

Detector Cuts

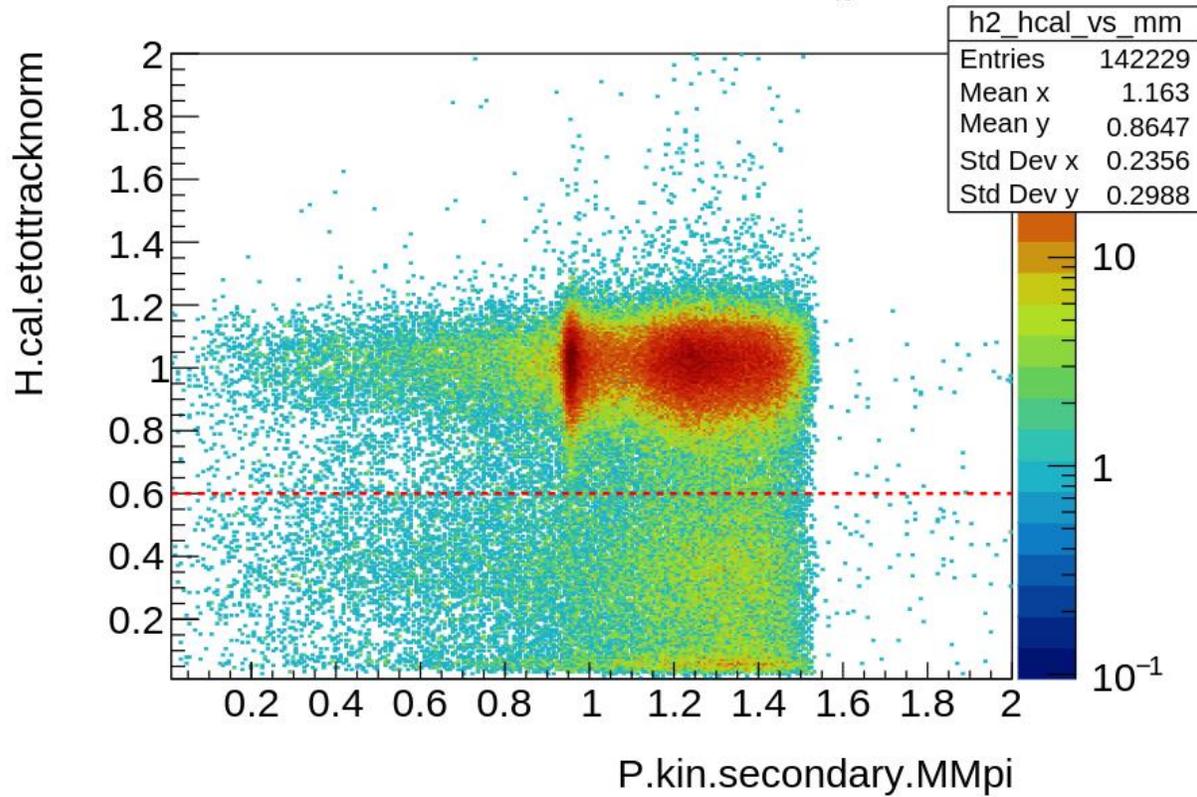
Refining HMS and SHMS cuts

12/03/26

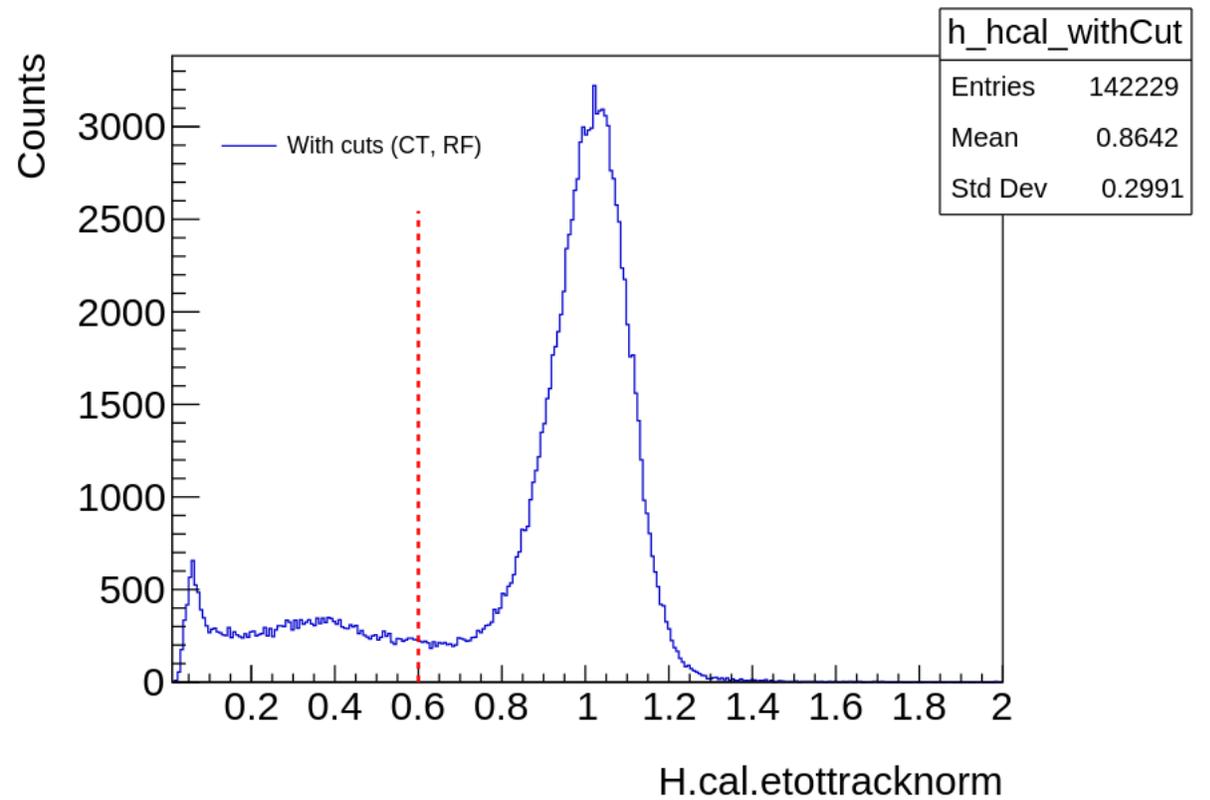
HMS – HCal (with timing cuts)

HCal > 0.6

H.cal.etottracknorm vs MM_{π}



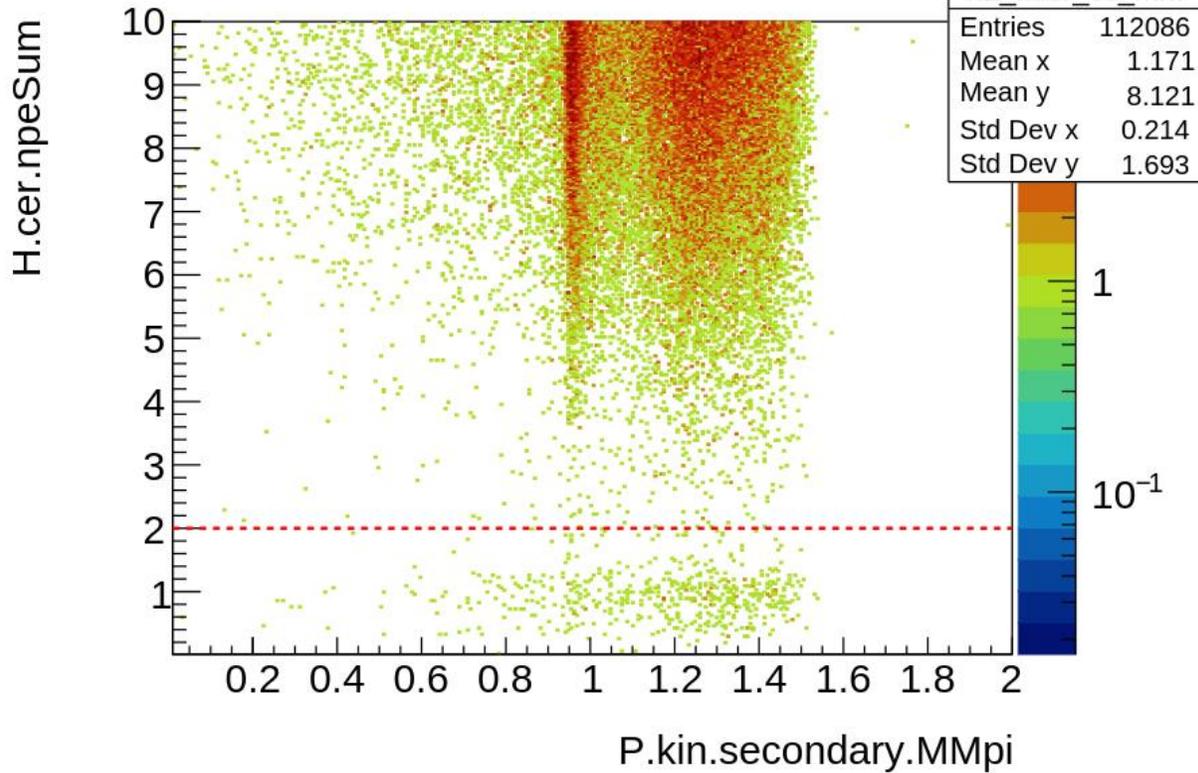
H.cal.etottracknorm



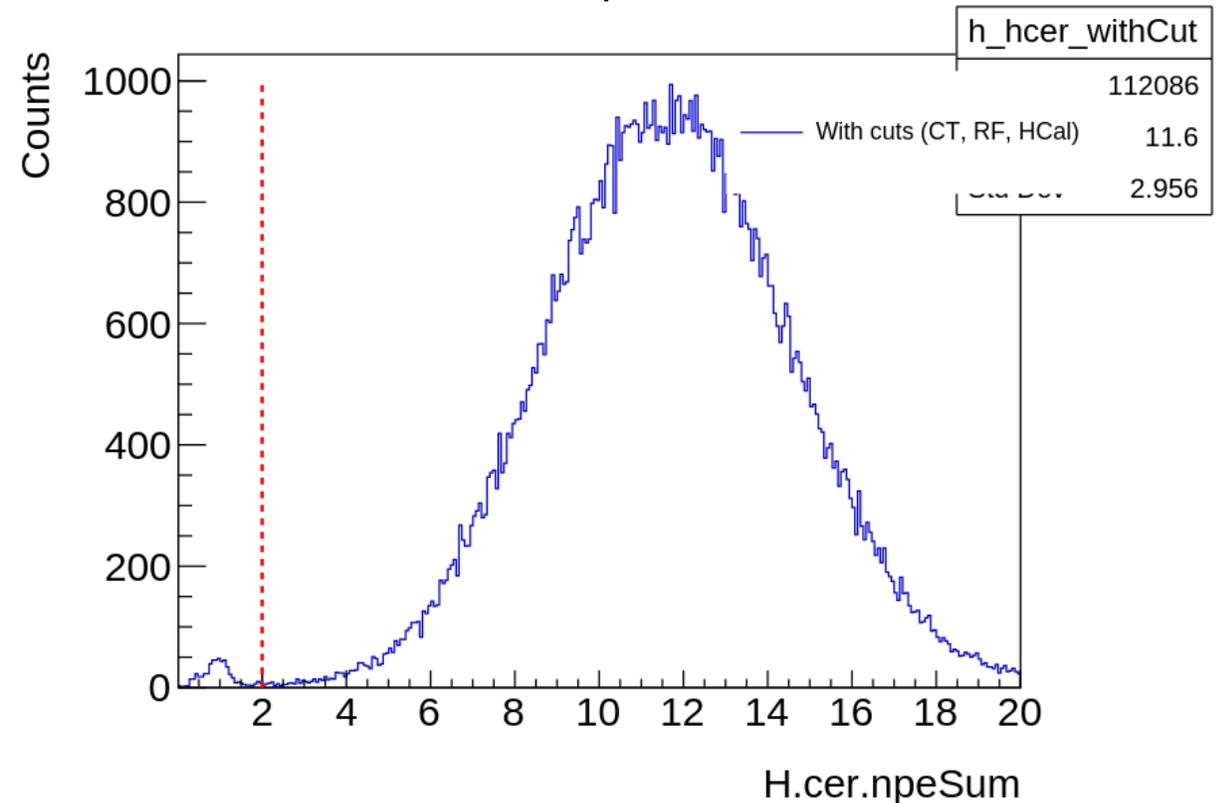
HMS – HCer (CT + RF + HCal cuts)

HCer > 2.0

H.cer.npeSum vs MM_{π}

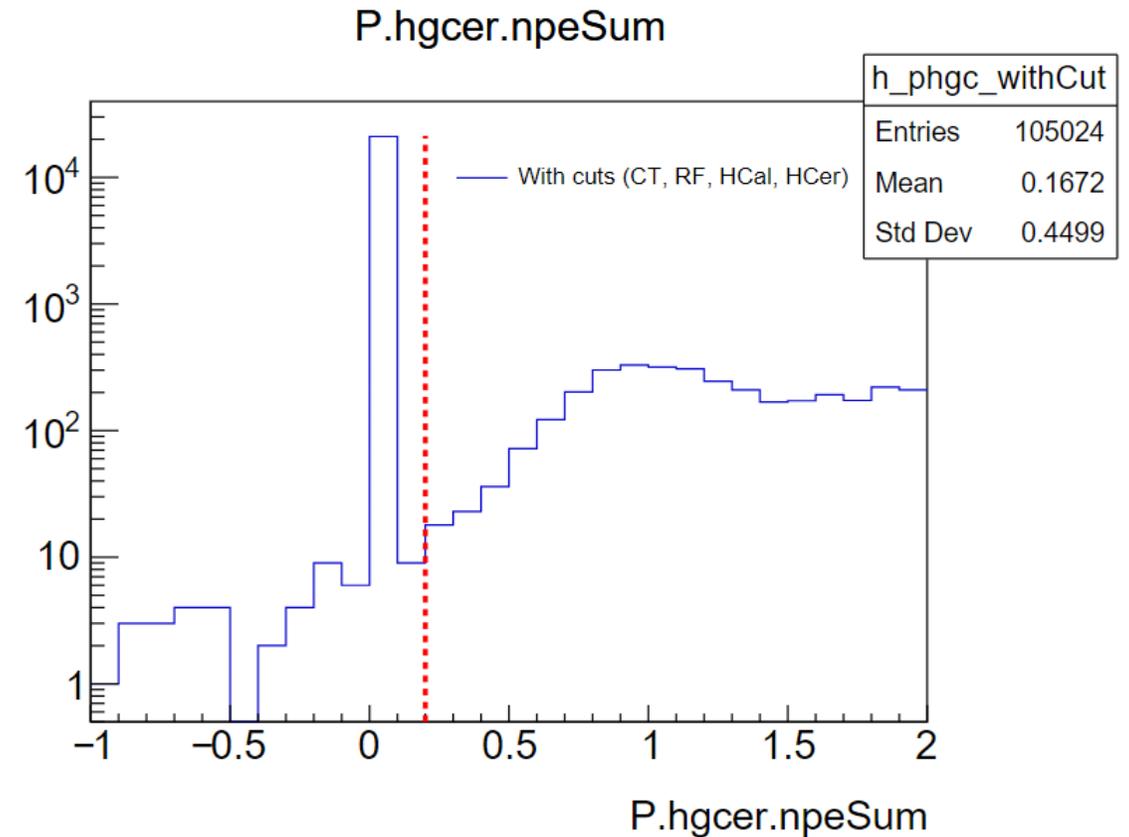
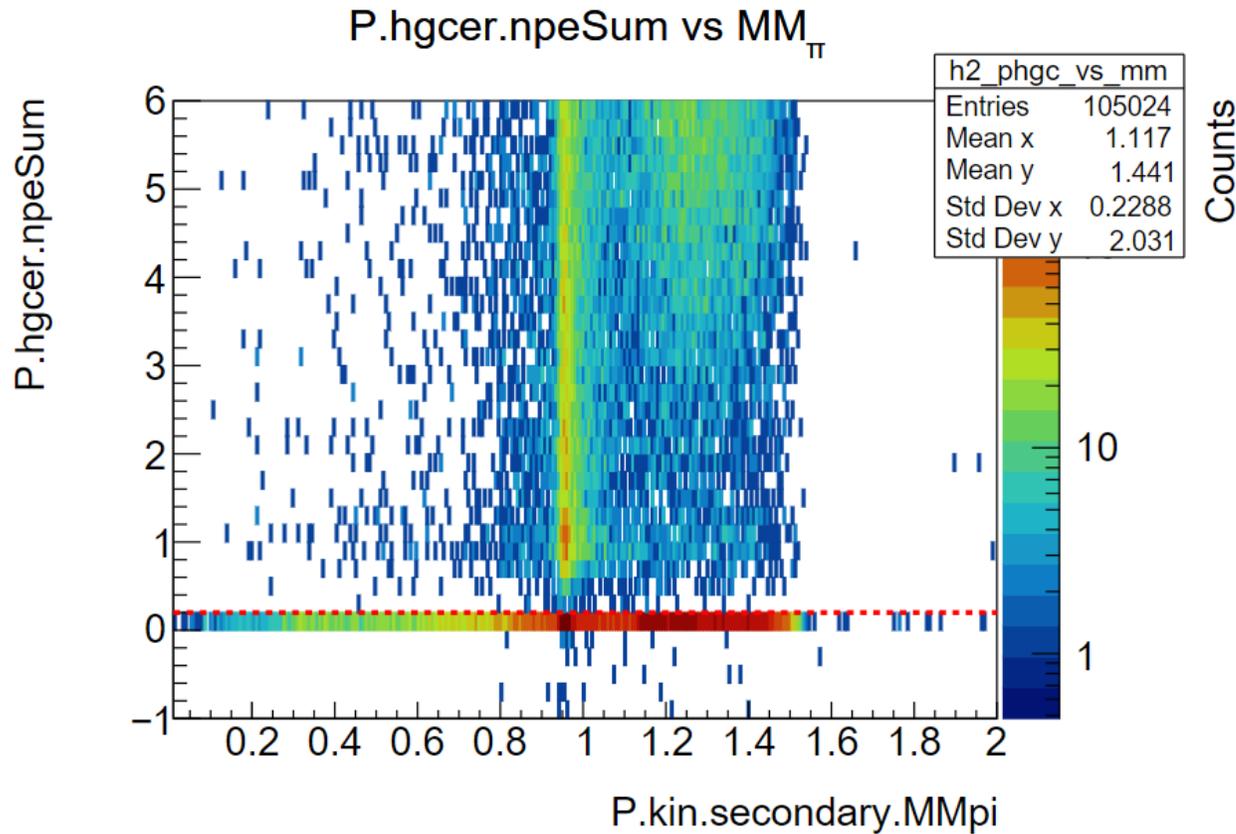


H.cer.npeSum



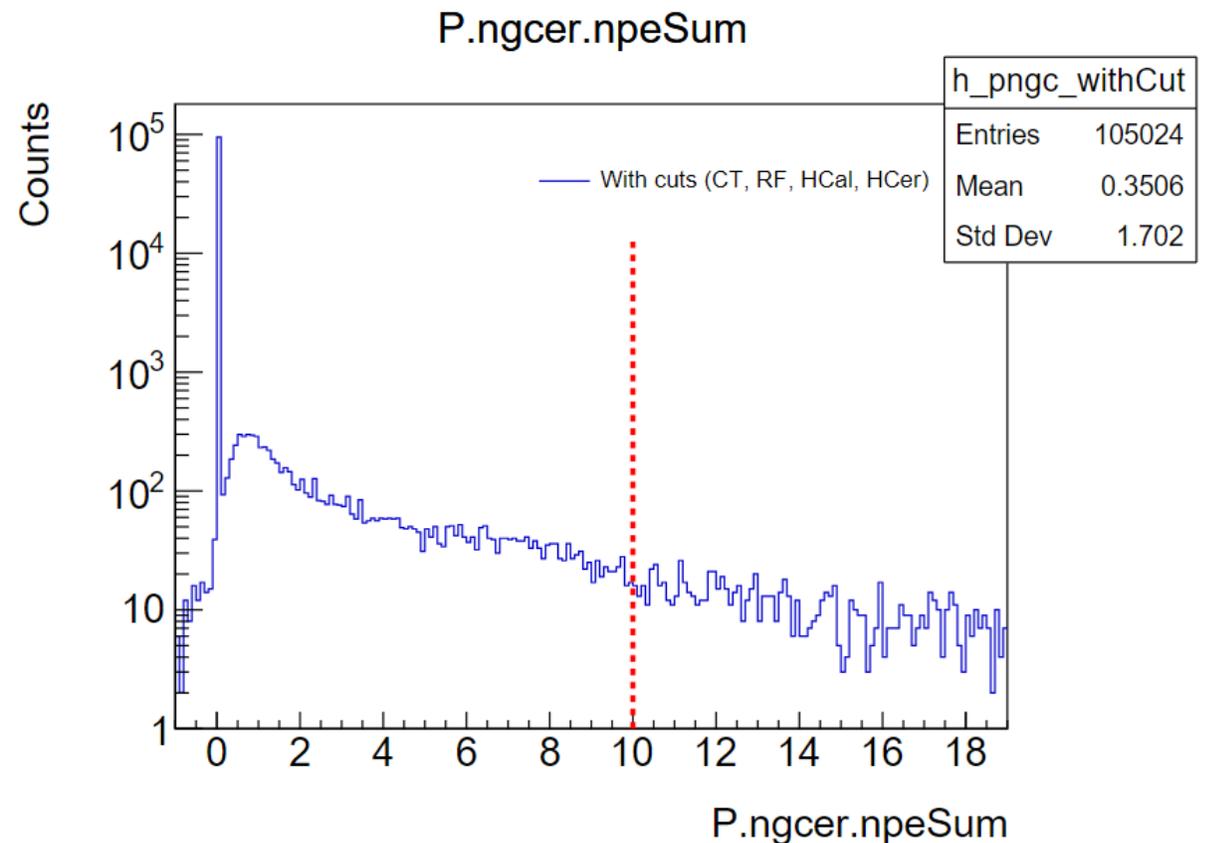
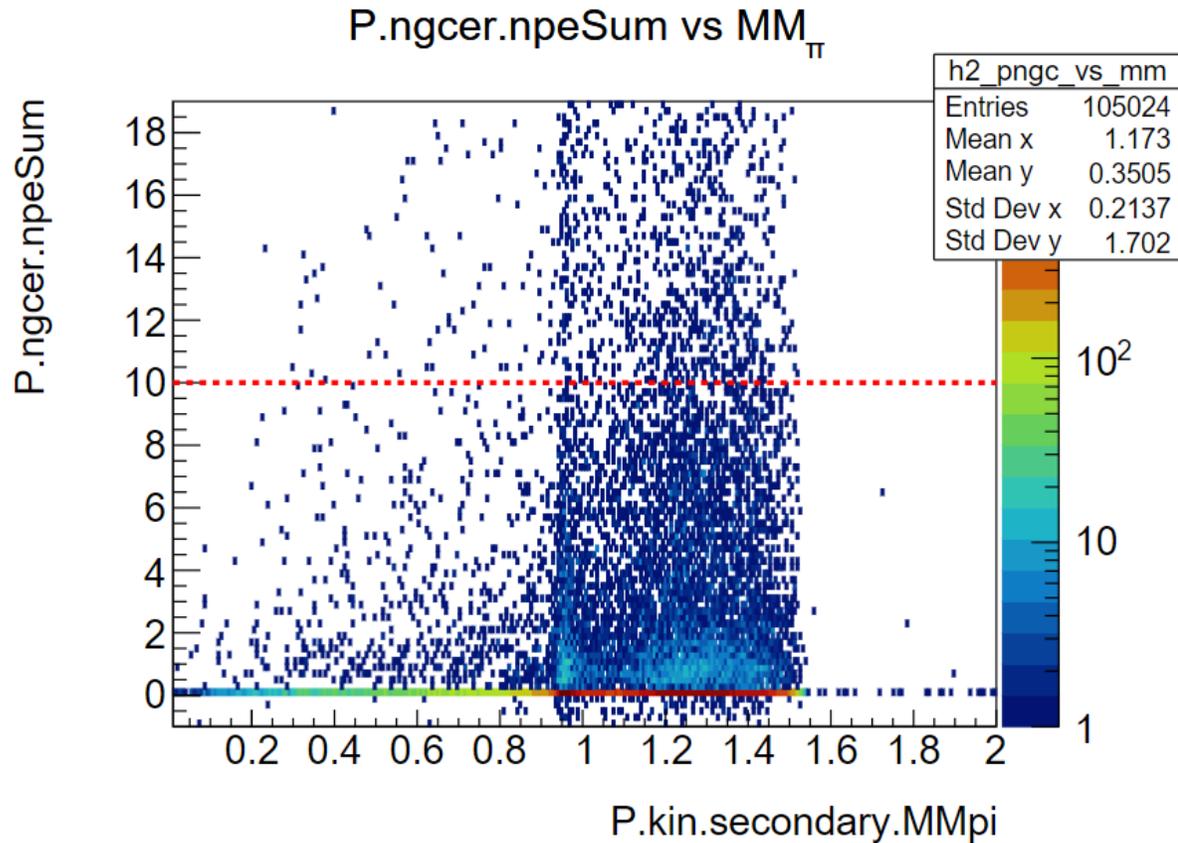
SHMS – HGC (CT + RF + HCal + HCer cuts)

P.hgcer > 0.2



SHMS – NGC (CT + RF + HCal + HCer cuts)

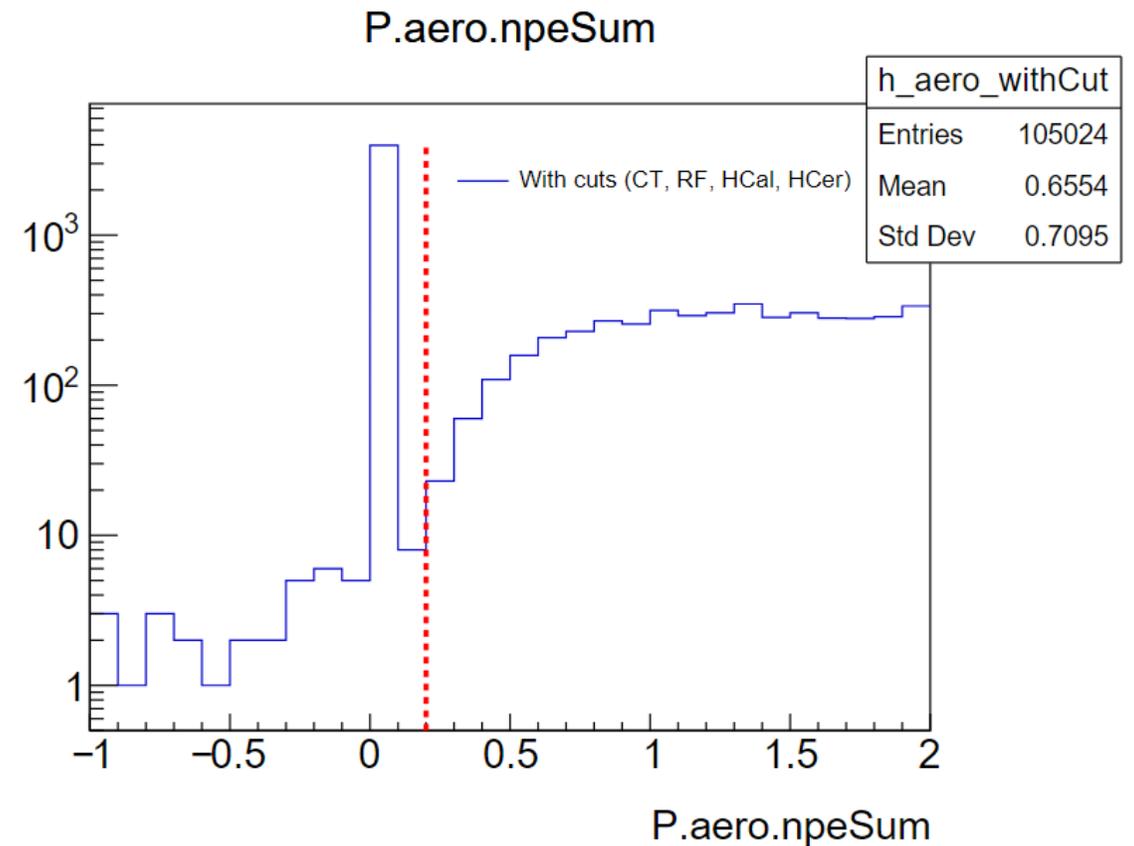
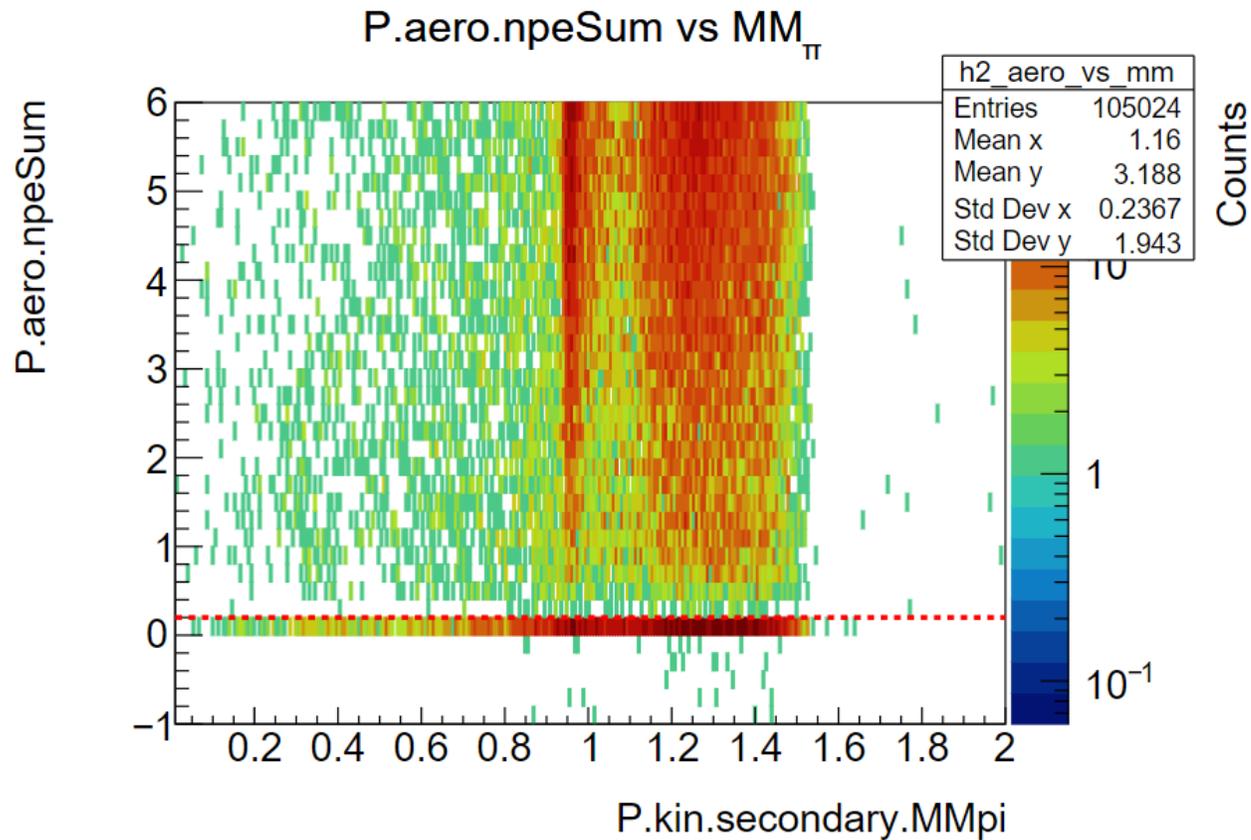
P.ngcer < 10



SHMS – Aerogel (CT + RF + HCal + HCer cuts)

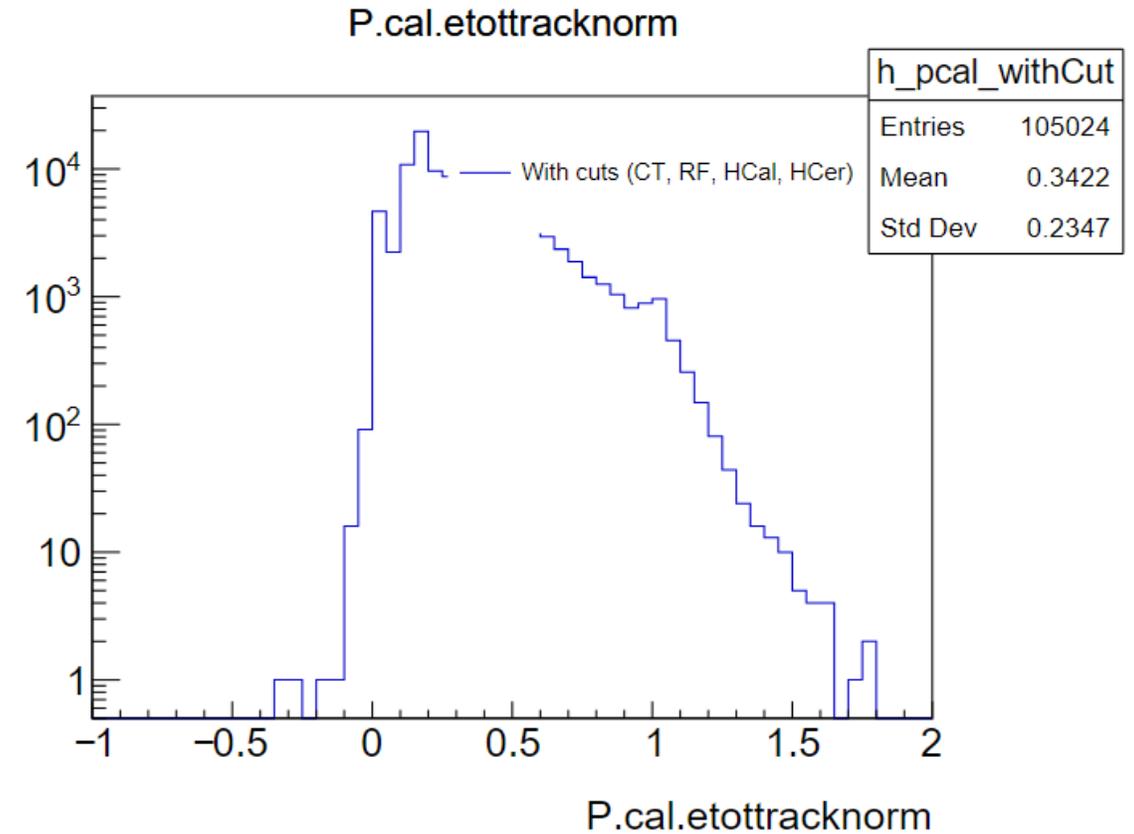
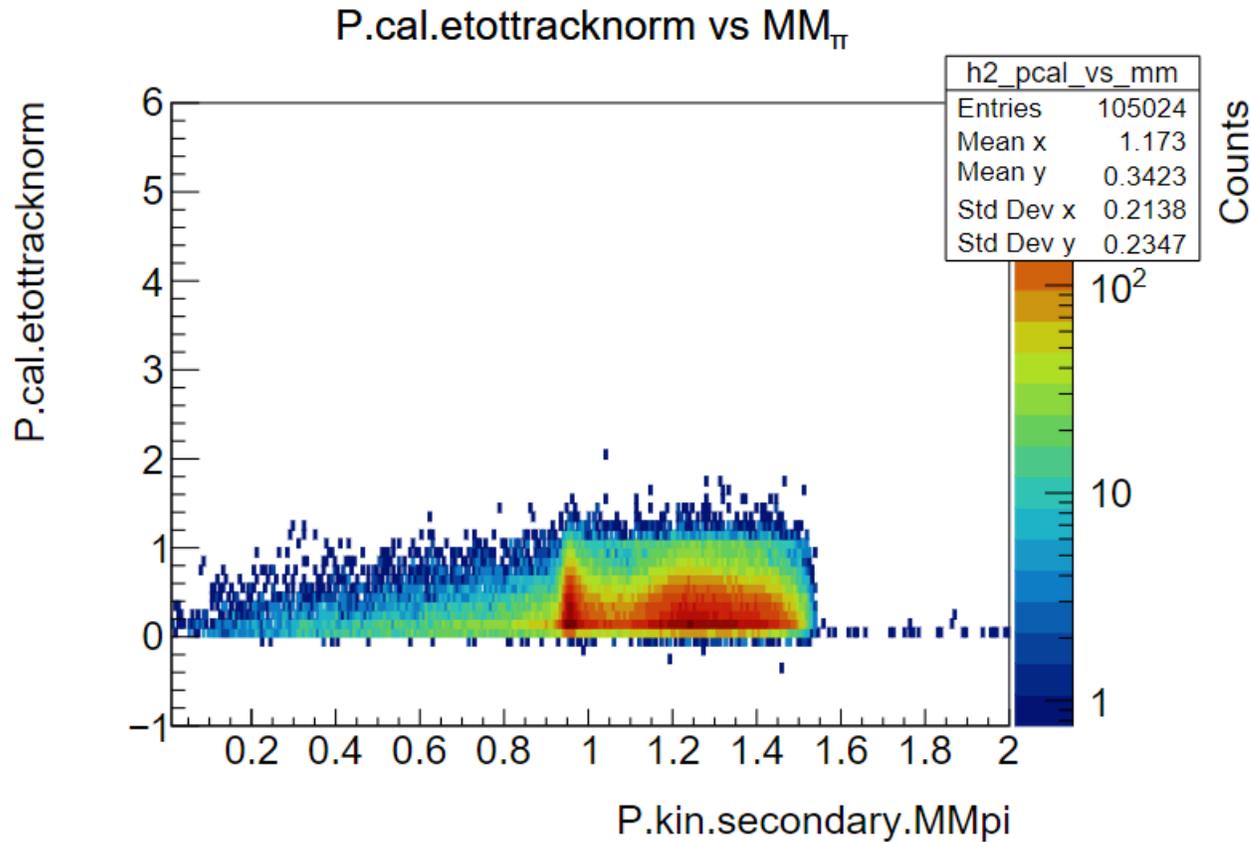


$P_{\text{Aero}} < 0.2$



SHMS – PCal (CT + RF + HCal + HCer cuts)

PCal – no cut since no electron band at 1



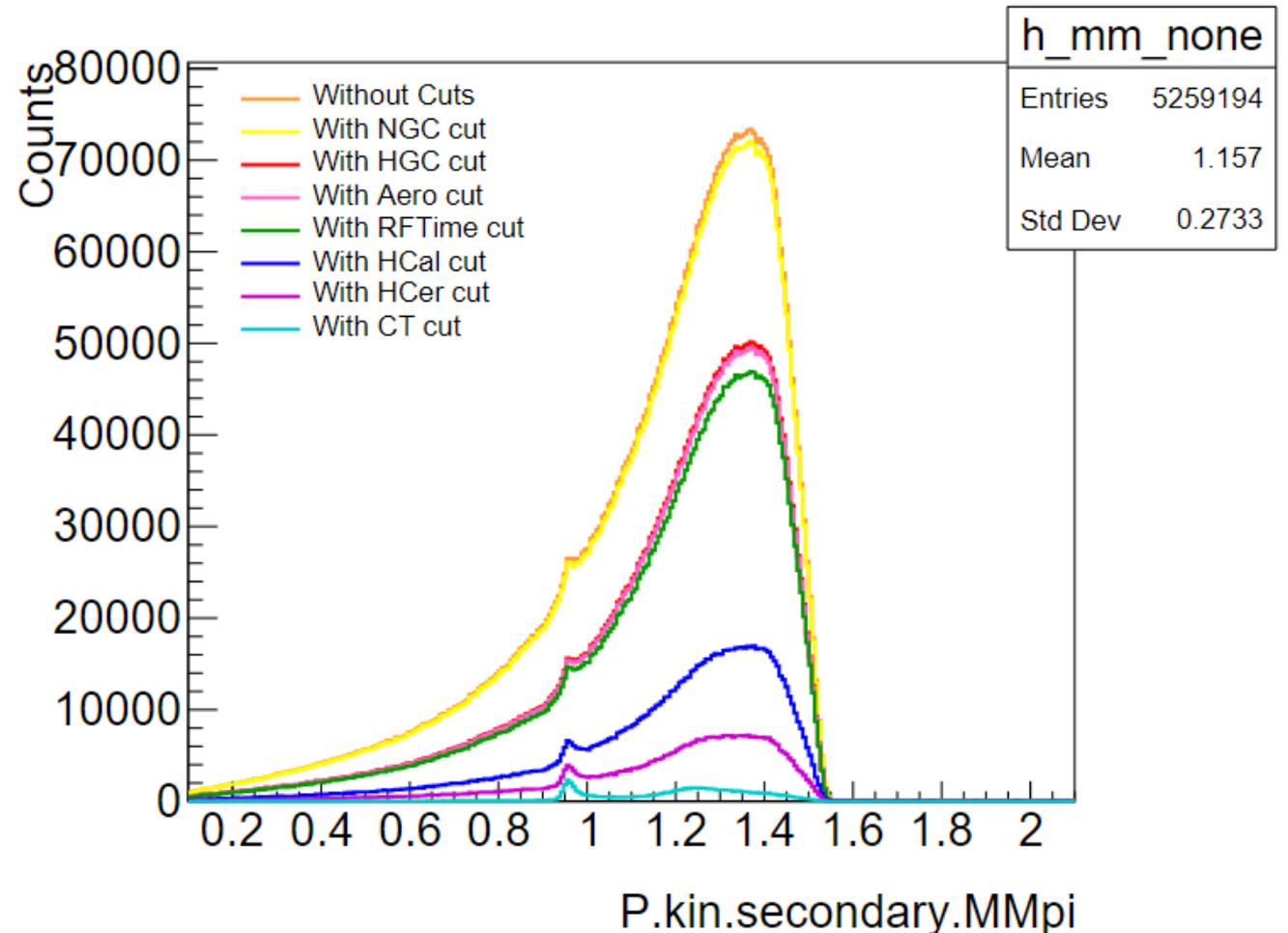
Effectiveness of PID cuts

SHMS

- Noble gas Cherenkov
- Aerogel Cherenkov

Both cuts have little to no effect on the missing mass, thus can be excluded.

Missing Mass after cumulative cuts



Final PID cuts

HMS

- $H.cal.etottracknorm > 0.6$
- $H.cer.npeSum > 2.0$

SHMS

- $P.hgcer.npeSum > 0.2$

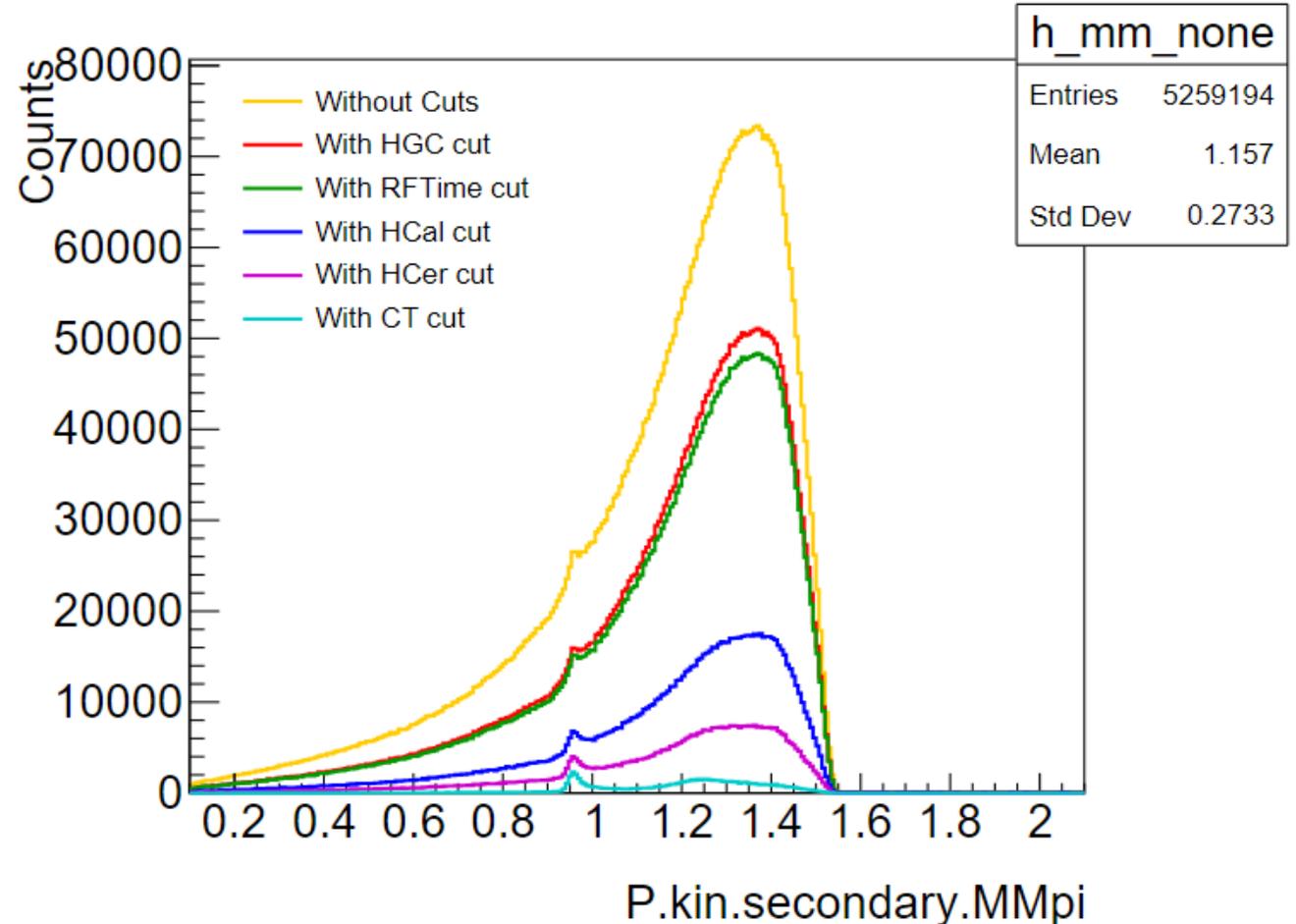
Timing

- $abs(CTime.ePiCoinTime_ROC1 - 0.881) < 2.0$
- $0.9 < RFTIME.SHMS_RftimeDist < 3.6$

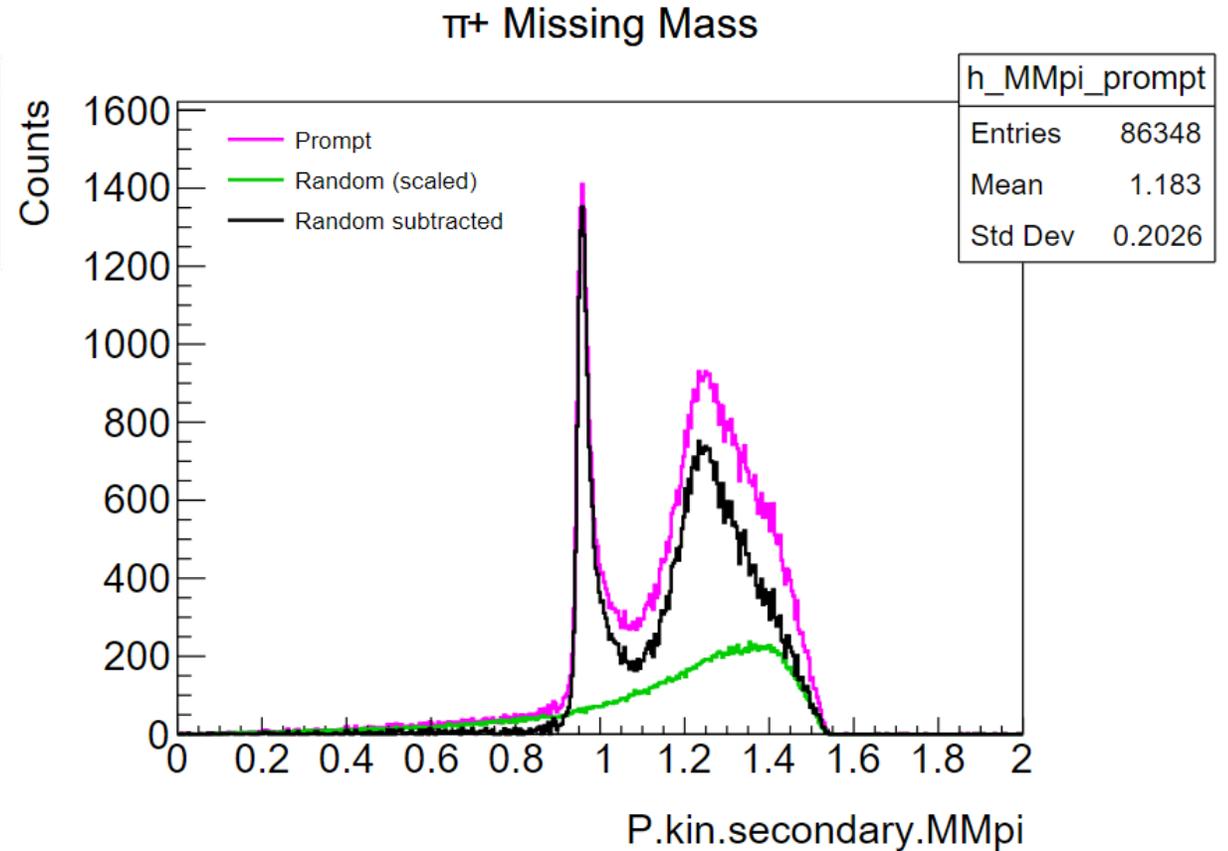
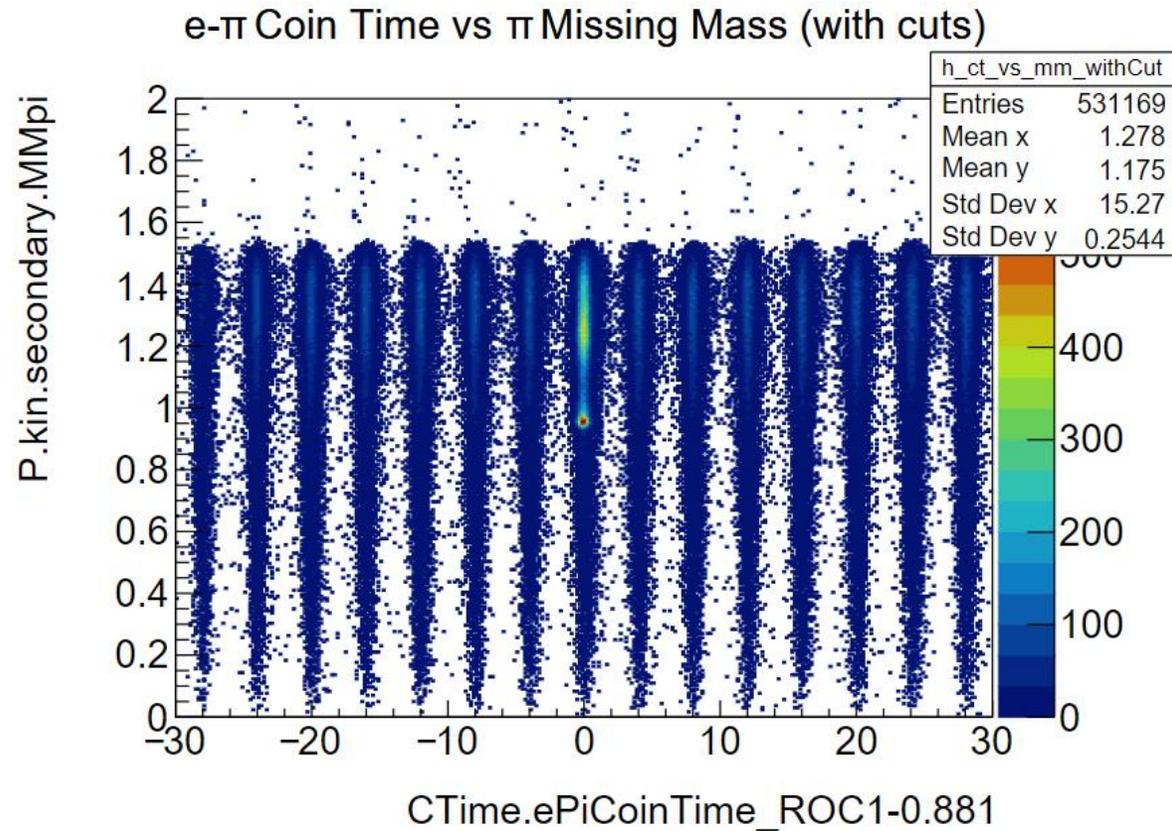
Find the yield under neutron peak.
Define π^+ yield and compare it to the
online value.

Do the same for 75 μA .

Missing Mass after cumulative cuts



Random subtraction (updated cuts)



Acceptance Cuts

Allowing good event selection

12/03/26

Acceptance criteria

HMS Specification	HMS Characteristic
Central Momentum	0.4 - 7.4 GeV/c
Momentum Acceptance	-8% - +8%
Momentum Resolution	0.1% - 0.15%
Rotational Angle Range	10.5° to 90° w.r.t. beamline
Horizontal Angle Acceptance	±32 mrad
Vertical Angle Acceptance	±85 mrad
Solid Angle Acceptance	8.1 msr
Horizontal Angle Resolution	0.8 mrad
Vertical Angle Resolution	1.0 mrad

SHMS Specification	SHMS Characteristic
Central Momentum	2.0 - 11.0 GeV/c
Momentum Acceptance	-10% - +20% or +22%
Momentum Resolution	0.03% - 0.08%
Rotational Angle Range	5.5° - 40° w.r.t. beamline
Horizontal Angle Acceptance	±18 mrad
Vertical Angle Acceptance	±50 mrad
Solid Angle Acceptance	> 4 msr
Horizontal Angle Resolution	0.5-1.2 mrad
Vertical Angle Resolution	0.3-1.1 mrad

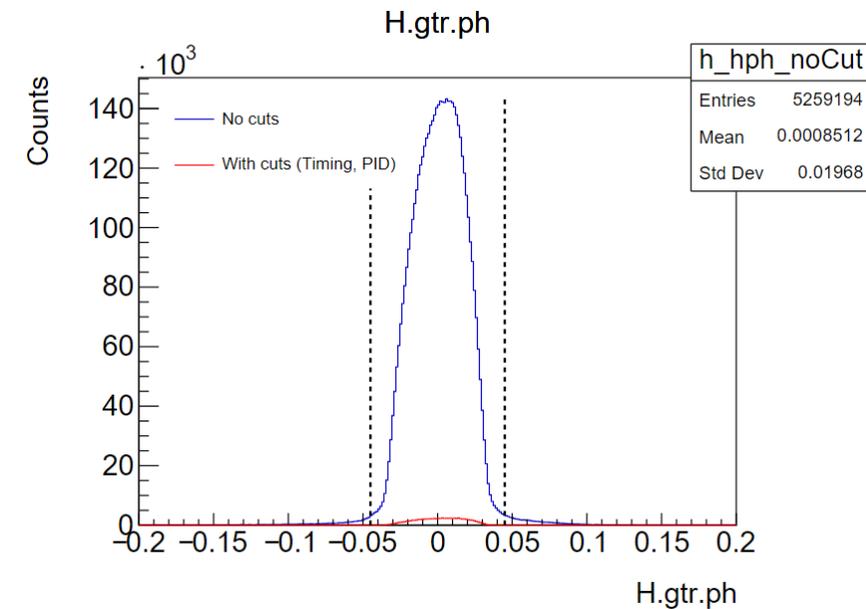
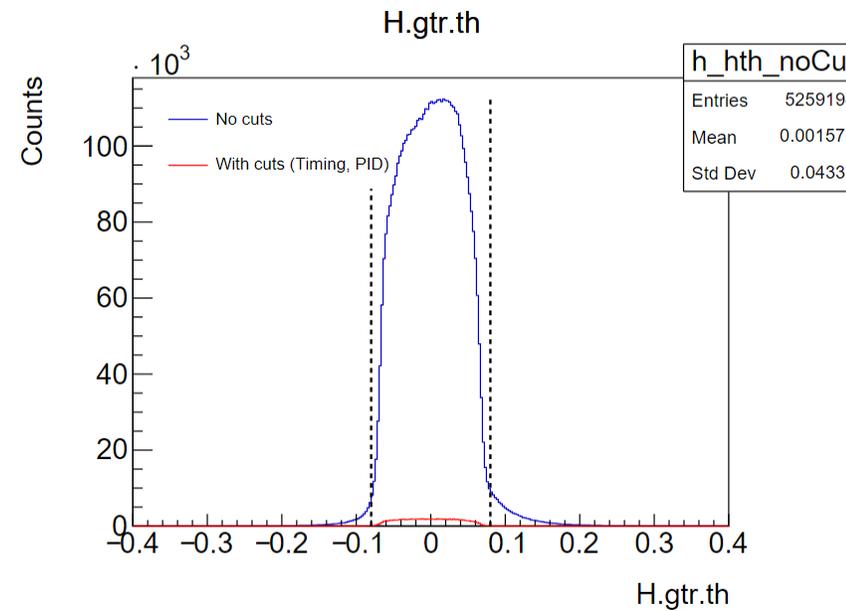
[1]

Now PID cuts have been identified, the acceptance cuts for the spectrometers, SHMS and HMS, are applied.

These cuts encompass the angular and momentum acceptances (x_{ptar} , y_{ptar} , δ) at the target.

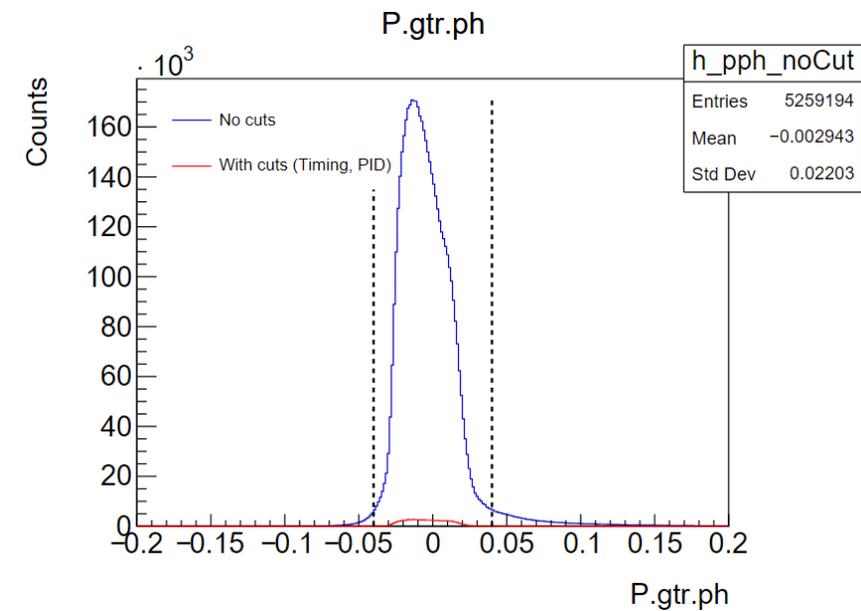
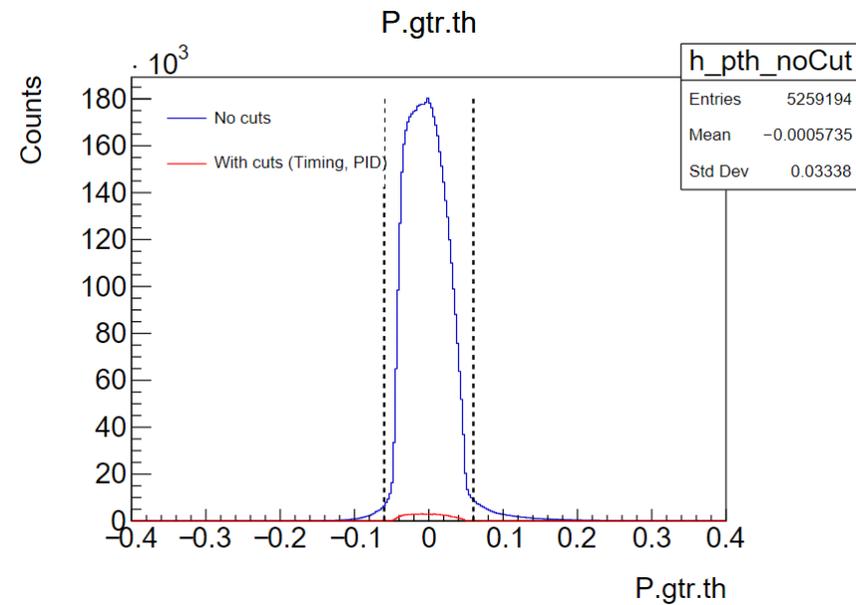
Acceptance cuts - HMS

The current cuts were from Vijay's thesis. Are these standard or do I need to revise them for my specific runs?



Acceptance cuts - SHMS

Want to make cuts at the minima of these distributions.

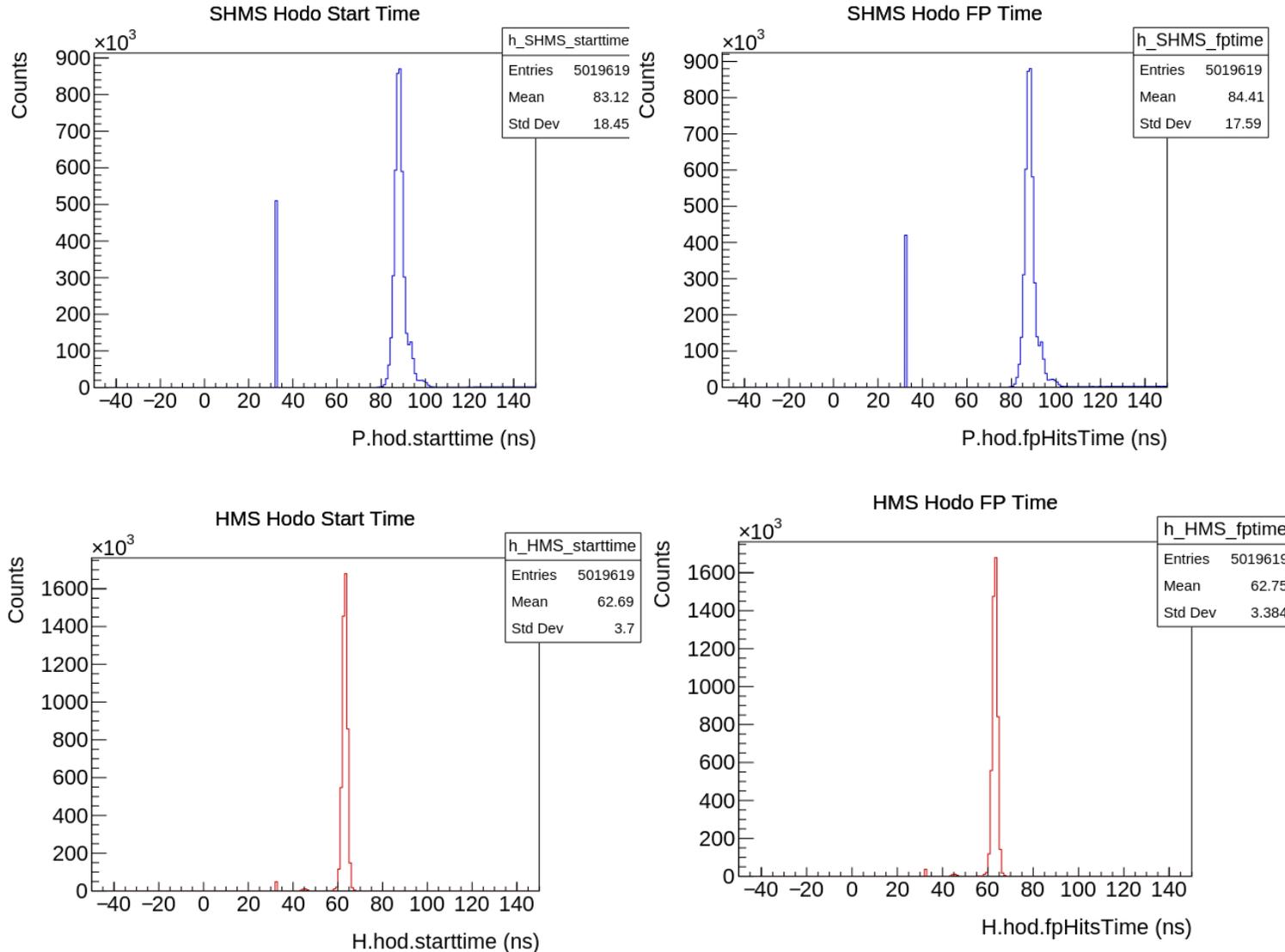


Backups

Investigating detector calibrations

11/03/26

LD+ Coin Time: 32 uA

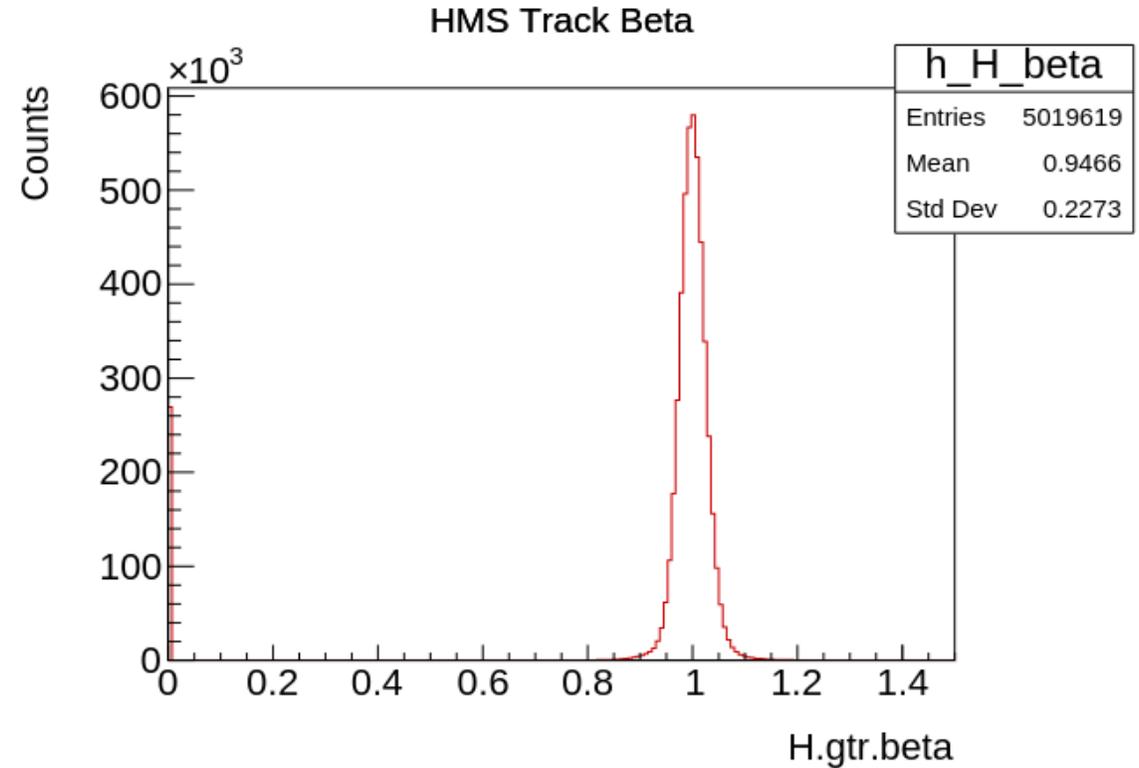
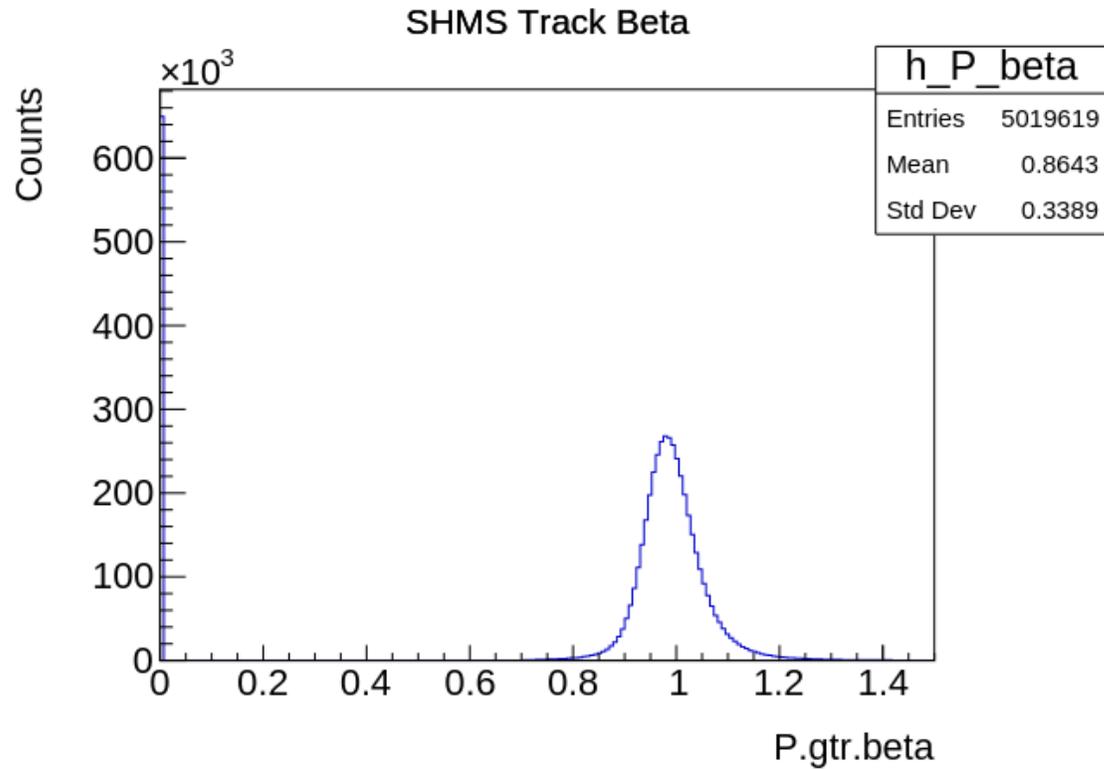


I think the SHMS starttime is the problem because it has a standard deviation of 20 ns. This directly smears the coin time by a similar amount. The spread is actually 32 ns but that is including the HMS and the trigger. This means that the hodoscope calibration parameter files need to be reviewed:

`PARAM/SHMS/HOD/phodo_TWcorr.param`

Make a cut on the shms hodoscope and then plot the coin time.

LD+ Coin Time: 32 uA



Beta looks fine so not sure whats next.