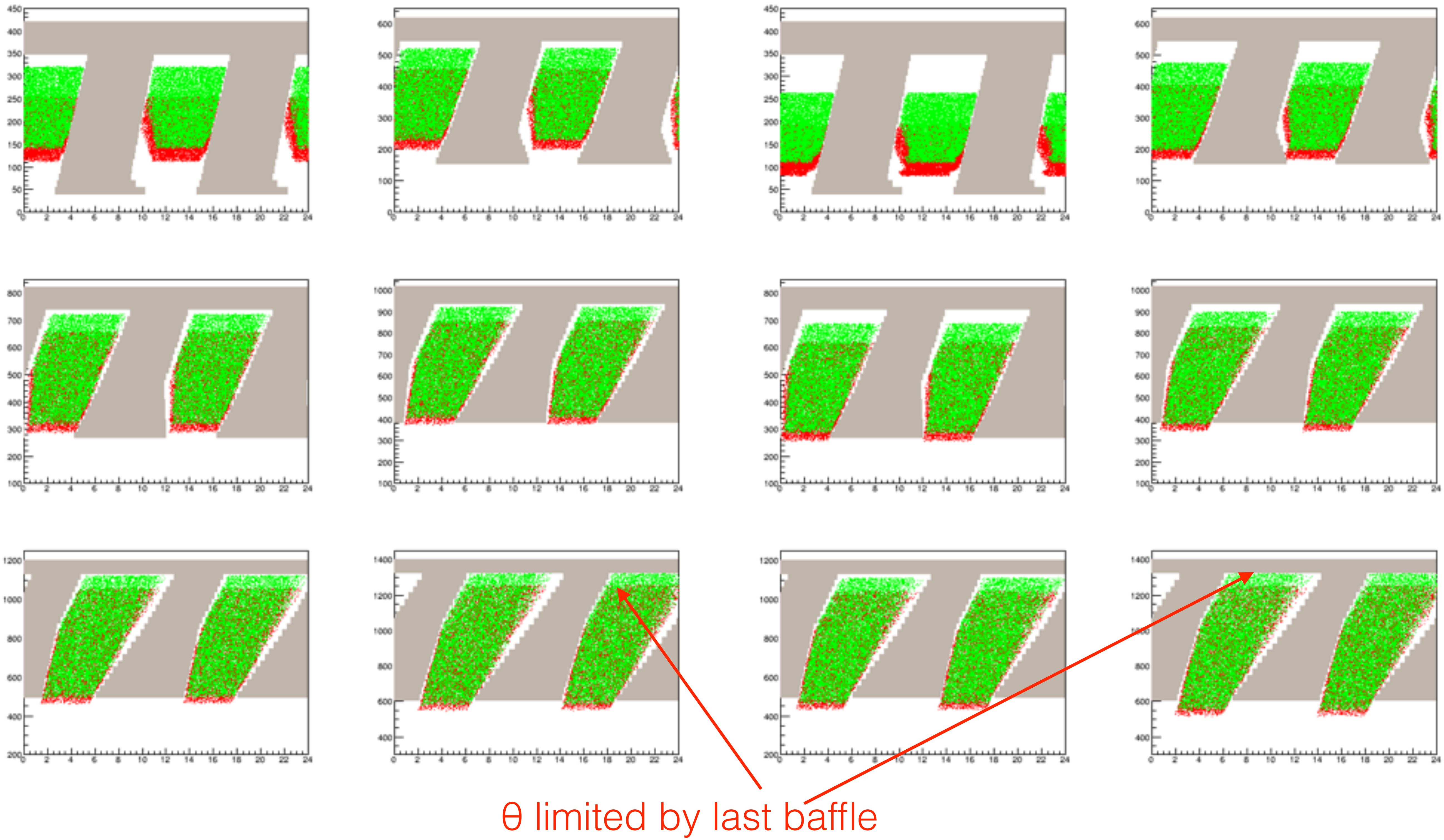
Same cuts imposed: $x_{Bj} > 0.55$, $W^2 > 4$ GeV^2, $Q^2 > 6$ GeV^2, $p > 2$ GeV/c^2

Plotted points are positions at front (red) and back (green) of each baffle plane *for only those tracks that get through all 11 Kryptonite baffles*

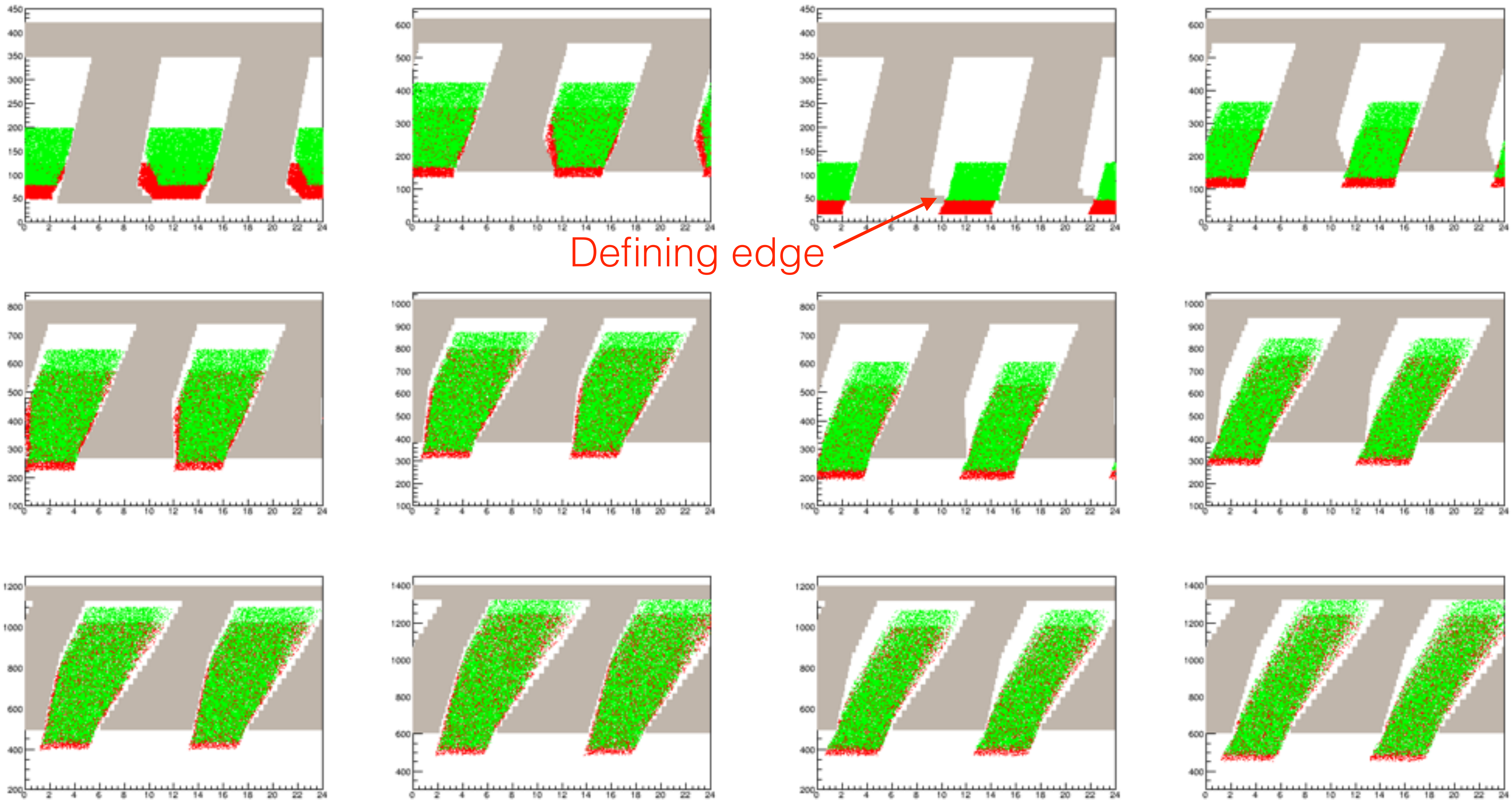


Mid/upstream vertex

Middle vertex

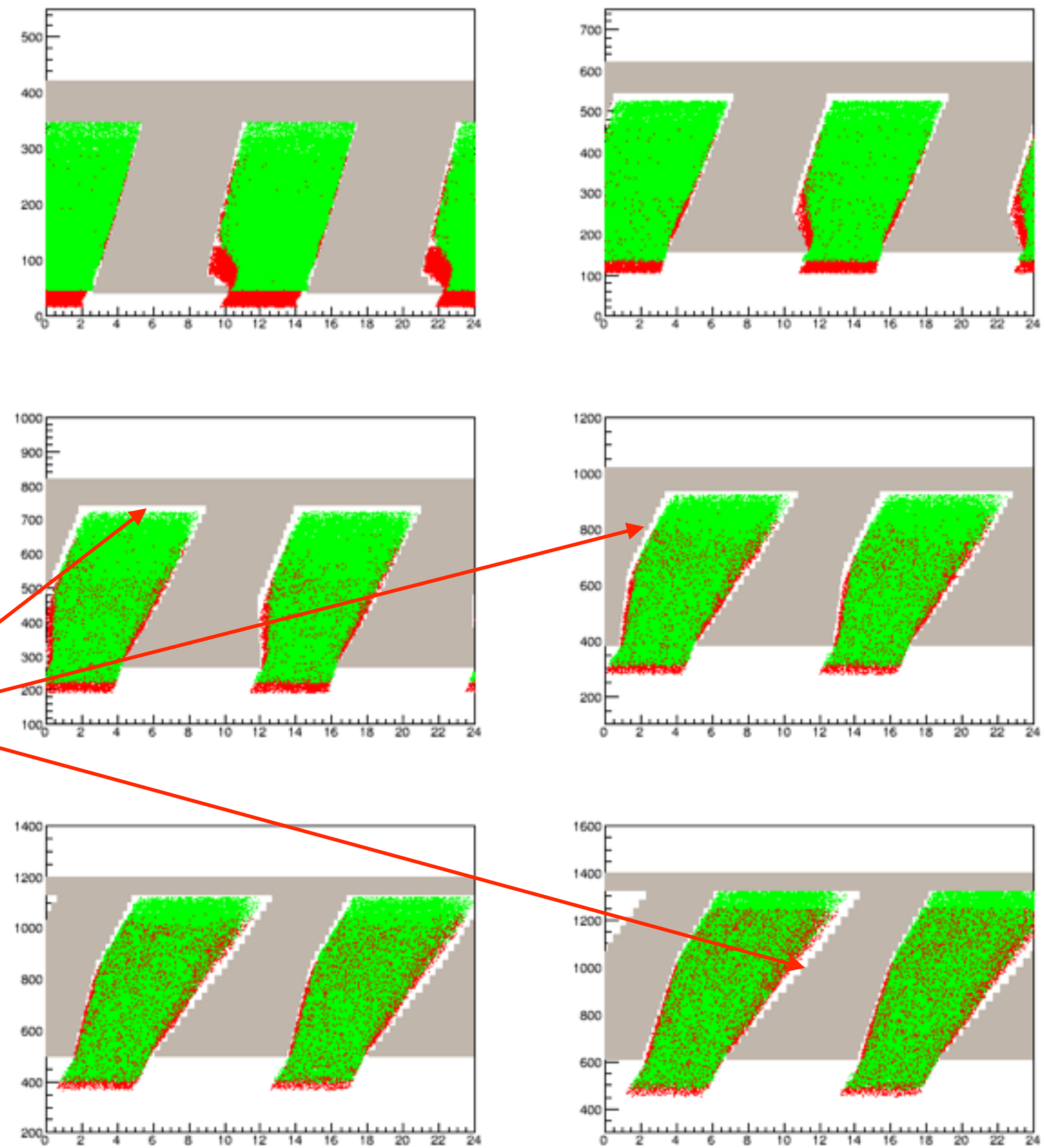


Mid/downstream vertex	Downstream vertex



5 vertex

Tracks from all vertex positions superimposed

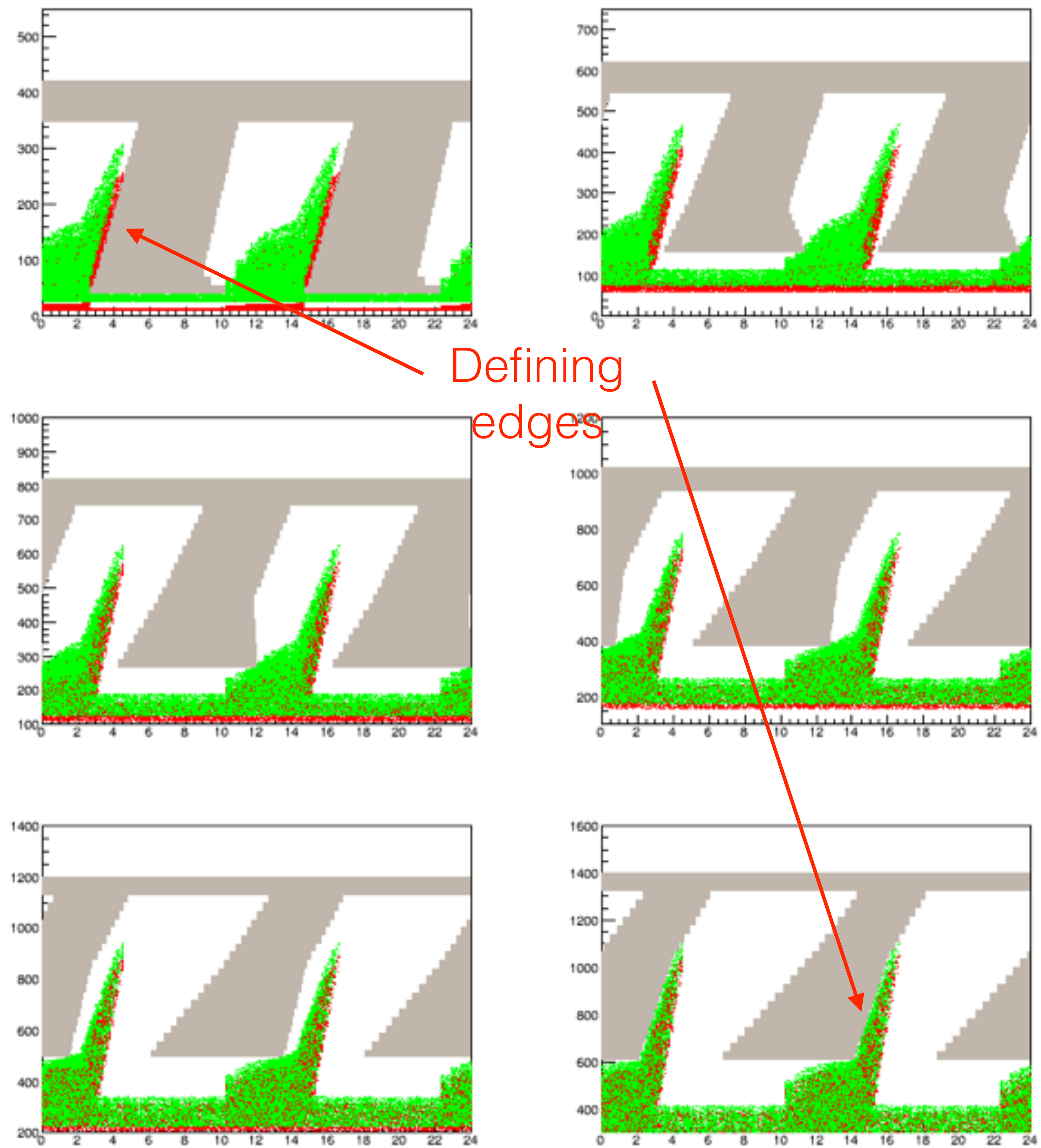


Gaps where no tracks go

Right edge gaps probably due to lower integrated field for CLEO solenoid

5 vertex

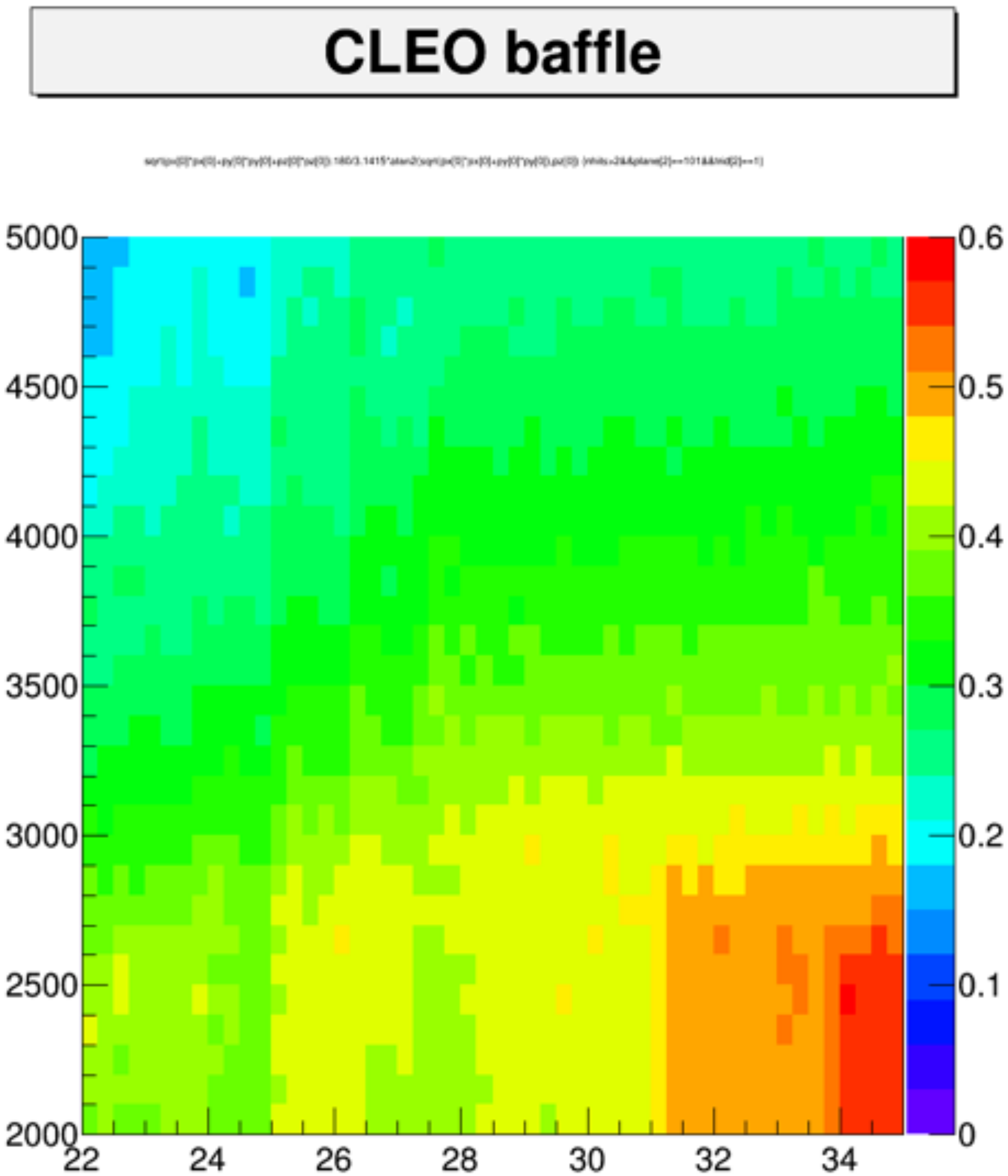
Same for photons

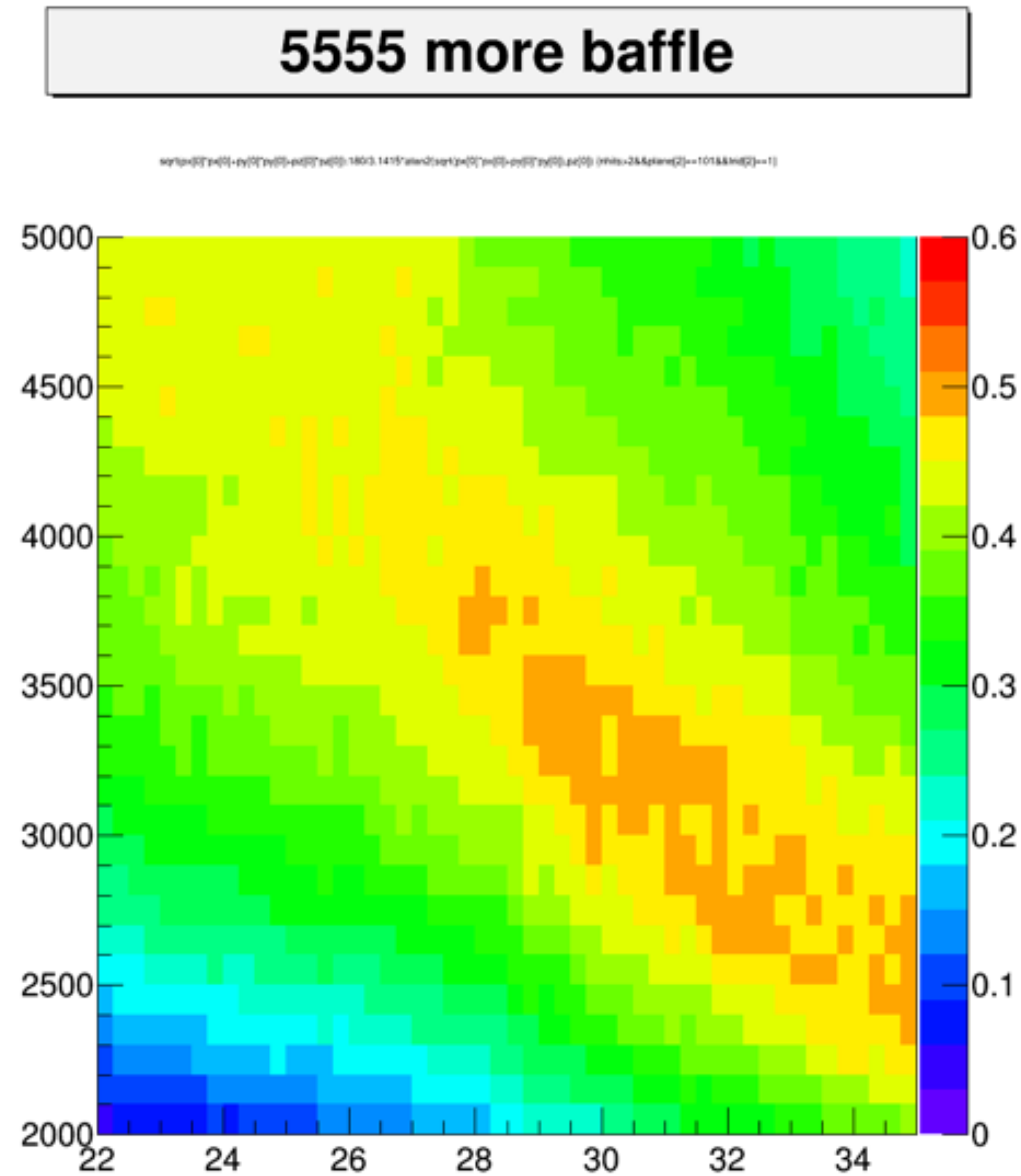


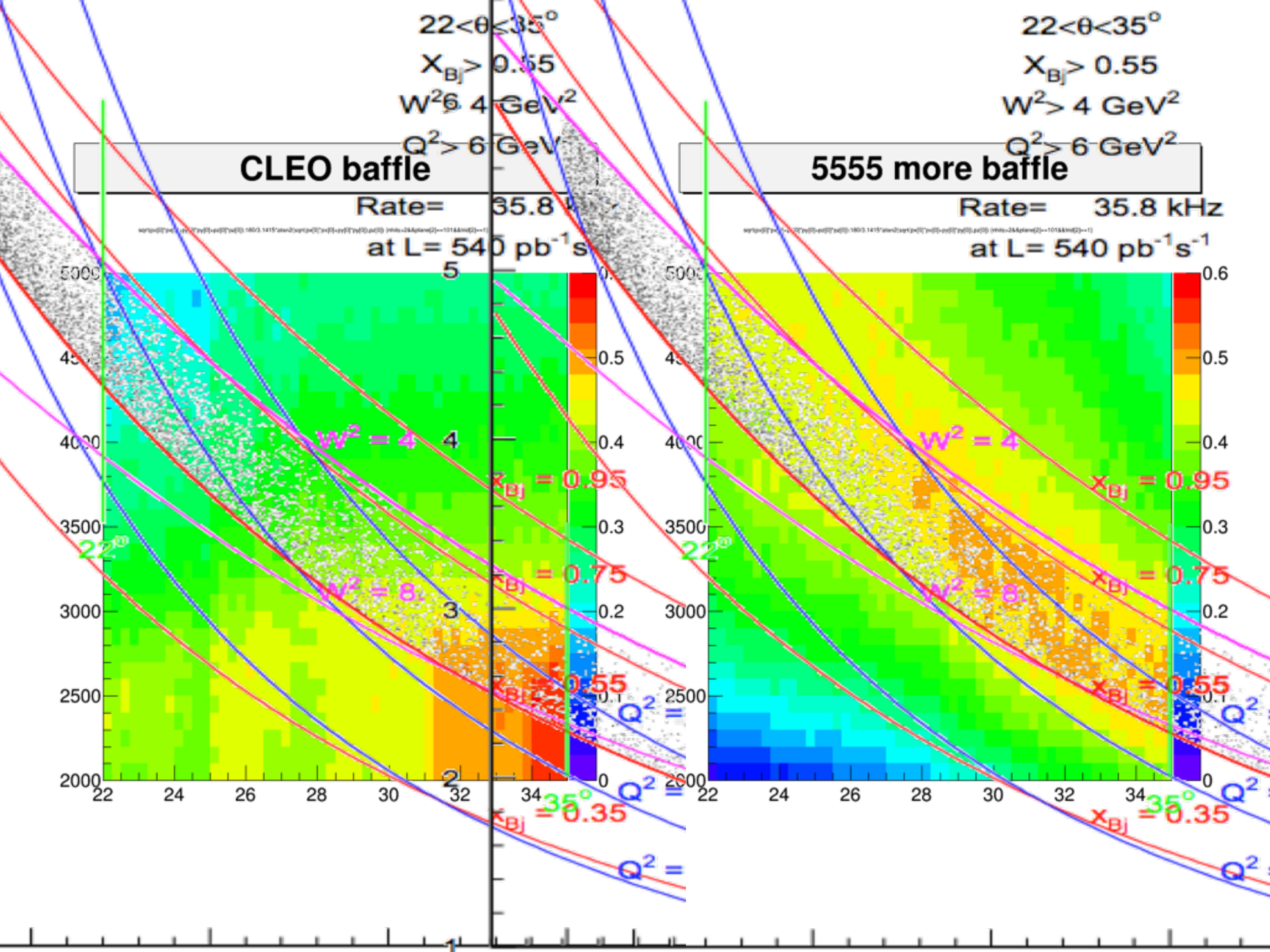
Conclusions

- Downstream target acceptance is limited by upstream baffles' inner rings
- Small θ acceptance is reduced by slit shape design
- There are regions of the slits that contribute no acceptance for good events
- Straight through acceptance at low θ on high momentum side of slit

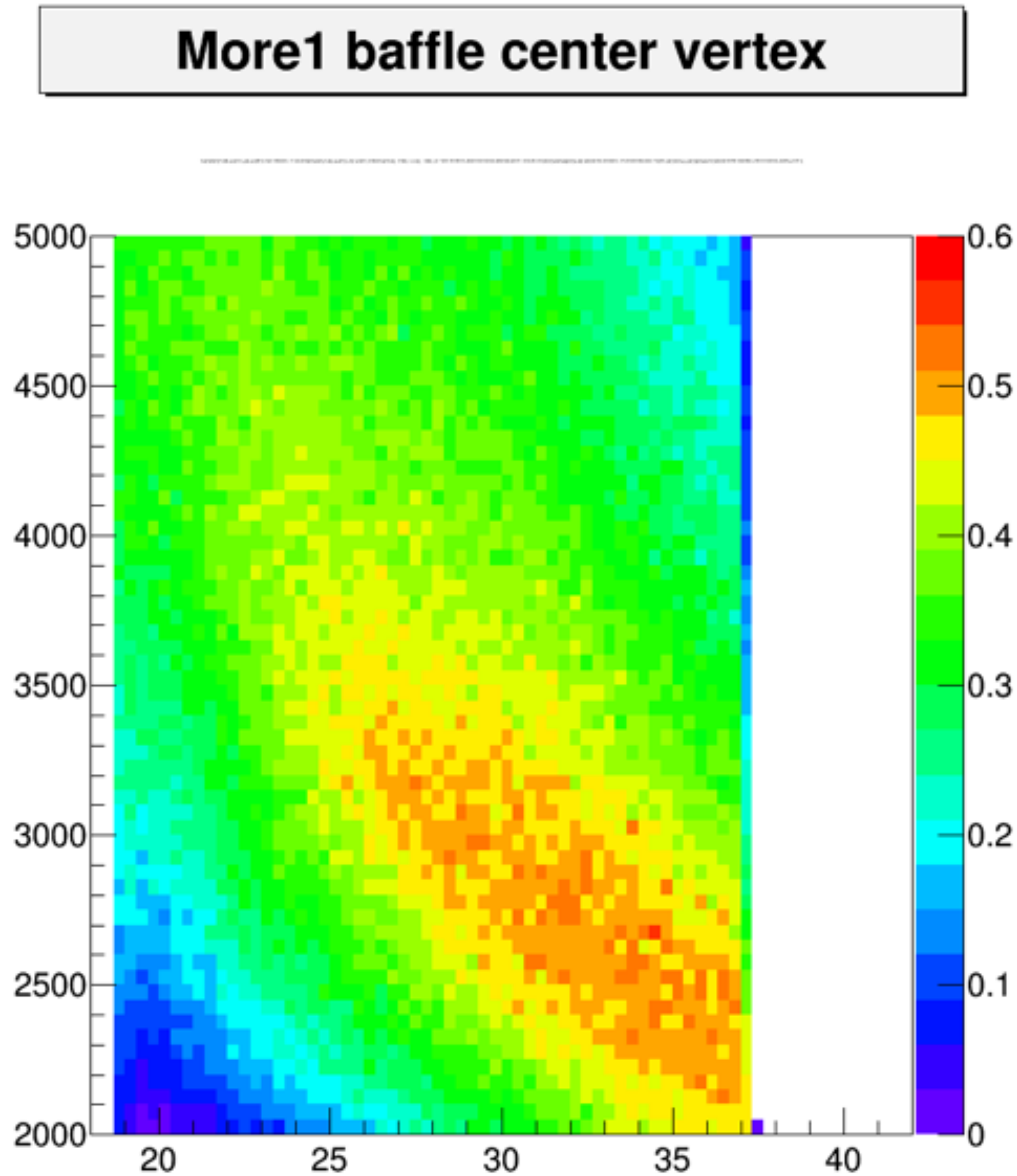
Extra


CLEO baffle
5000
4500
4000
3500
3000
2500
2000
22
24
26
28
30
32
34
0.6
0.5
0.4
0.3
0.2
0.1
0

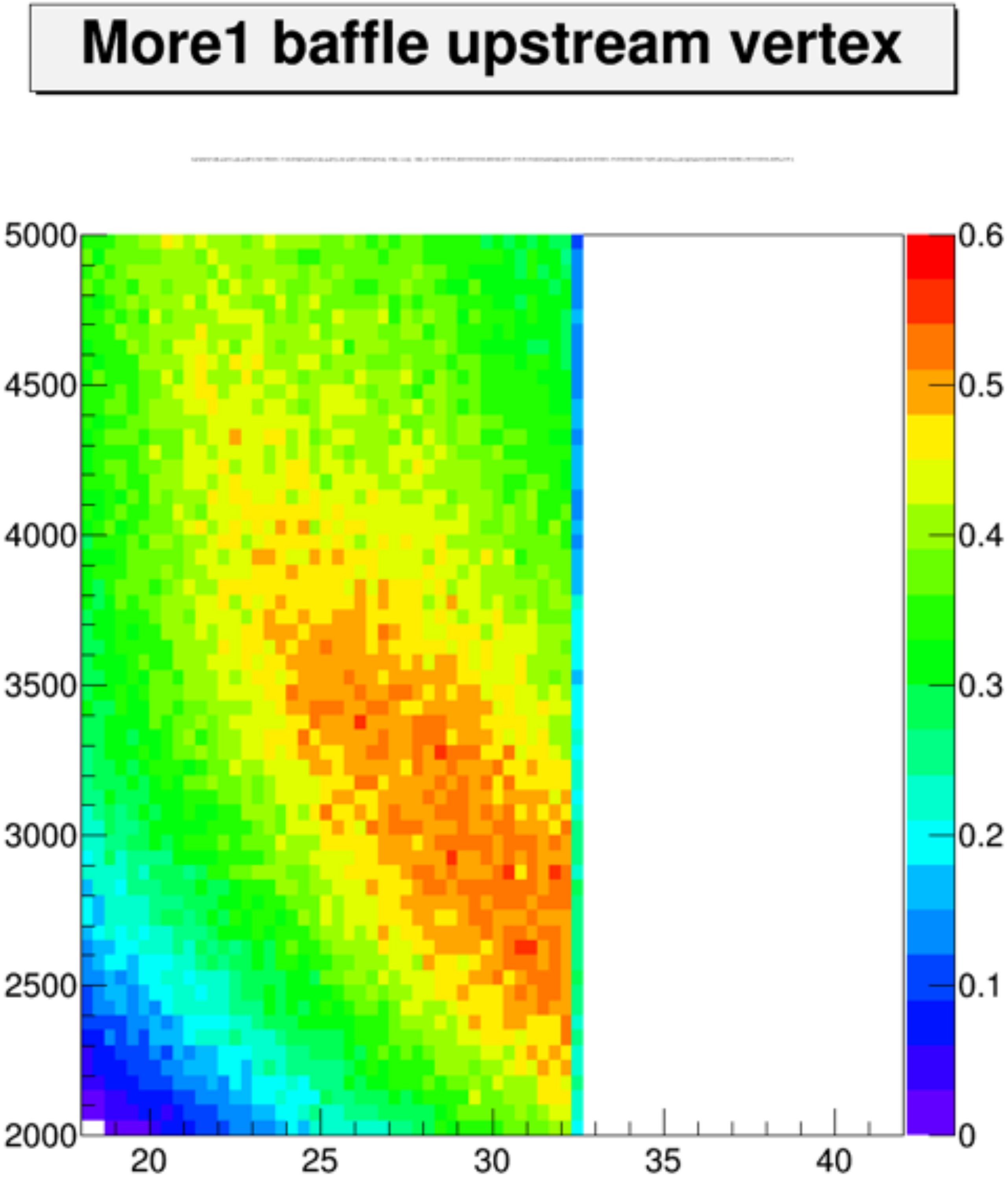

5555 more baffle
5000
4500
4000
3500
3000
2500
2000
22
24
26
28
30
32
34
0.6
0.5
0.4
0.3
0.2
0.1
0

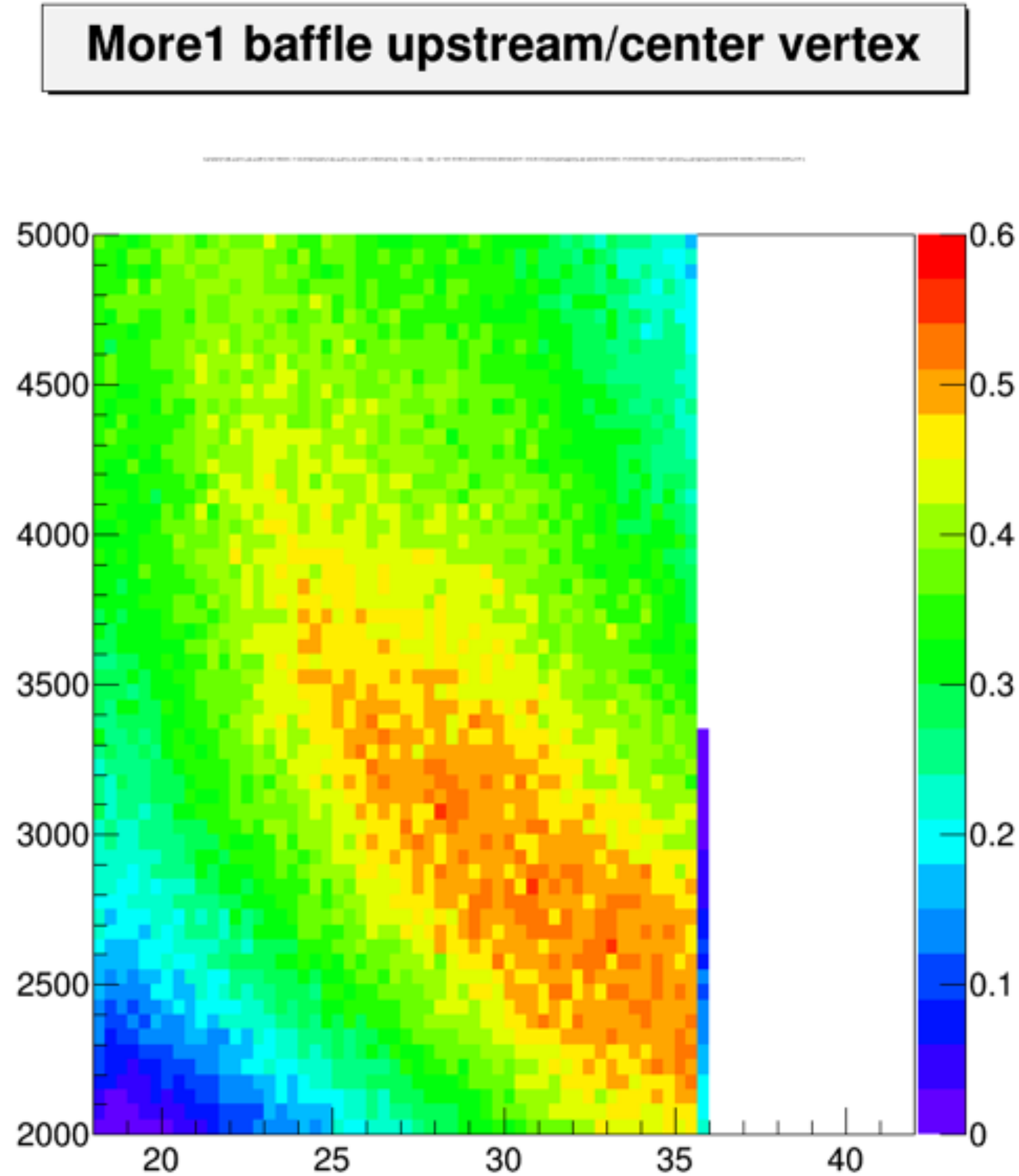

CLEO baffle
22<θ<35°
X_Bj> 0.55
Q²> 6 GeV²
Rate= 35.8 kHz
at L= 540 pb⁻¹s⁻¹
W² = 4
W² = 8
X_Bj = 0.95
X_Bj = 0.75
X_Bj = 0.55
X_Bj = 0.35
22°
35°
5555 more baffle
22<θ<35°
X_Bj> 0.55
W²> 4 GeV²
Q²> 6 GeV²
Rate= 35.8 kHz
at L= 540 pb⁻¹s⁻¹
W² = 4
W² = 8
X_Bj = 0.95
X_Bj = 0.75
X_Bj = 0.55
X_Bj = 0.35
22°
35°

Without inner rings

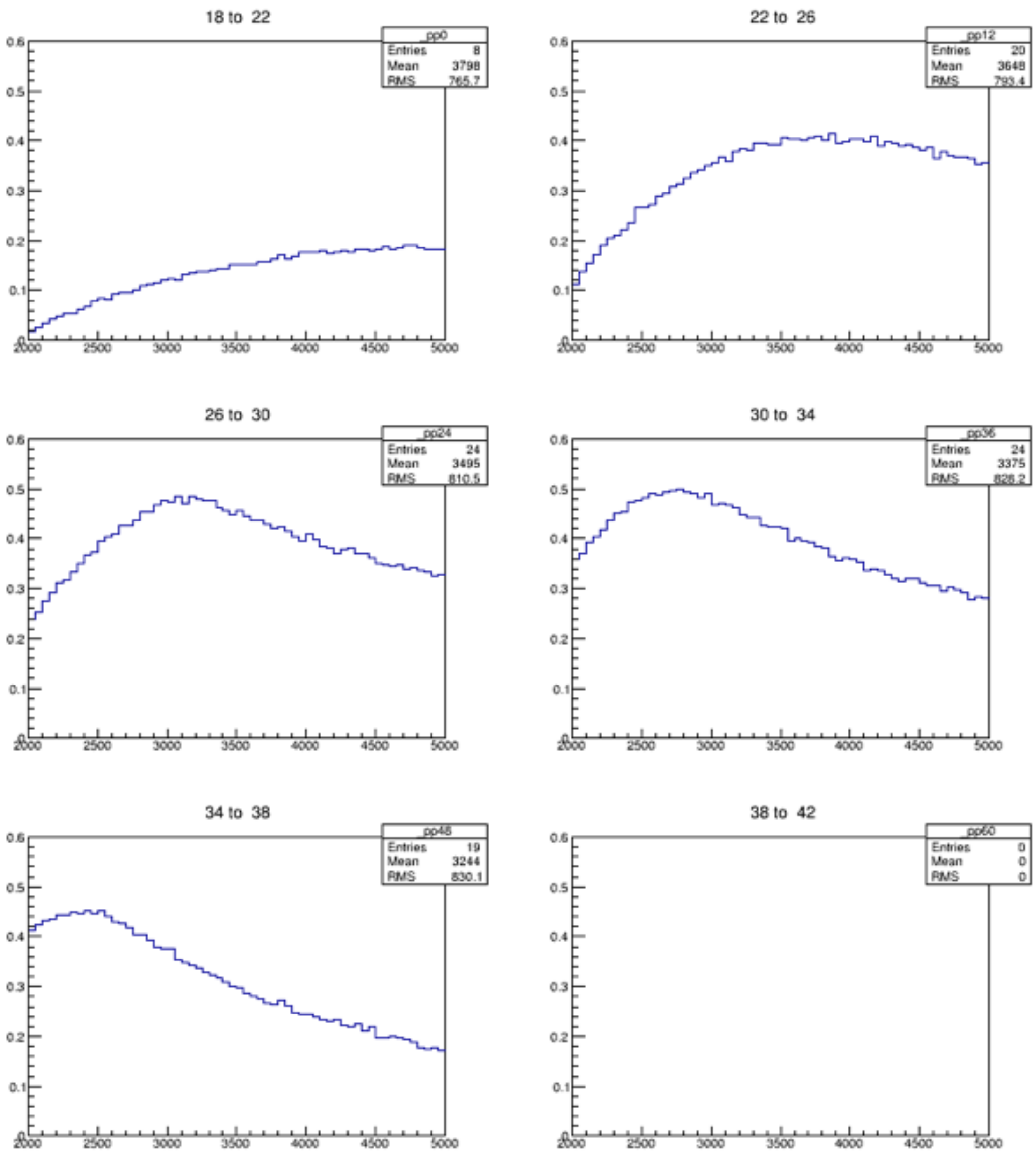


Without inner rings

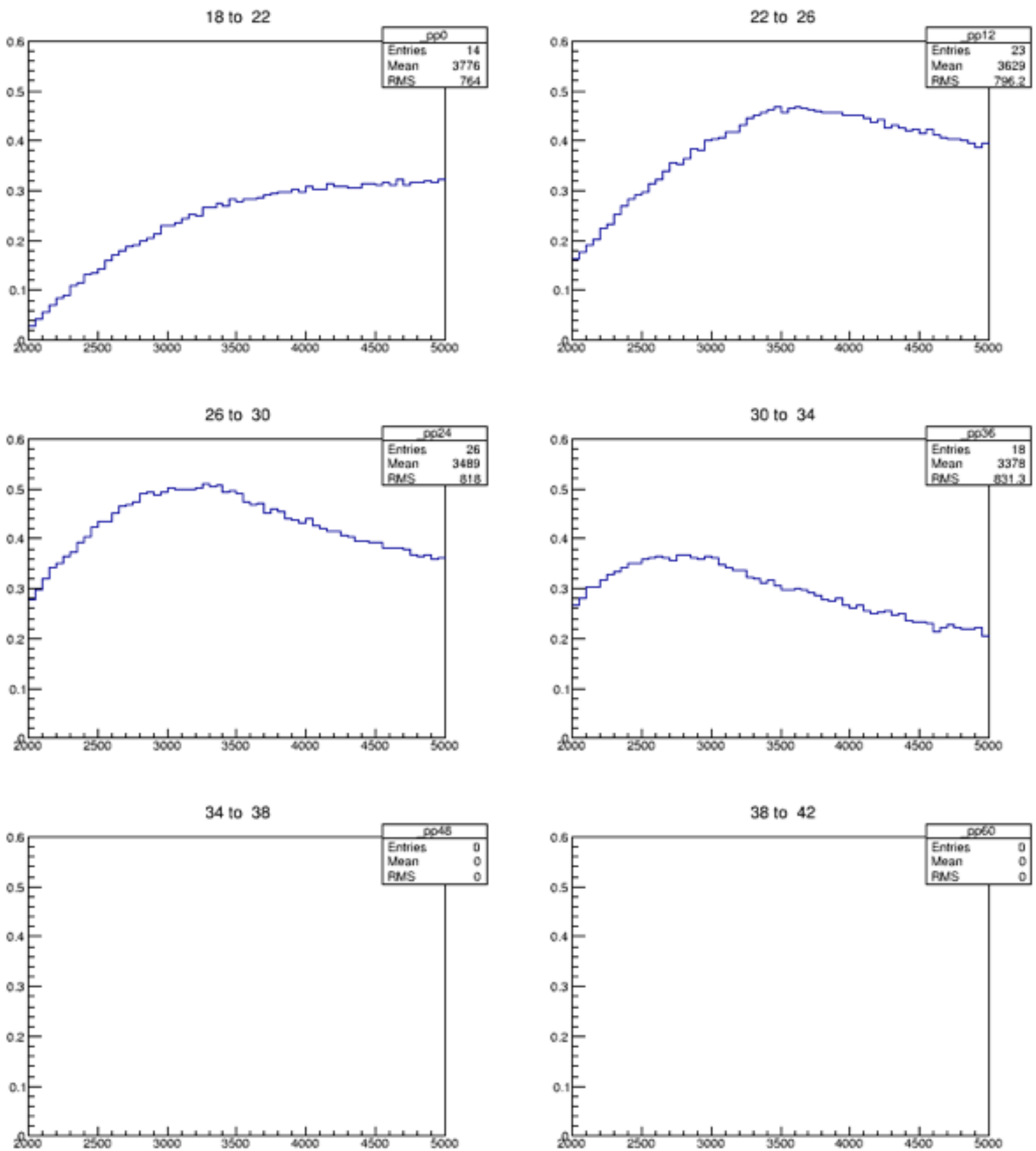




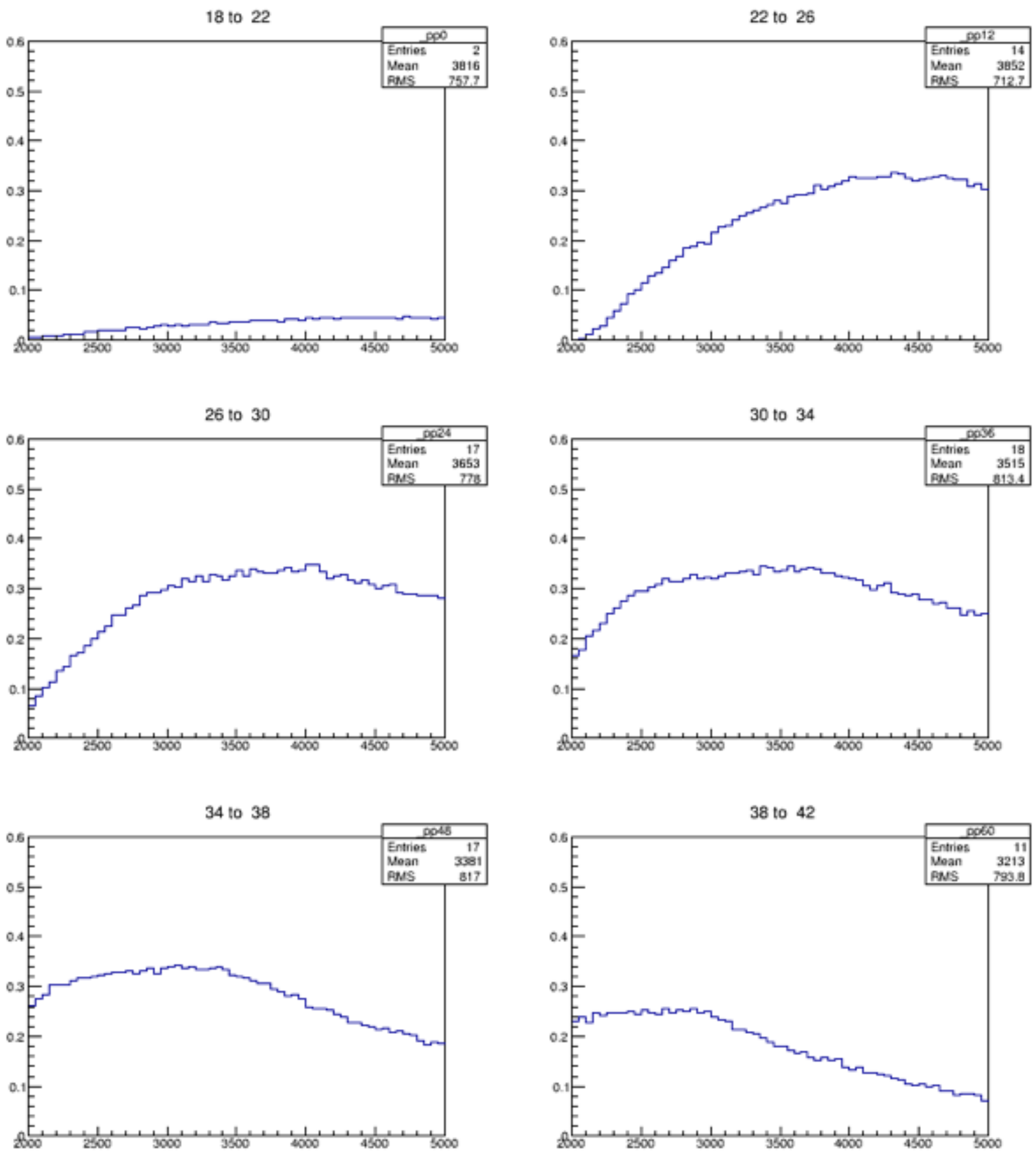
More1 baffle center vertex slices in angle



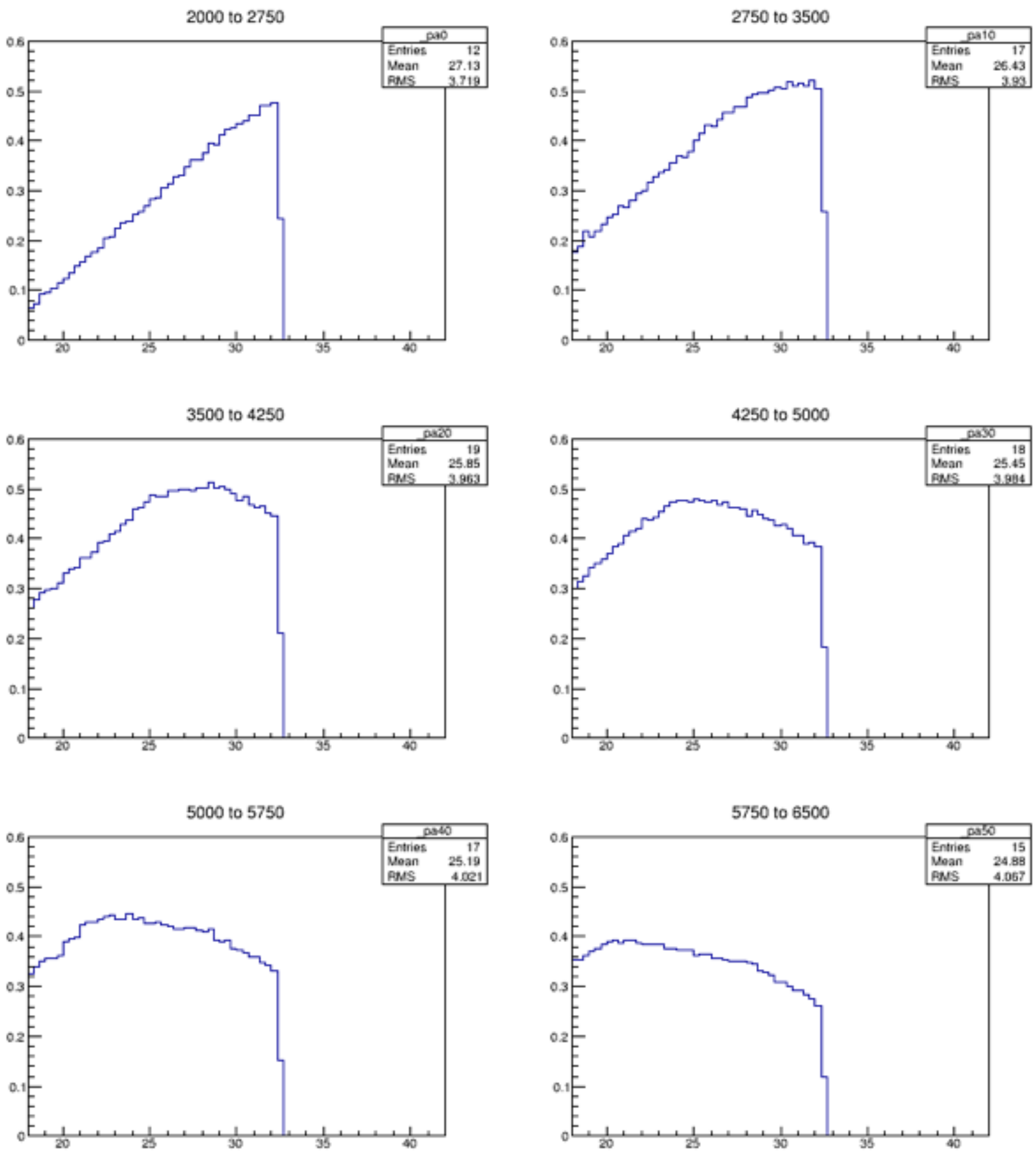
More1 baffle upstream vertex slices in angle



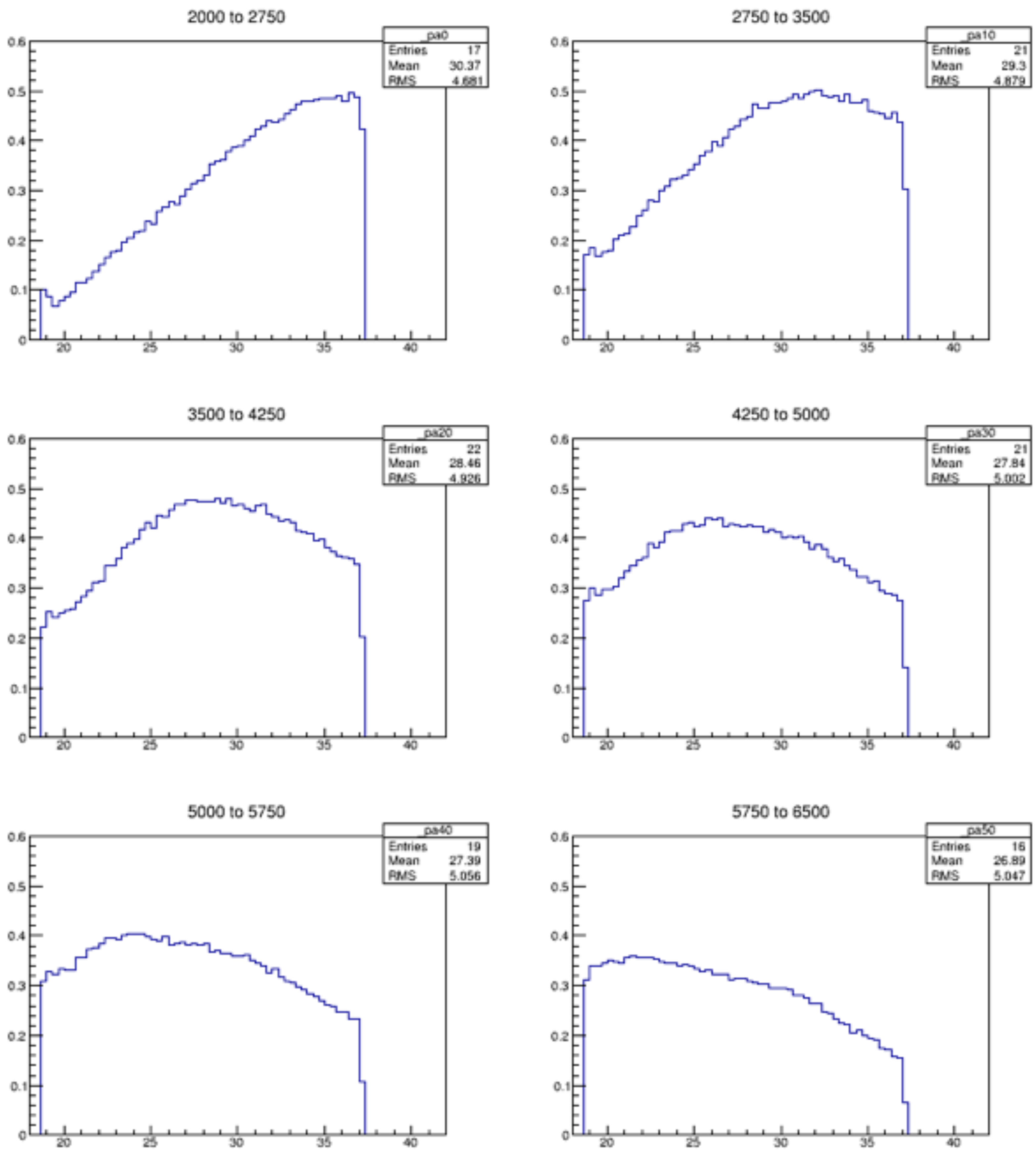
More1 baffle downstream vertex slices in angle



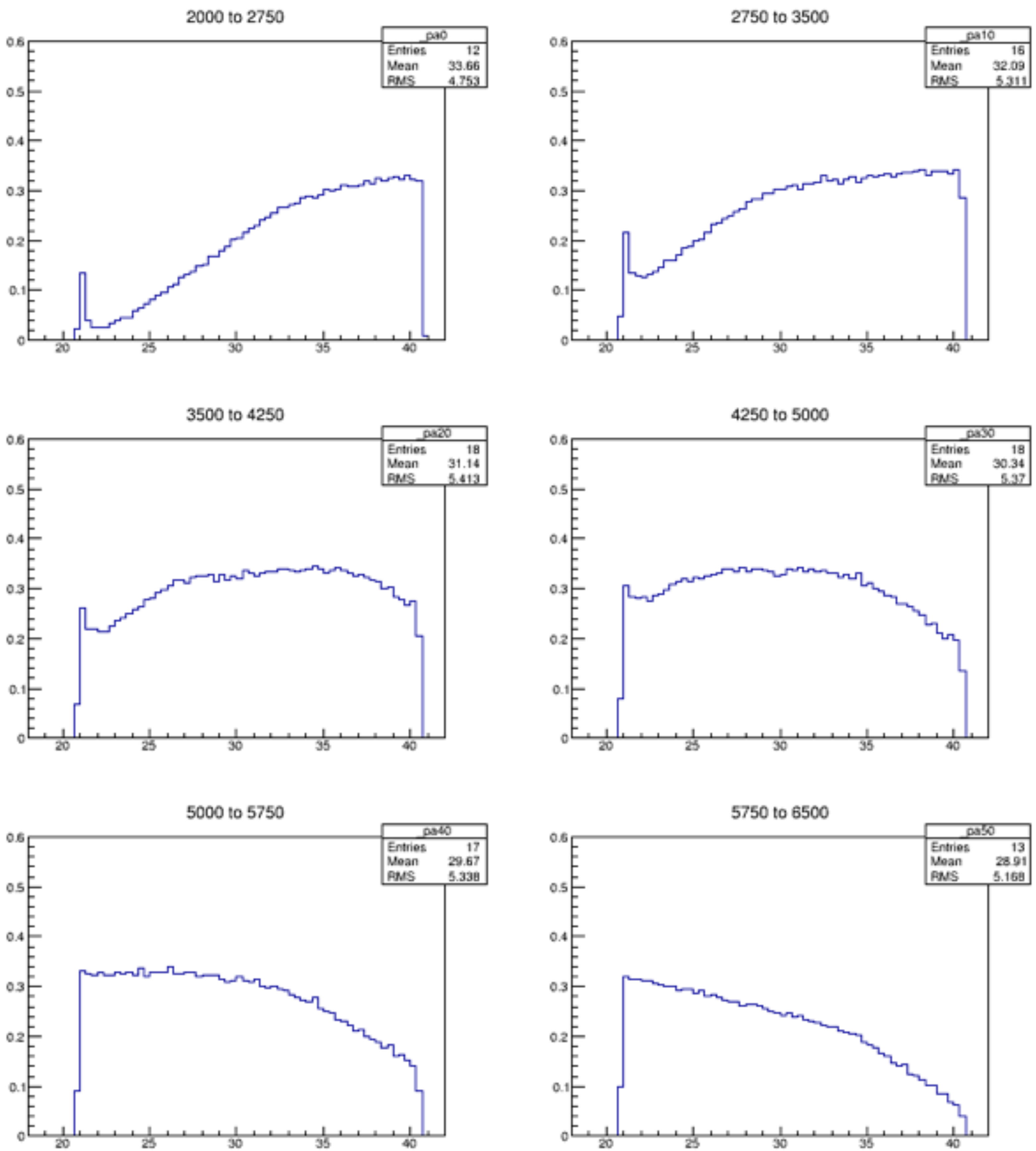
More1 baffle upstream vertex slices in p



More1 baffle center vertex slices in p

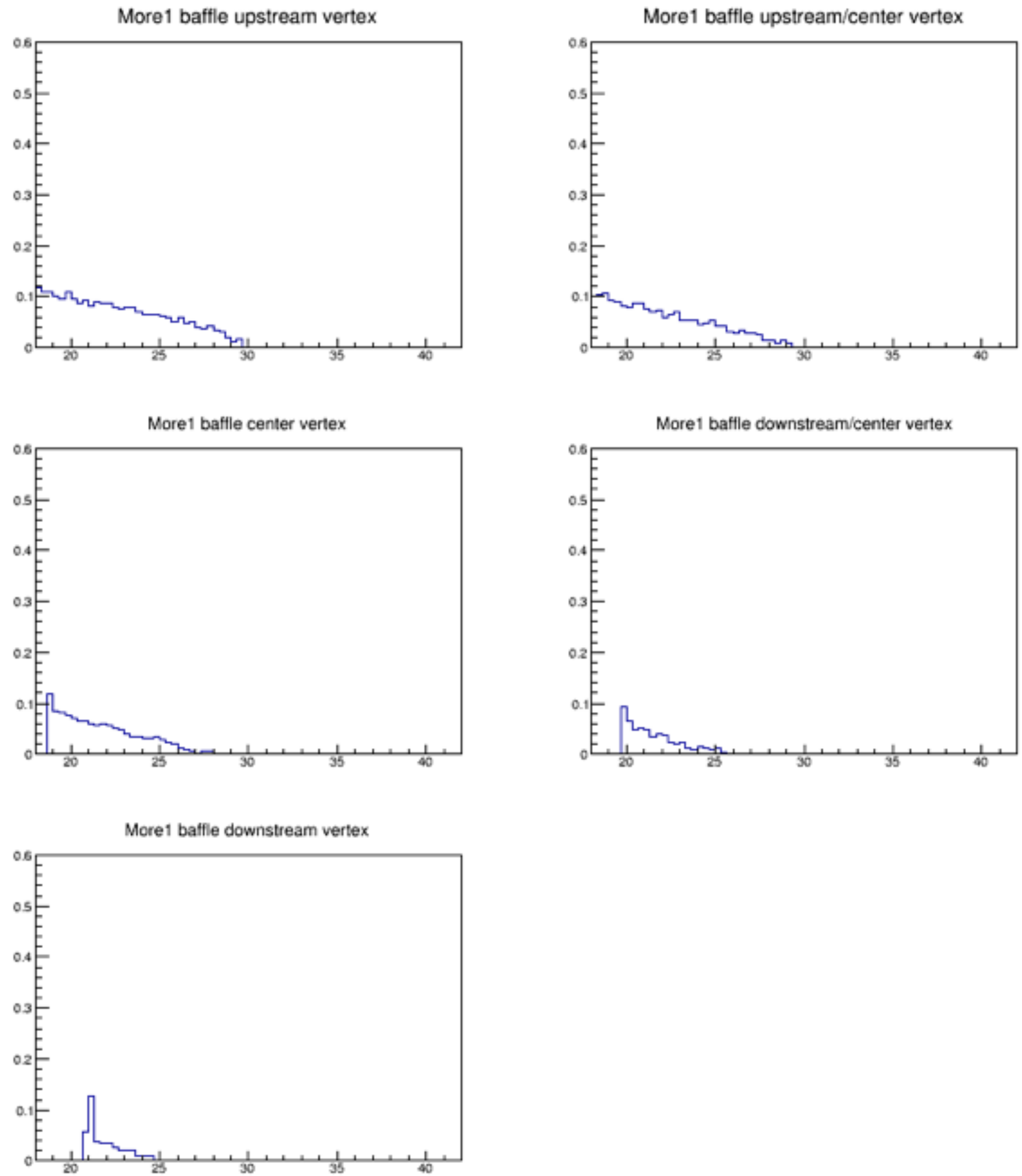


More1 baffle downstream vertex slices in p



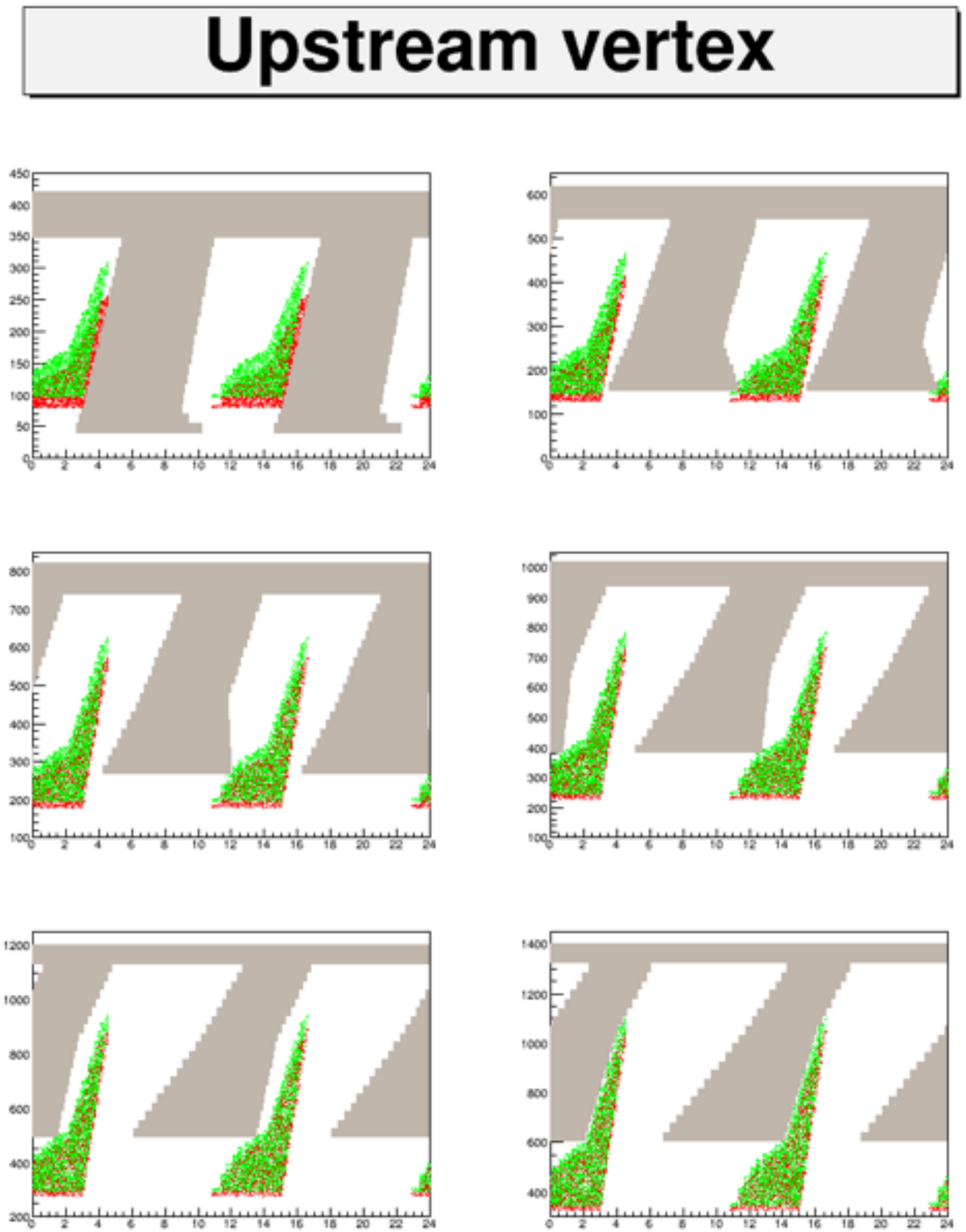
Neutrals

- Geometric acceptance vs. θ for photons

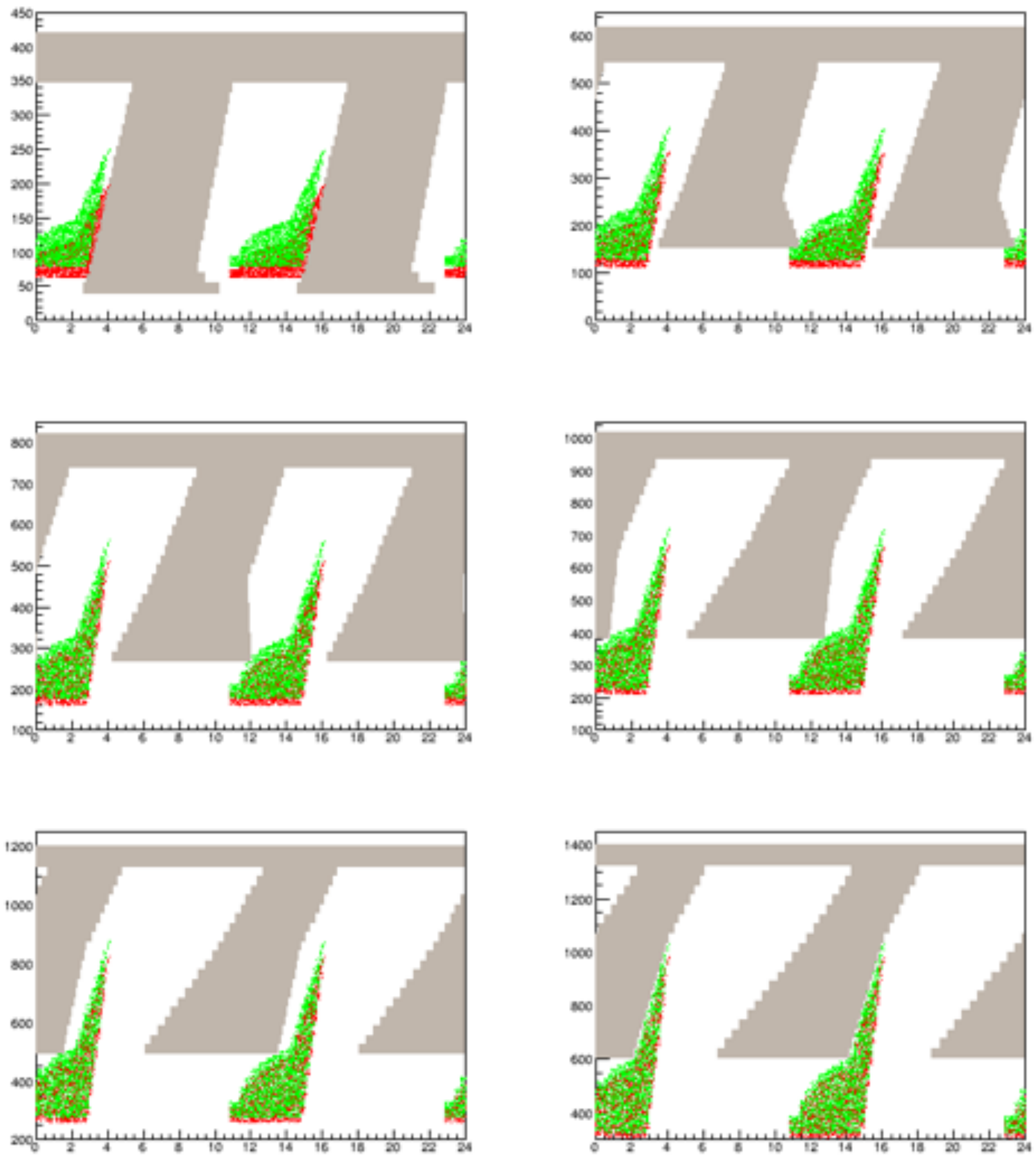


For these plots, photons generated uniform in θ and ϕ

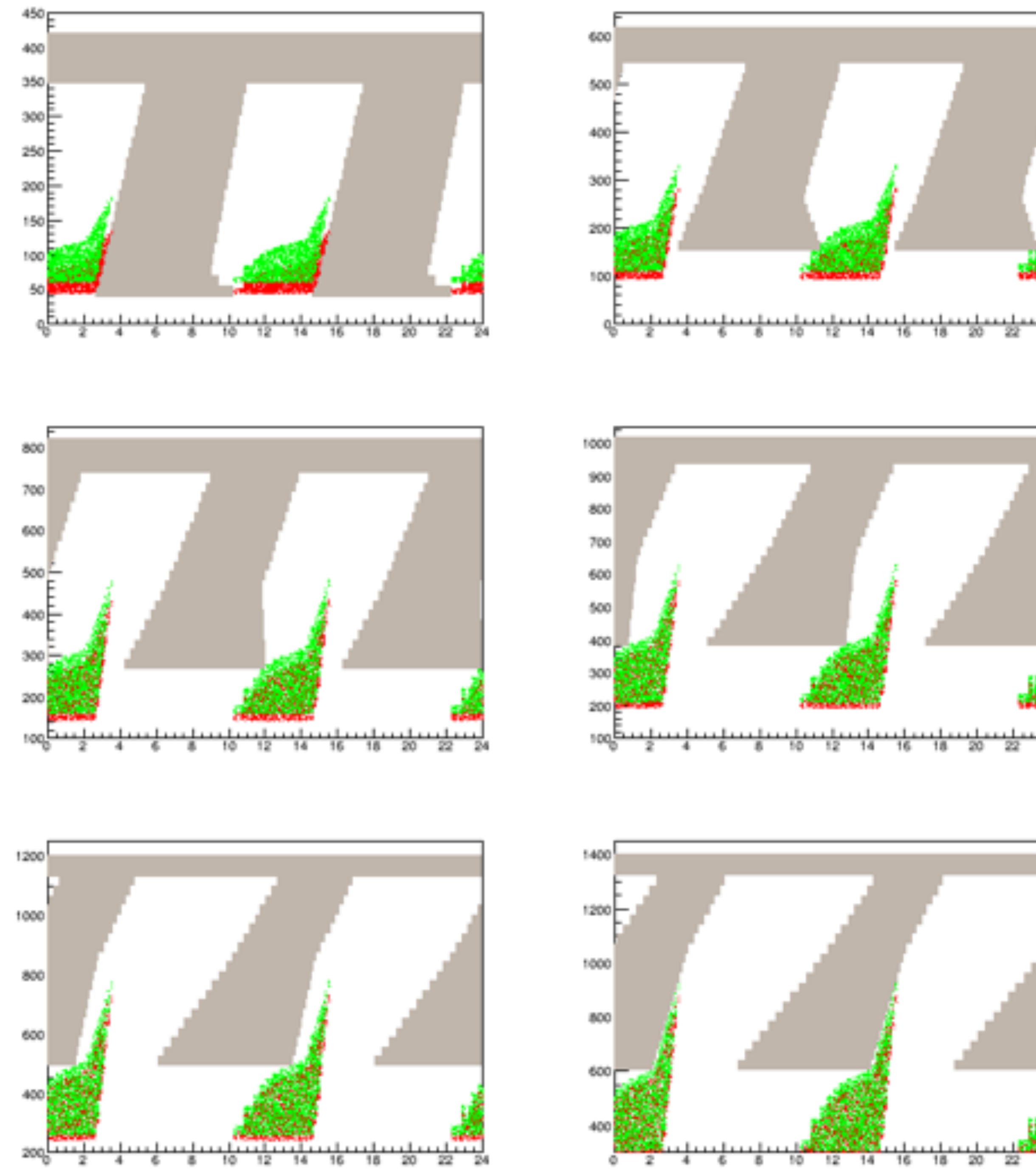
Plotted points are positions at front (red) and back (green) of each baffle plane *for only those photons that get through all 11 Kryptonite baffles*



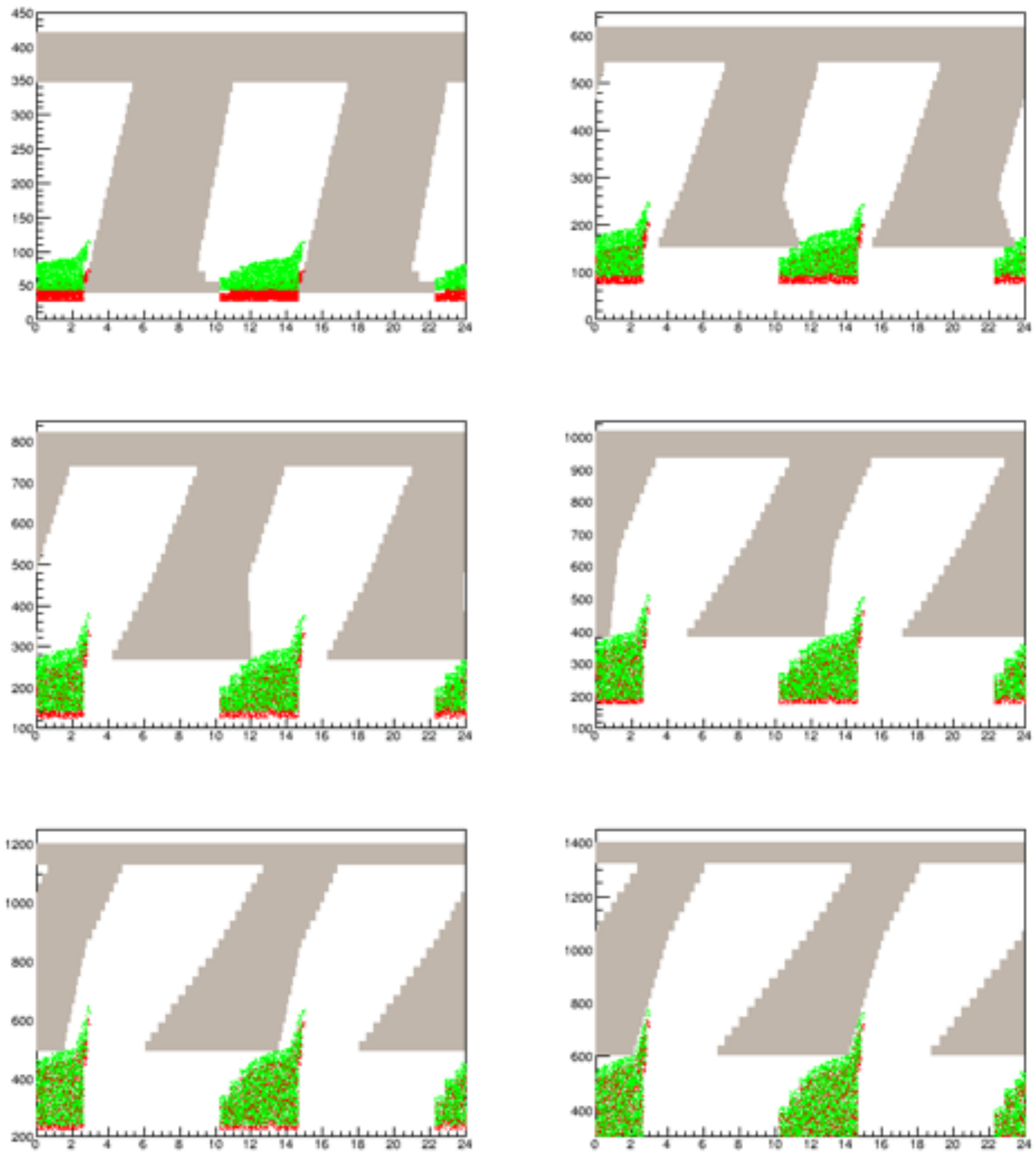
Mid/upstream vertex



Middle vertex



Mid/downstream vertex



Downstream vertex