Tracking performance studies

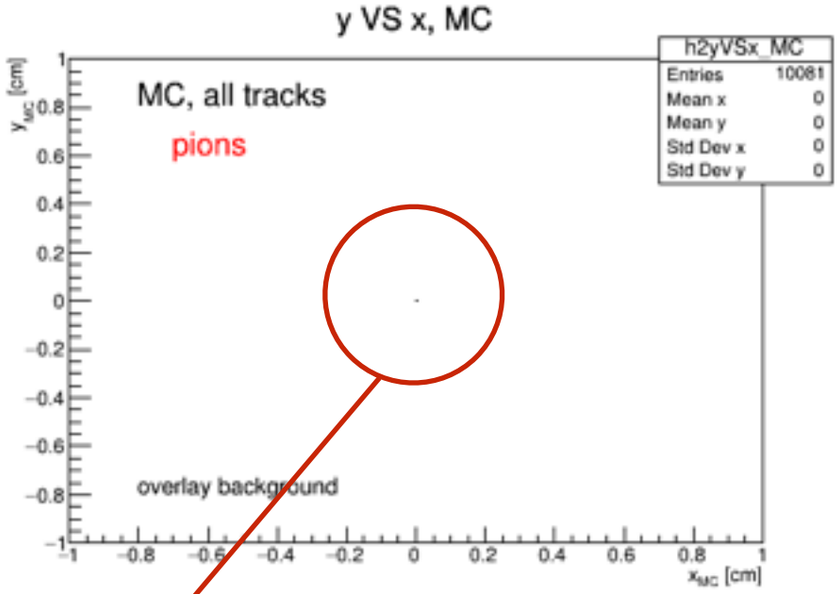
Outline

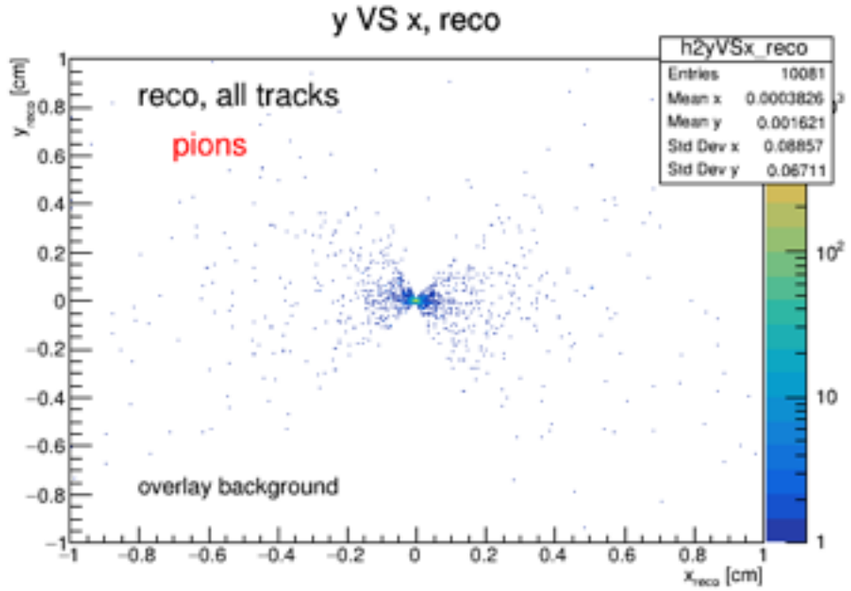
1. update on last week presentation (vertex position)
    - bug found and fixed
2. pt resolution and efficiency studies with different pValues requirement

1. Vertex position

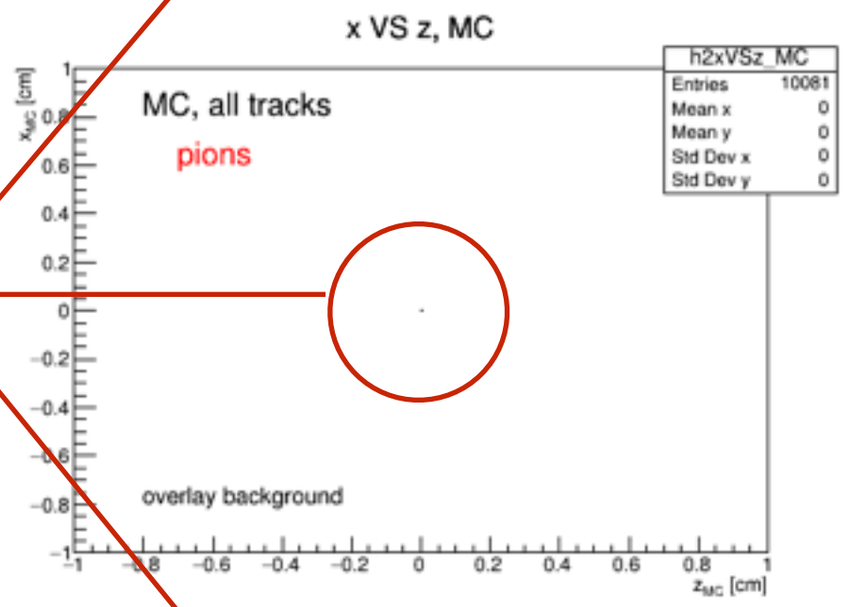
pions

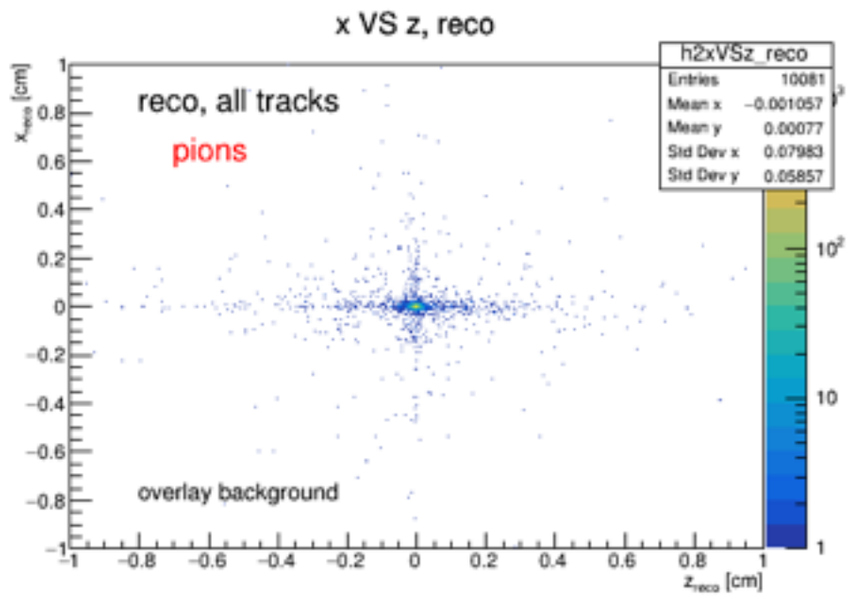
V (0,0,0)



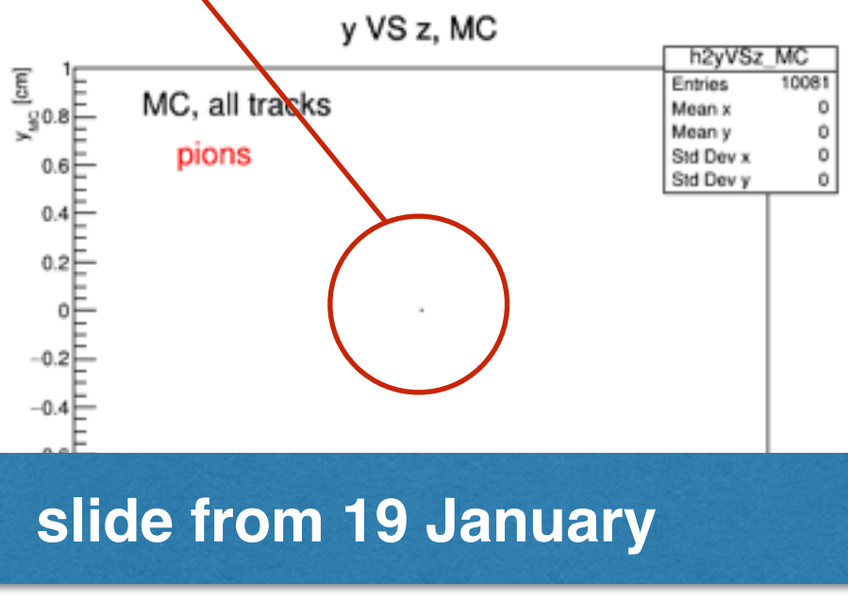


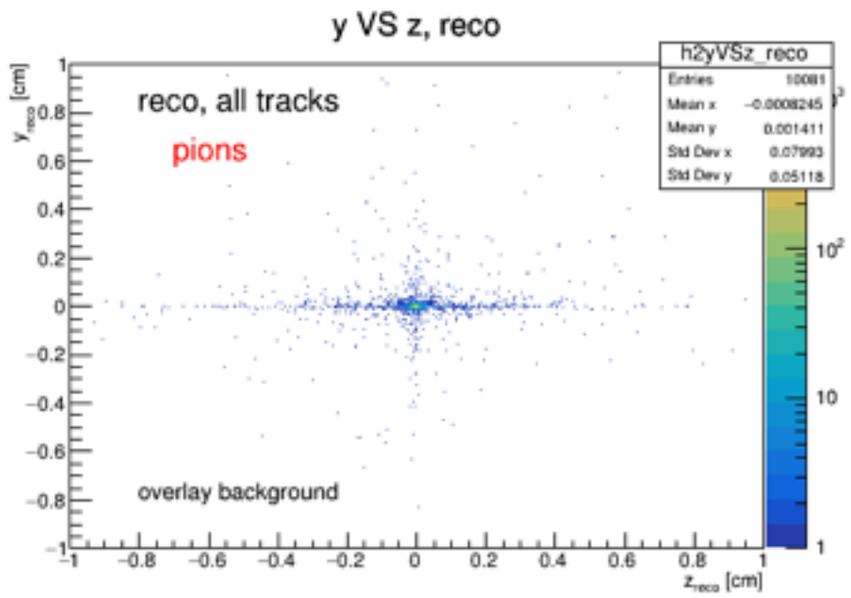
y VS x





x VS z





y VS z

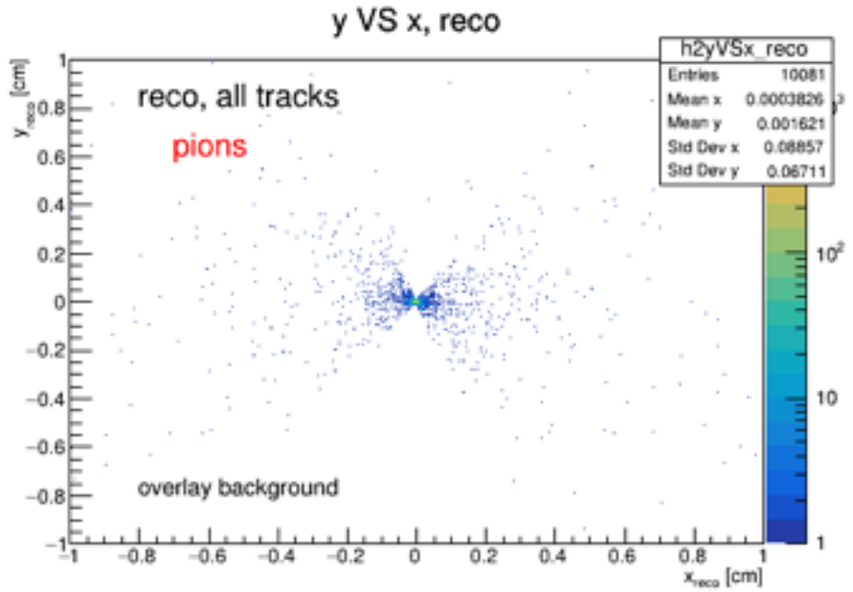
slide from 19 January

pions

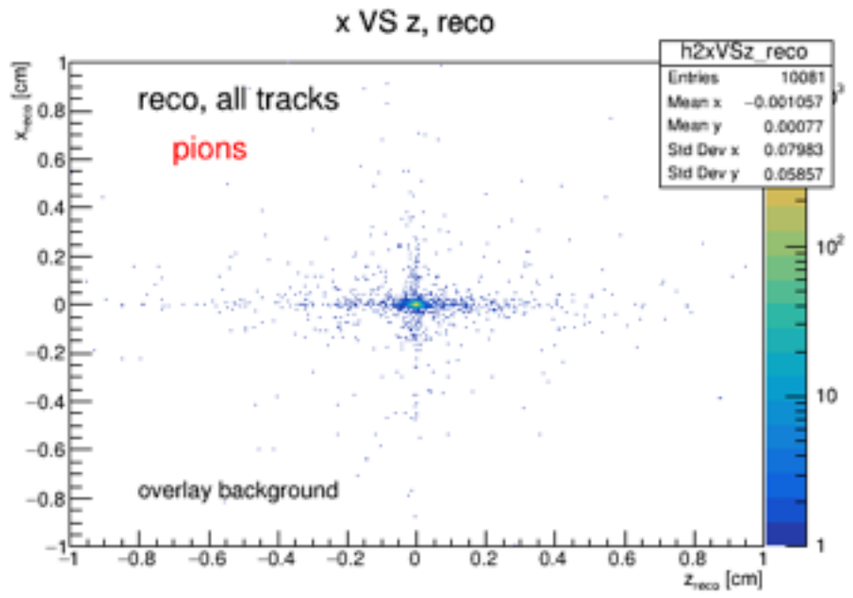
bug:

(how the sample was generated)

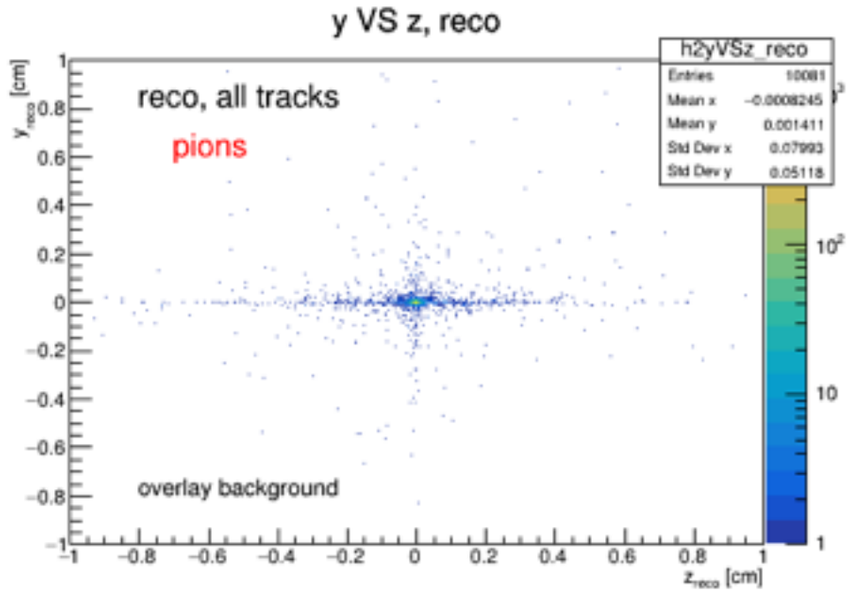
not uniform in all ϕ range



y VS x



x VS z



y VS z

(new) data sample

- 10000 generic Y(4S) events

- particle gun: 1000 events, 10 π(K/p)/event
  - p uniform [0.05 GeV/c, 3.0 GeV/c]
  - θ uniform [17°, 150°]
  - ϕ uniform [0°, 360°]
  - V (0,0,0)

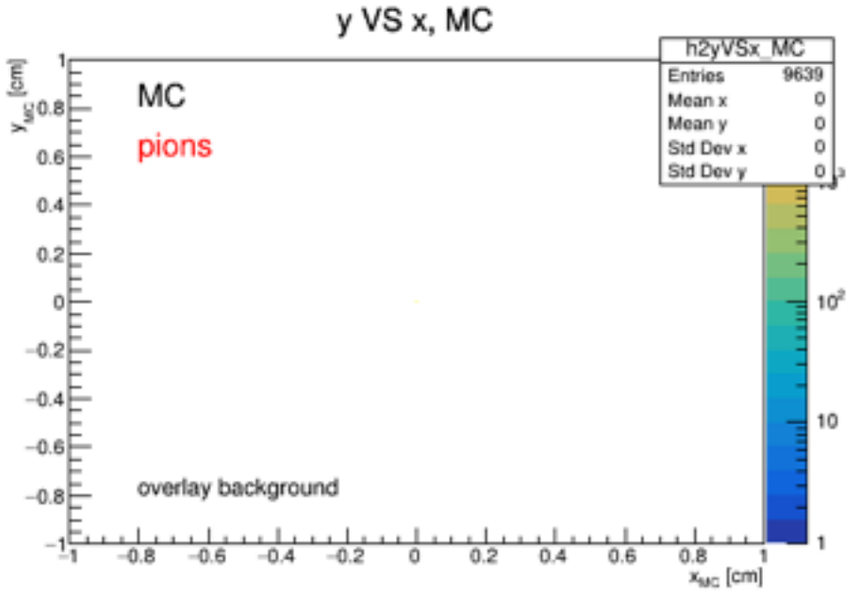
same for 1. and 2.

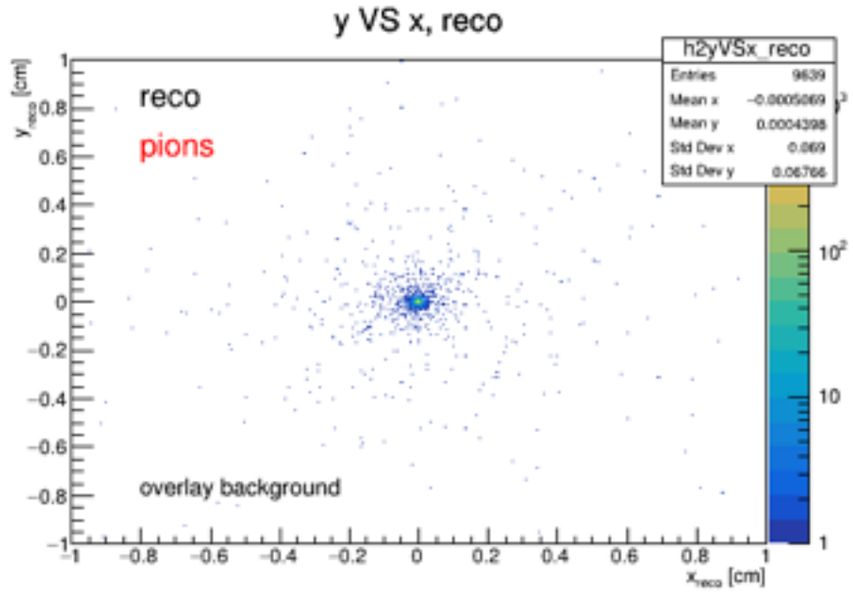
- particle gun: 1000 events, 10 π / event
  - p uniform [0.05 GeV/c, 3.0 GeV/c]
  - θ uniform [17°, 150°]
  - ϕ uniform [0°, 360°]
  - displaced vertex

backup

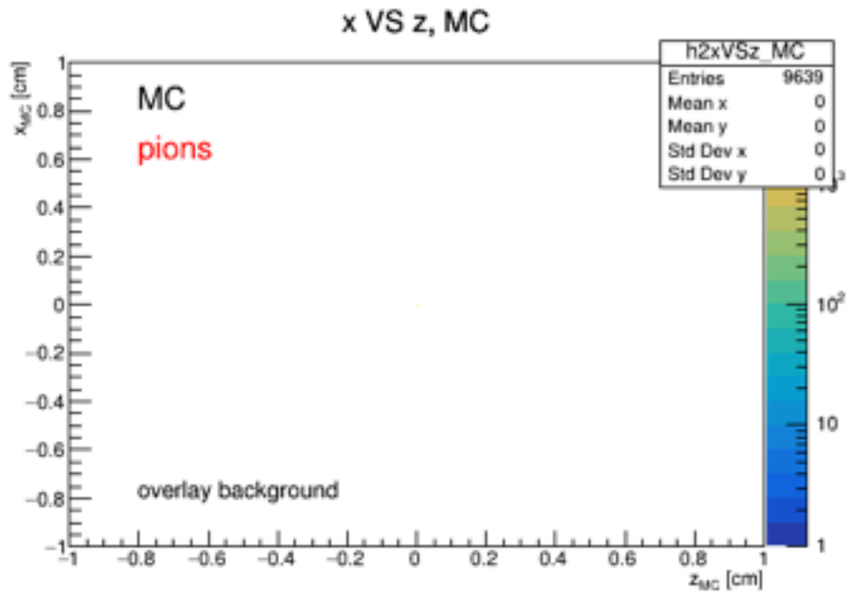
- overlay background

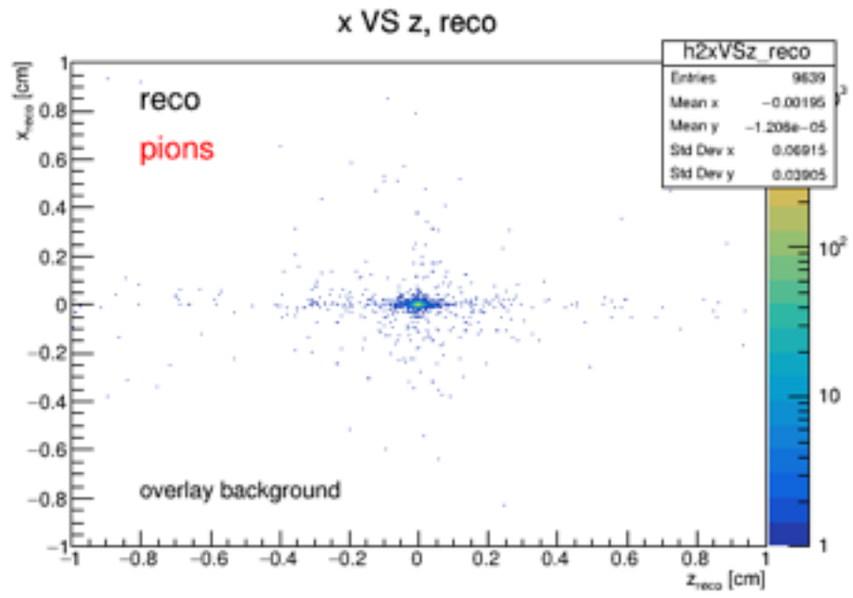
pions (particle gun)



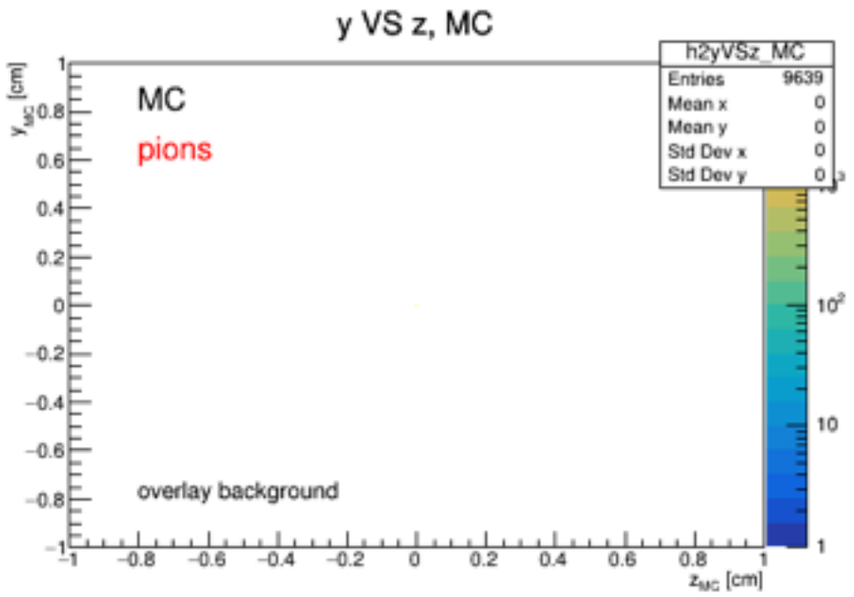


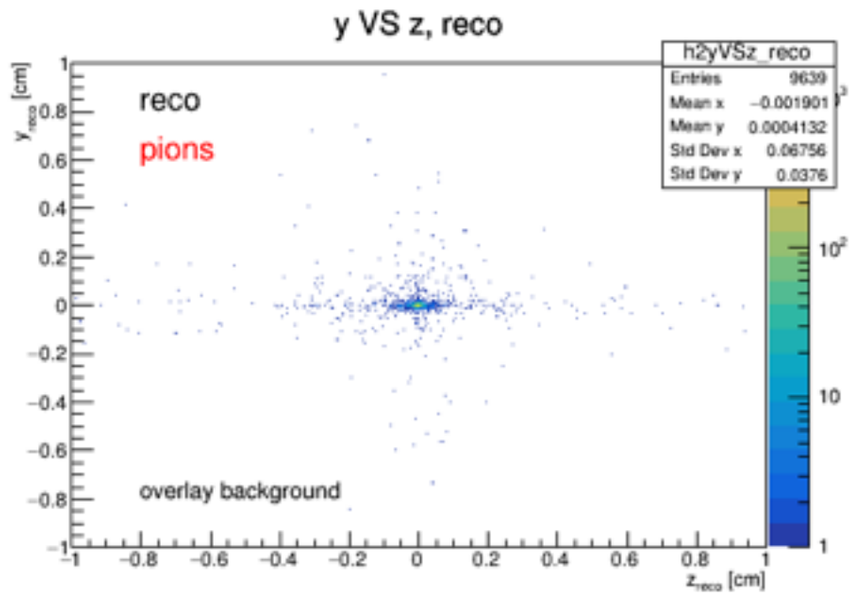
y VS x





x VS z

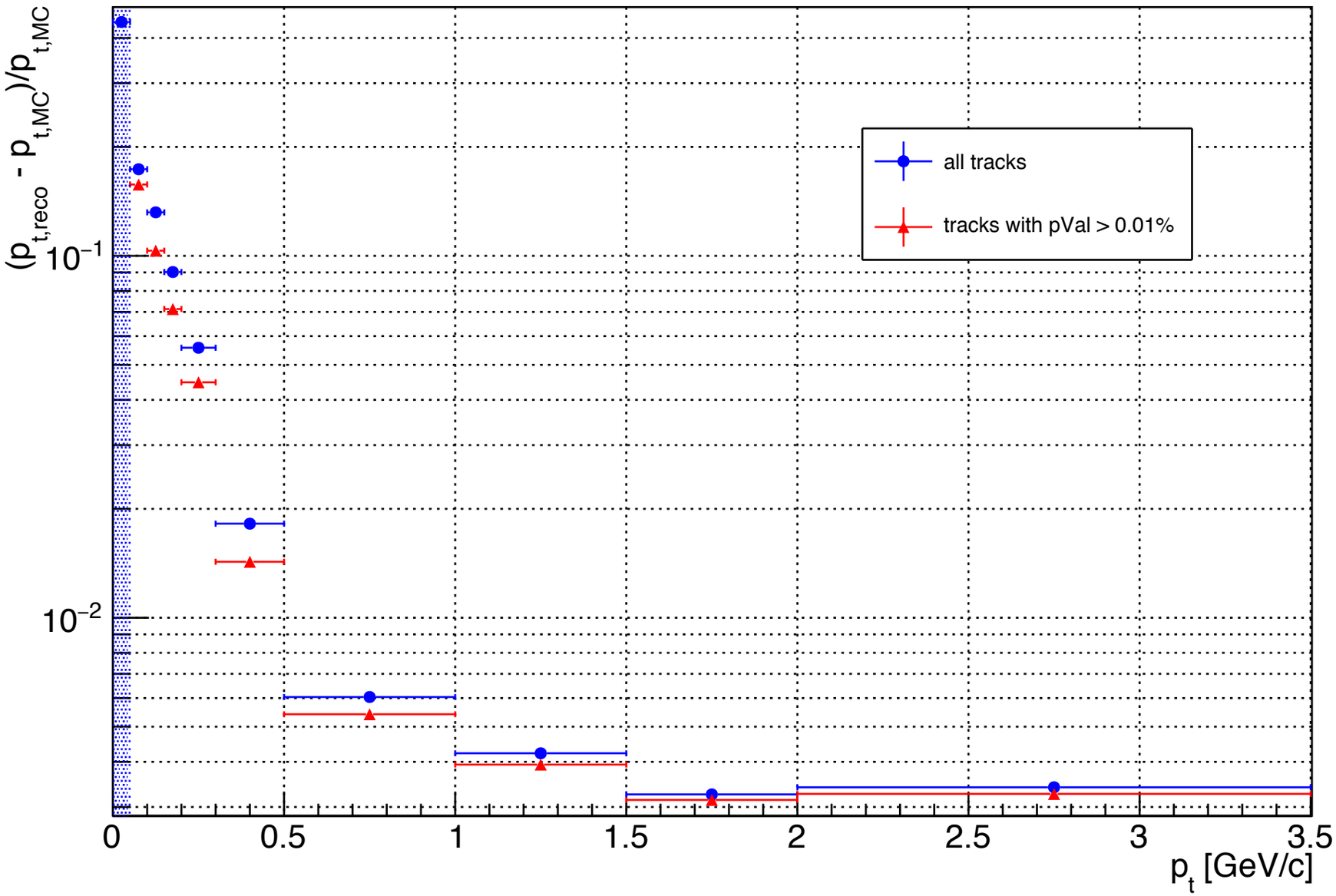




y VS z

2. pt resolution and efficiency studies

p_t resolution



all tracks = 106184
tracks with pVal > 0.01% = 92417 (~ 87%)

→13% of tracks lost

slide from 12 January

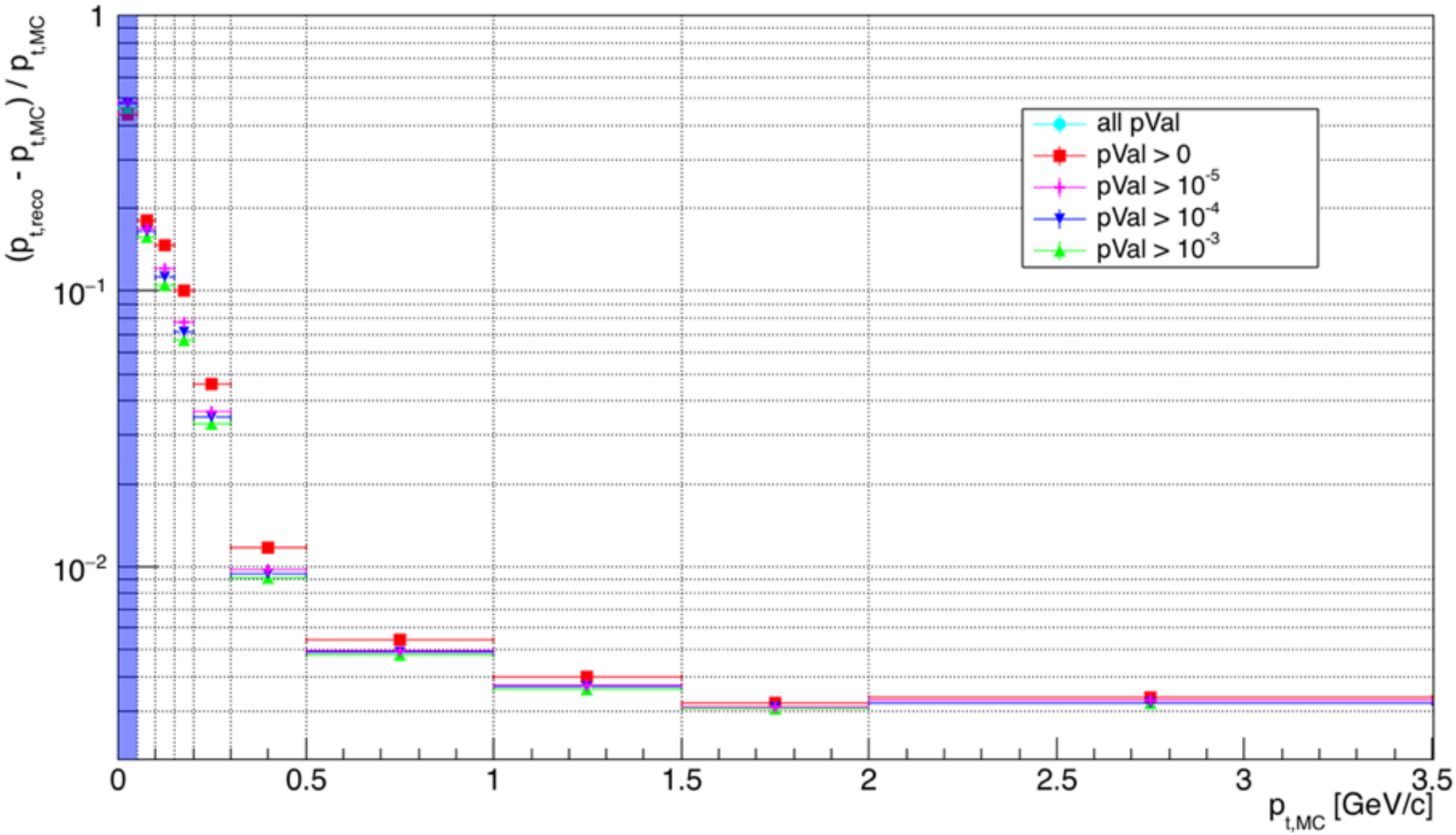
pt resolution

relative pt resolution, integrated over all pt values

pVal cut	no cut	pVal > 0	pVal > 10^{-5}	pVal > 10^{-4}	pVal > 10^{-3}
Y4S	1.71 %	1.71%	1.29 %	1.21 %	1.15 %
π	0.57 %	0.57%	0.53 %	0.53 %	0.53 %
K	0.87 %	0.87 %	0.76 %	0.74 %	0.72 %
p	1.22 %	1.22 %	0.82 %	0.78 %	0.74 %

- no difference between the two first column
- bigger pVal cut -> increase in the resolution

p_t resolution VS p_t



- cyan and red points are overlapped (first two column)

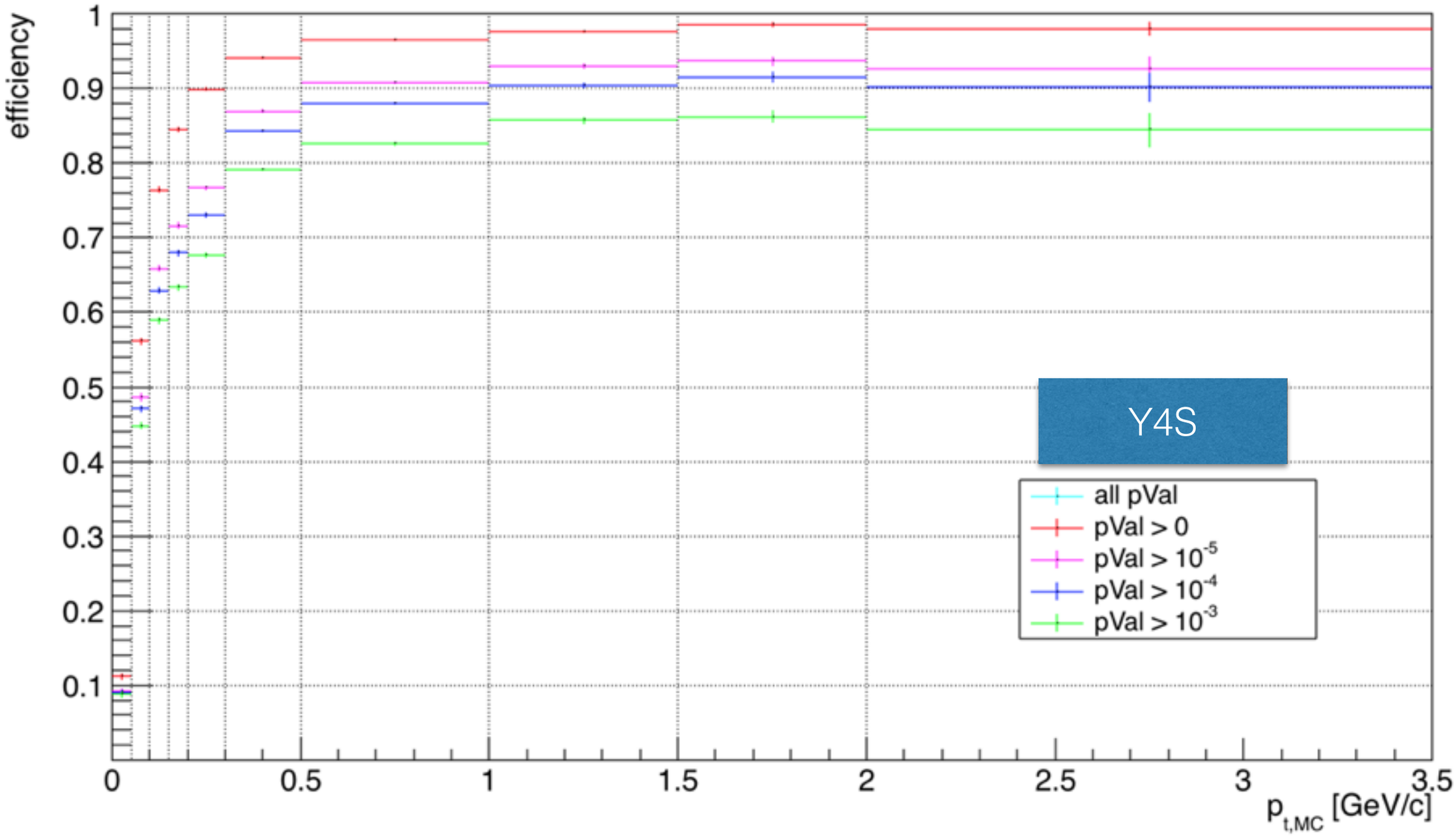
efficiency (%)

pVal cut	no cut	pVal > 0	pVal > 10^{-5}	pVal > 10^{-4}	pVal > 10^{-3}
	normalized to MCParticles				
Y4S	85.22 ± 0.11	84.70 ± 0.11	76.86 ± 0.13	74.06 ± 0.14	69.45 ± 0.15
π	96.39 ± 0.19	96.18 ± 0.19	92.29 ± 0.27	90.47 ± 0.30	86.92 ± 0.34
K	90.77 ± 0.30	90.59 ± 0.30	85.56 ± 0.36	83.11 ± 0.39	78.61 ± 0.42
p	90.32 ± 0.31	89.93 ± 0.31	81.58 ± 0.40	78.98 ± 0.43	74.10 ± 0.46
	normalized to MCRecoTracks				
Y4S	94.94 ± 0.07	94.36 ± 0.07	85.62 ± 0.07	82.51 ± 0.07	77.37 ± 0.07
π	98.13 ± 0.14	97.91 ± 0.14	93.95 ± 0.14	92.10 ± 0.14	88.49 ± 0.14
K	97.28 ± 0.17	97.09 ± 0.17	91.69 ± 0.17	89.07 ± 0.17	84.25 ± 0.17
p	98.28 ± 0.14	97.86 ± 0.14	88.77 ± 0.14	85.94 ± 0.14	80.63 ± 0.14

- small difference between the first two column
- bigger pVal cut -> efficiency drop

efficiency VS pt

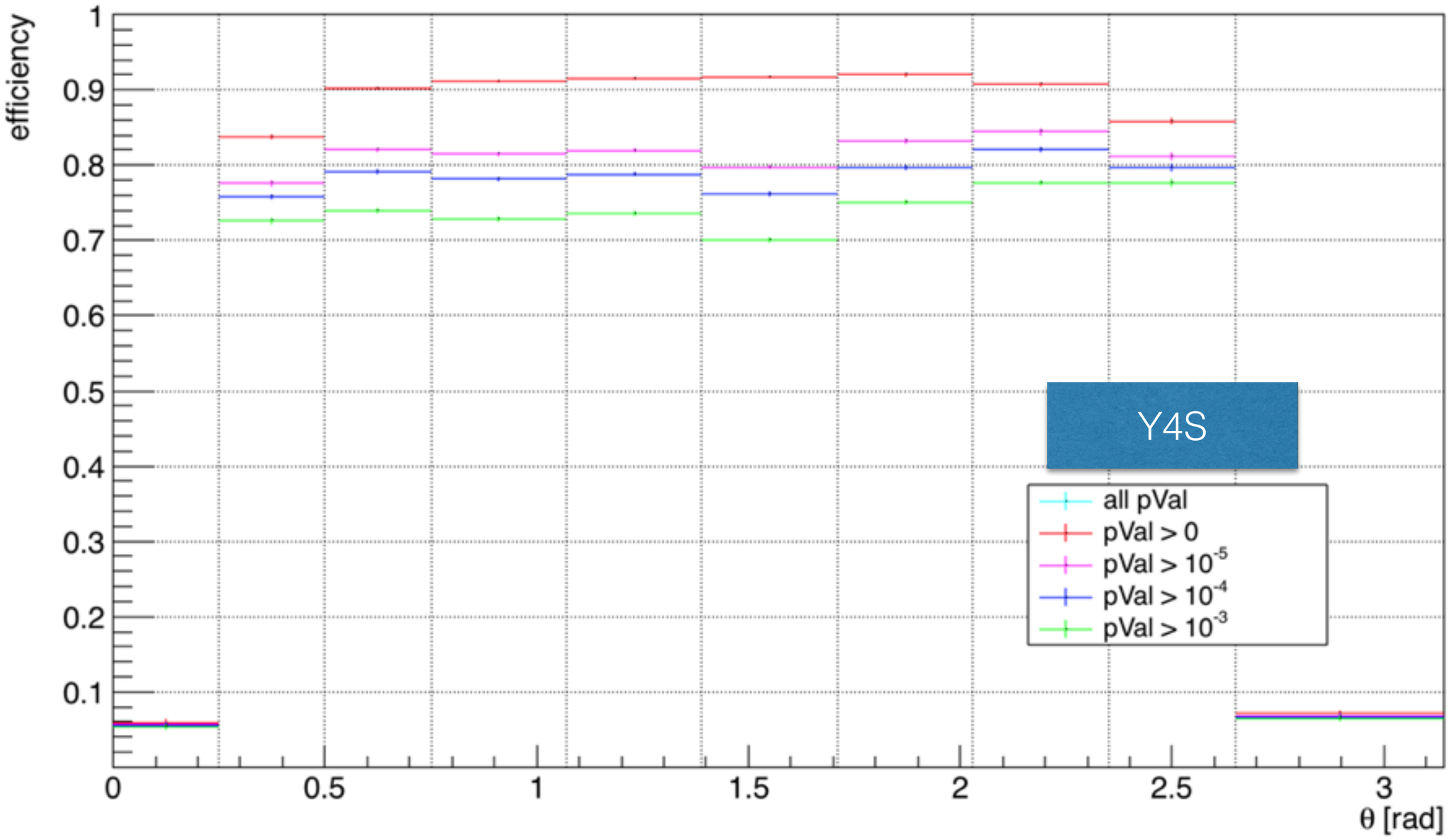
normalized to MCParticles



- cyan and red points are overlapped (first two column)

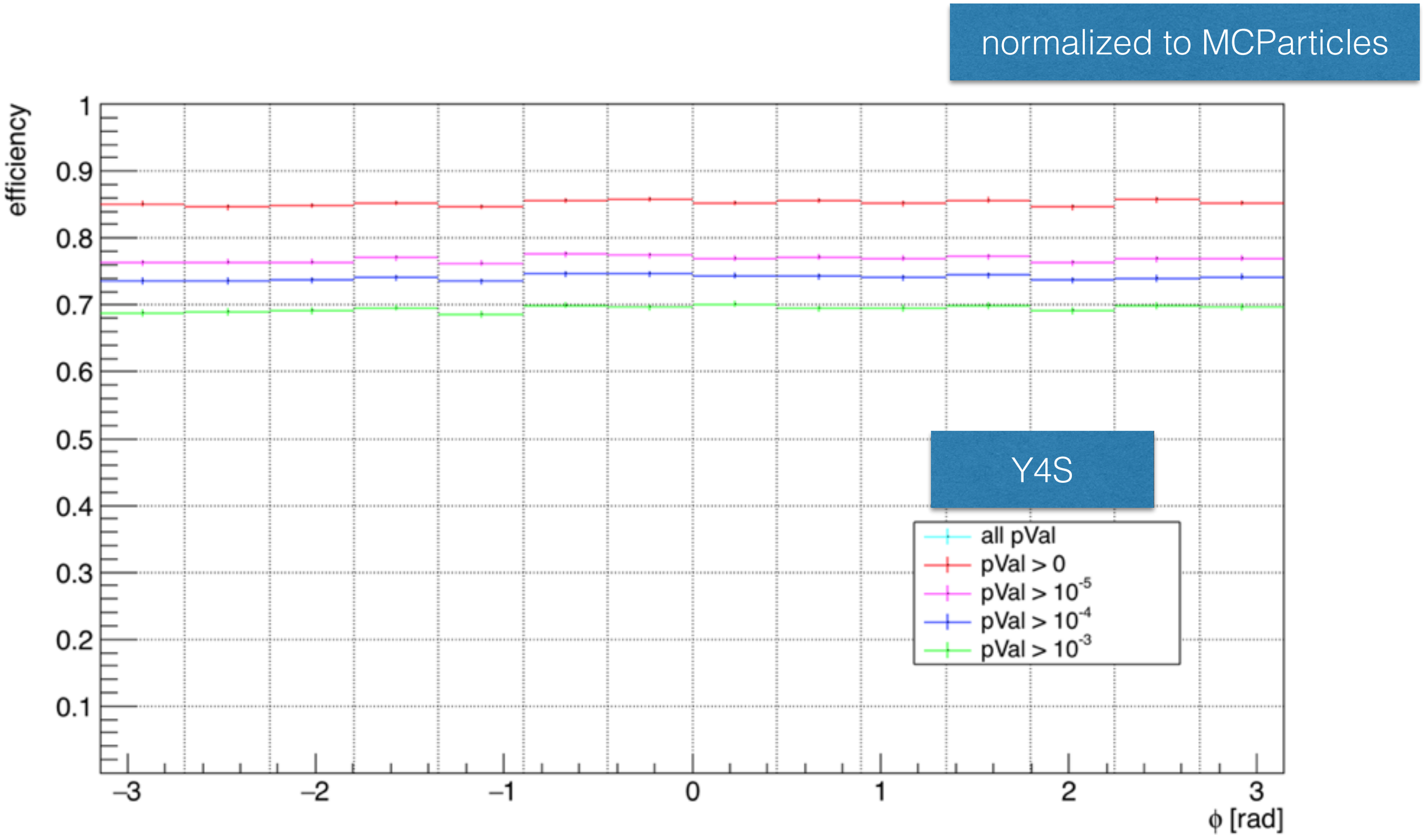
efficiency VS θ

normalized to MCParticles



- cyan and red points are overlapped (first two column)

efficiency VS Φ



- cyan and red points are overlapped (first two column)

Summary

- with (any) cut on pVal:
  - increase of the pt resolution
  - drop in the efficiency

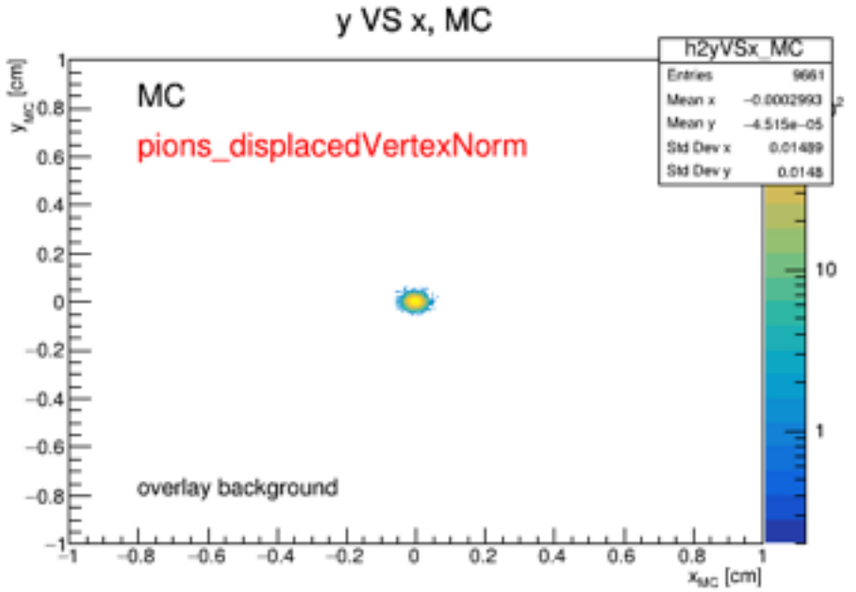
- to keep high efficiency:
  - cut pVal > 0

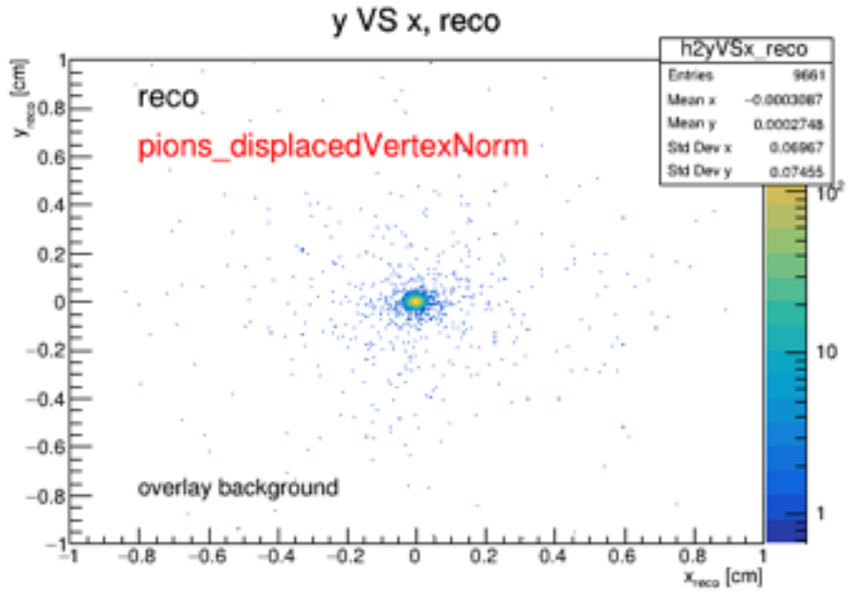
but: no gain in resolution

backup

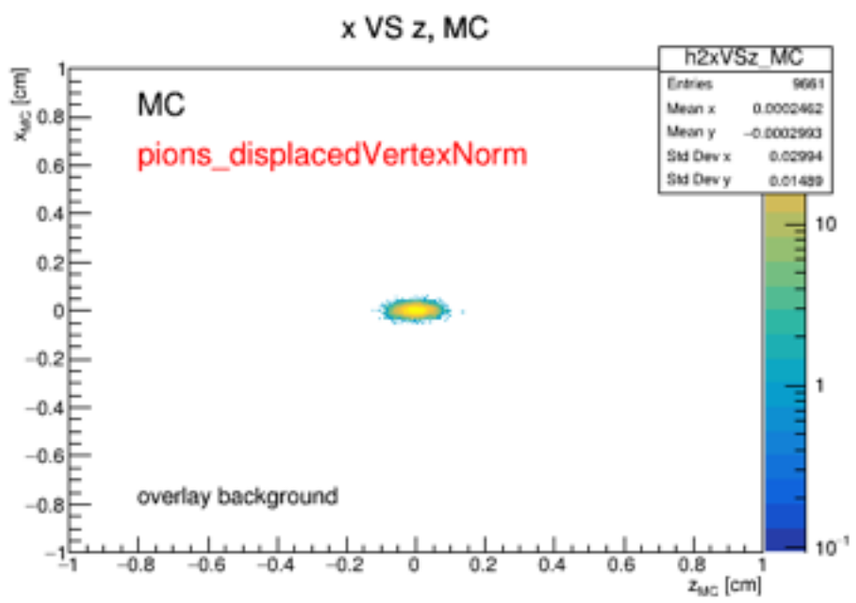
pions (particle gun)

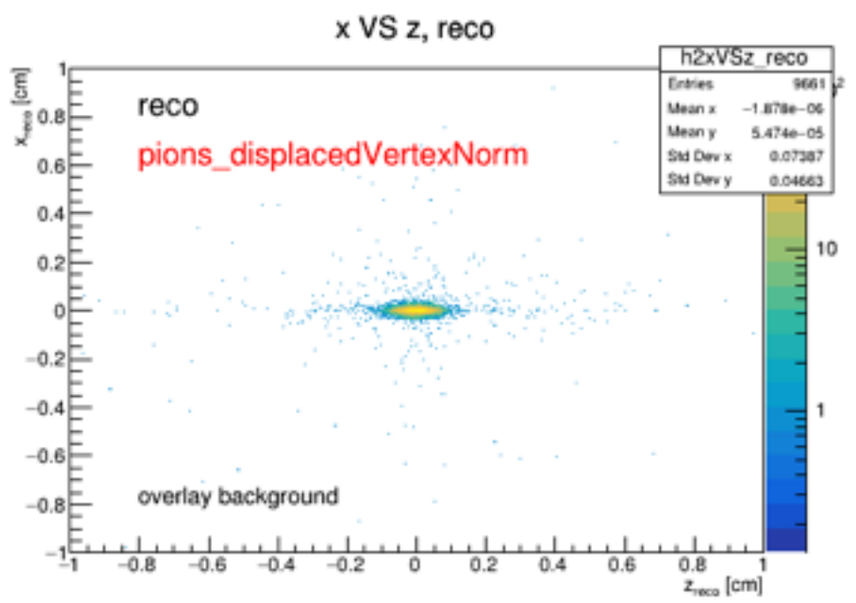
displaced vertex



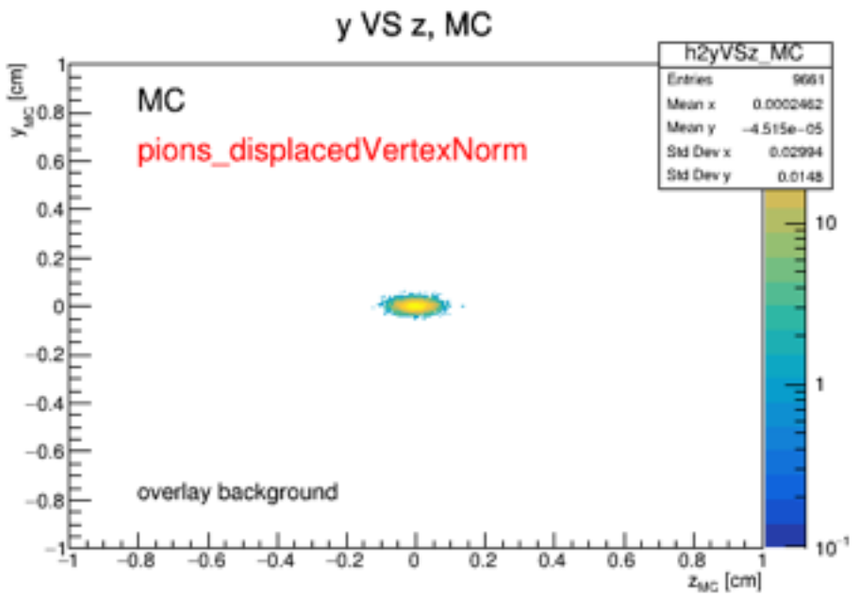


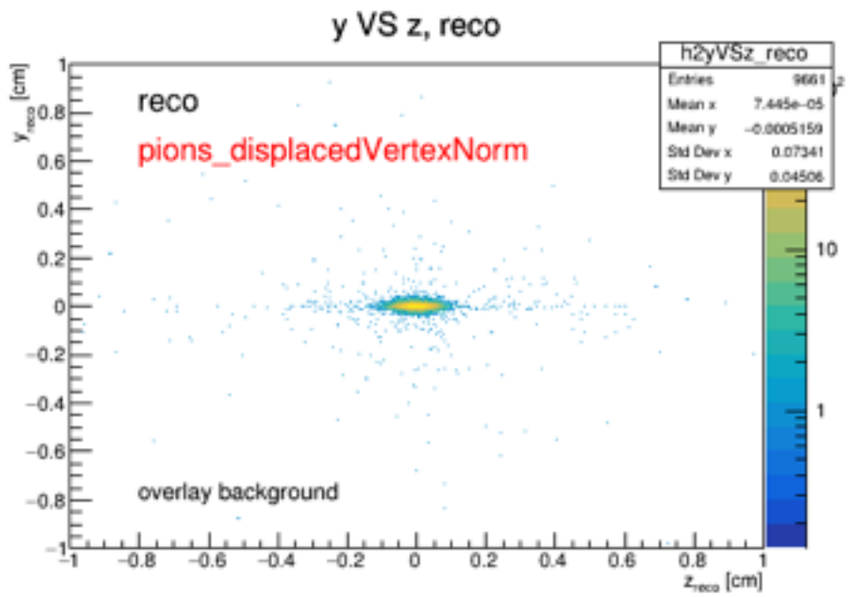
y VS x





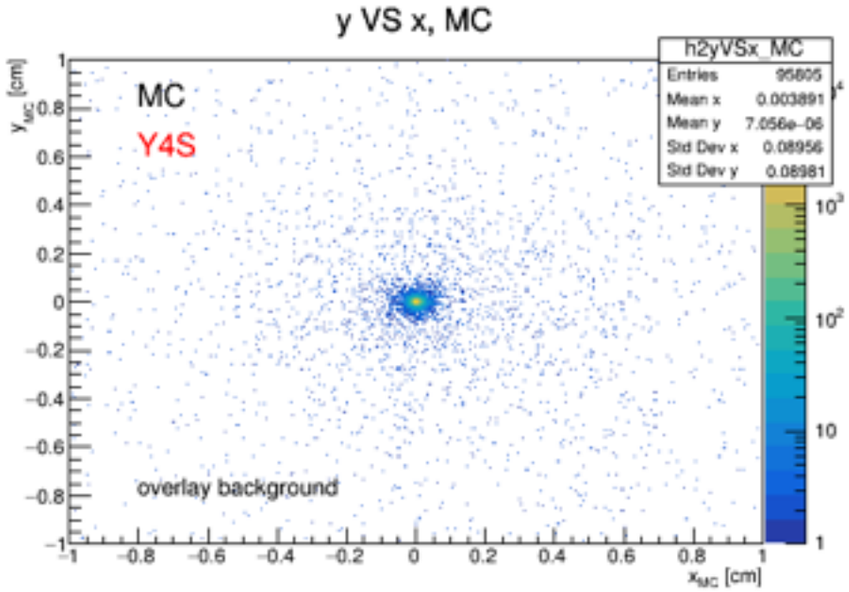
x VS z

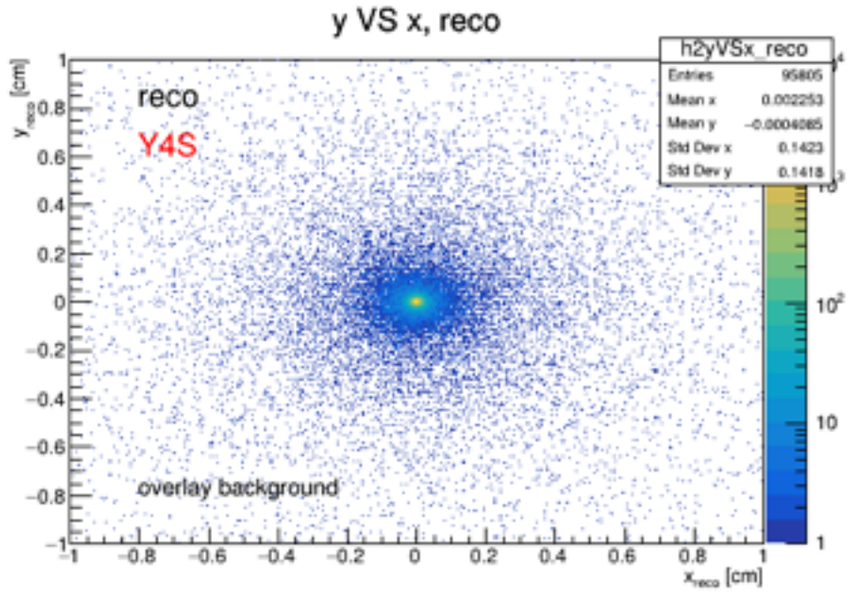




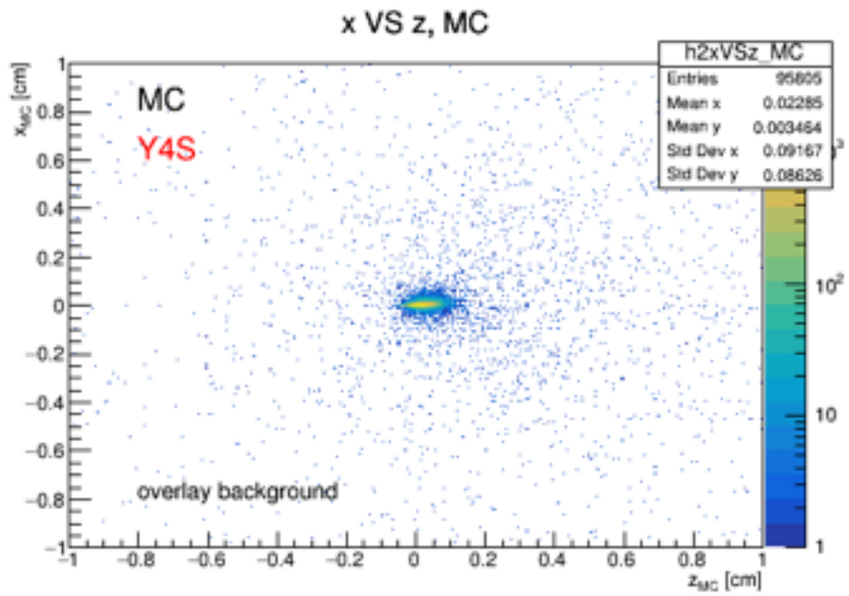
y VS z

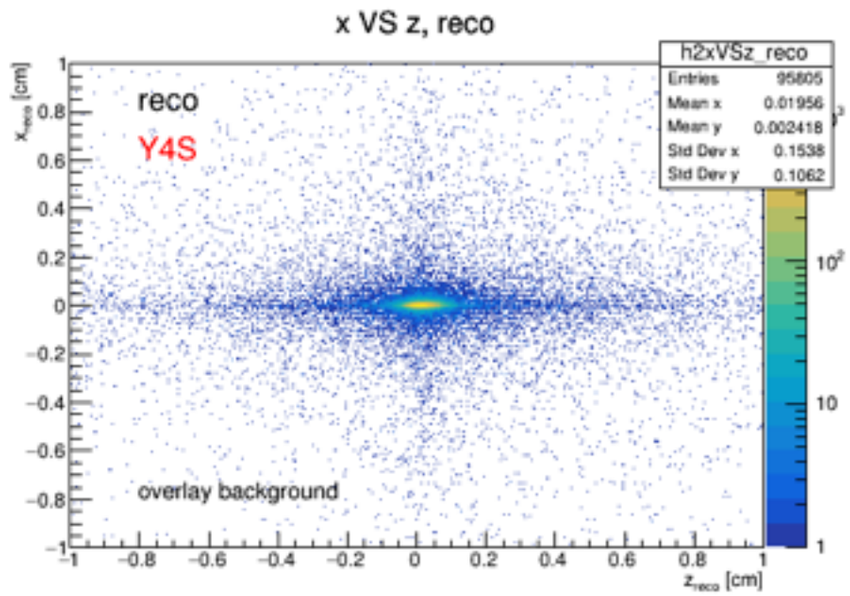
Y(4S)



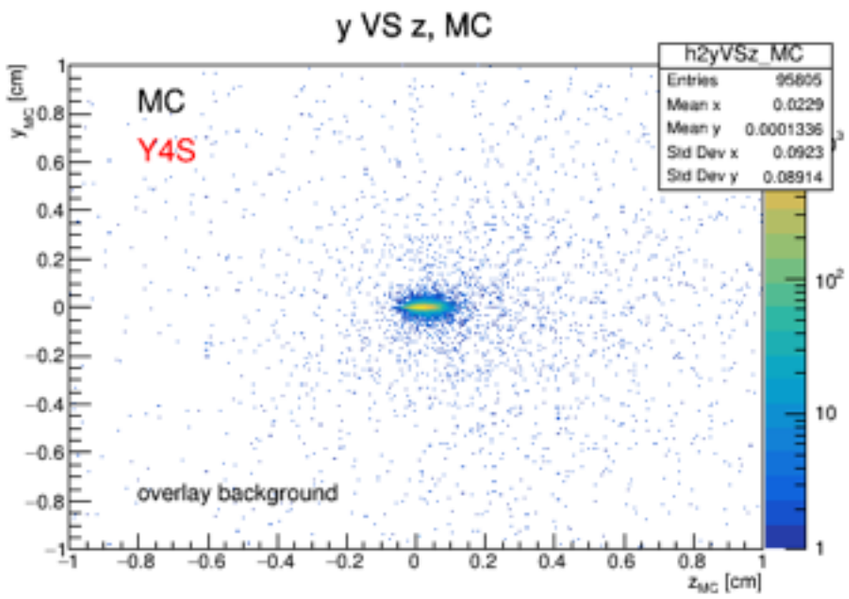


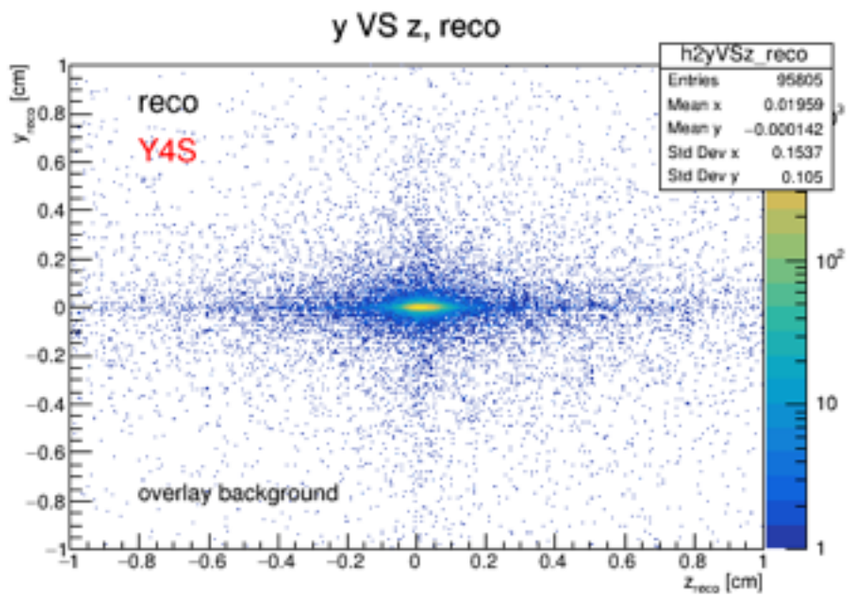
y VS x





x VS z





y VS z

Y(4S) → tracks with p_t > 1 GeV/c only

y VS x

x VS z

y VS z