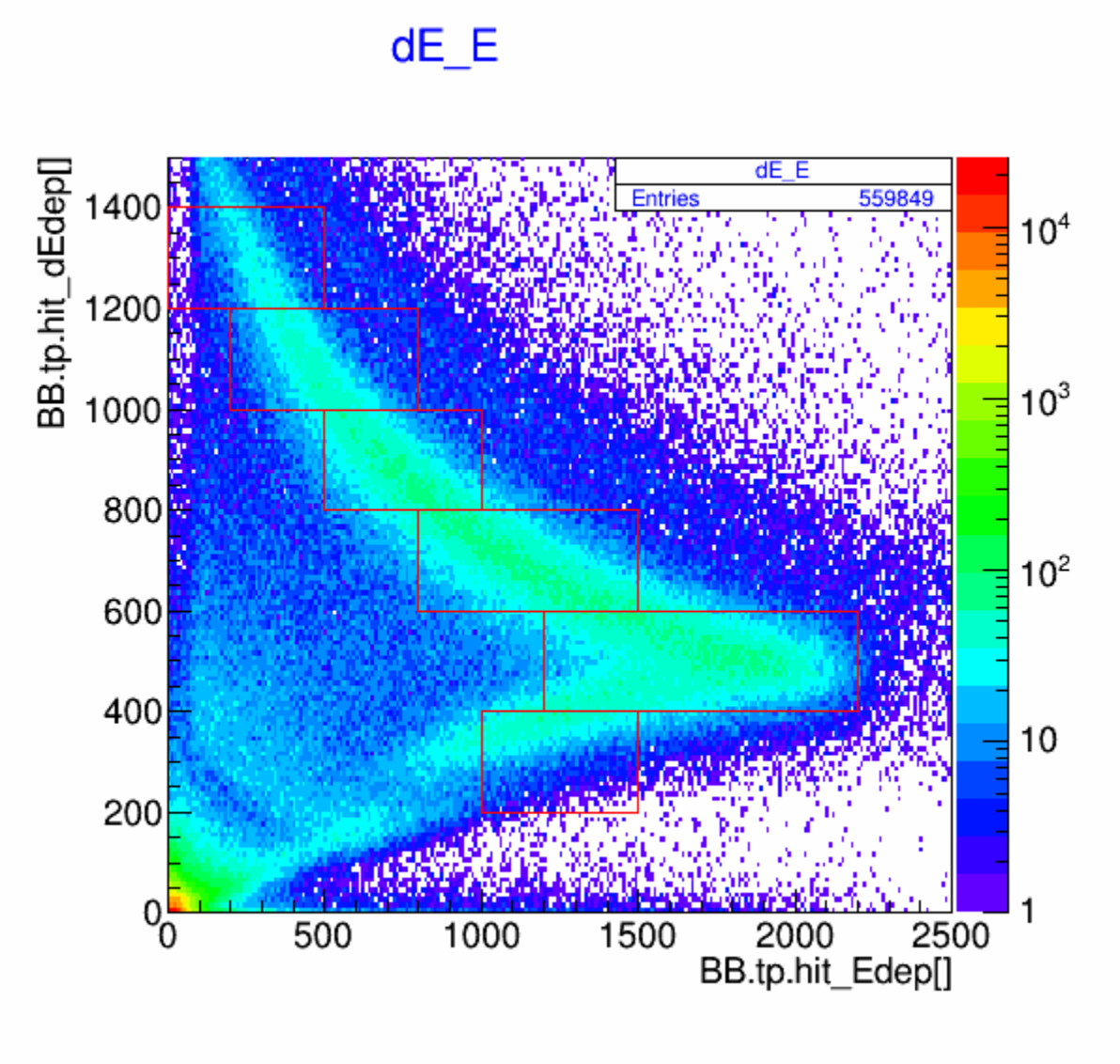
BB Track Efficiency:

Consider the data with both dE and E (if link to track it will be called fullhit)
Sample data:
T3 and no edtm

electron PID (modified) : (prl1.e+prl2.e)/(1000*L.gold.p)>0.6
NORMAL LHRS acceptance cut:
|theta_e|<=0.060,
|phi_e|<=0.030 and
|dp|<=4.5%
–--------OMIT----------------
Coincidence time |CT|<= 3.5 ns
–-------------------------------

Making multiple area of dE vs E (momentum dependent): (using 40 run for data set 1-2)



Still Checking Upper Bound with BB.tr.n>0

dE_min	dE_max	E_min	E_max	sample data	BB.tr.n>0	Eff	%err
200	400	1000	1500	75216	45038	0.599	0.36
400	600	1200	2200	351793	256709	0.730	0.19
600	800	800	1500	253233	189089	0.747	0.23
800	1000	500	1000	163166	125410	0.769	0.29
1000	1200	200	800	102244	80316	0.786	0.37
1200	1400	0	500	37603	30417	0.809	0.62

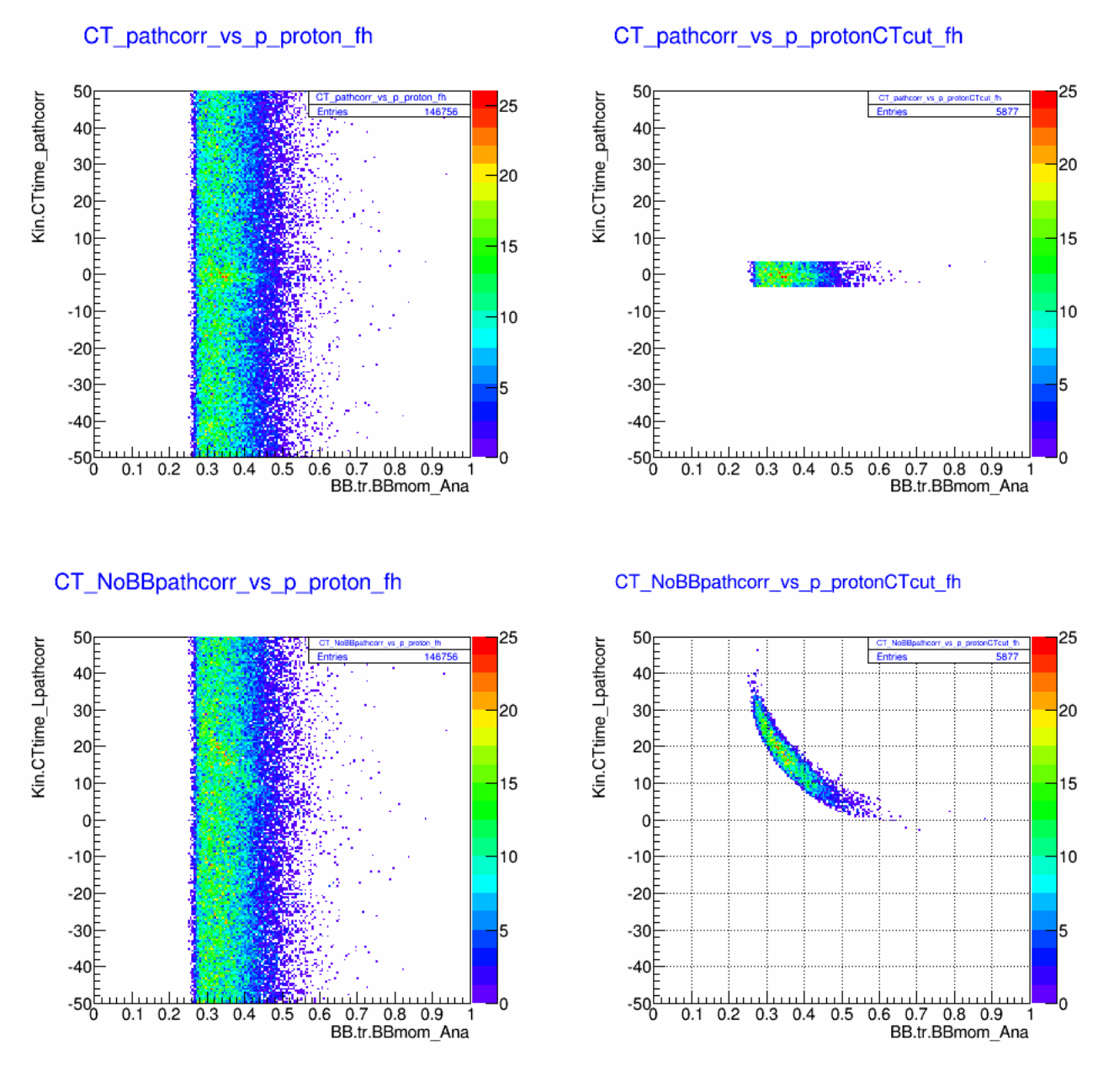
with Track Matching

dE_min	dE_max	E_min	E_max	sample data	TrackMatch	Eff	%err
200	400	1000	1500	75216	39640	0.527	0.33
400	600	1200	2200	351793	232384	0.661	0.18
600	800	800	1500	253233	173086	0.684	0.21
800	1000	500	1000	163166	116161	0.712	0.27
1000	1200	200	800	102244	74740	0.731	0.35
1200	1400	0	500	37603	28860	0.767	0.60

It seems like there are too many background to actually say definite about the efficiency.
Next is to add the CT cut time.

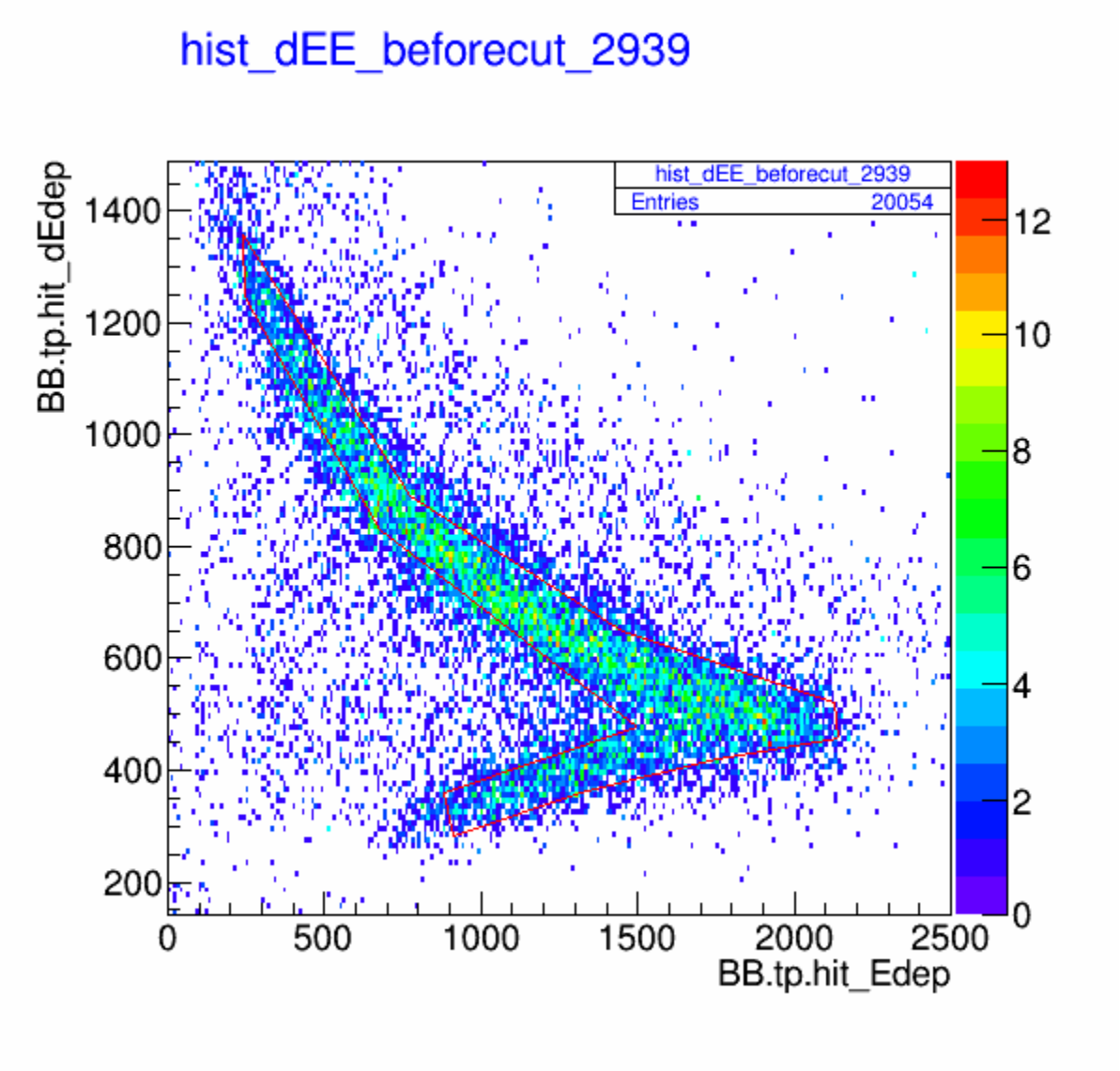
Sample:

1. Trigger 3 and no simulated data and no ends widow for level 1 accepted in BigBite
   :DBB_evtypebits&(1<<3)&& DBB_edtpl[0]==0 && DBB_l1a[0]>=120 &&
DBB_l1a[0]<=570 &&
2. LHRS acceptance cut |phi|,|theta|,|dp|
   :fabs(exL_ph)<=0.030 && fabs(exL_th)<=0.060&& abs(exL.dp)<=0.045
3. LHRS vertex cut out end caps:
   :fabs(rpl_z)<=0.075 &&
4. LHRS electron selection
   :(L_prl1_e*0.93+L_prl2_e*1.13)>2700 &&
5. LHRs single track
   :L_tr_n==1
6. cut on coincidence time with LHRS path-length correction for data with both dE and E matching:
   :0<=CTtime_Lpathcorr[fullhit]<=35
   this match to when I have abs(CTtime_pathcorr[])<=3.5



range for CT_no BB pathcorr (0-35)

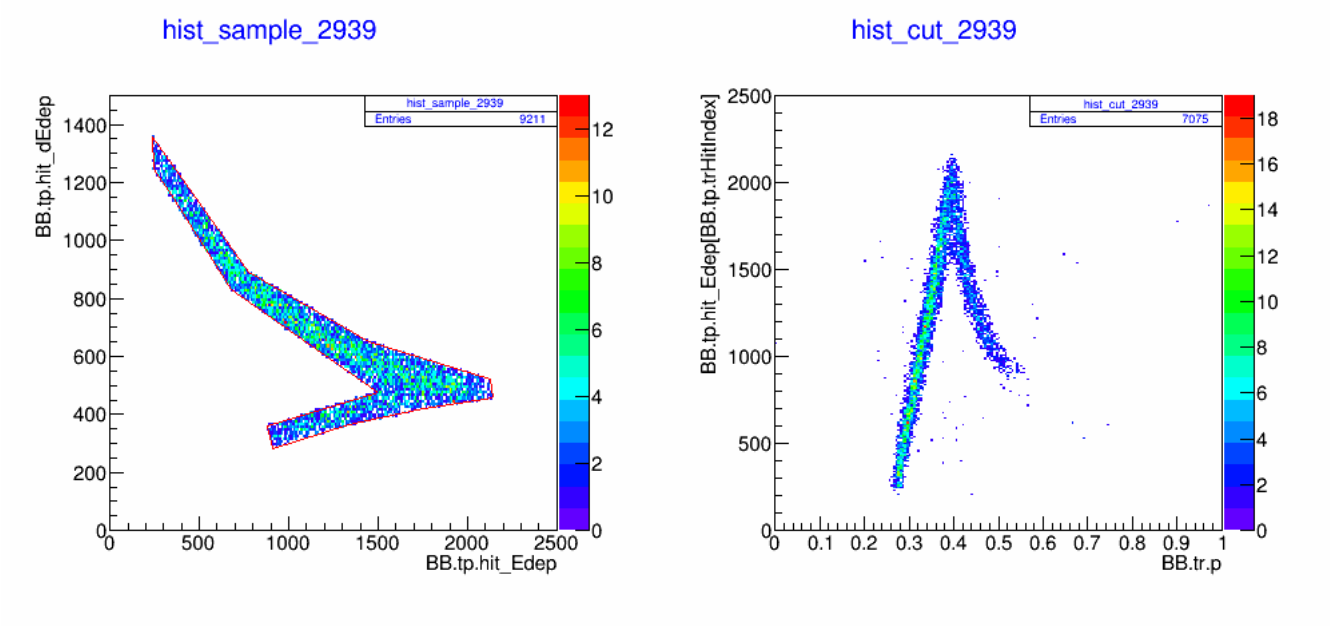
7.graphic dE vs E cut



cut:
8. BB.tr.n>0
9. track Matching to fullhit: abs(trHitIndex-5)<=5
10. graphic cut E_p

runs: 2939,2940,2941,2942,2943,2944,2945,2946,2947,2985,
2986,2987,2988,2989,2994,2995,2996,2997

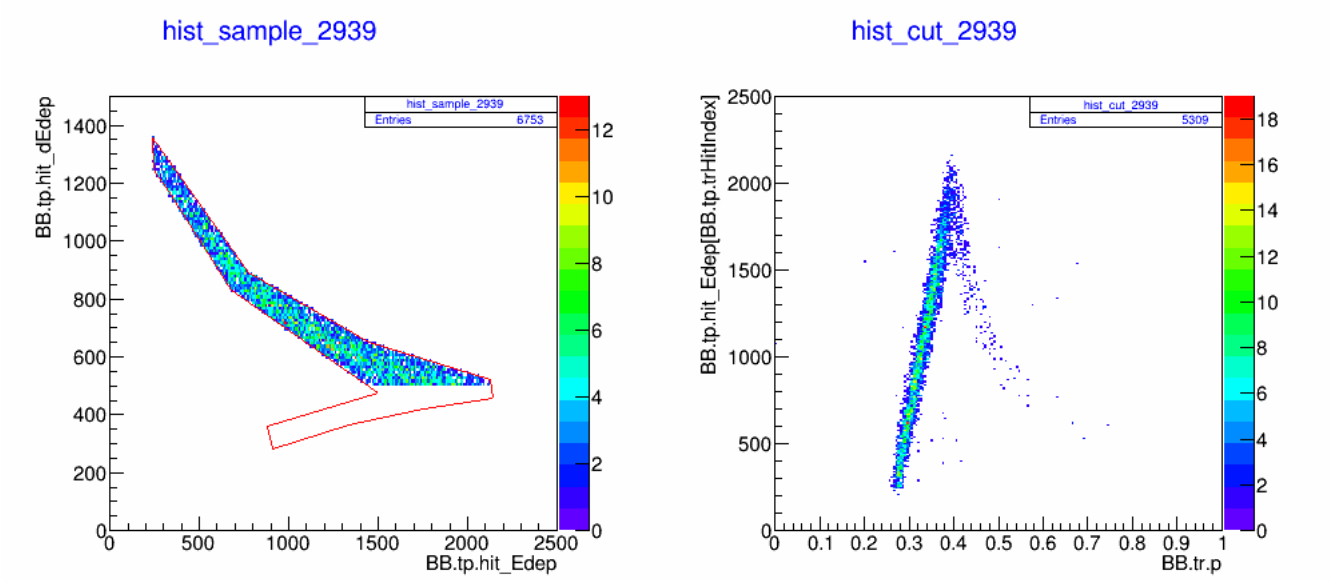
sample entries: 9002 (take out multiple-count hit)
cut entries: 7005 (take out muliple-count hit and track)
Eff: 0.778



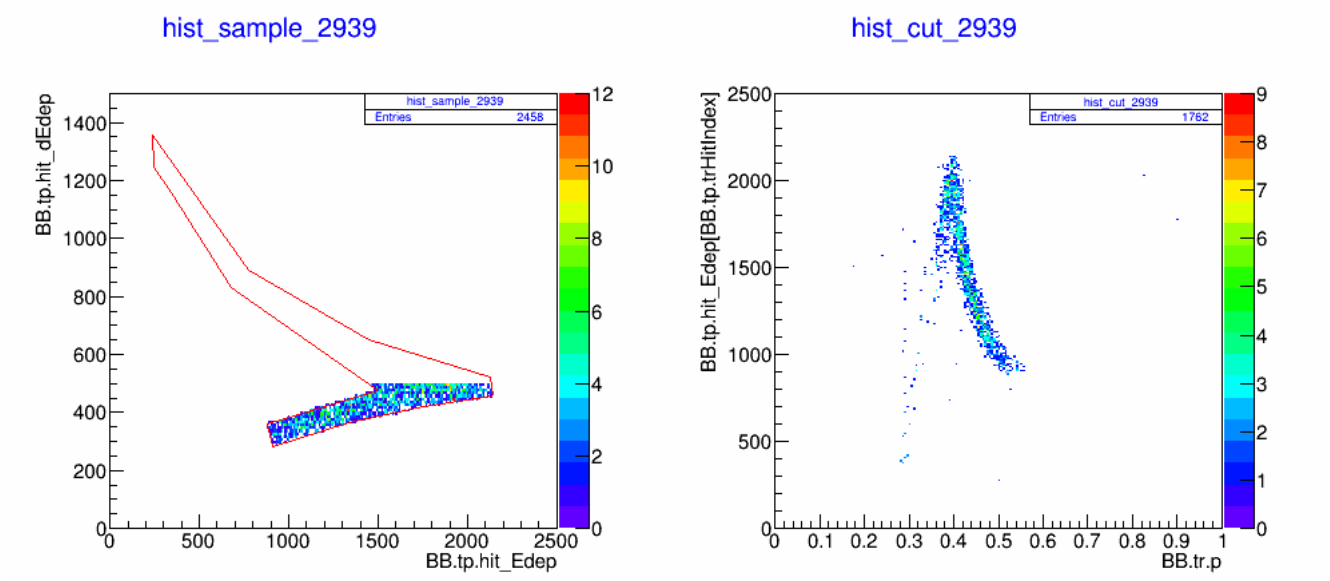
The **sample data** is within the rough coincidence time **without** BB-path-length correction (better than no cut on CT at all). Scan through all the hit for which dE and E plane data matched. Only keep the data with all the hit has information within the proton PID dE_vs_E cut.

The **cut data** has additional requirement. The data must have track. The track can also be match to the fullhit data. The data also pass graphic E vs p proton PID.

To see whether the efficiency has momentum dependent I make a cut about the punch through point.



sample entries: 6656(take out multiple-count hit)
cut entries: 5272 (take out muliple-count hit and track)
Eff: 0.792

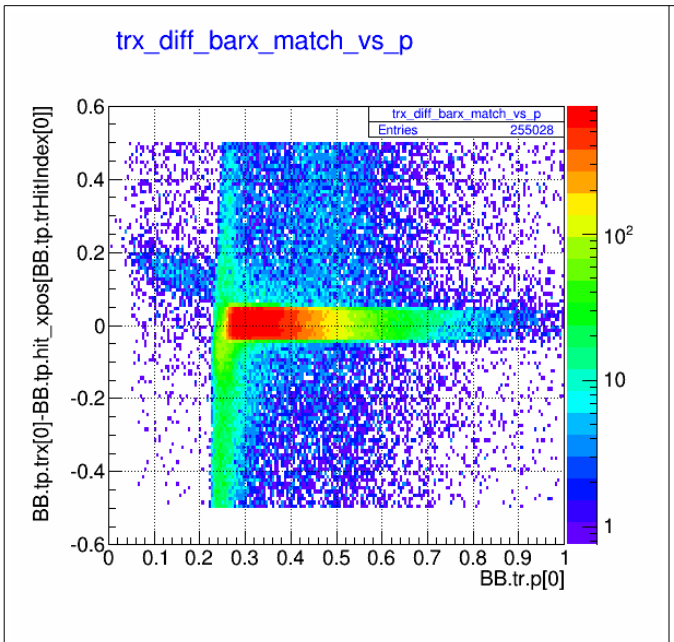


sample:2432
cut:1756
Eff: 0.722

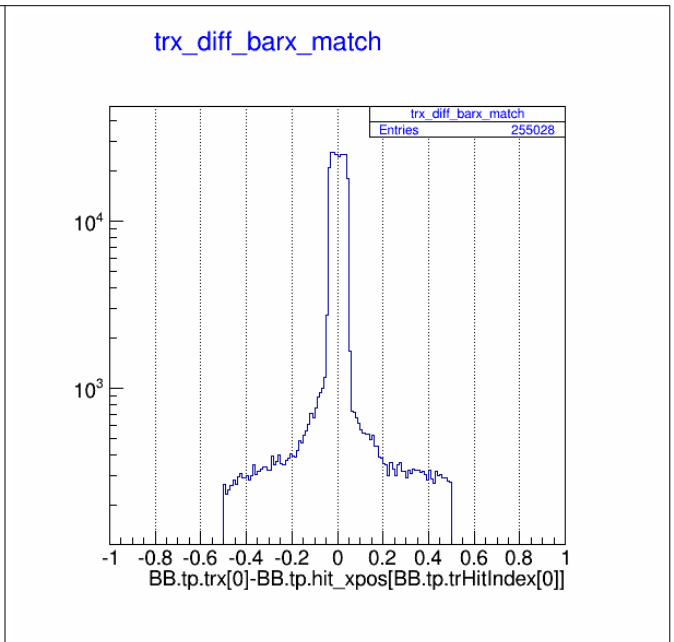
Does the matching create the cut that make the too-loose or too-tight cut on position both in x and y?

From the fullhit the efficiency is lower in upper section of the momentum. Testing for the possible of the source.

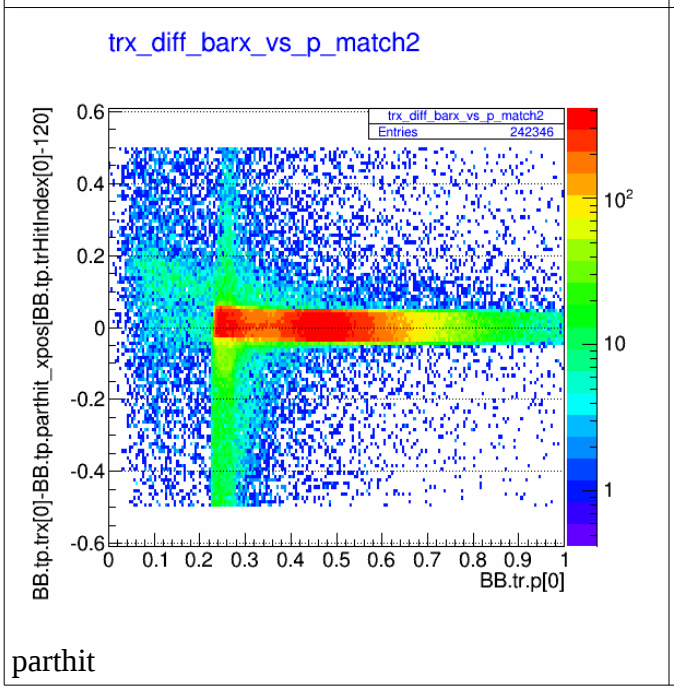
X-position:
The majority of data is within +/- 0.05 m. Where the bar position is discrete number. ~0.08 m.



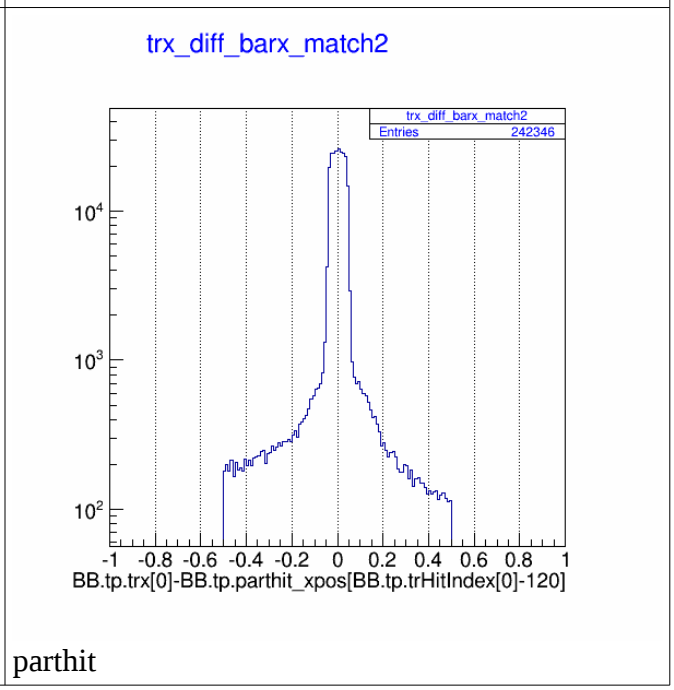
Fullhit



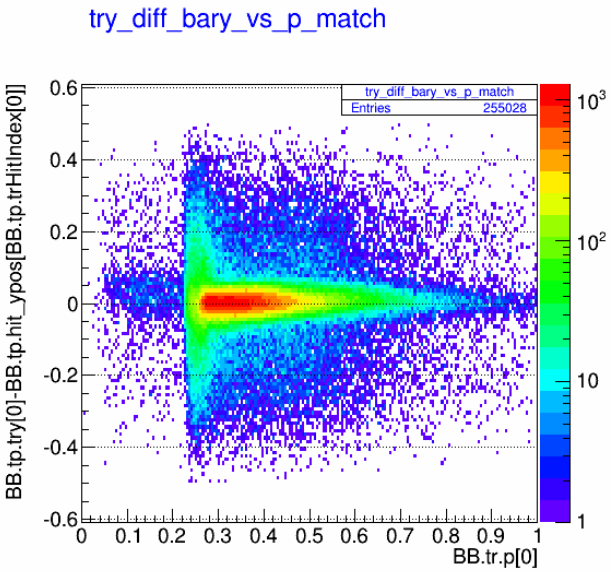
fullhit



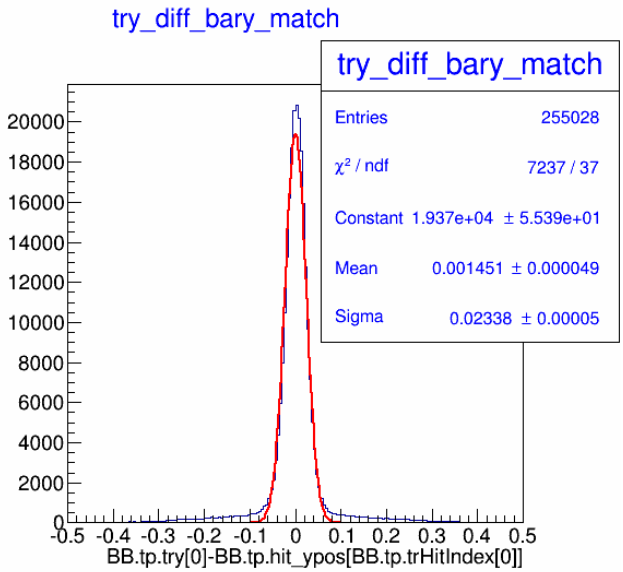
parthit



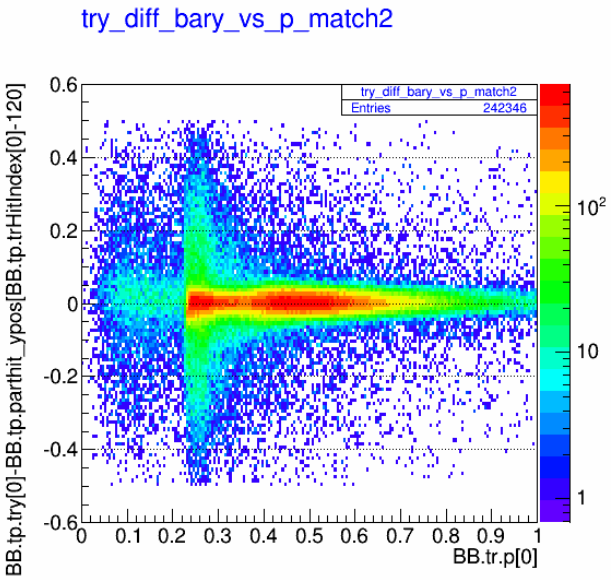
parthit



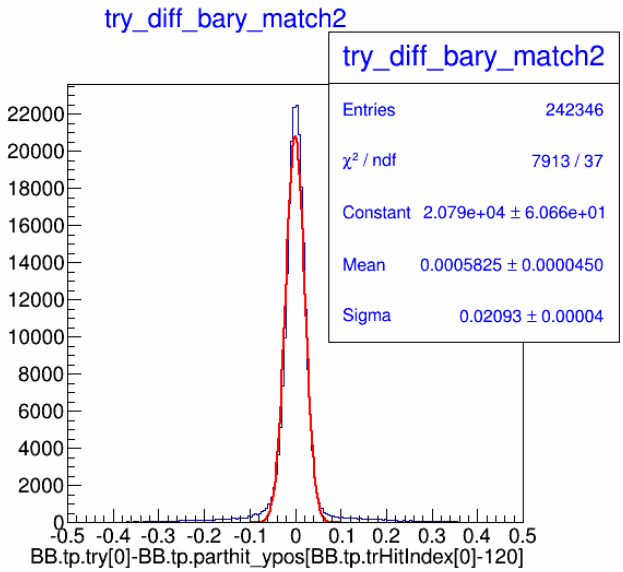
fullhit



fullhit



parthit

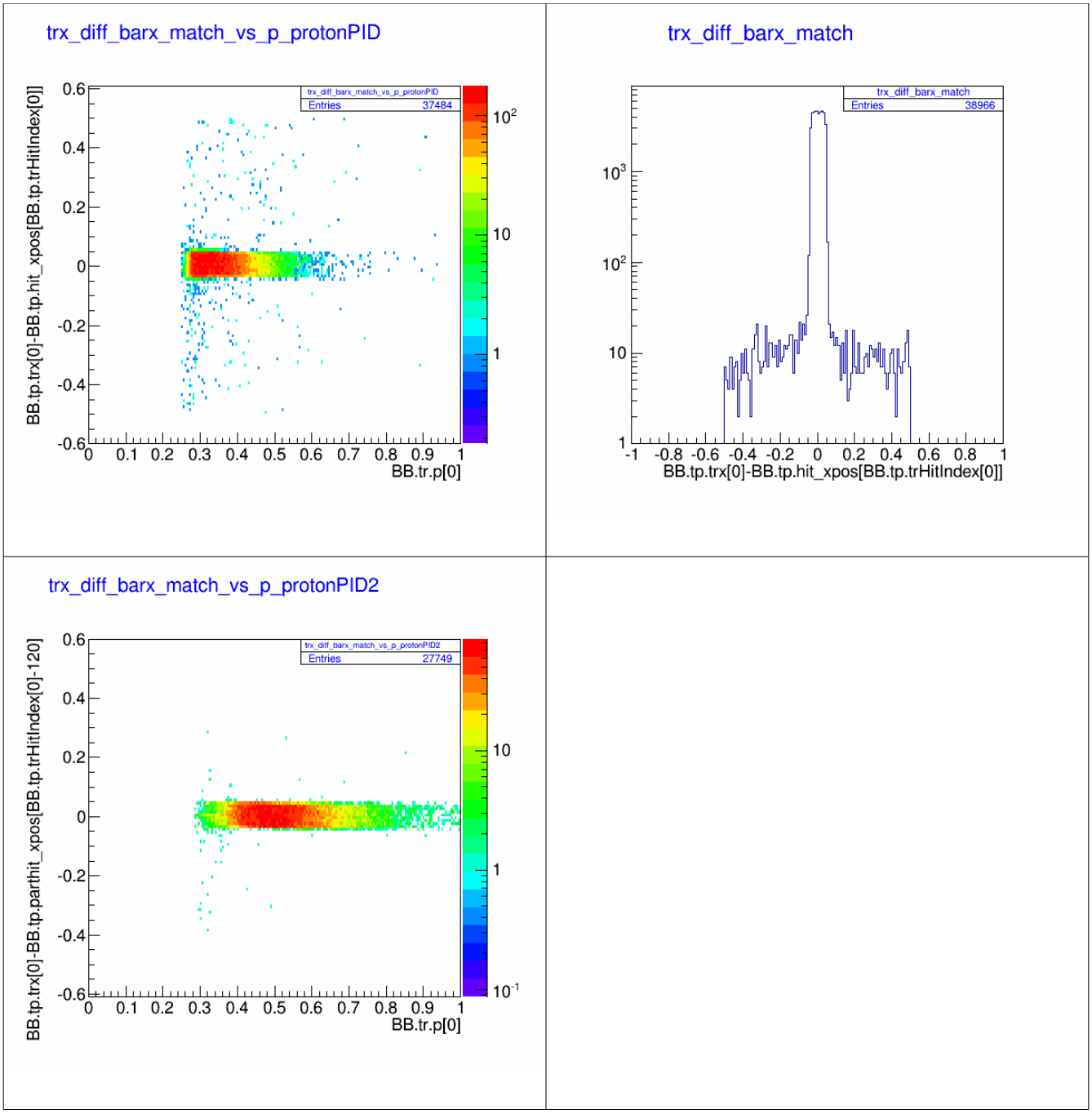


parthit

From the distribution in both diff_x and diff_y, it seems that the matching is “too loose”. A lot of data are accepted as matching even if the diff_x is much larger than “zero” +/- 3*sigma.

Next is to actually tighten the matching requirement.

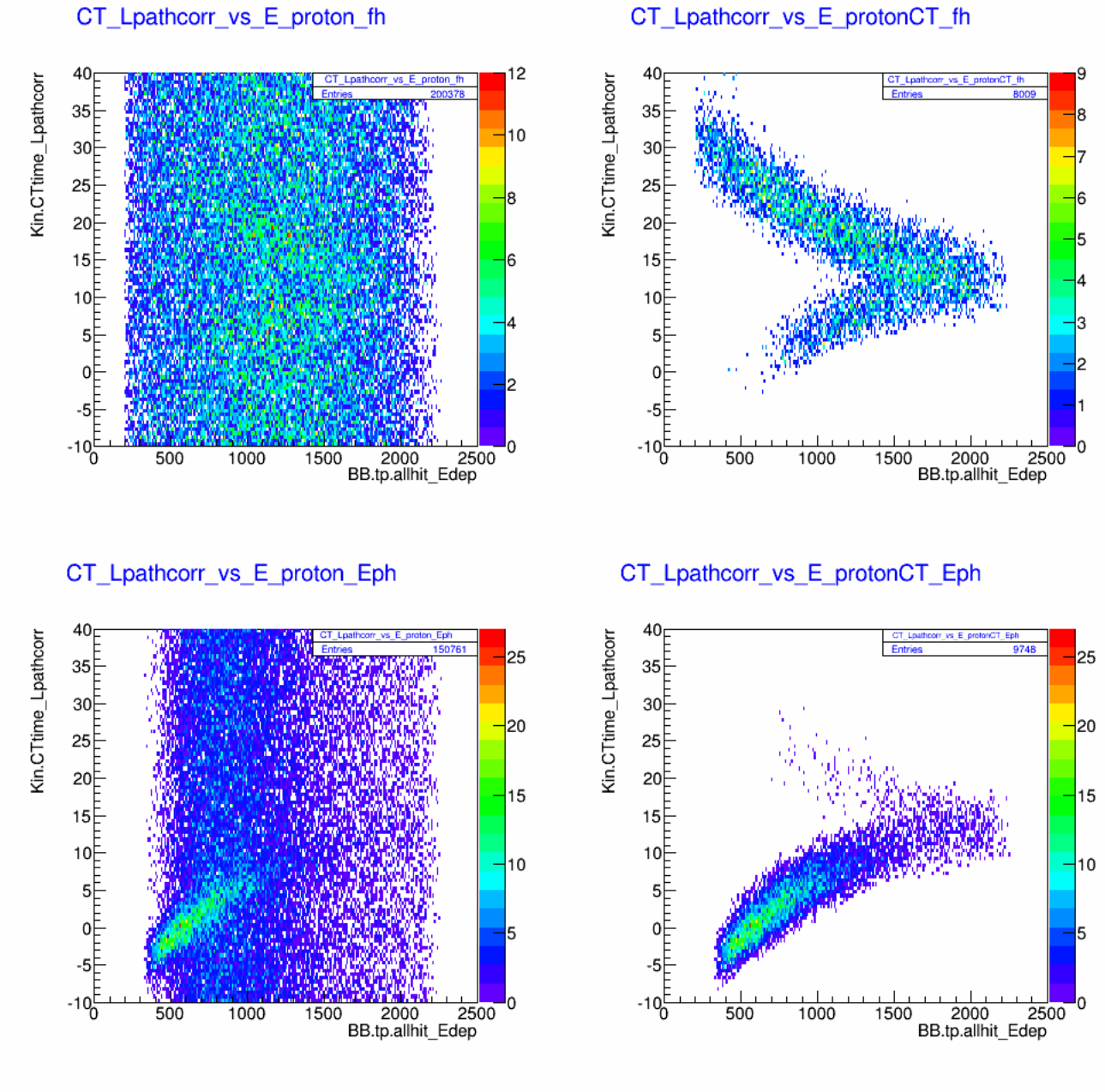
Is it the case after proton PID?



This seems “NOT” the case.

For the higher momentum which only have the data in E plane I can have proton PID from CT vs E as follow:

Trying with the combination of CT_Lpathcorr with Edep.
Consider the CT_Lpathcorr with Edep from proton (Ep) PID and |CT_pathcorr|<=3.5 ns cut.



top row is from the fullhit :

Left: proton

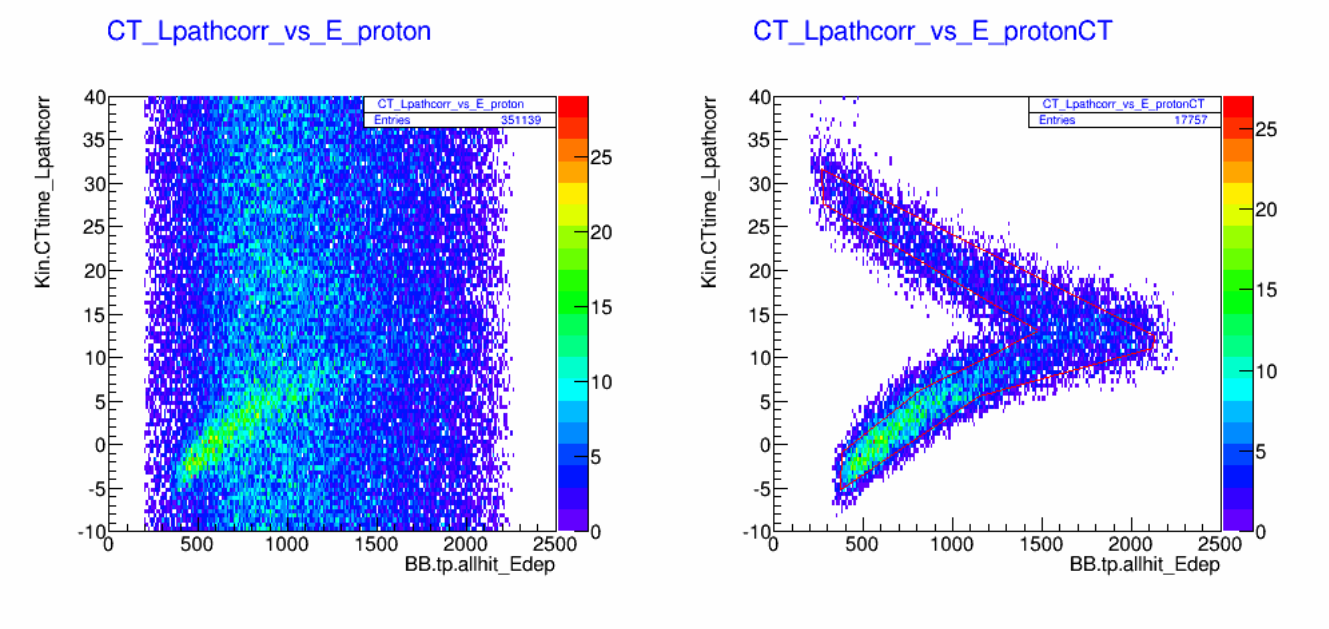
Right: proton with CT cut

Bottom row is from the parthit :

Left: proton

Right: proton with CT cut

Combine this two data sets we have,



The proton PID from CT_noBBpathcorr and Edep shown in the right figure in red graph (cut into the selection).