HPS-Sim Update

Bradley Yale

09/11/2018

Some hps-sim notes

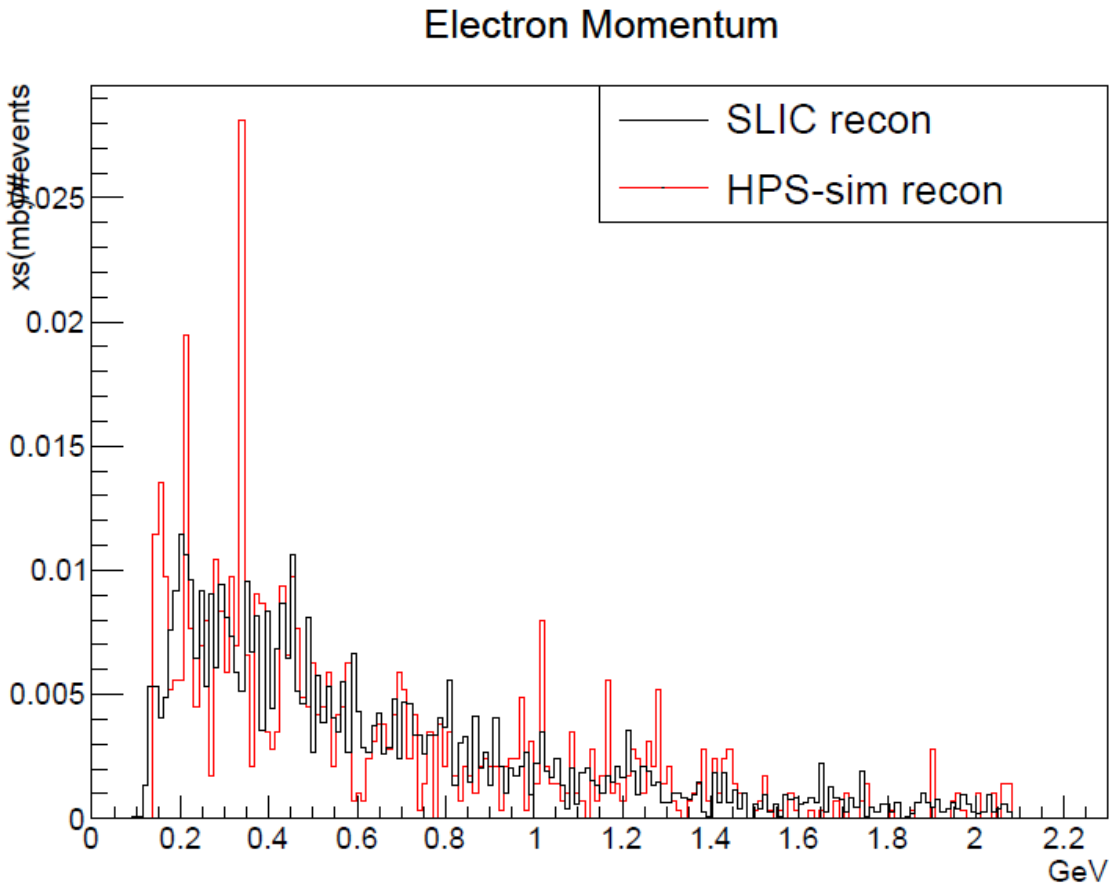
- Hps-sim is much faster now, thanks to Maurik's optimization
  - Only a few hours on the farm, instead of days

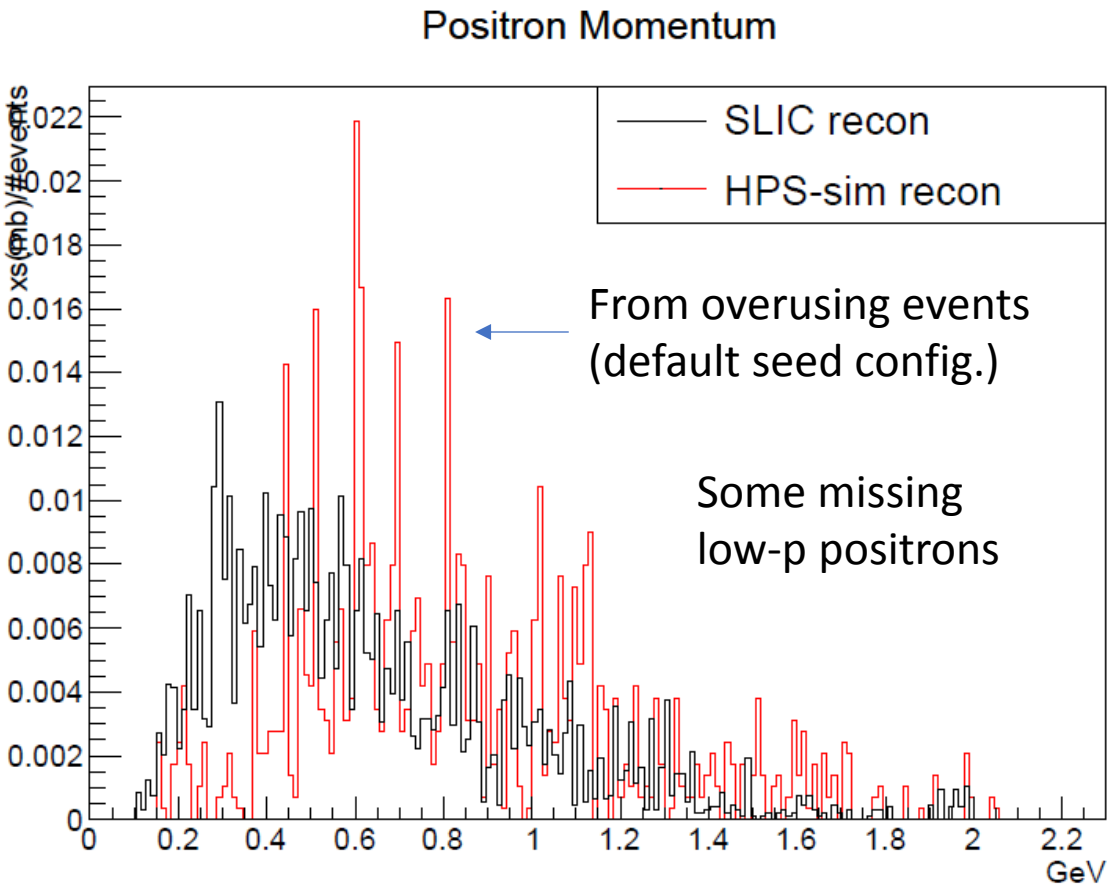
- Hps-sim currently keeps far more particles than SLIC
  - Each hps-sim file is 2.4 GB! (vs. ~900 MB for SLIC)

- Things looked screwy in events mixed by hps-sim, so I checked stdhep-mixed events that were simply propagated with hps-sim.

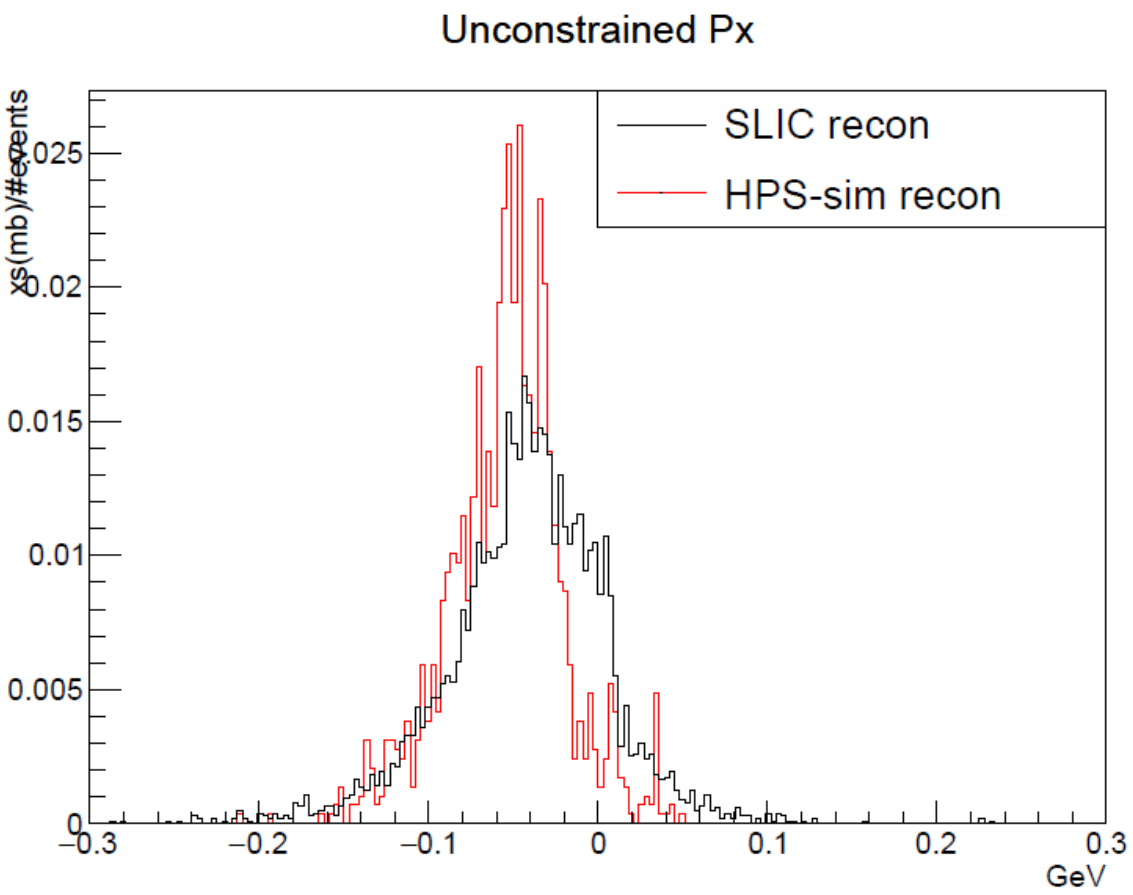
- These comparisons had to be normalized by n_events instead of n_files

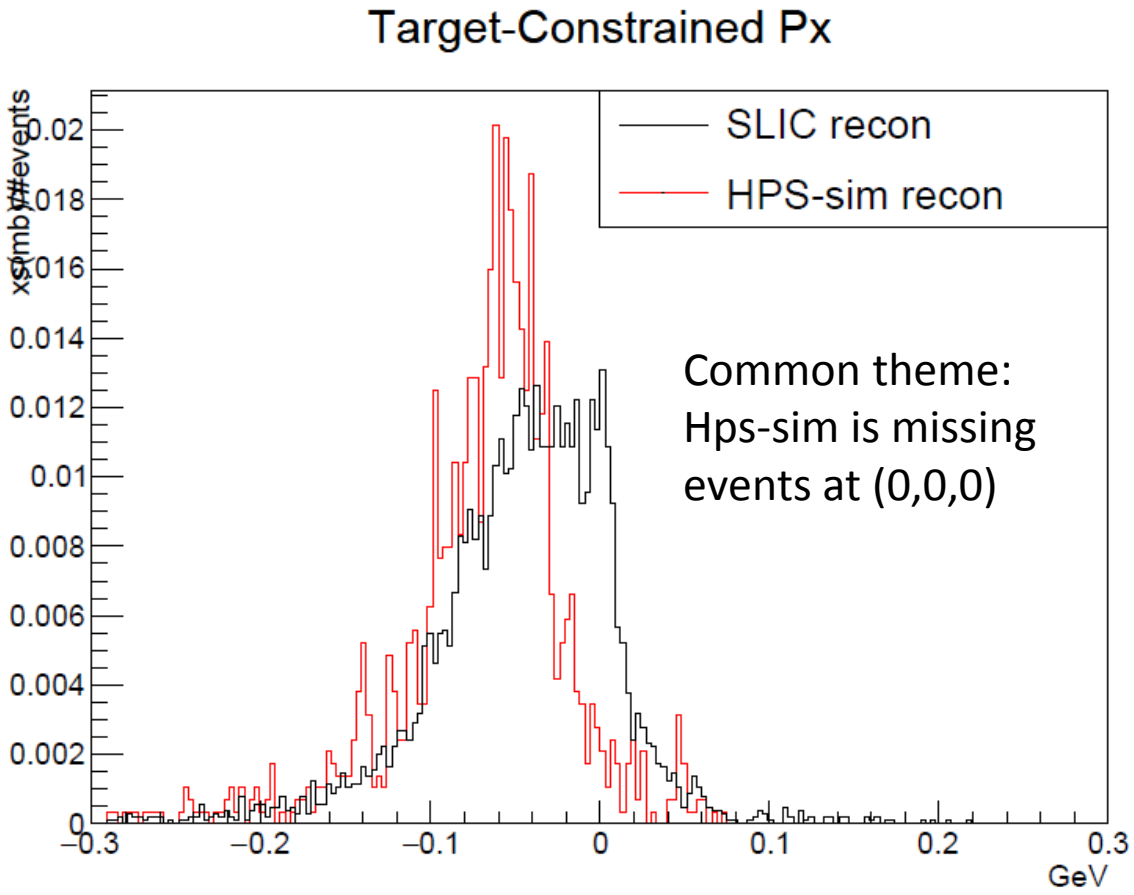
Wab-beam-tri events mixed using hps-sim (recon follow-up from last time)



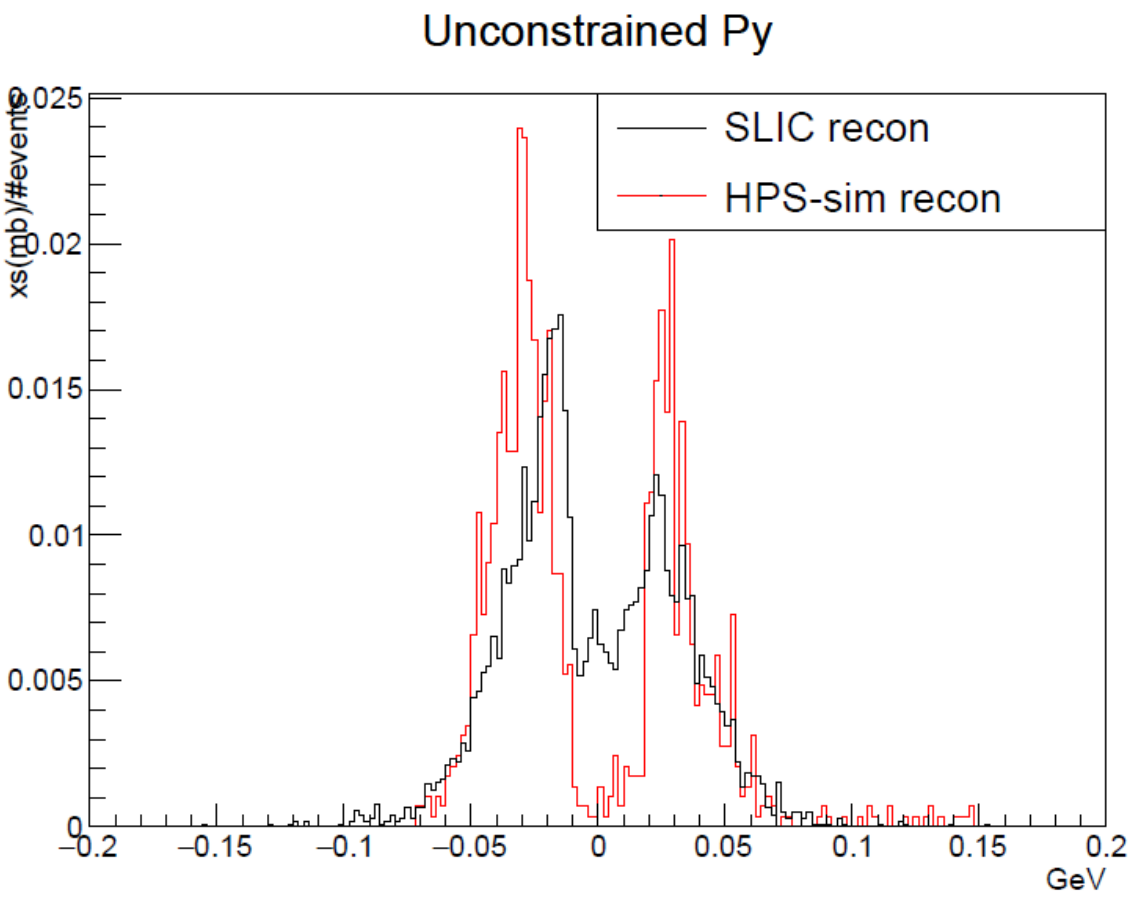


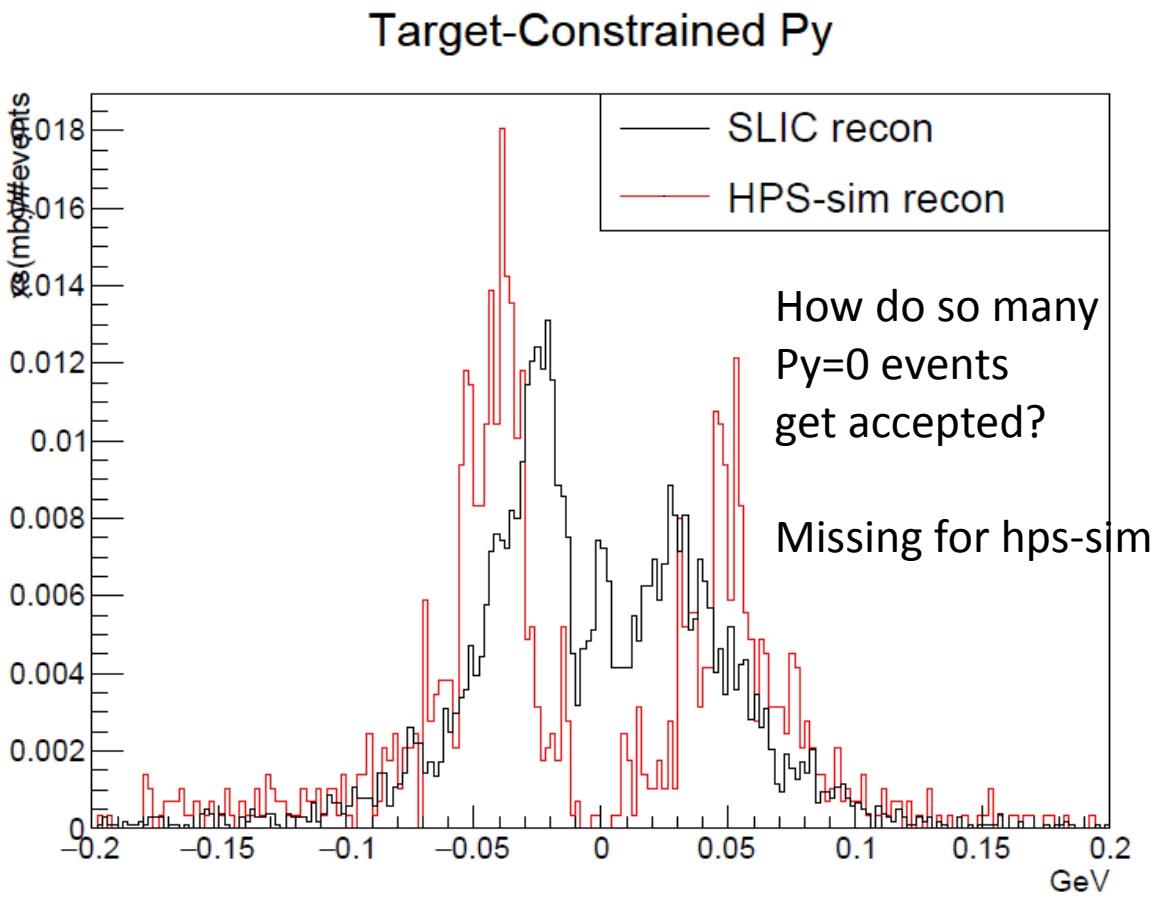
Hps-sim mixed (Px)



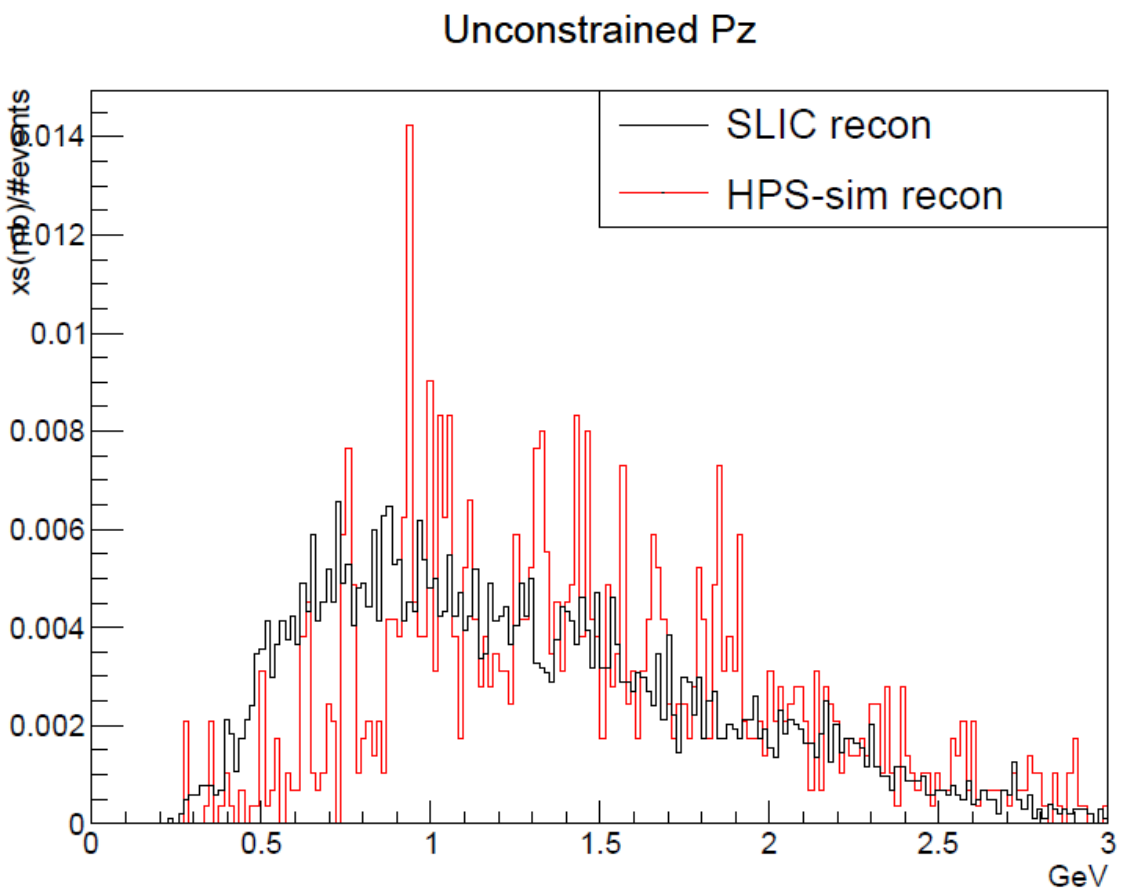


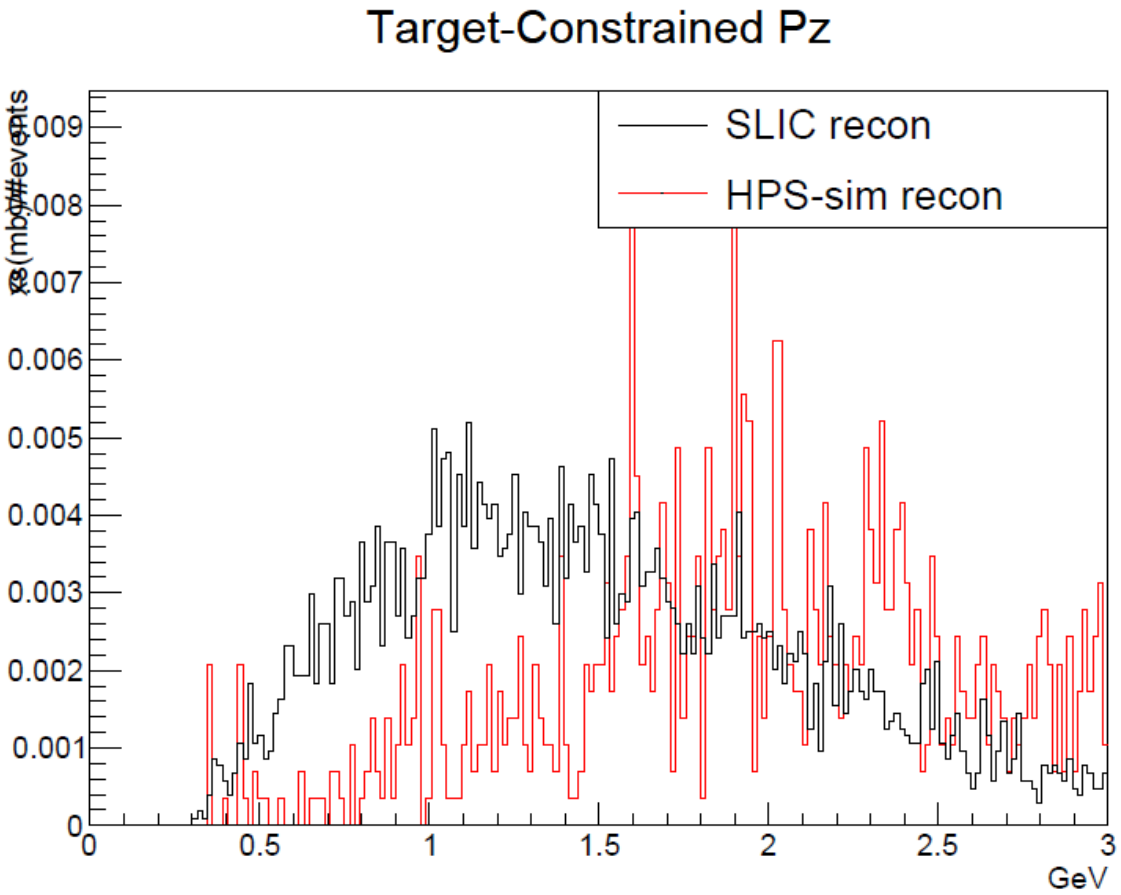
Hps-sim mixed (Py)



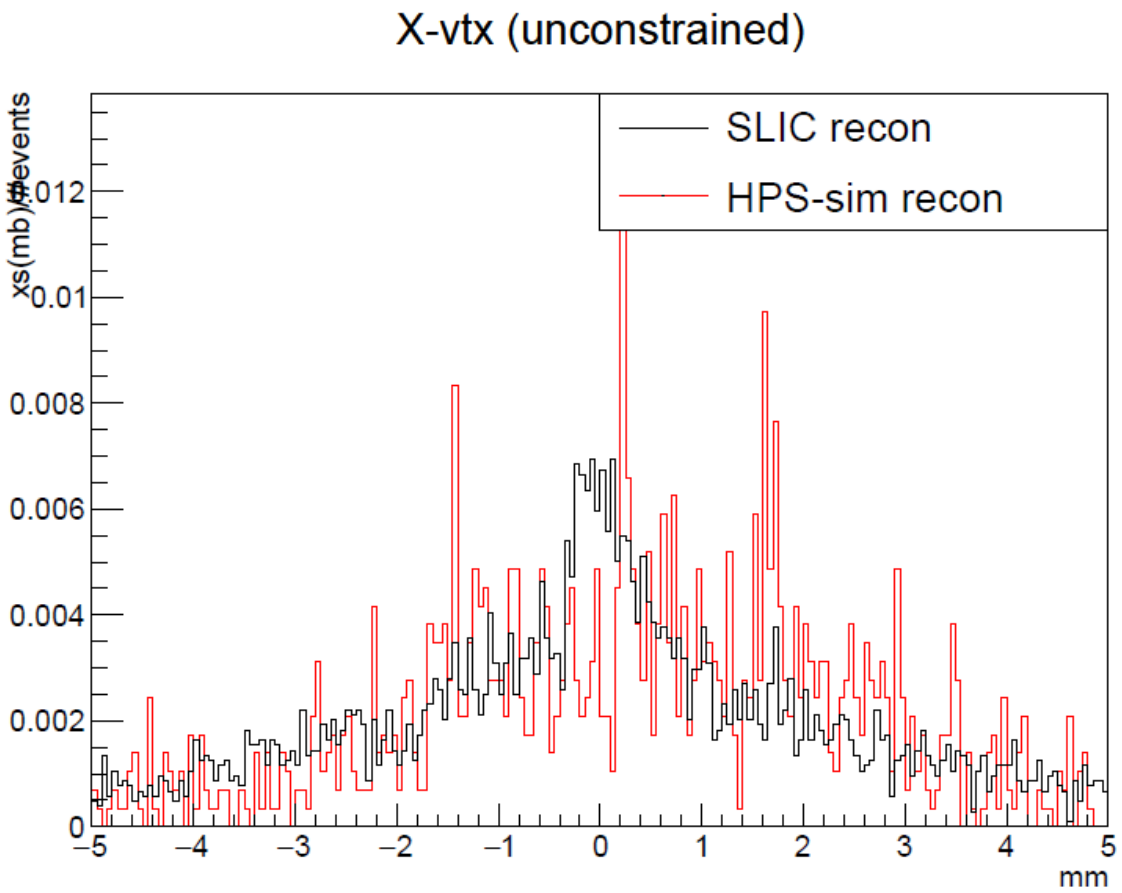


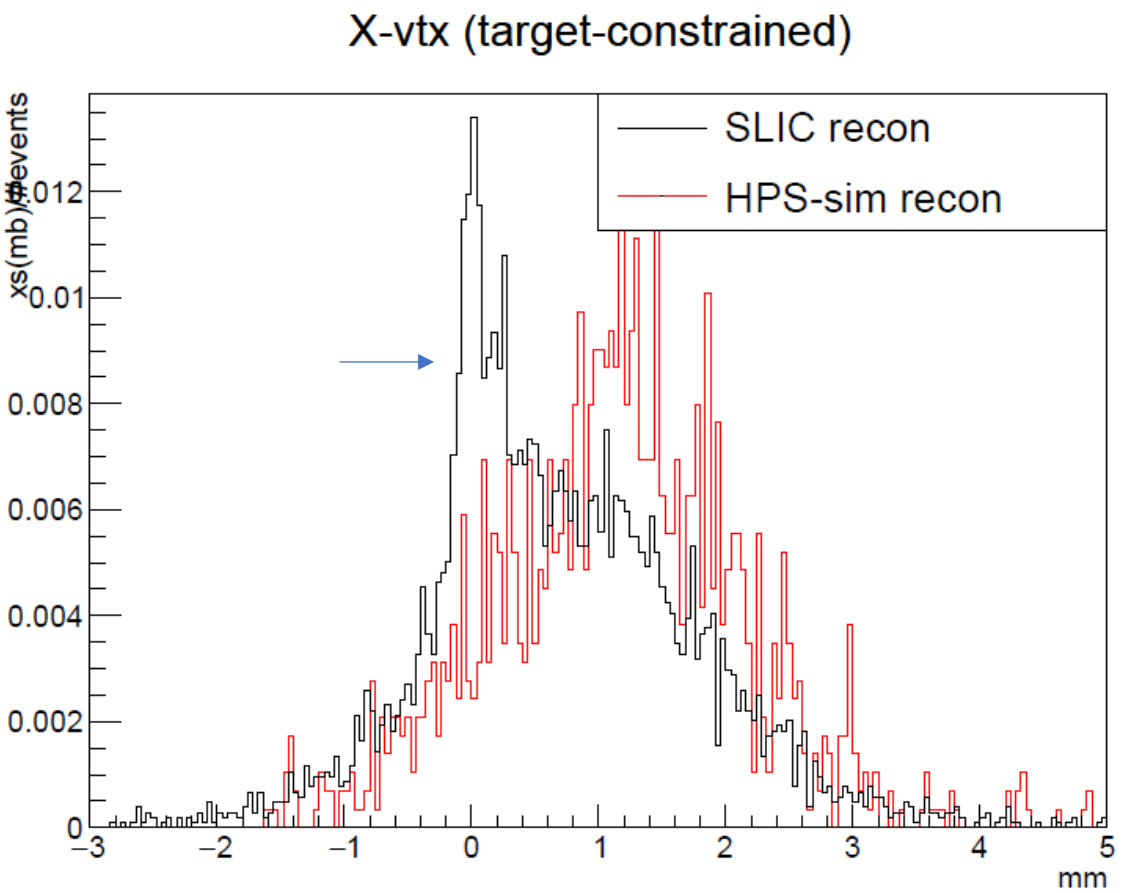
Hps-sim mixed (Pz)



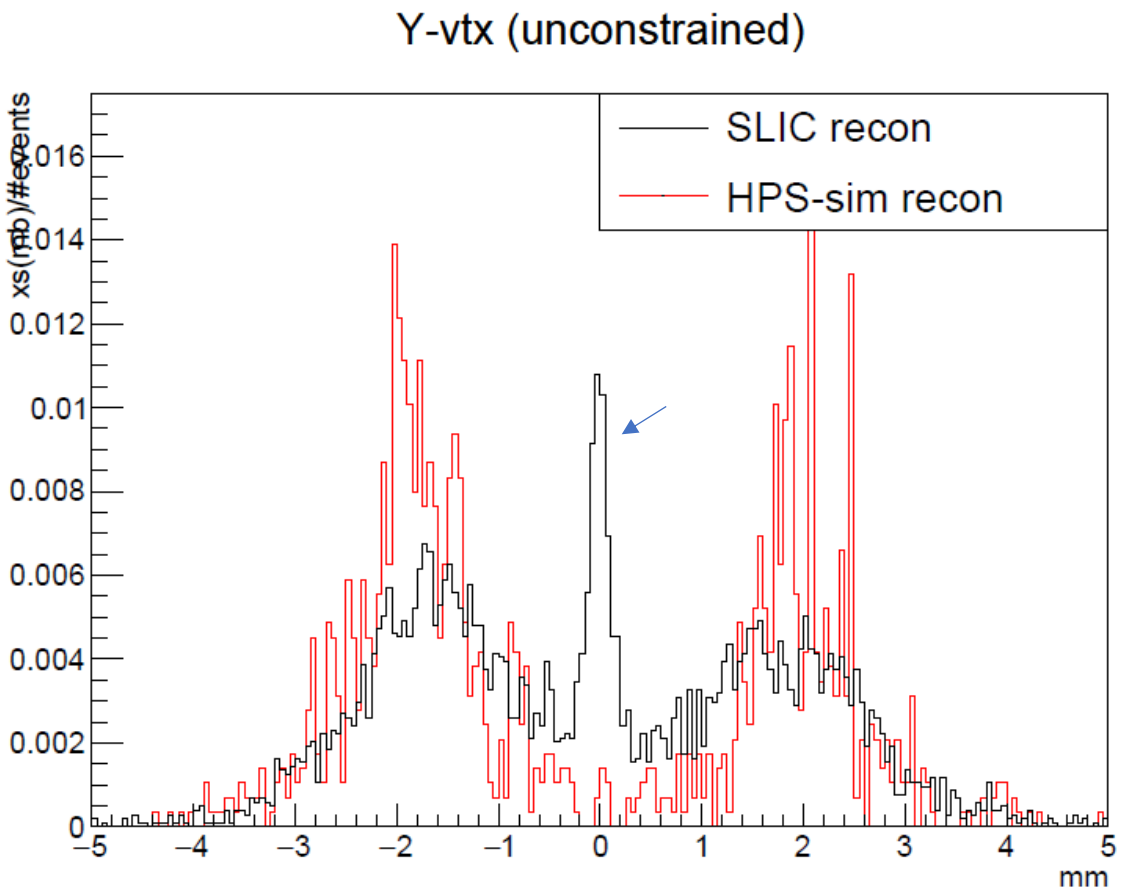


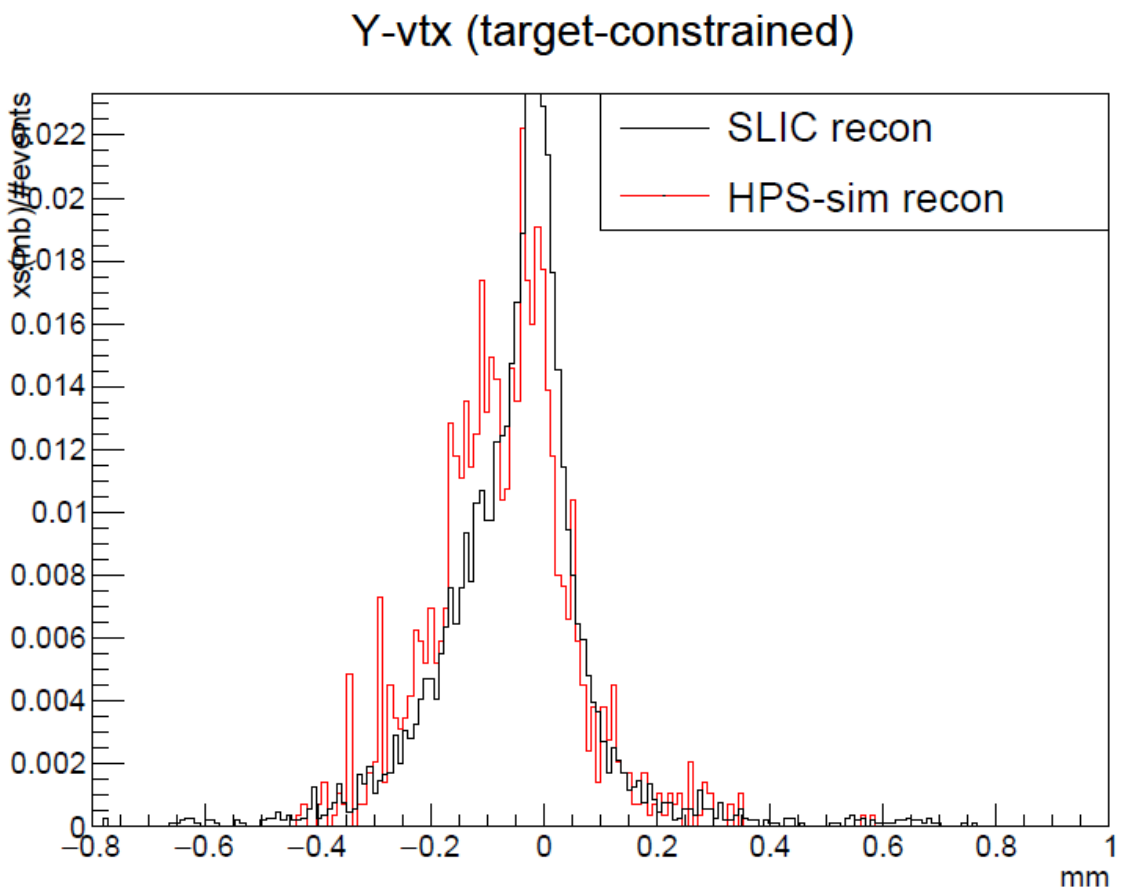
Hps-sim mixed (x-vtx)



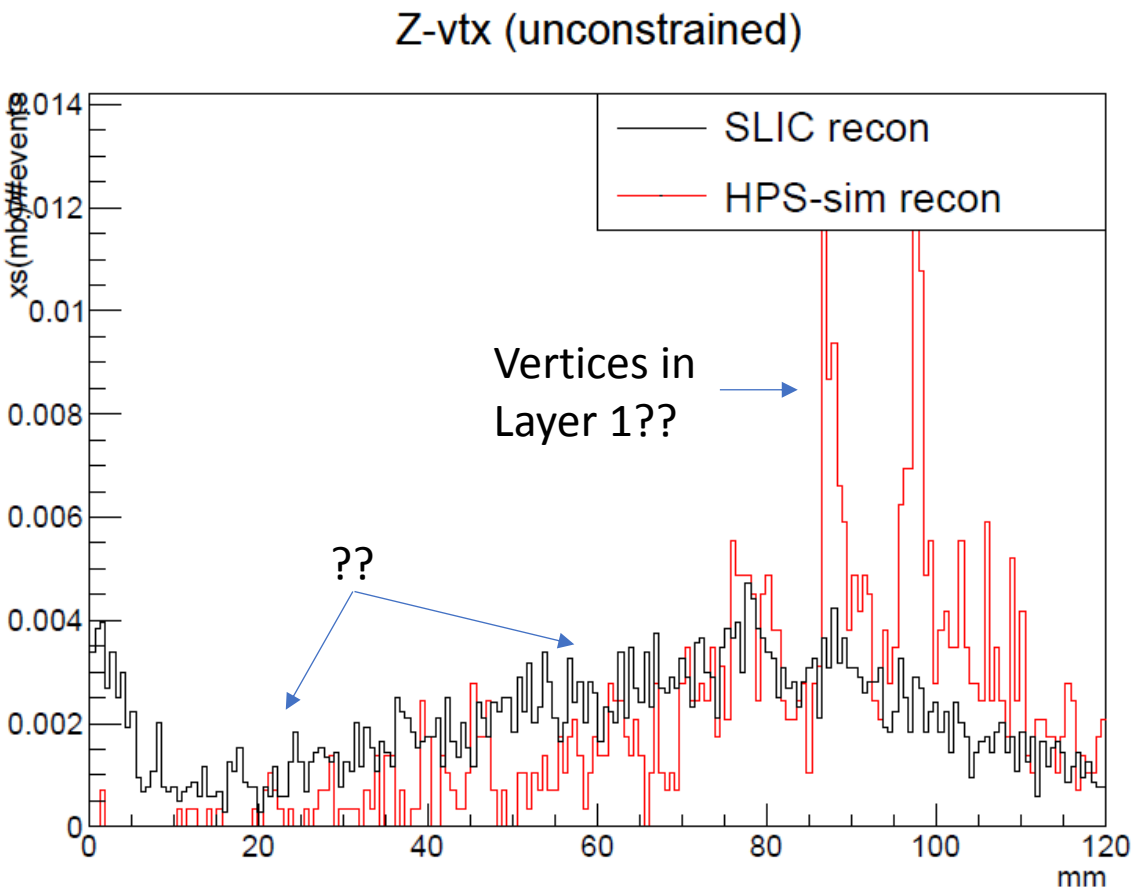


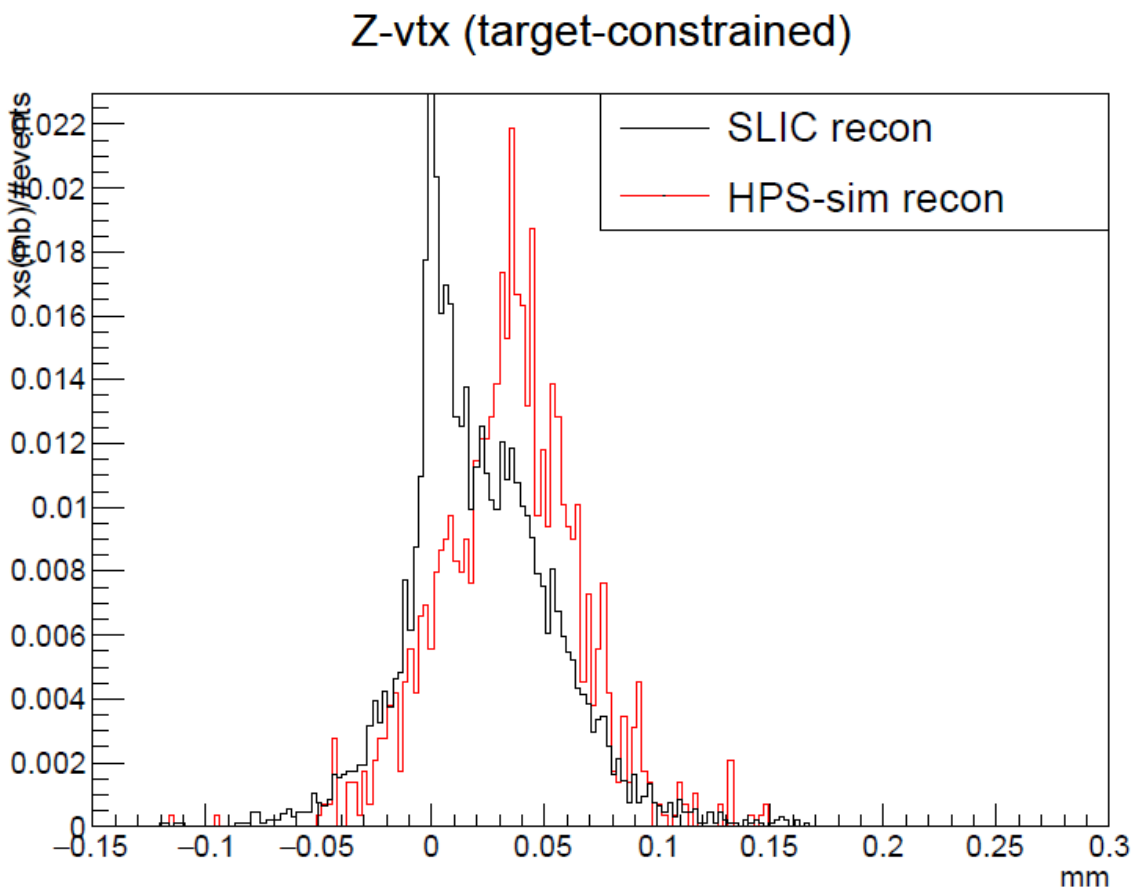
Hps-sim mixed (y-vtx)



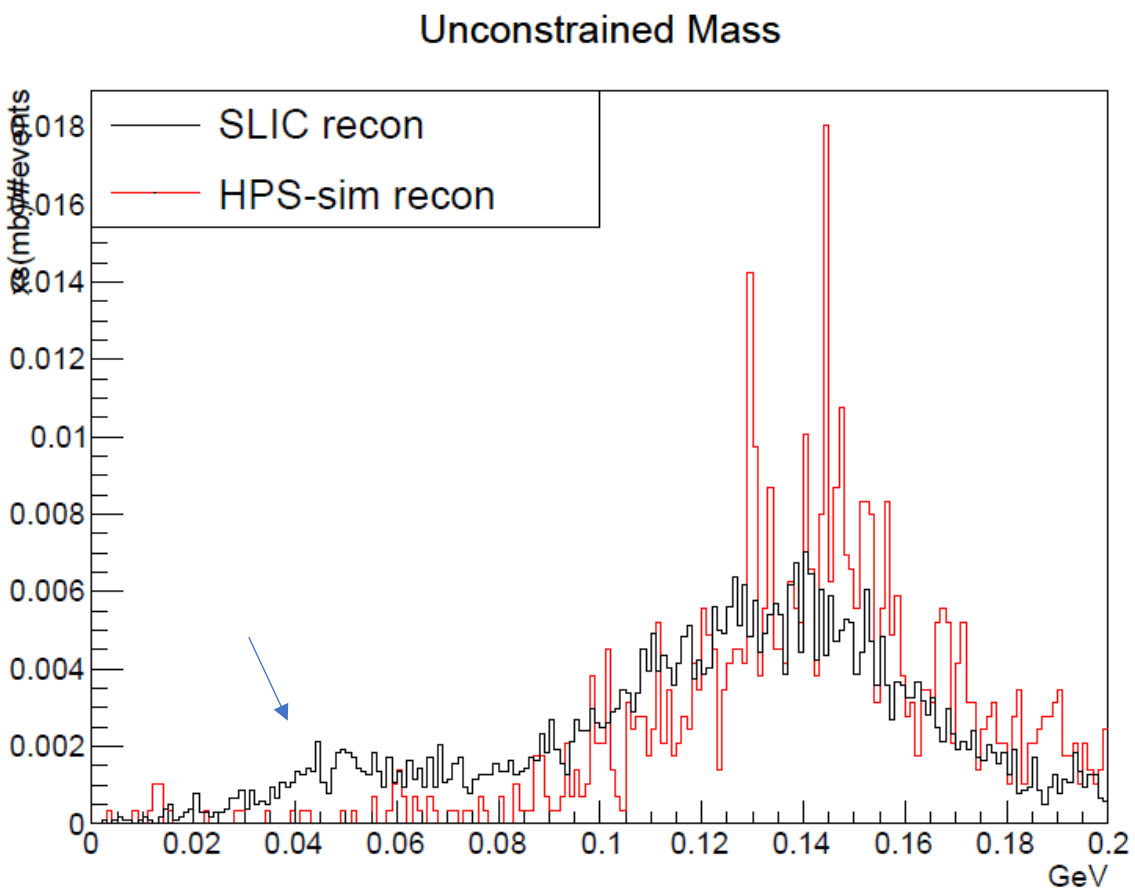


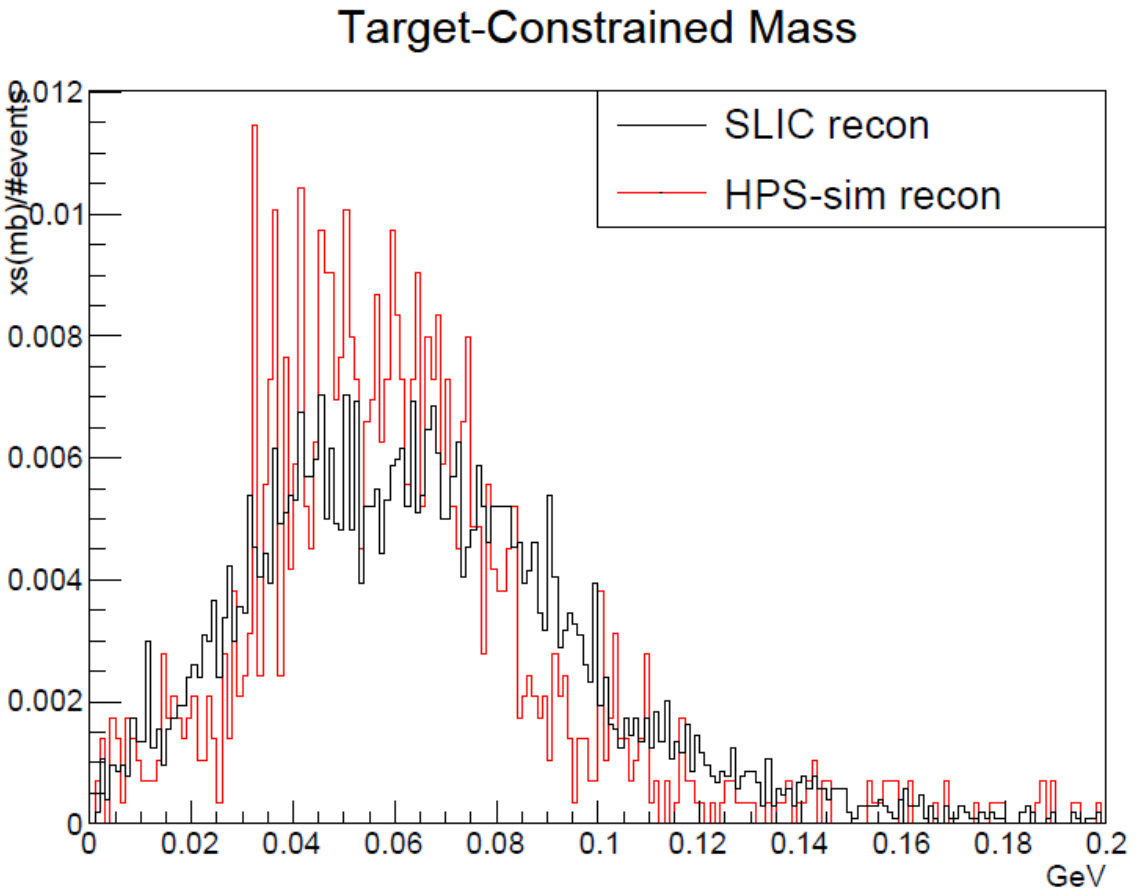
Hps-sim mixed (z-vtx)



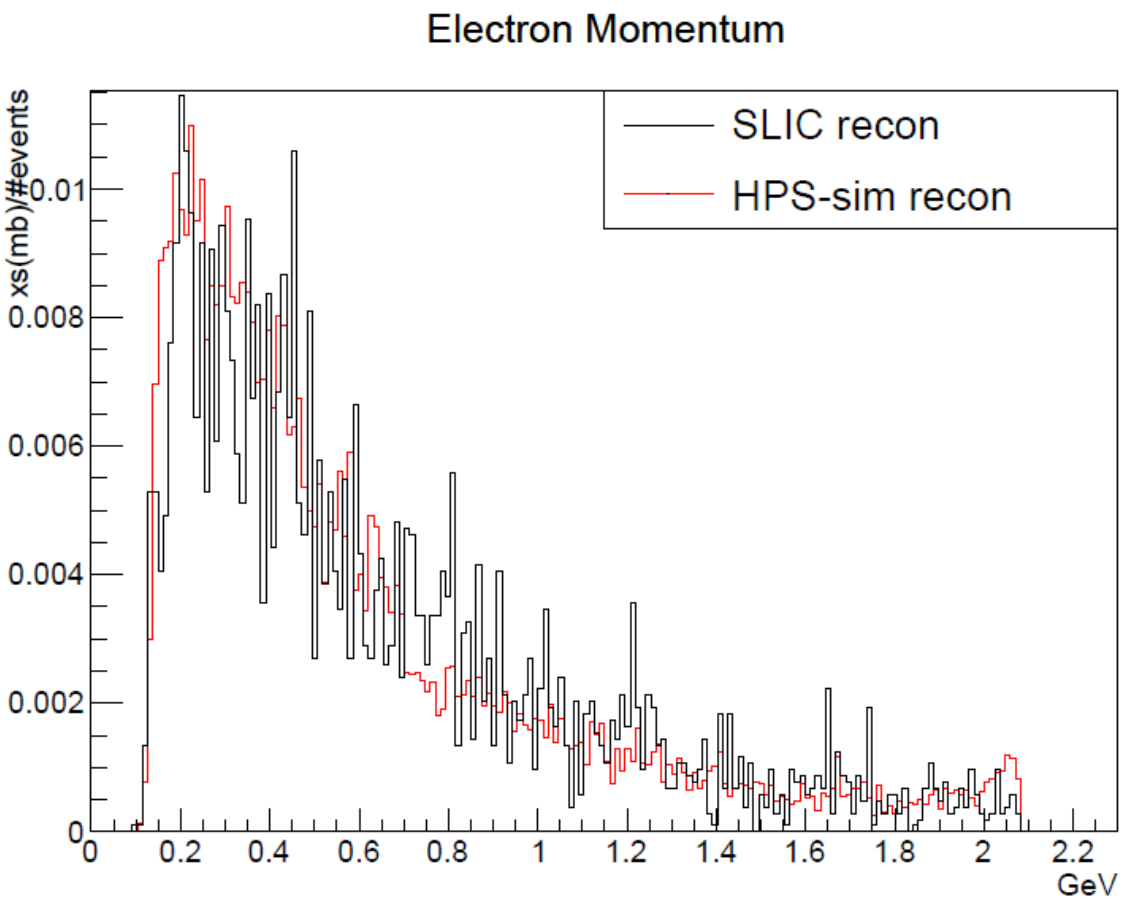


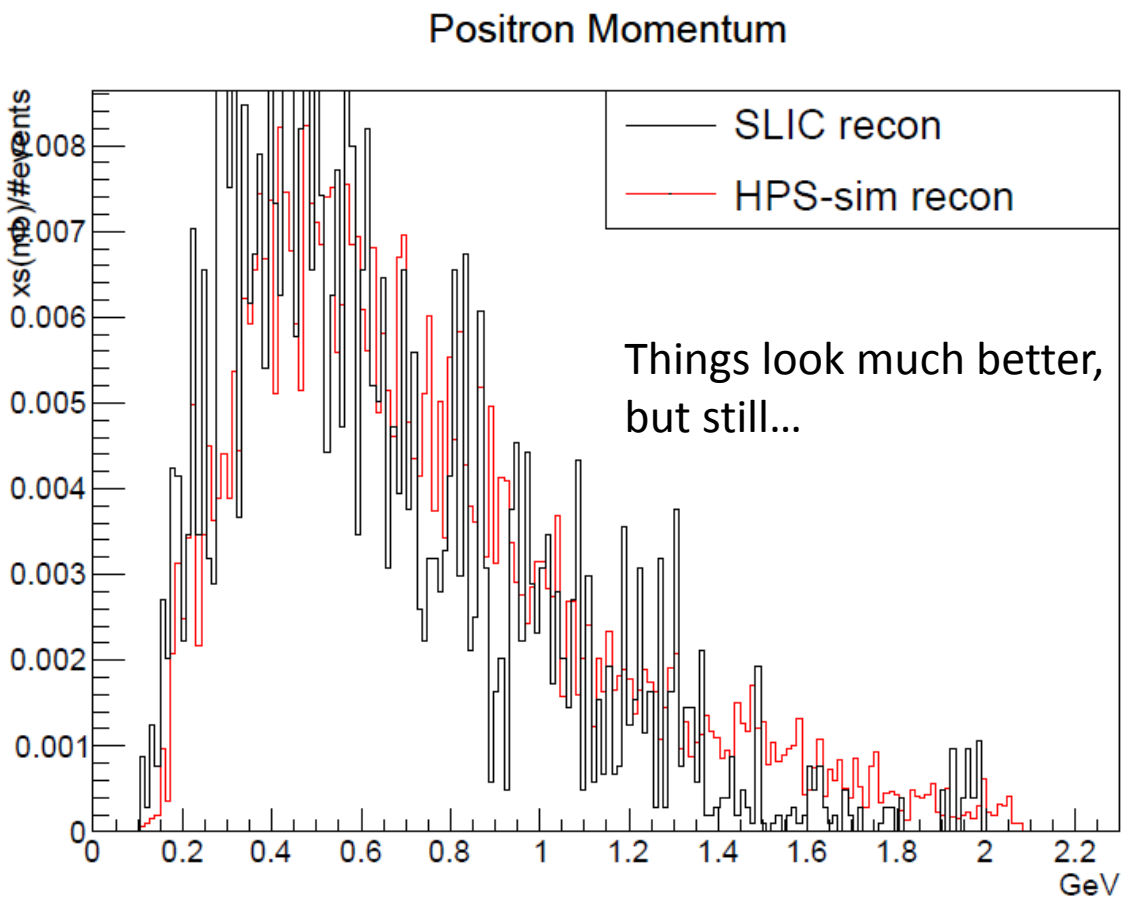
Hps-sim mixed (mass)



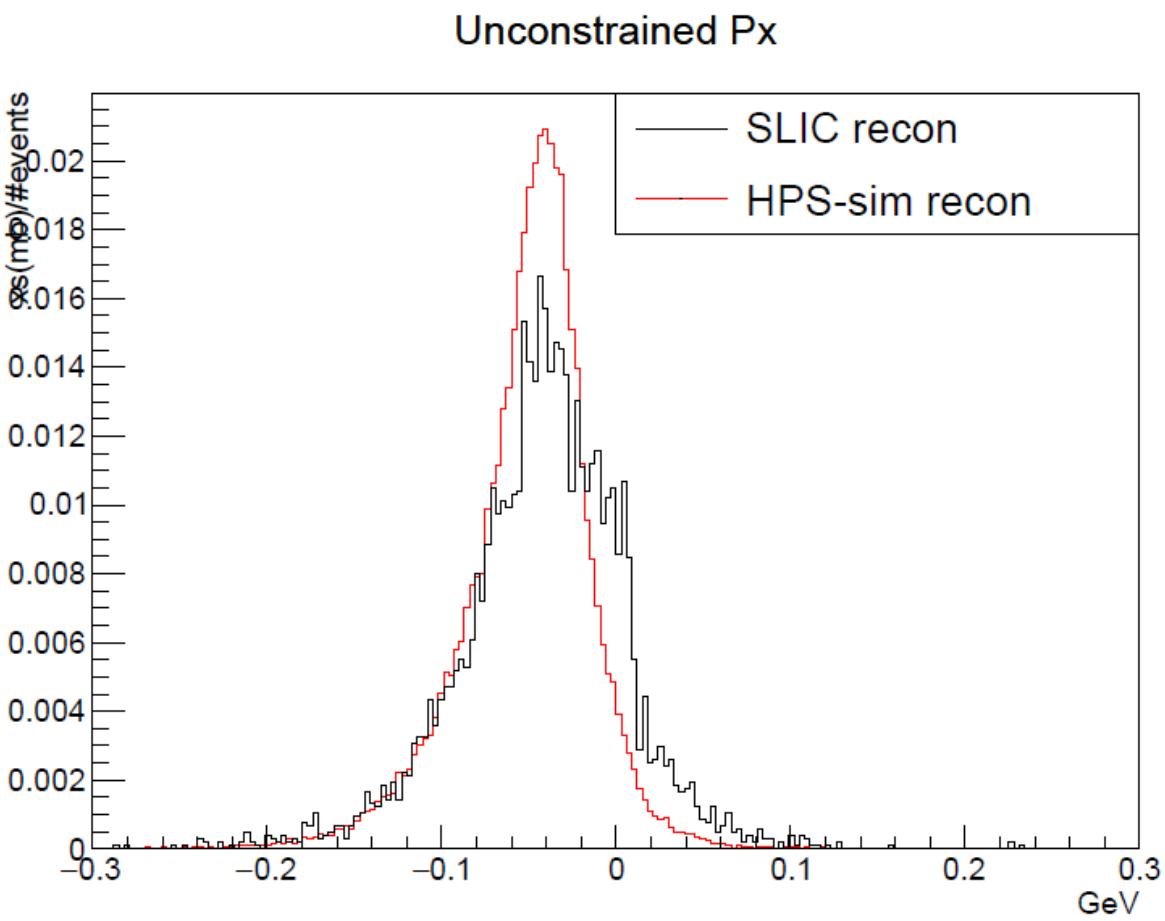


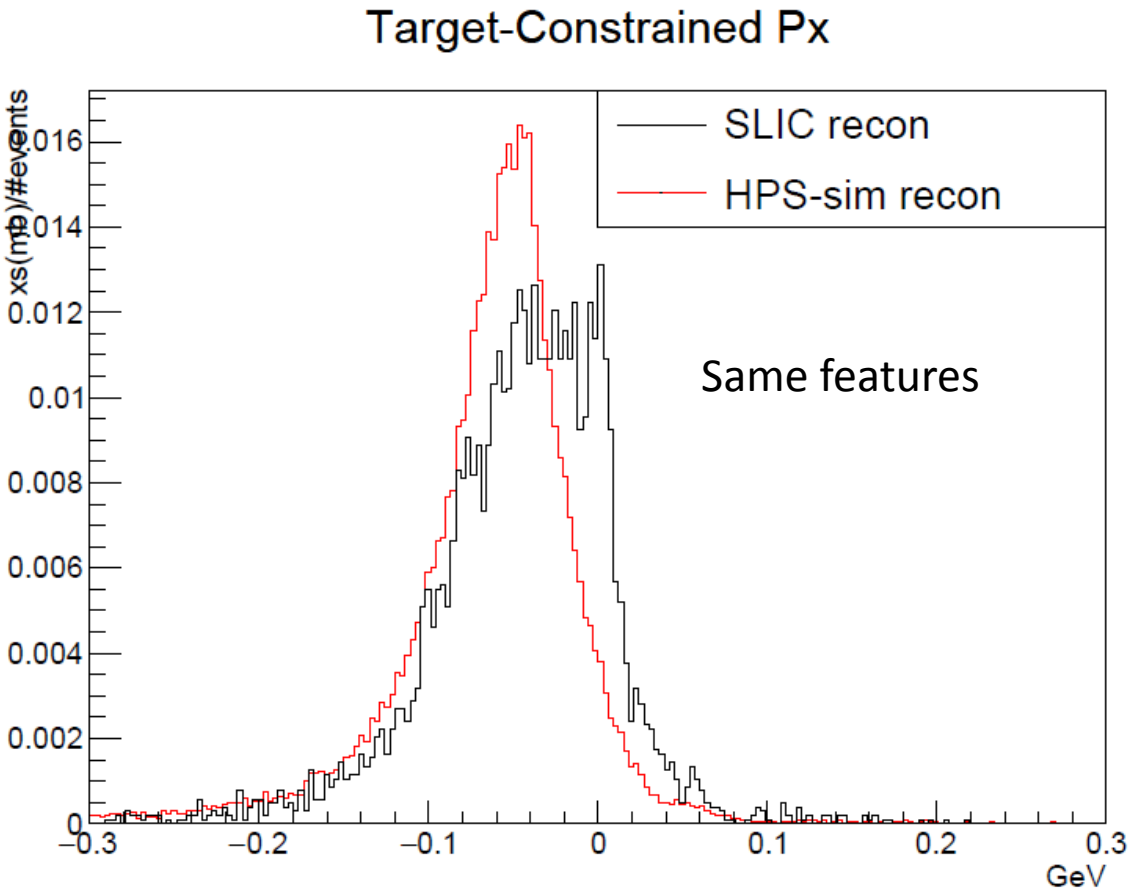
Using only stdhep-mixed events (same input)



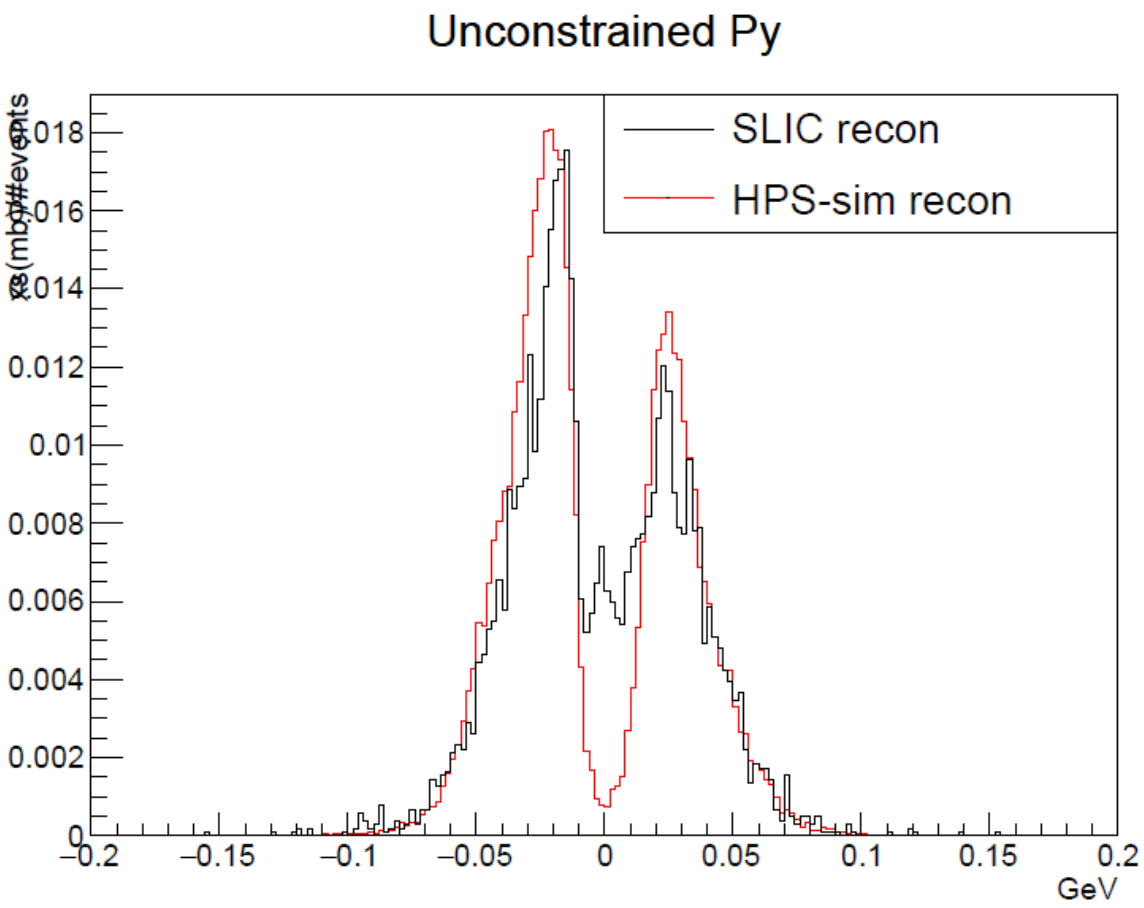


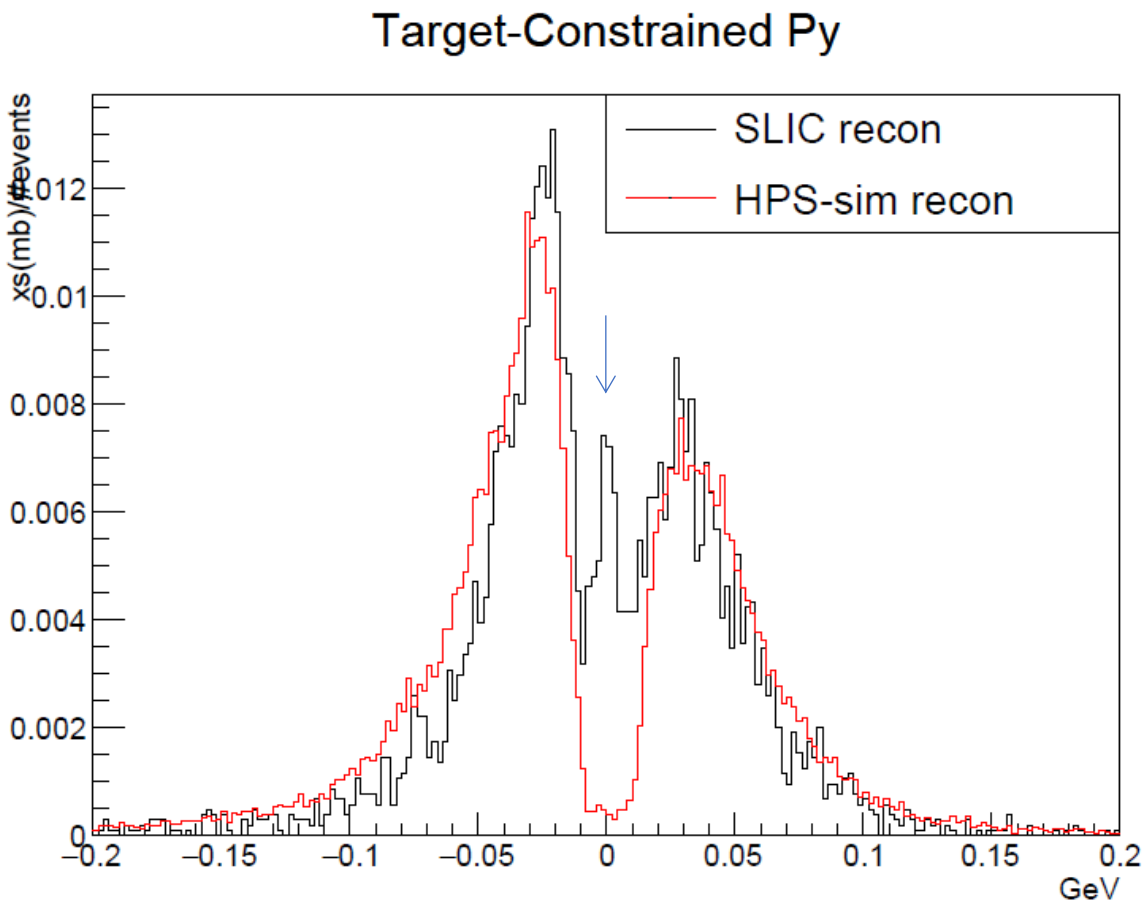
Stdhep-mixed events (Px)



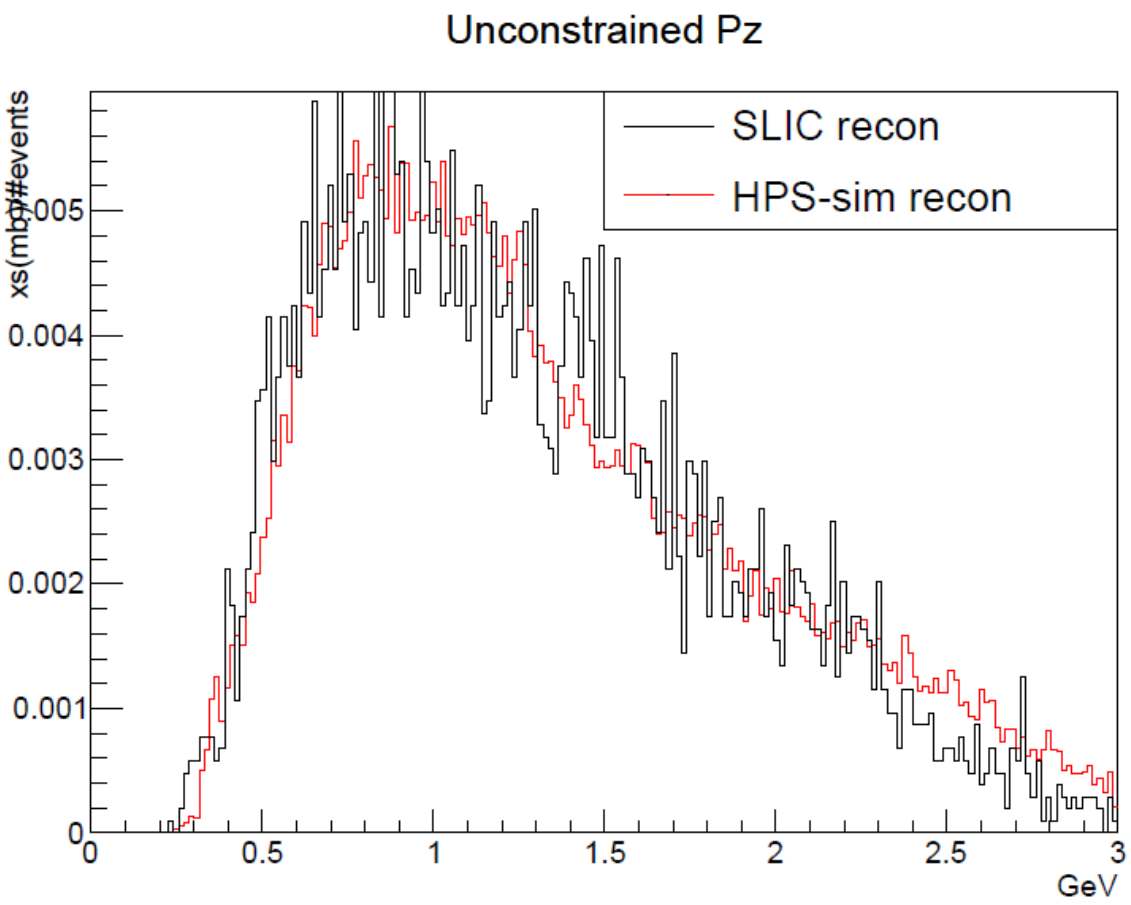


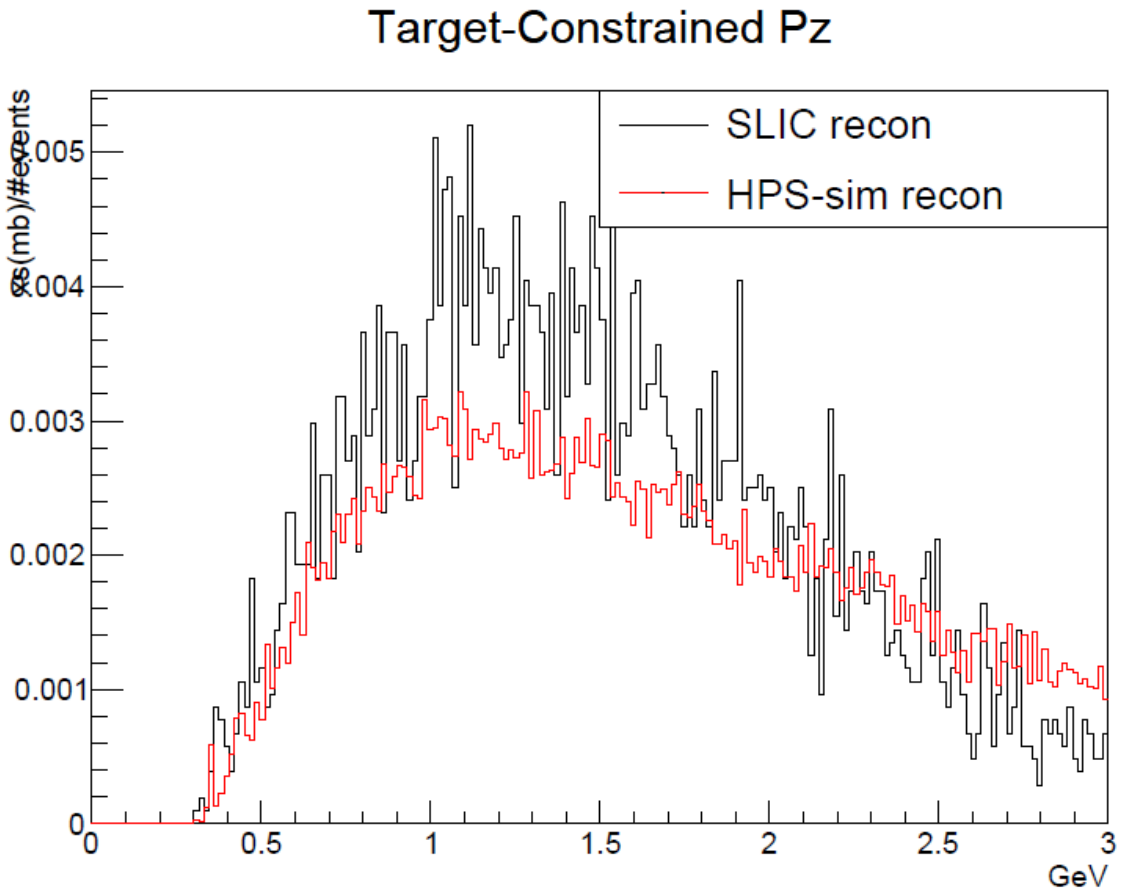
Stdhep-mixed events (Py)



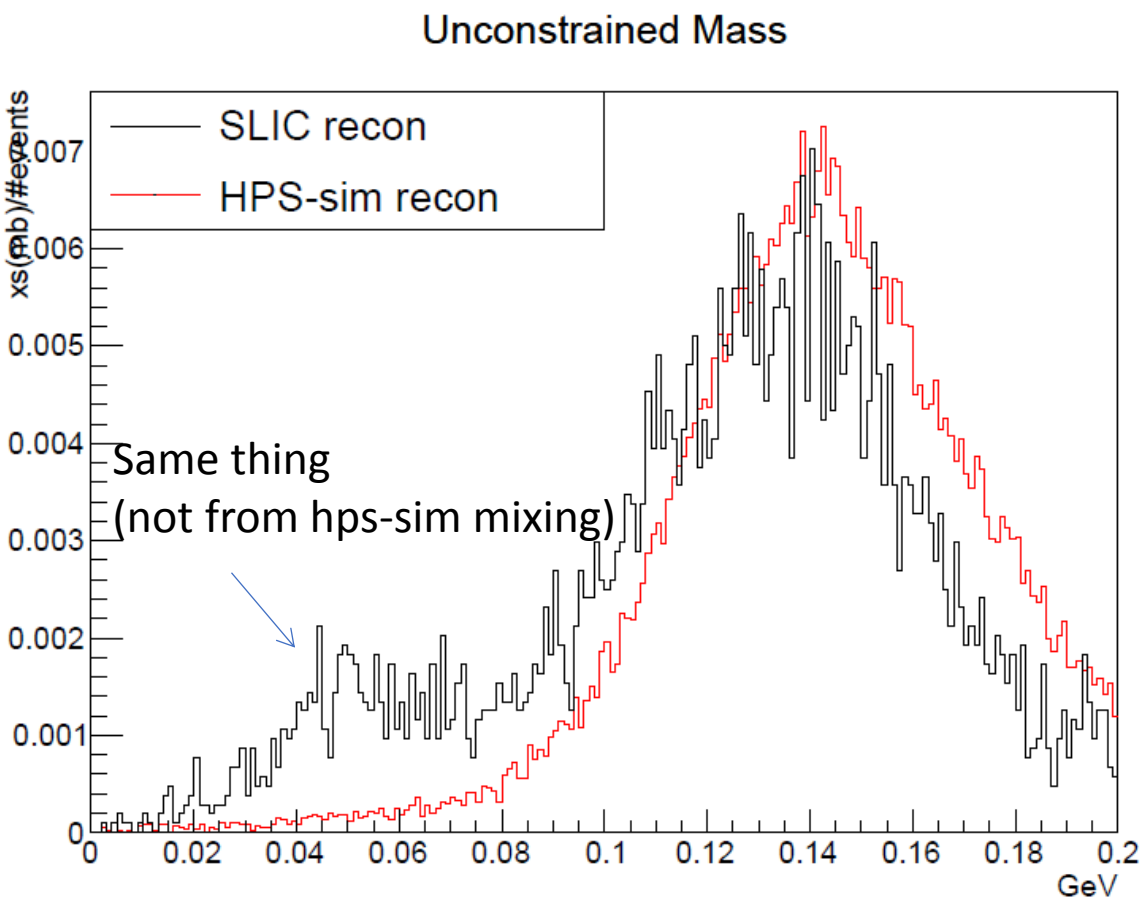


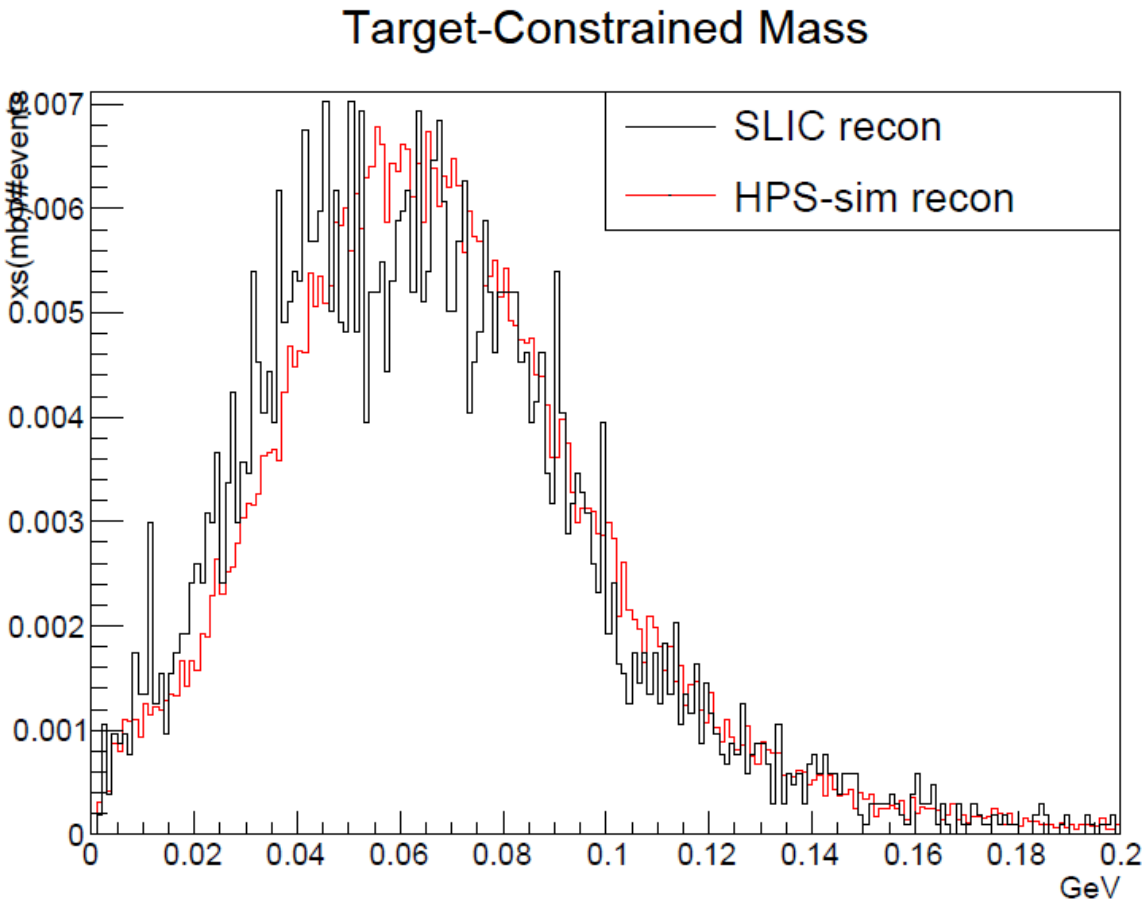
Stdhep-mixed events (Pz)



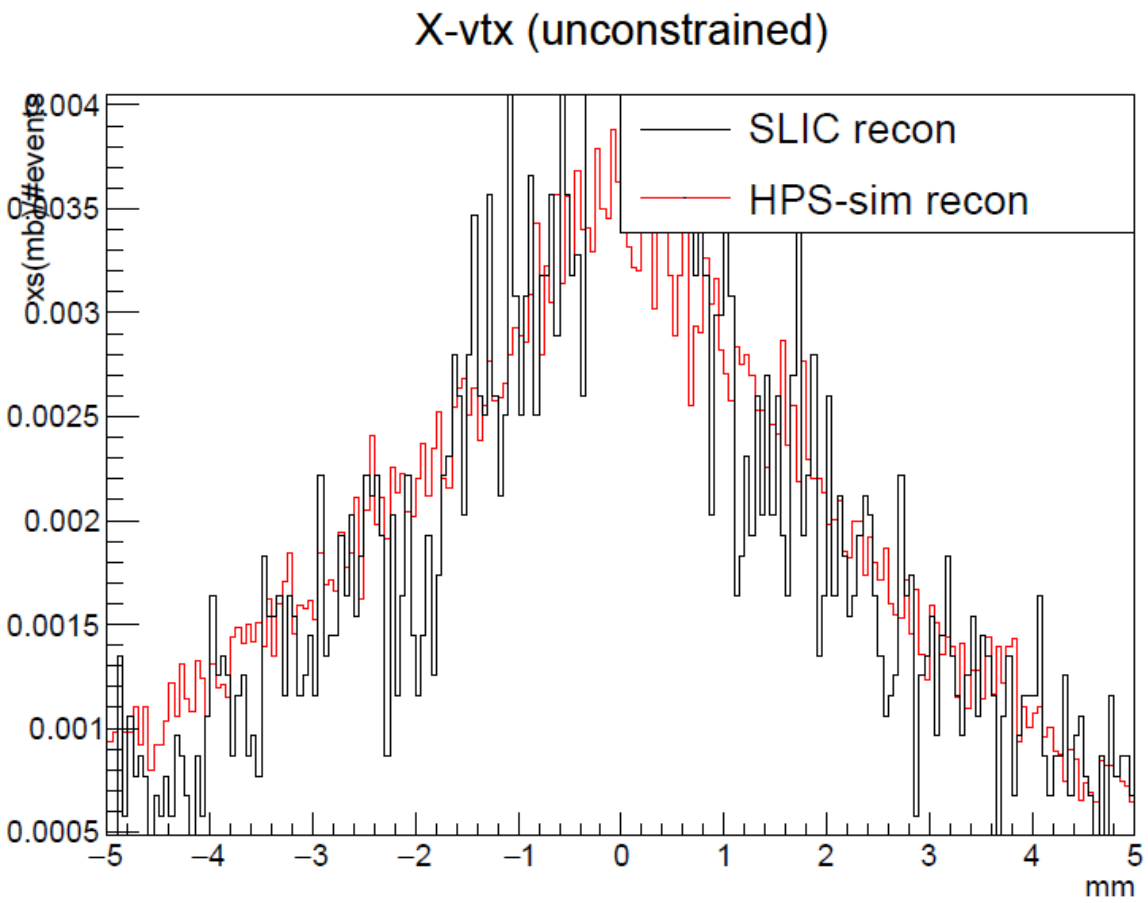


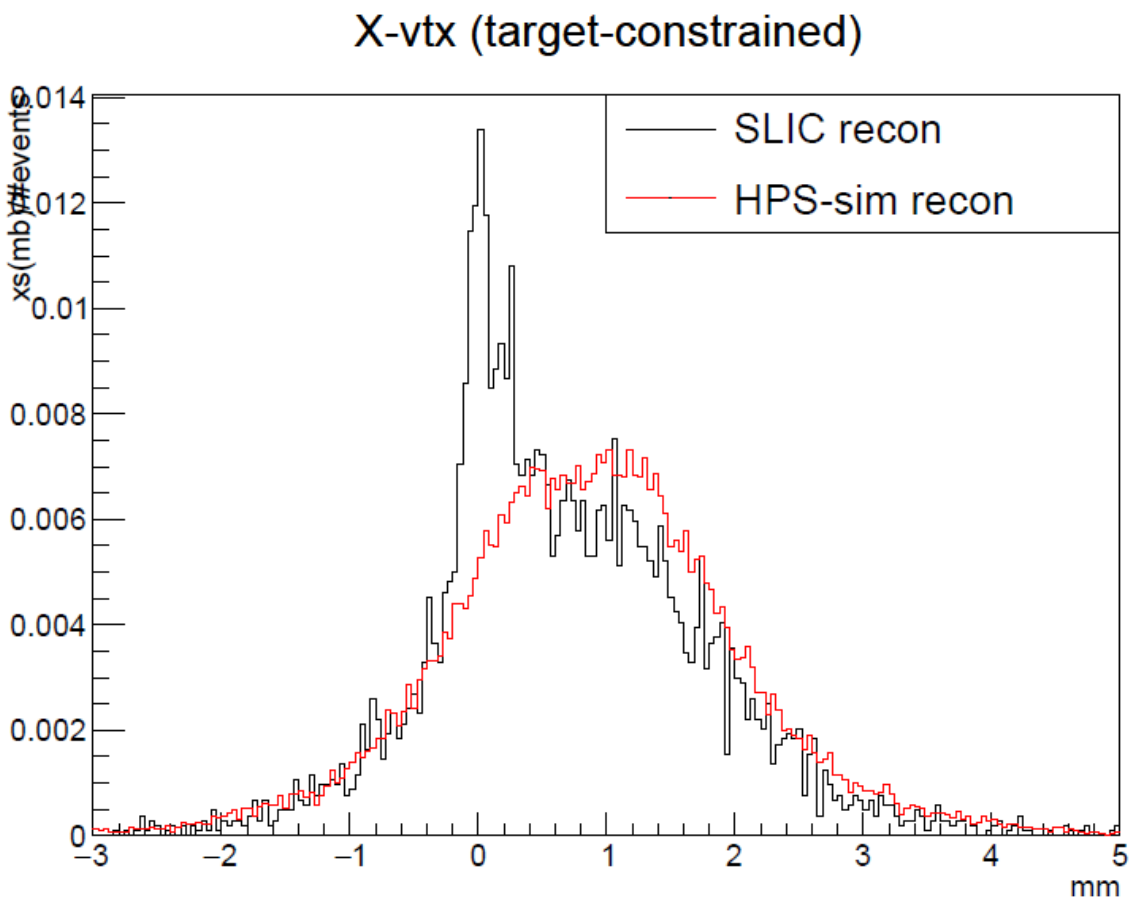
Stdhep-mixed events (mass)



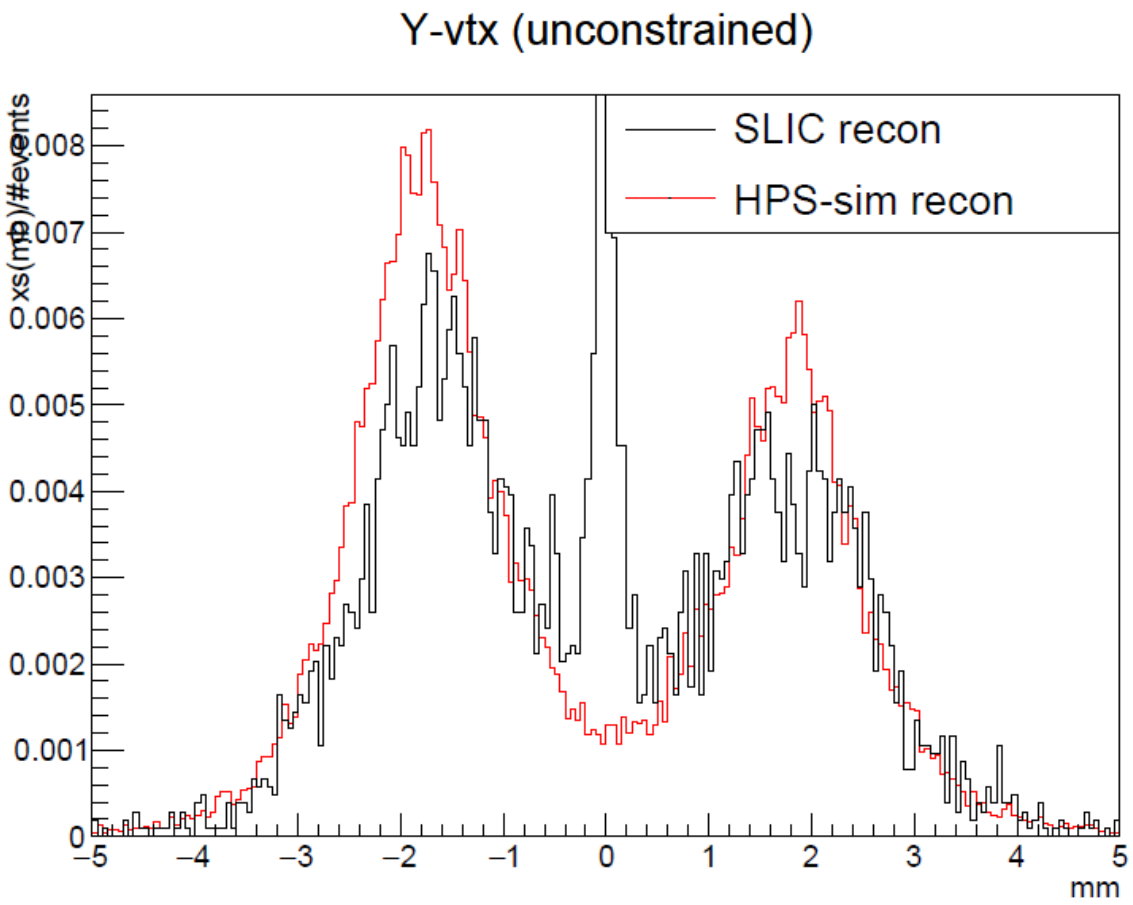


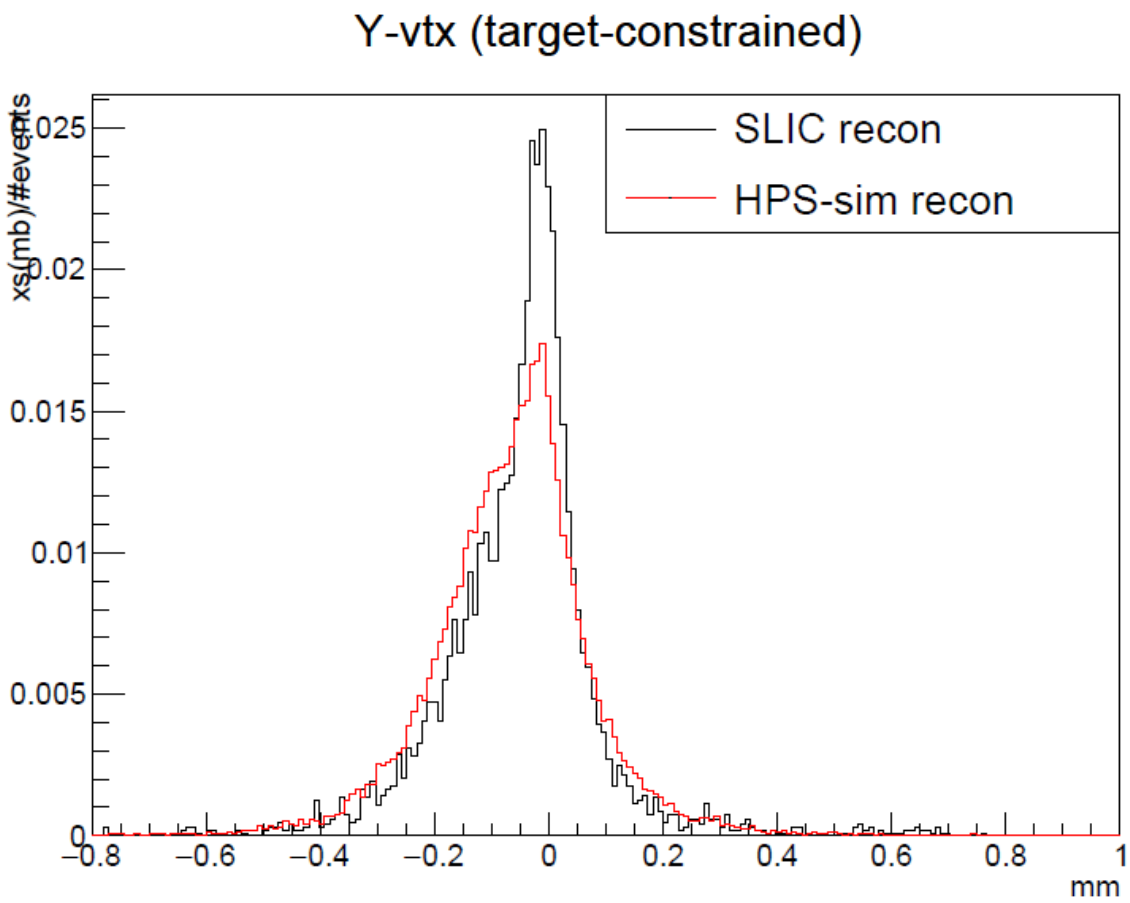
Stdhep-mixed events (x-vtx)



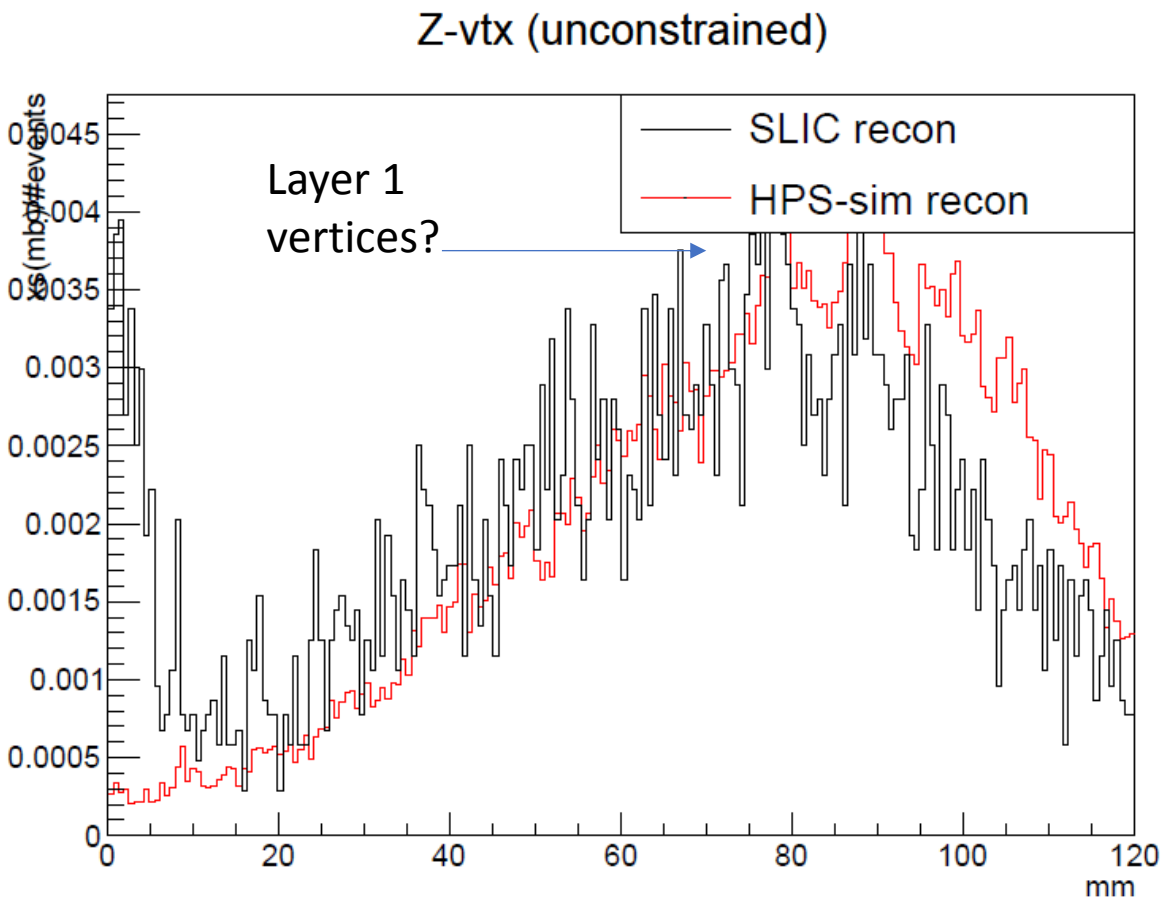


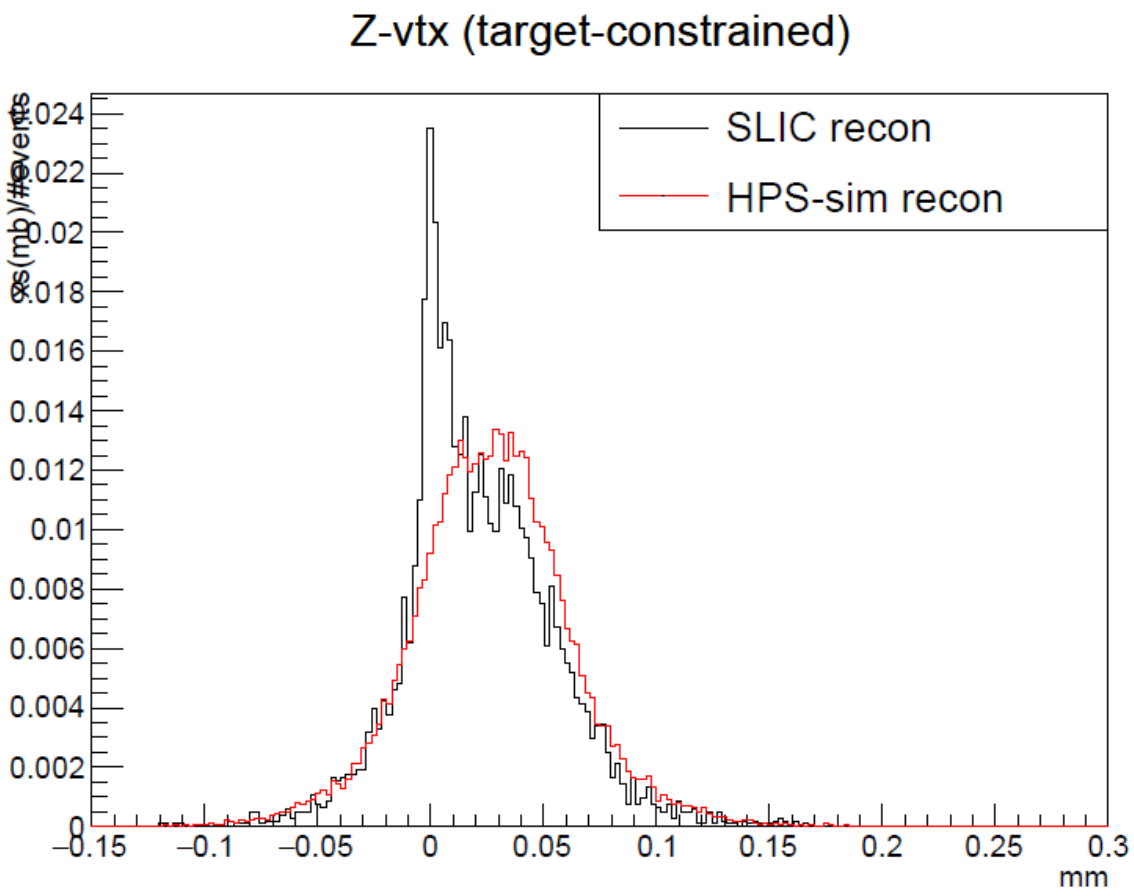
Stdhep-mixed events (y-vtx)



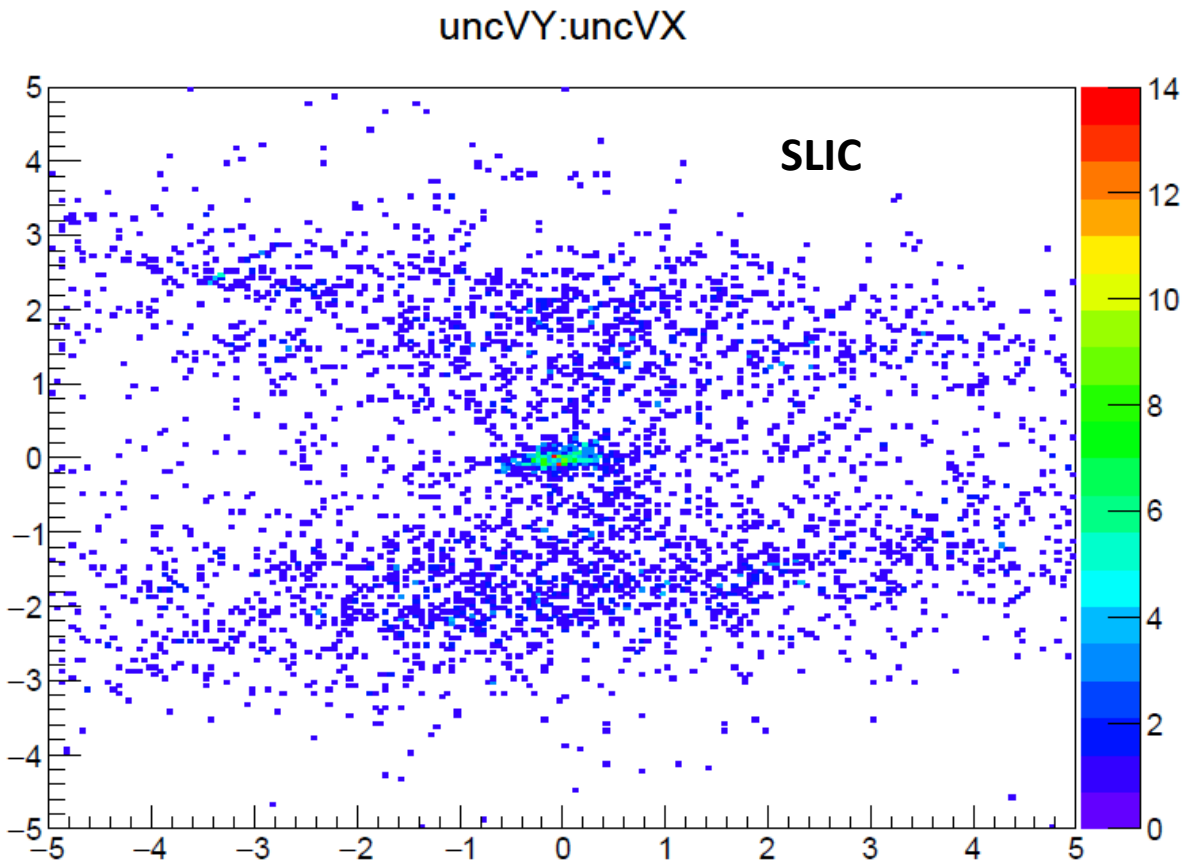


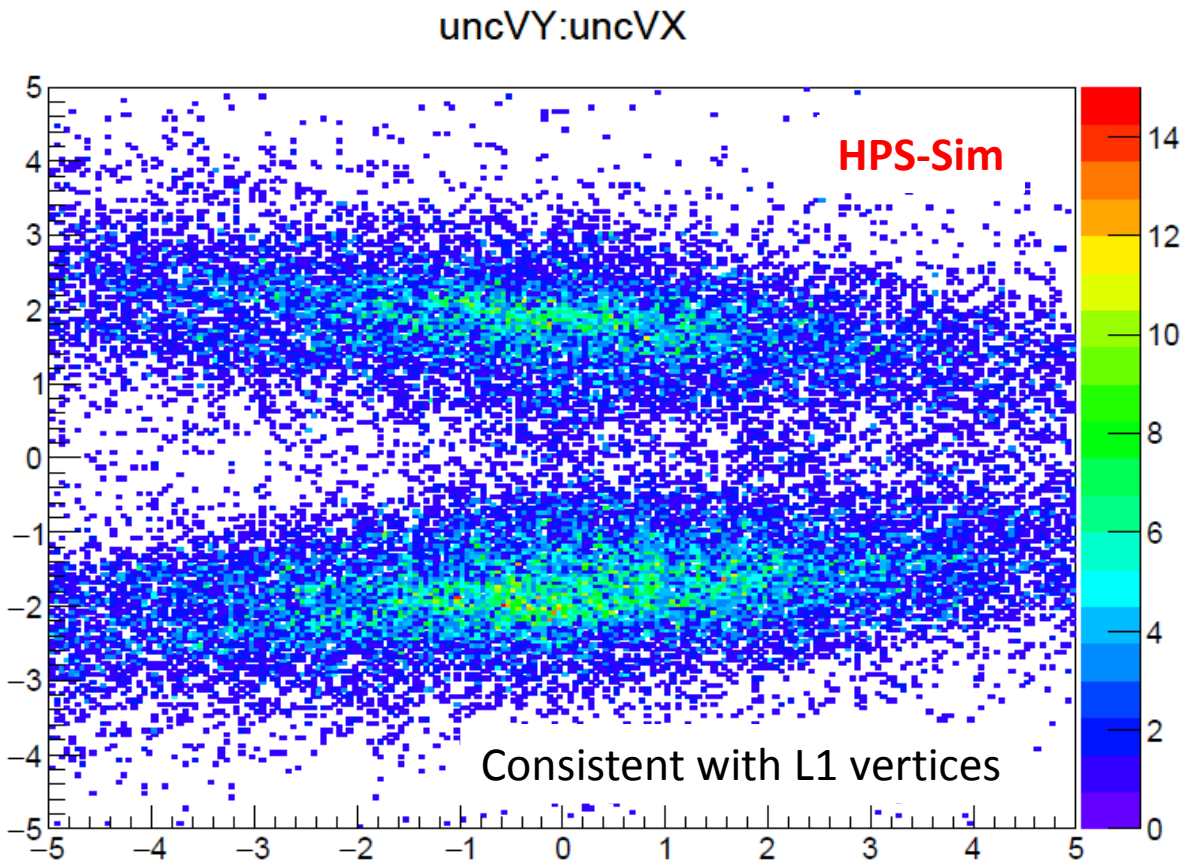
Stdhep-mixed events (z-vtx)



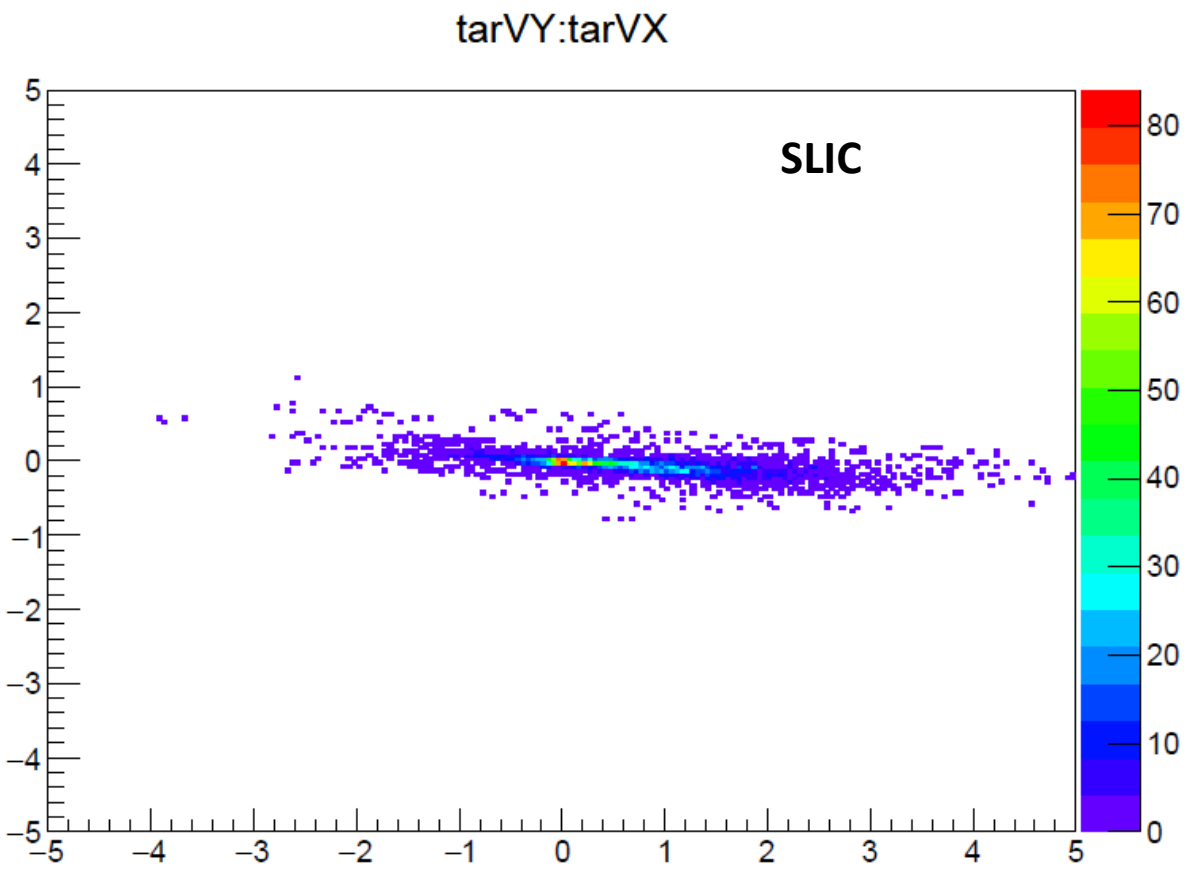


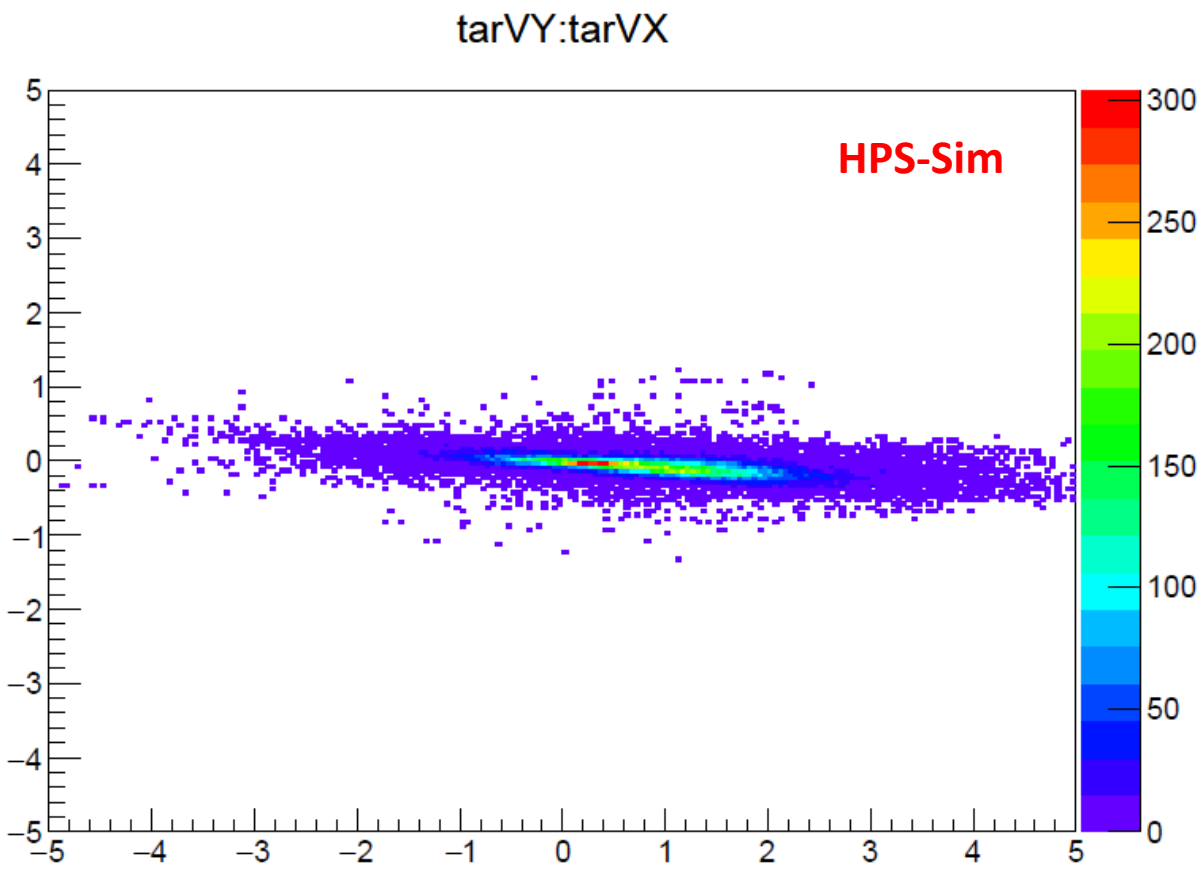
2D Vertex locations (unconstrained)



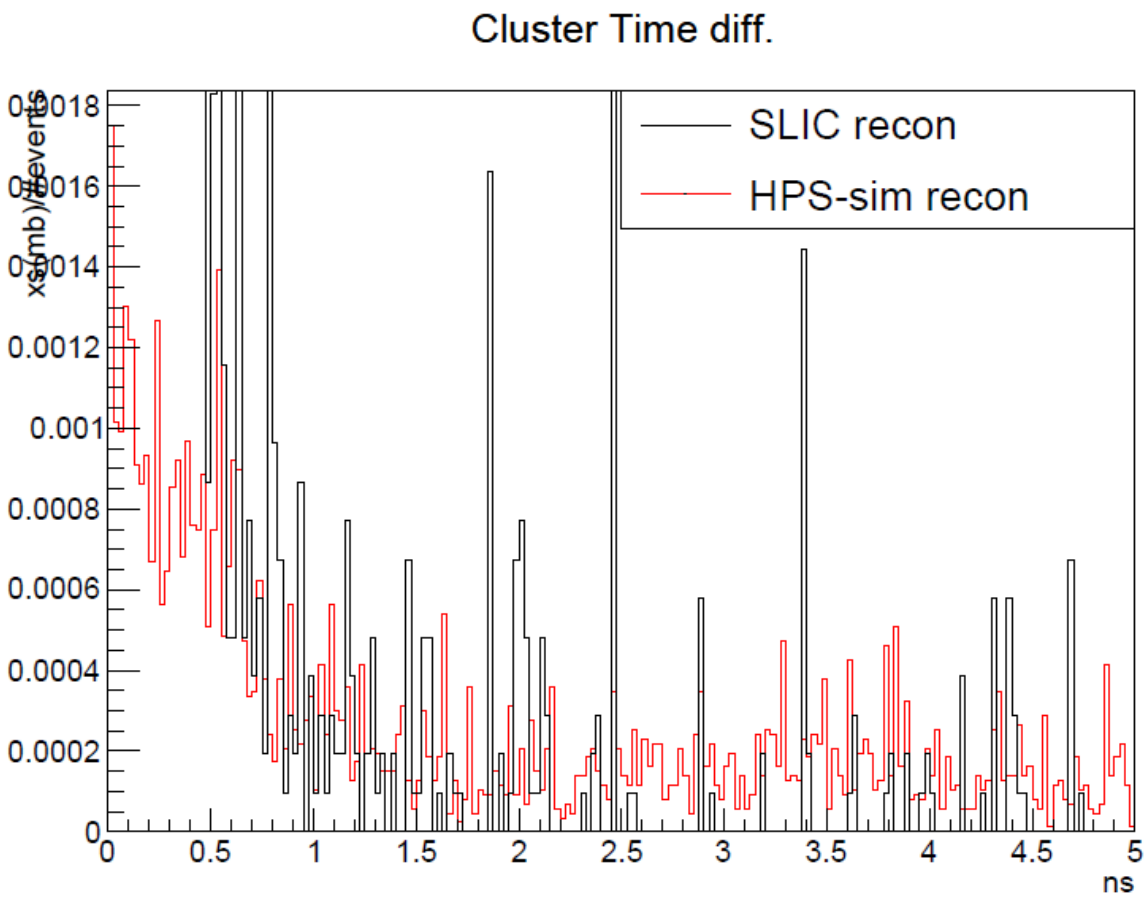


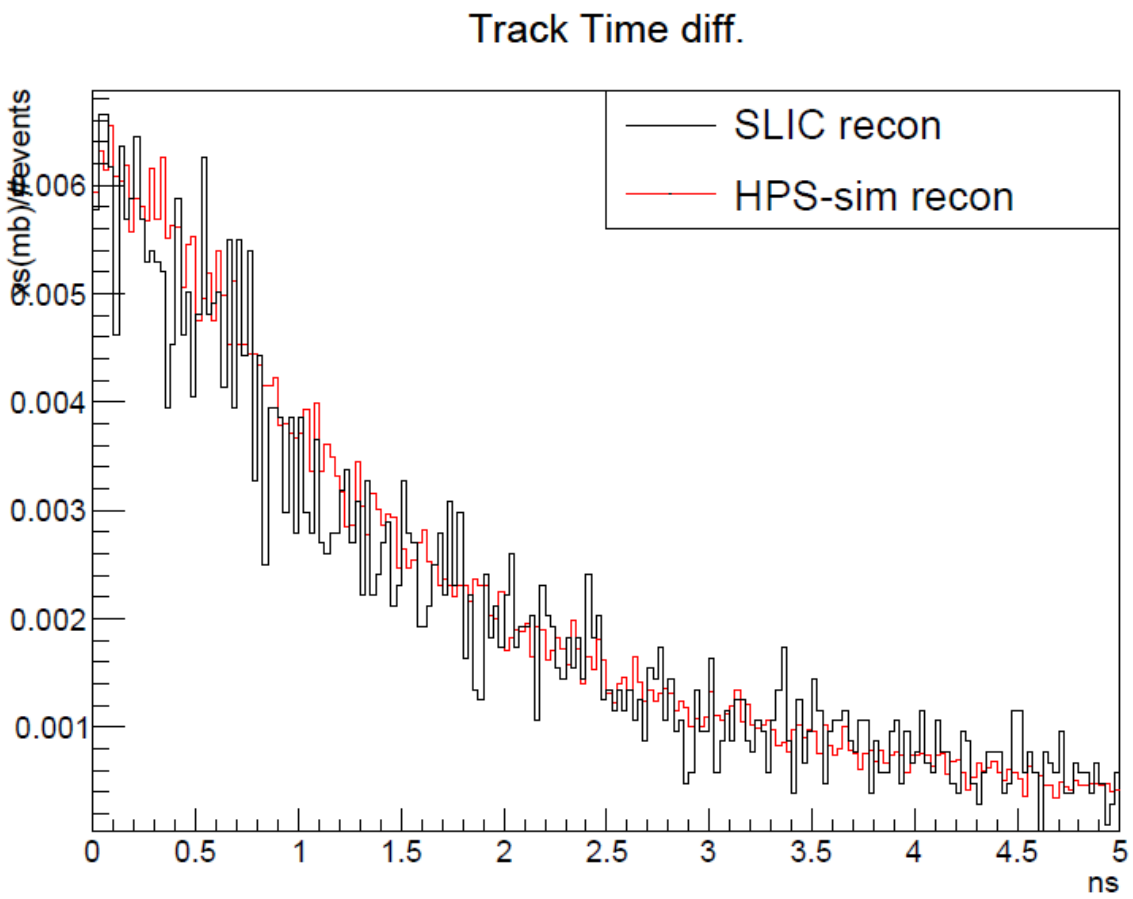
2D Vertex locations (target-constrained)



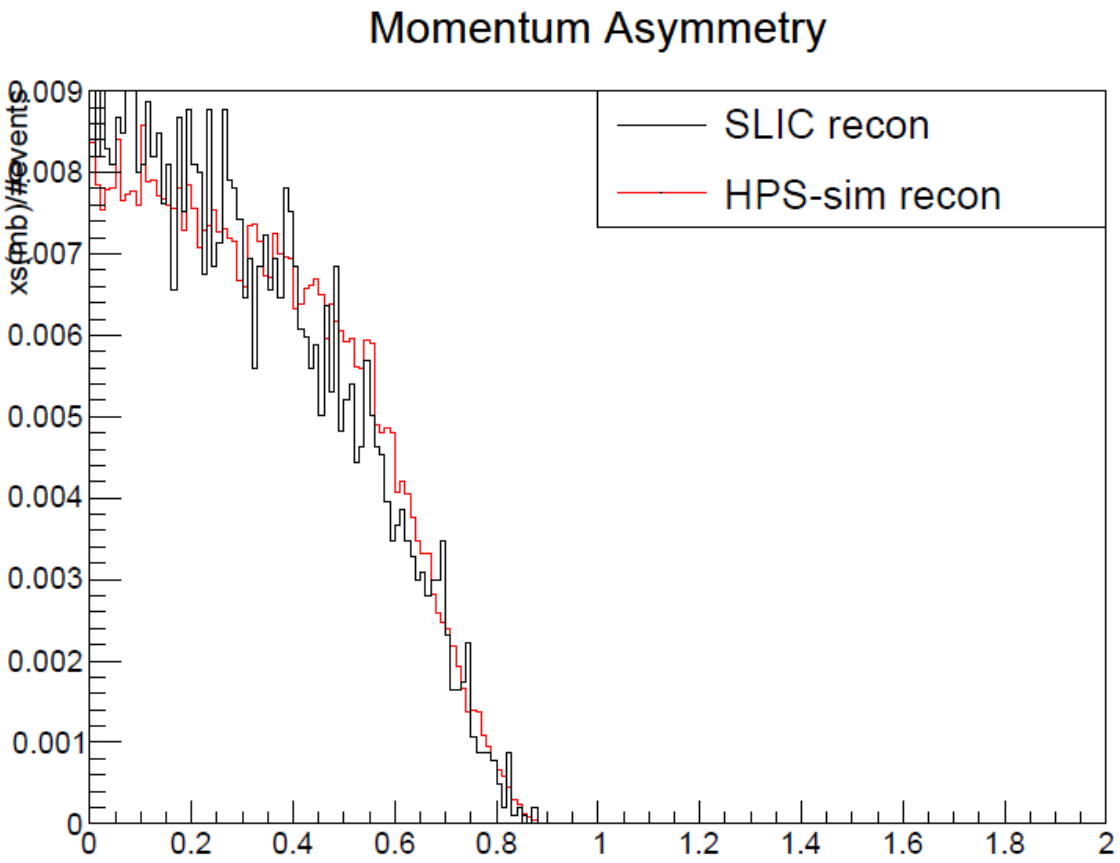


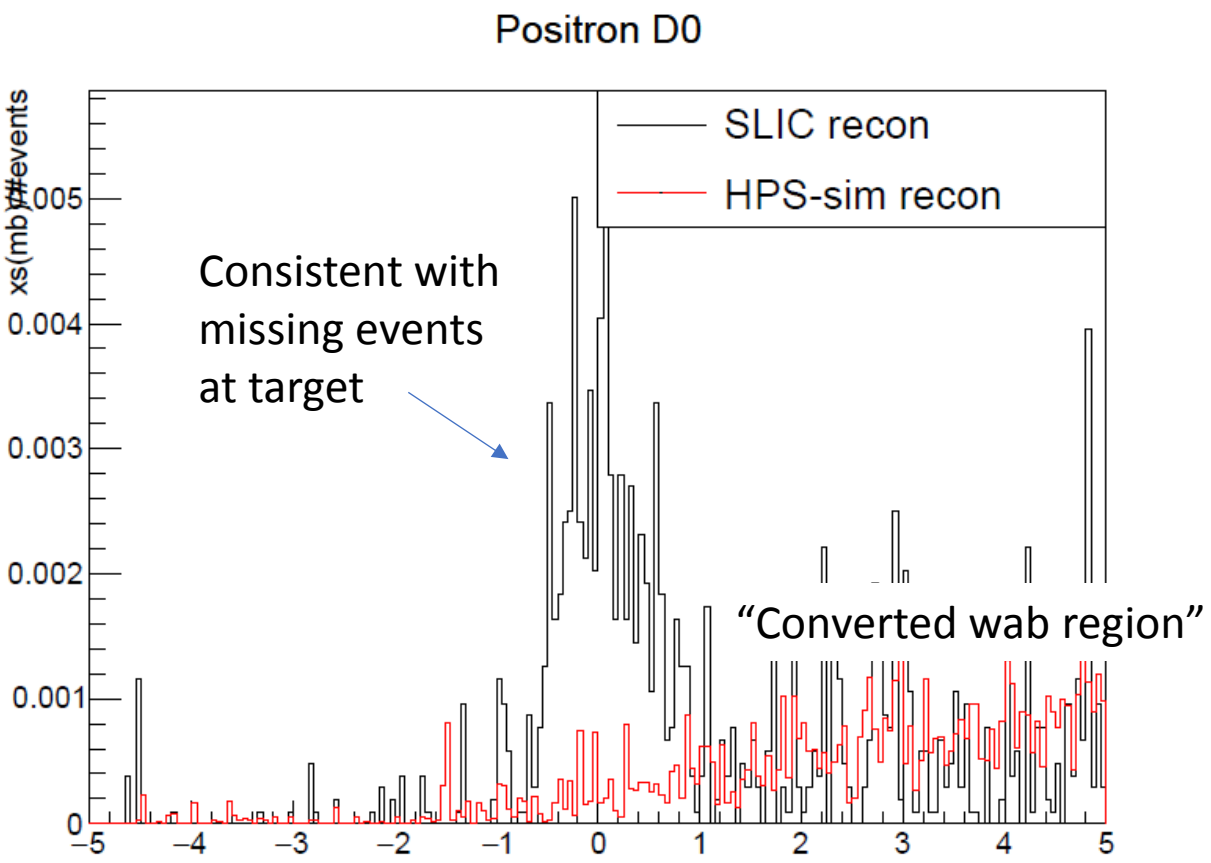
Timing


Cluster Time diff.
SLIC recon
HPS-sim recon
xs(mb)/#events
0.0018
0.0016
0.0014
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
ns

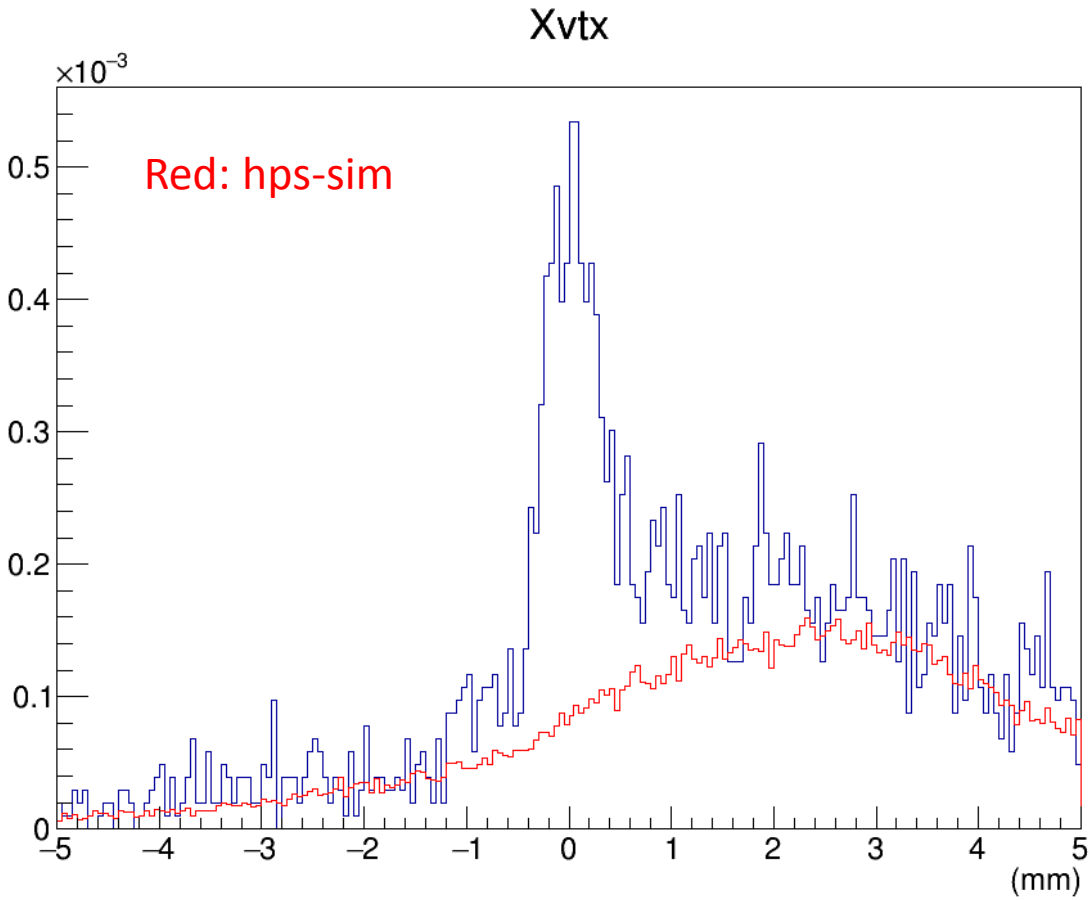

Track Time diff.
SLIC recon
HPS-sim recon
xs(mb)/#events
0.006
0.005
0.004
0.003
0.002
0.001
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
ns

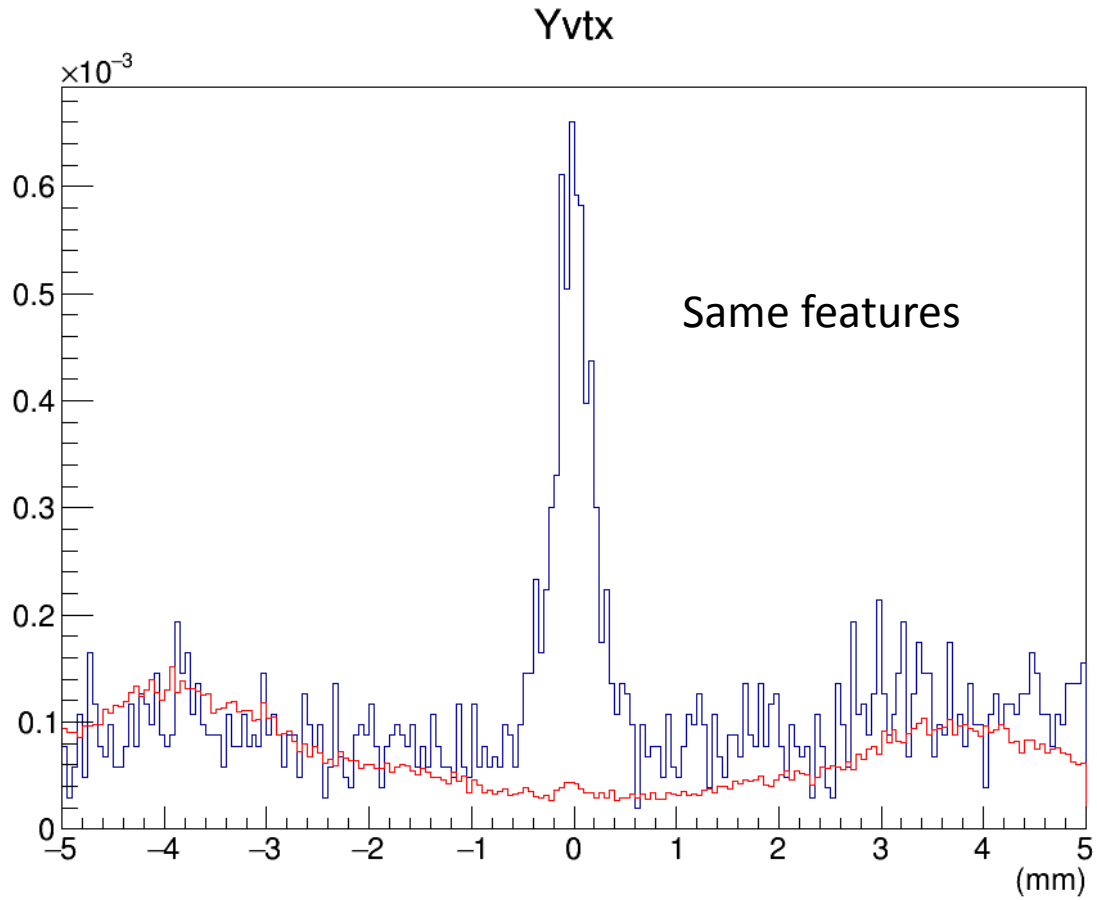
Other plots


Momentum Asymmetry
SLIC recon
HPS-sim recon
xs(mb)/#events
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2

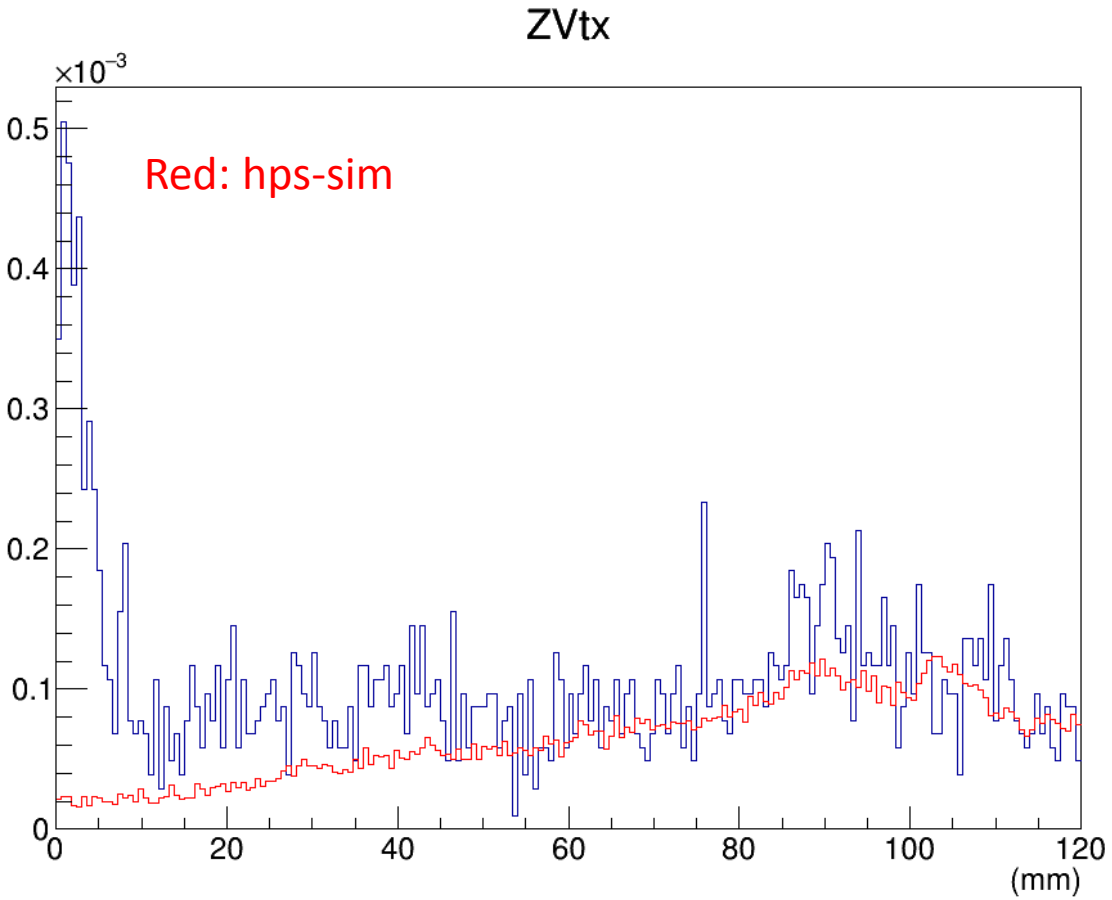

Positron D0
SLIC recon
HPS-sim recon
xs(mb)/#events
0.005
0.004
0.003
0.002
0.001
0
−5
−4
−3
−2
−1
0
1
2
3
4
5
Consistent with
missing events
at target
“Converted wab region”

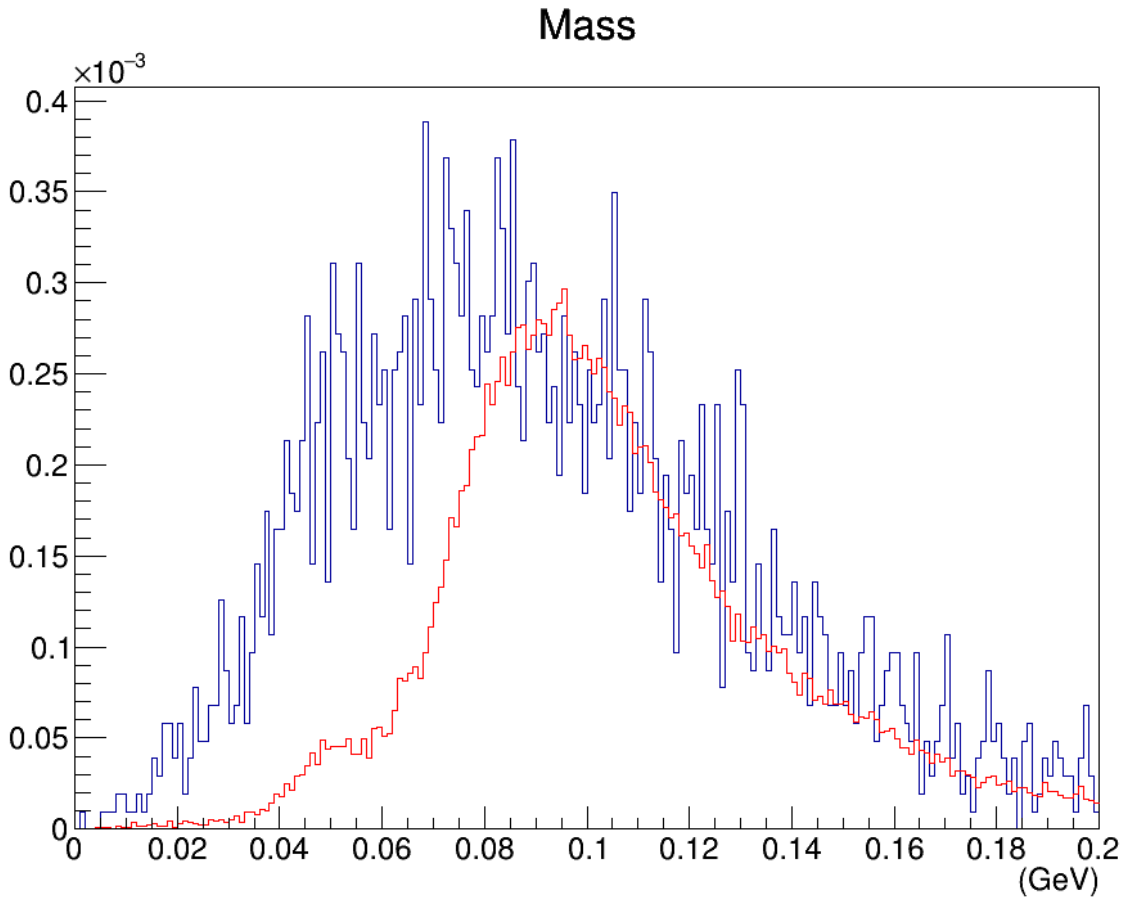
Looking at DSTs (tri tuples previously shown)



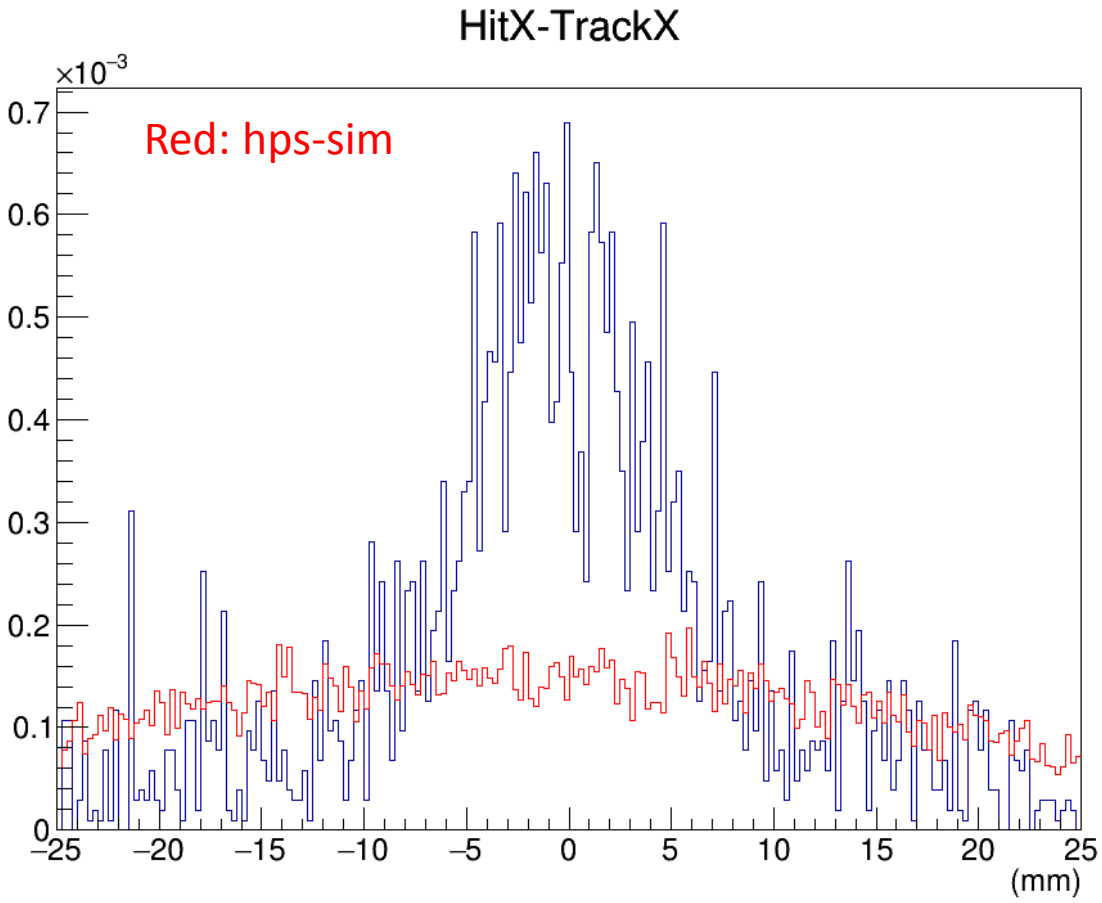


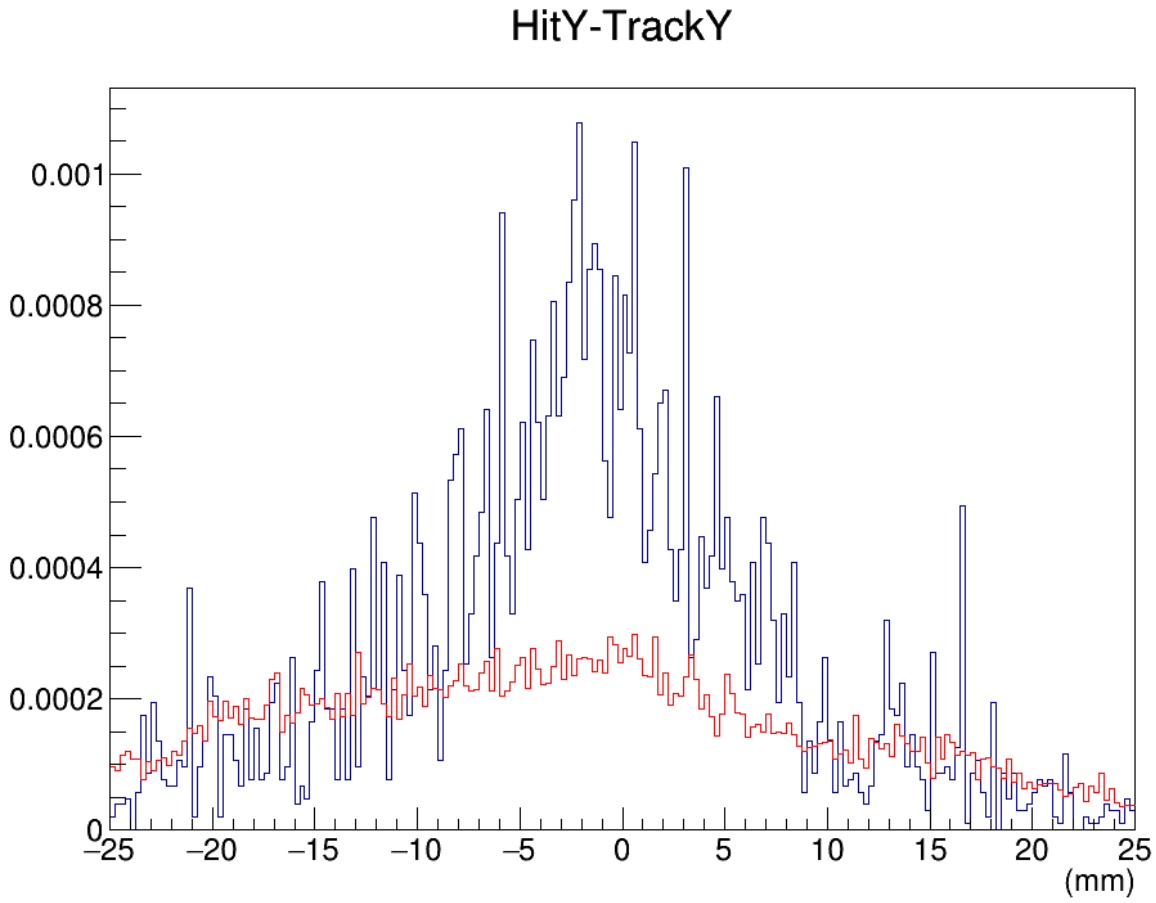
Slic vs. Hps-sim (DST V0's)



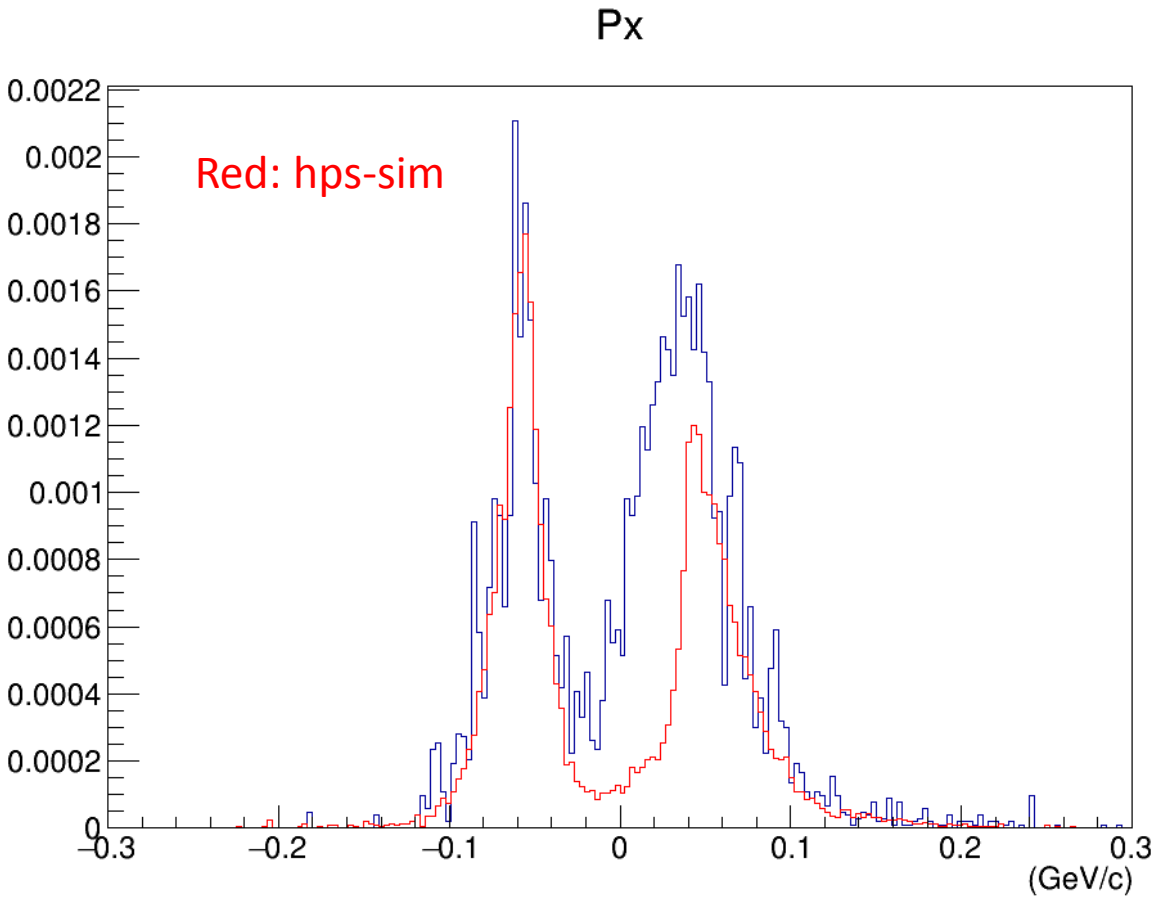


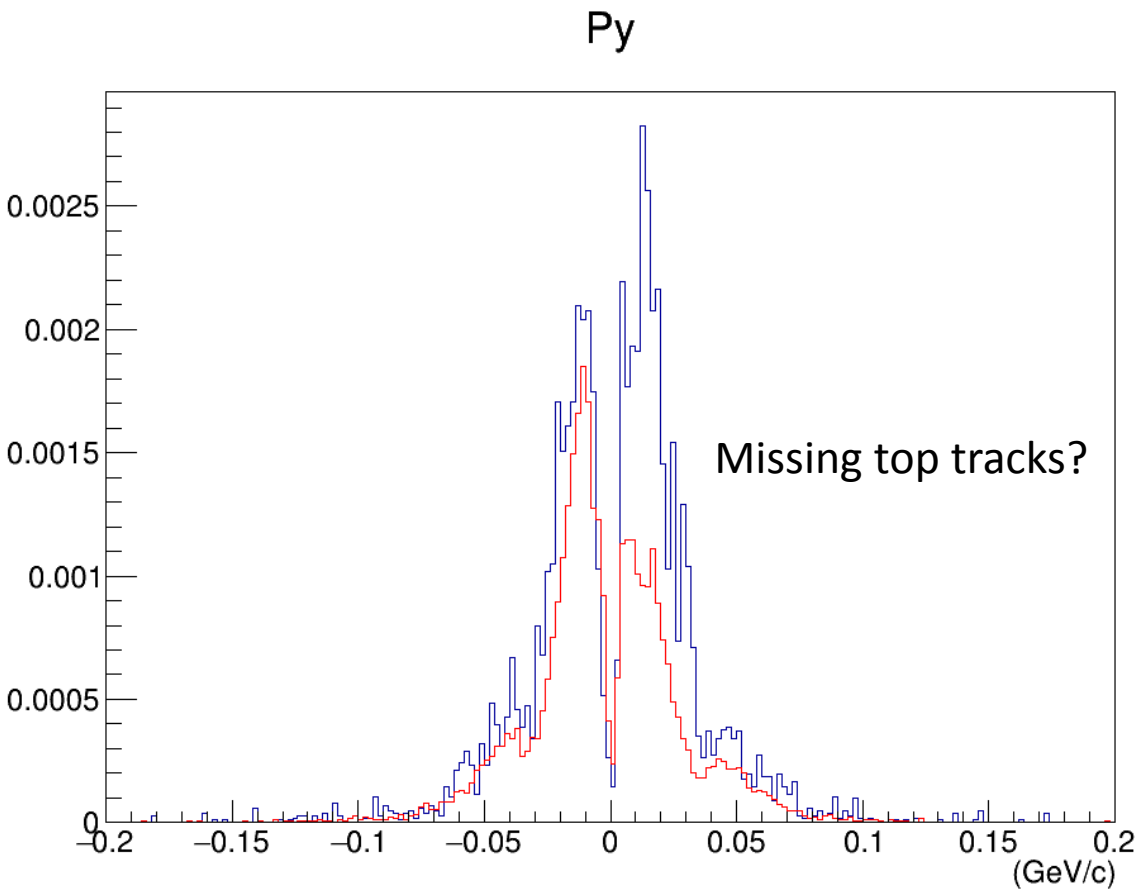
Track-Cluster Matching





Momentum (DST V0's)

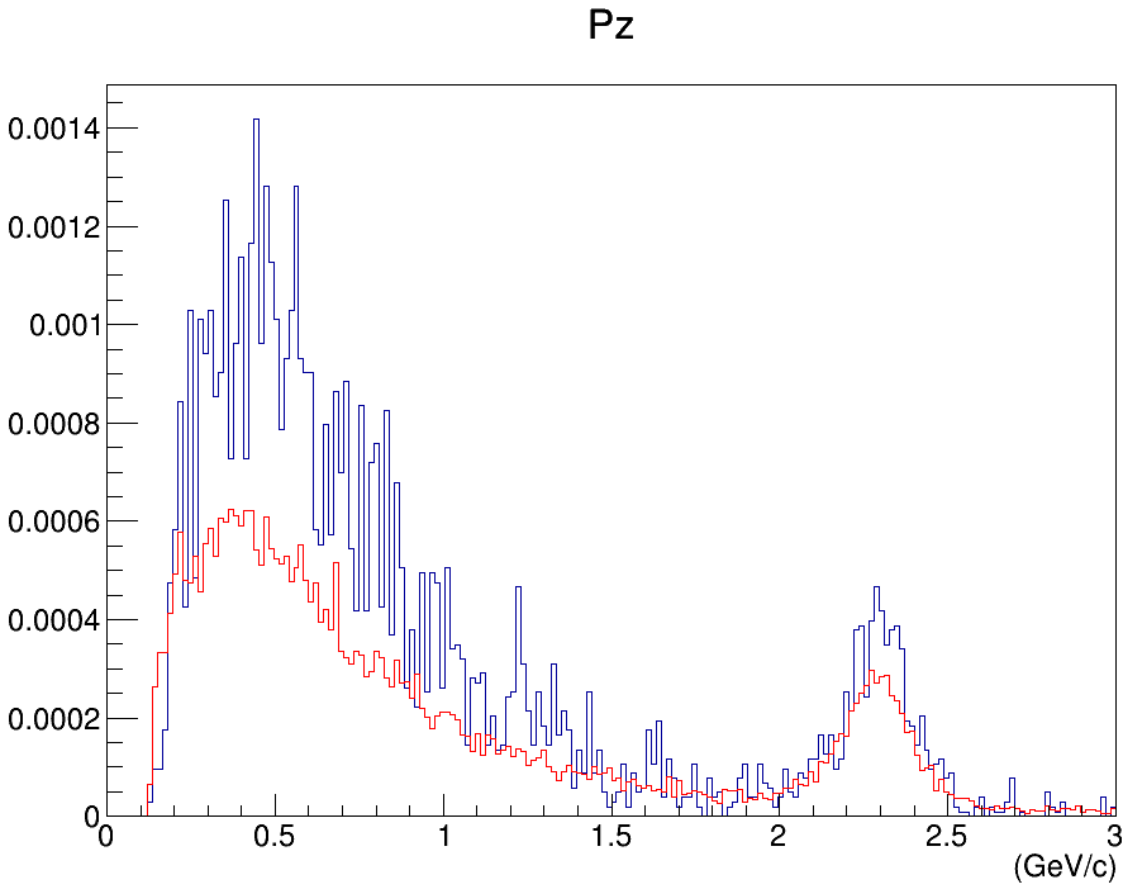


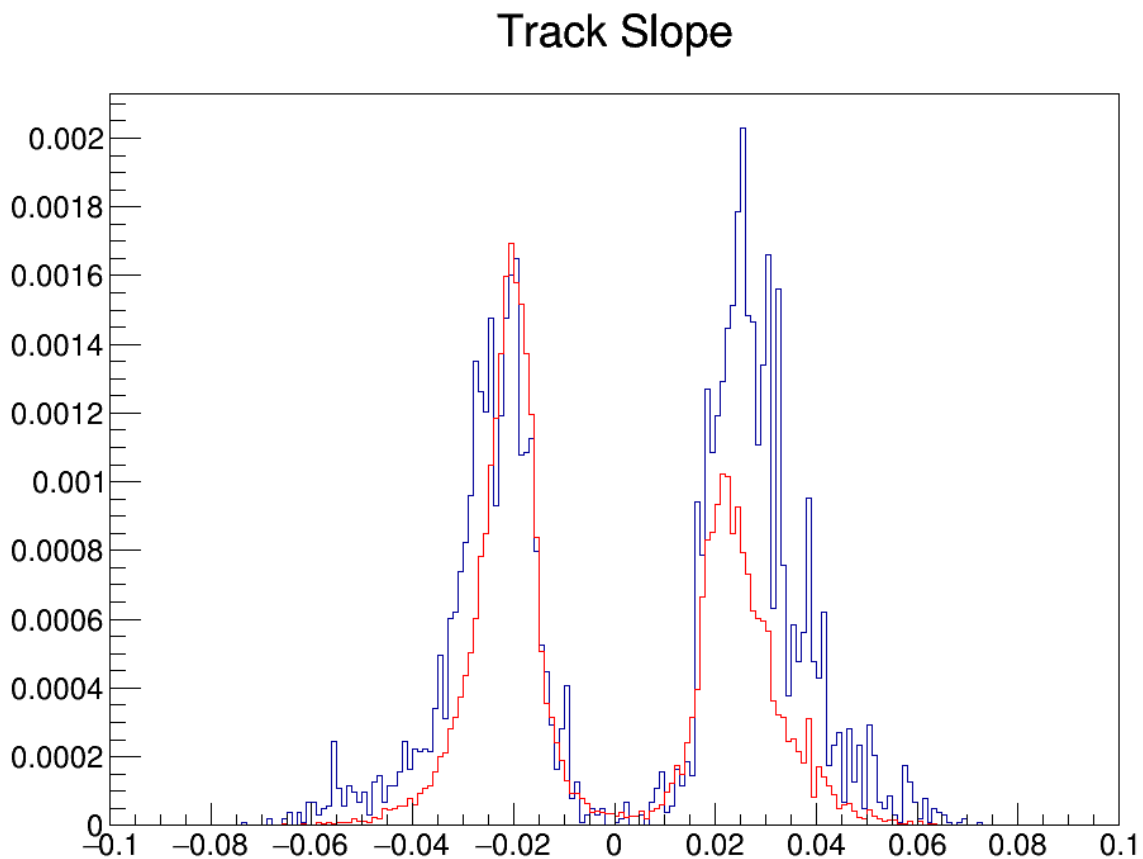


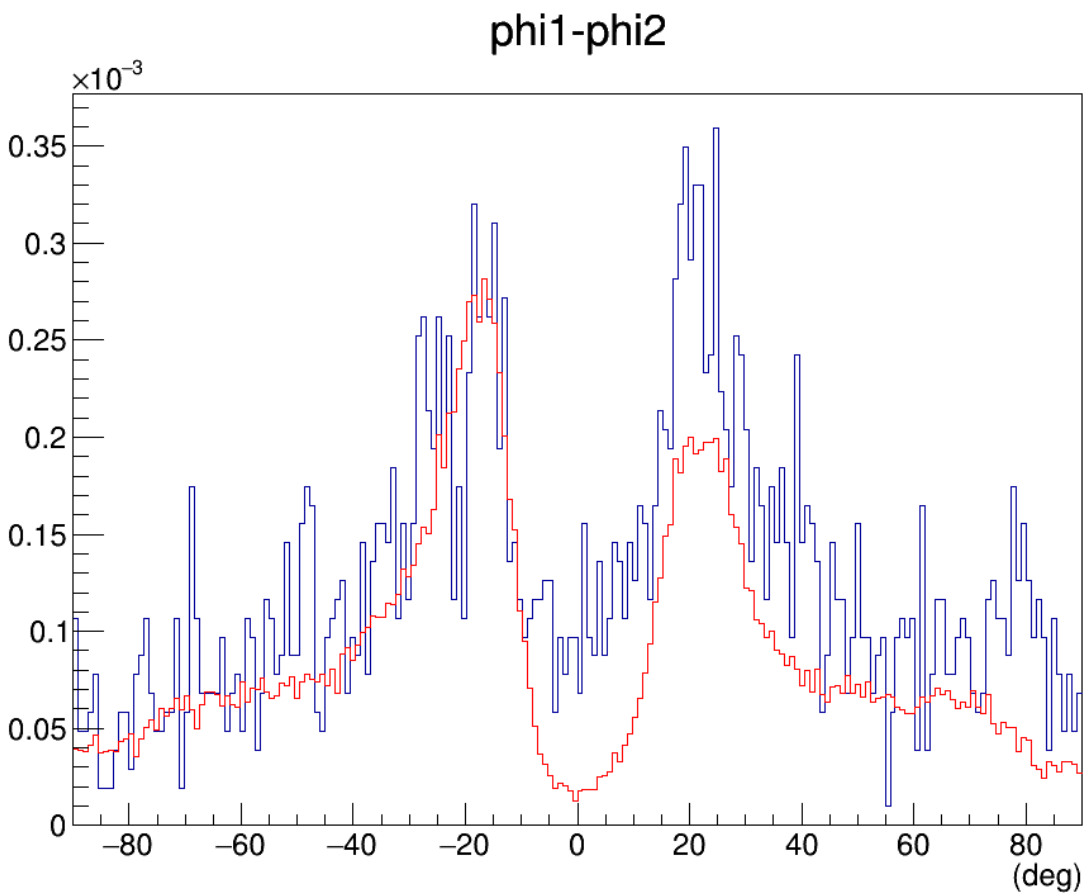
Summary

- Hps-sim problems seem mostly independent of its mixing procedure
- Hps-sim has missing WBT events at the target
  - Need to look at tritrig (simpler events) next
- More digging is needed

Momentum (DST V0's)




Track Slope
0.002
0.0018
0.0016
0.0014
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
−0.1
−0.08
−0.06
−0.04
−0.02
0
0.02
0.04
0.06
0.08
0.1


phi1-phi2
×10⁻³
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
−80
−60
−40
−20
0
20
40
60
80
(deg)