Cross Section He4(e,e'p_backward)X

6-fold: (d2\Omega_e) * (d\E'_e) (d2\Omega_p)*(d\p_p)

All cuts:

1.with T3, no edtm and l1a overflow 120<=l1a<=570

(id as cut_gen)

2. electron selection: at prl_sum_E/p>0.7 & single track

3. r-function >=0 (replace theta and phi cut)

4. target endcaps cut L- vertex: |rpl.z|<=0.075 m

5. track match with Trigger in BB

:BB.fh_id==1 ||

: (BB.Eph_id==1 && BB.tp.allhit_Edep>=1000.-1000*BB.tr.Bbmom_Ana)

6. With proton PID: (graphic cut E vs p) && BB.tr.tg_th>-0.3 (polarity cut)

7. Add coincidence vertex: abs(rpl.z-BB.tr.tg_y*1.12+0.007)<=0.04 m

8. Add coincidence time cut: at +/- 3.5 ns

	Correction due to cut
Single track in LHRS	Reduce data to 99.4% from all track

Only one ¼ of the data

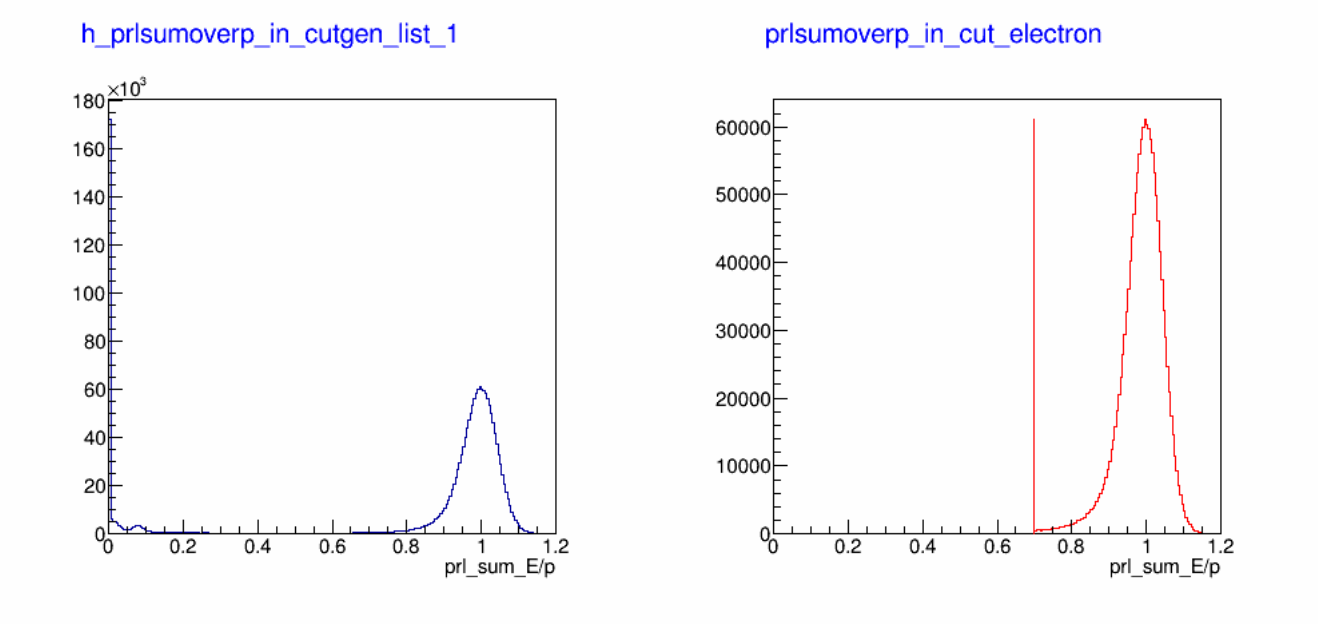


Figure C_1: before/after Electron PID (cut_2: prl_sum_E/p >=0.7) in cut #1

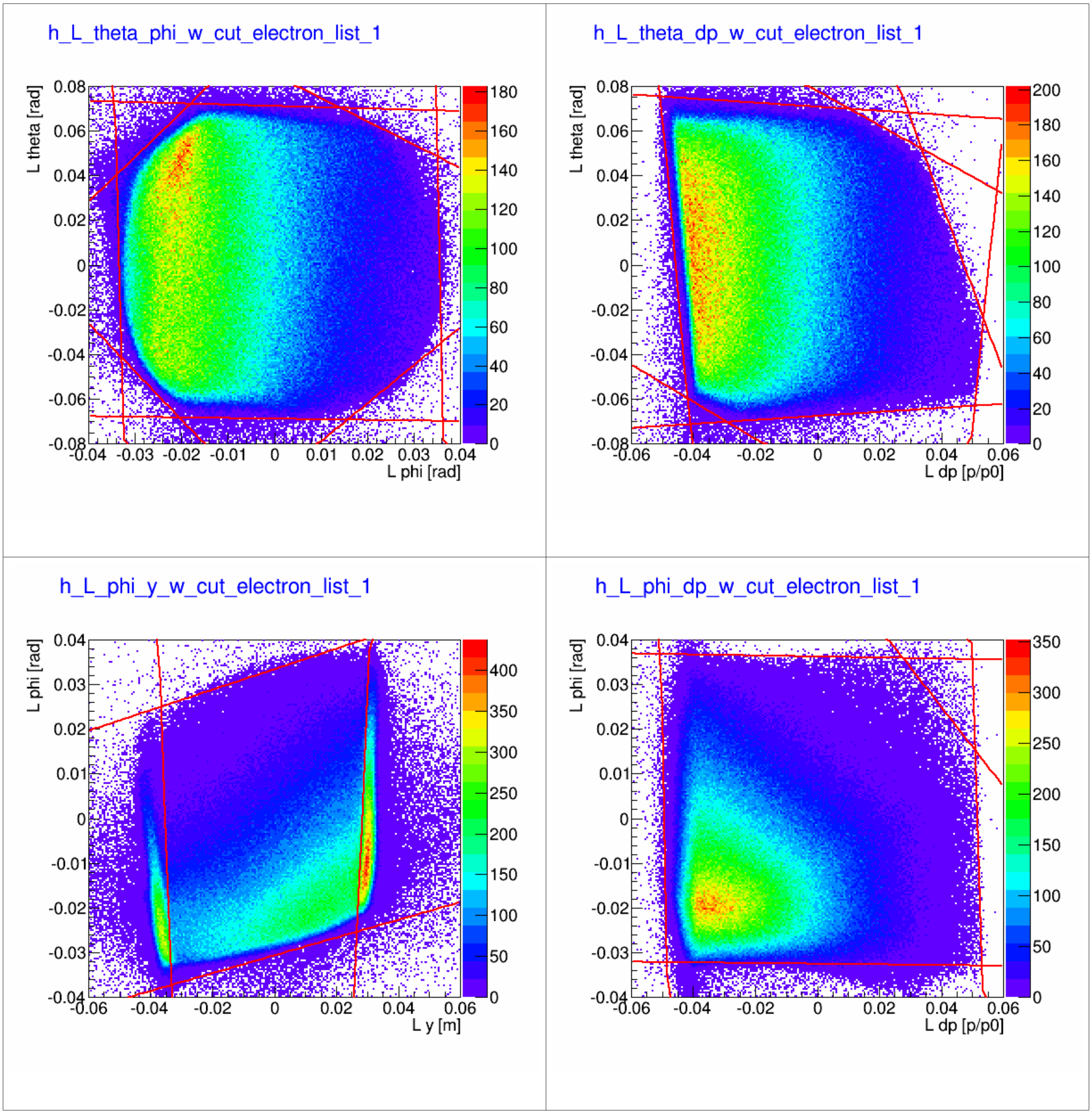


Figure C_2.1: theta,phi,dp,y parameters to obtain r-function.
r-function is >=0 when the data are within all the polygons

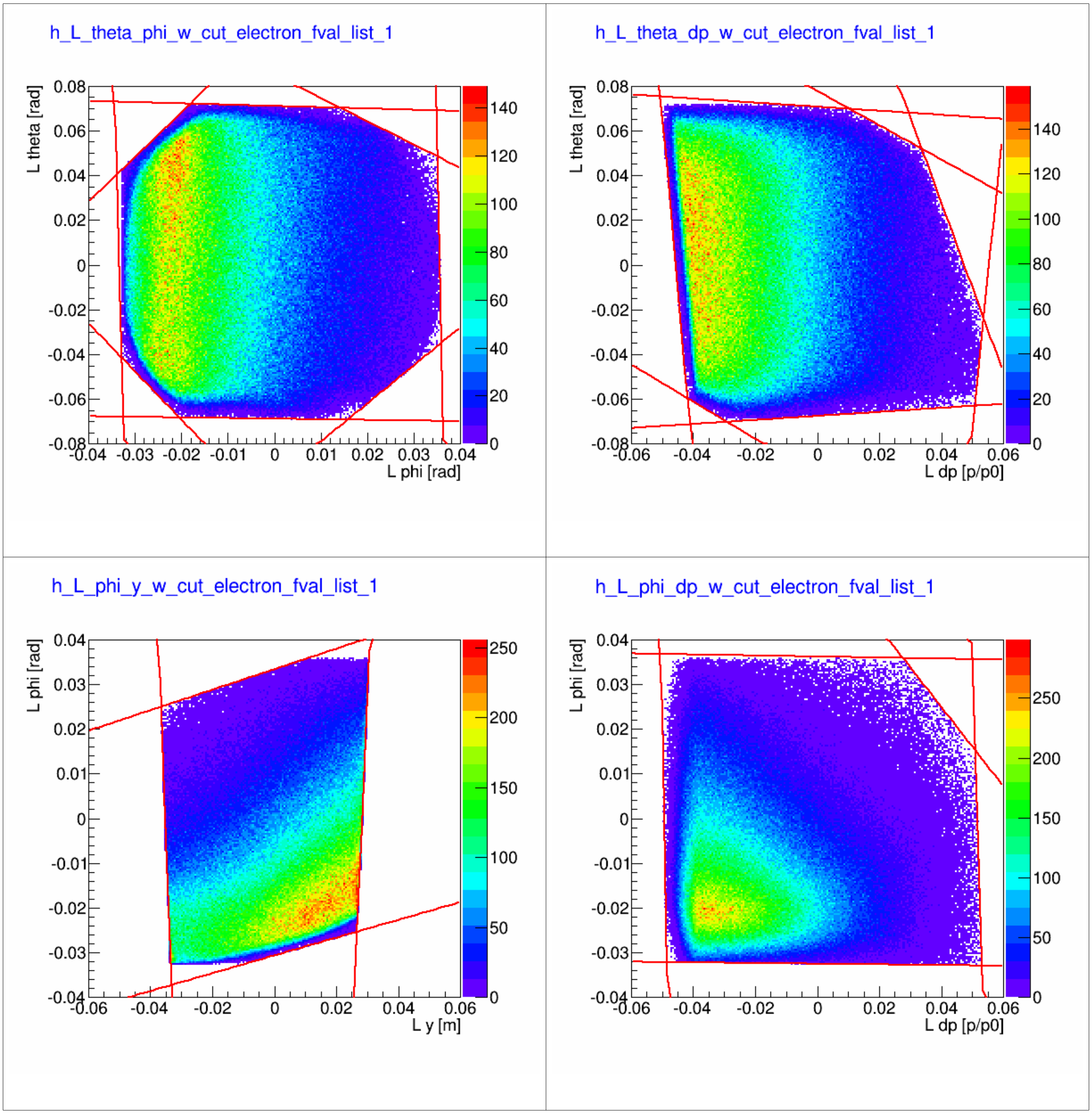
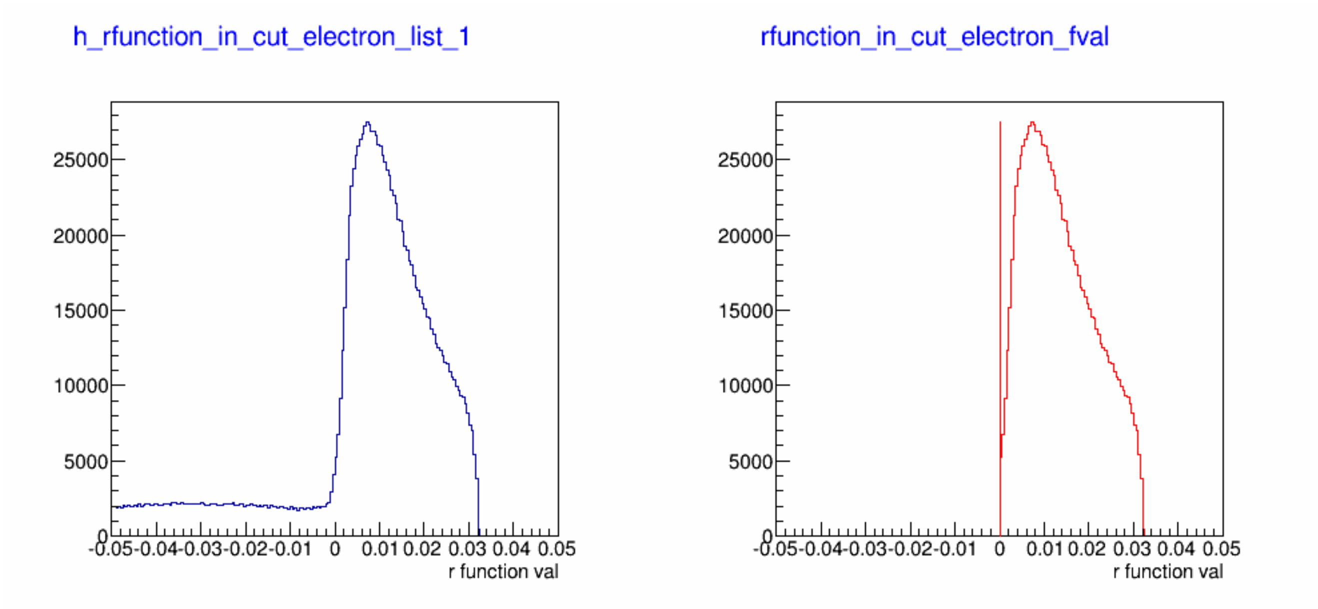


Figure C_2.2: theta,phi,dp,y with rfval>=0



Figurer C_2.3: before/after r-function cut (rfval>=0) in cut #1&#2

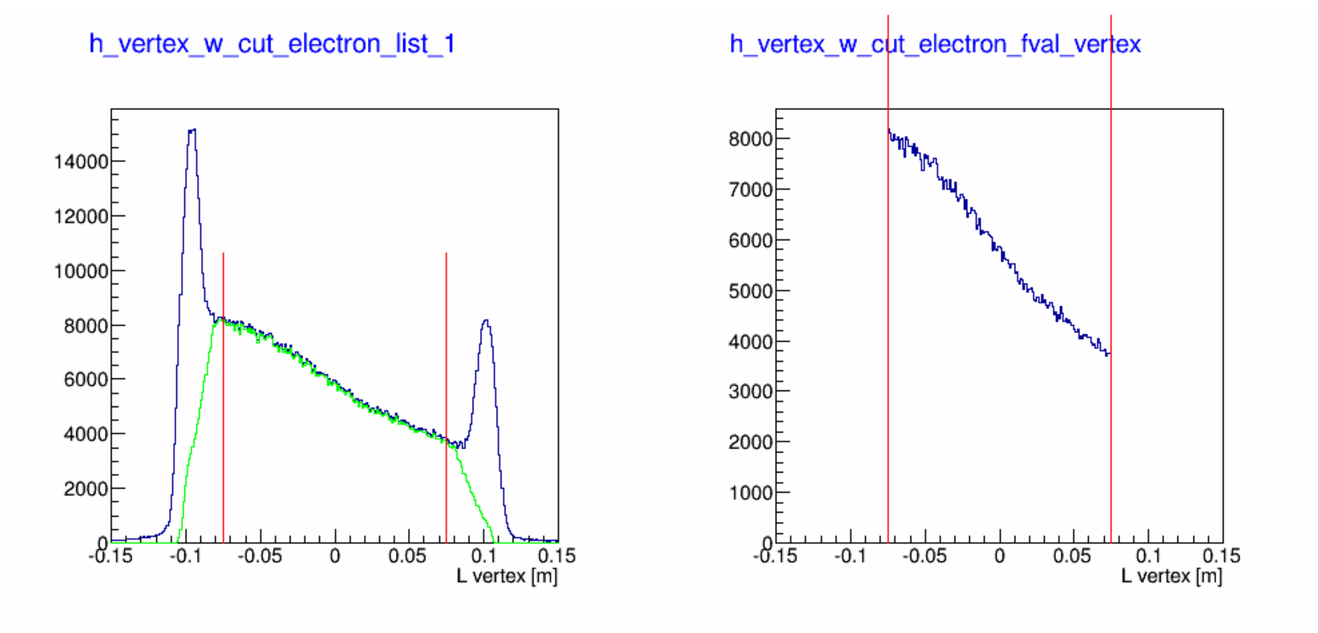


Figure C_3: before/after vertex cut (|rpl.z|<=7.5 cm) in cut #1,#2 & #3

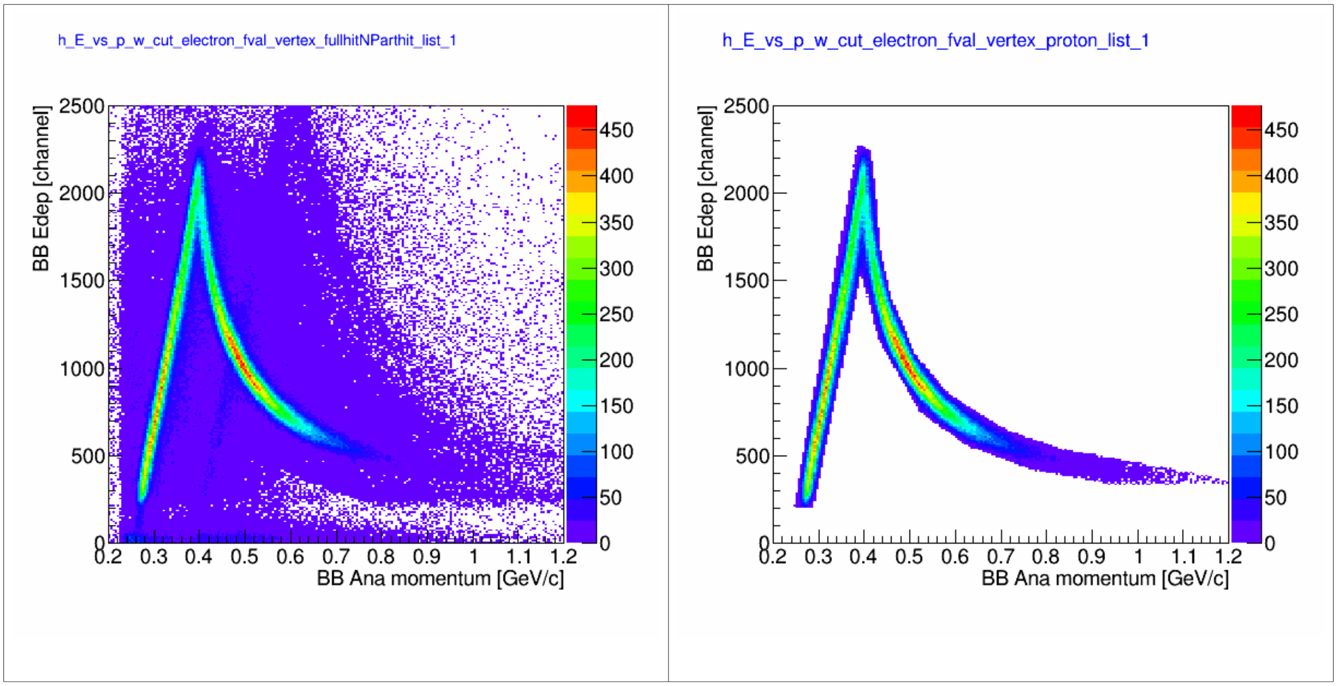


Figure C_4: before/after proton PID in cut #1,#2,#3,#4 & #5
Left: fullhit N parthit
Right: with protonPID

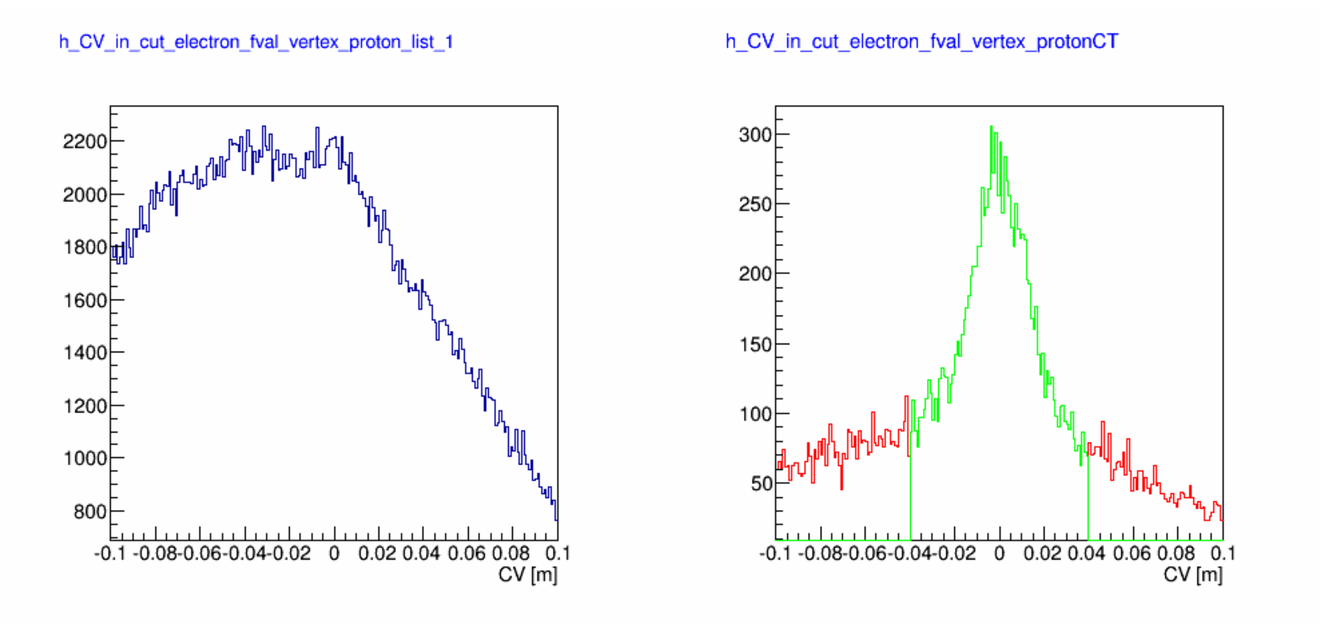


Figure C_5: coincidence vertex
Left: CV in cut #1,#2,#3,#4 & #5,&#6
Right: CV before/after in cut #1,#2,#3,#4 & #5,#6 &#8

Consider the Raw cross section

$$= \frac{N\_pass\_cut/(dOmega\_e*dE\_e*dOmega\_p*dmomentum\_p)}{N\_electron\_Target\_area\_number\_density}$$

where
Target_area_number_density = (Target density)*(target Length)*(N_A)/(A_z)
N_electron = (Total charge)/(Electron charge)

N_electron_Target_area_number_density = (Target density)*(target Length)*(N_A)/(A_z)*(Total charge)/(Electron charge)

N_A = 6.02e23 atom/mol, A_z = 4 g/mol, 1 barn = 1e24 cm^2
electron charge :1.6e-19 C/electron

Calculation Table

	Parameter	Unit	Kin 12 value
1.	Target density d_loss at 4 uA = 1.2%	g/cm^3	33.834 * 10^-3
2.	Target Length	cm	15
3.	Total Charge	C	2.27381
4.	**N_pass_cut from CT (all cut are listed in the first page)**	**entries**	**(peak)-(bg) = 42028(+/- 0.49%) -16023 (+/-0.8%) =26005 (+/- 0.8%) entries** with original cuts before the propose cut to get access to dOmega_e and dOmega_p
5	Target area number density= (Target density)*(target Length)*(N_A)/(A_z)	Atom/cm^2 or atom/barn	7.638e22 atom/cm^2 7.638e-2 atom/barn
6	N_electron= (Total charge)/ (Electron charge)	electron	1.421e+19
7	N_electron_target_area_number_density	electron*atom/barn	1.085e+18

** using the background from the the fit and then scale the background distribution

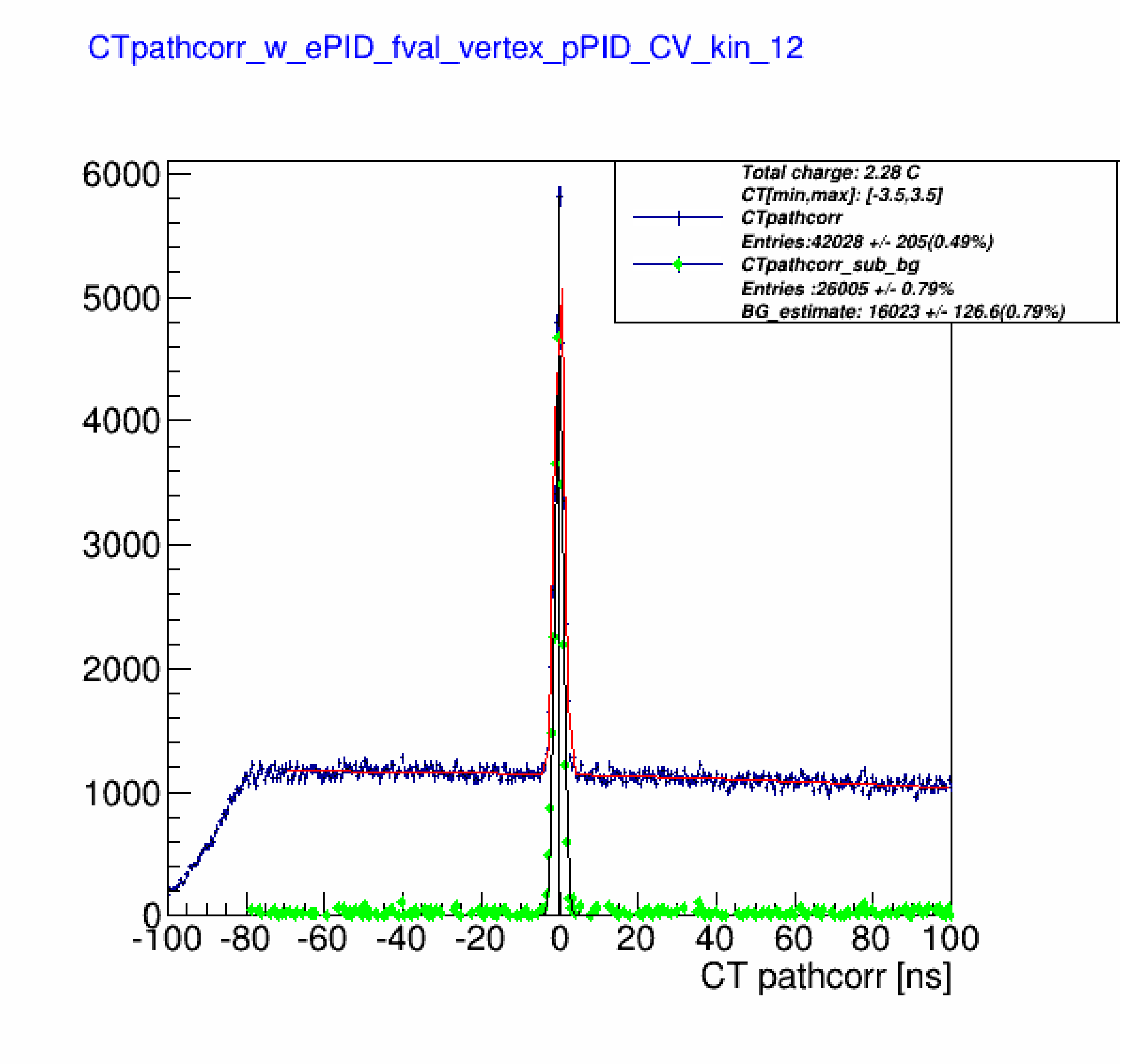


Figure B_1 : CT pathcorr with all cuts: e-pid,fval>=0,|vertex|<=7.5 cm, p-pid, coincidence vertex cut

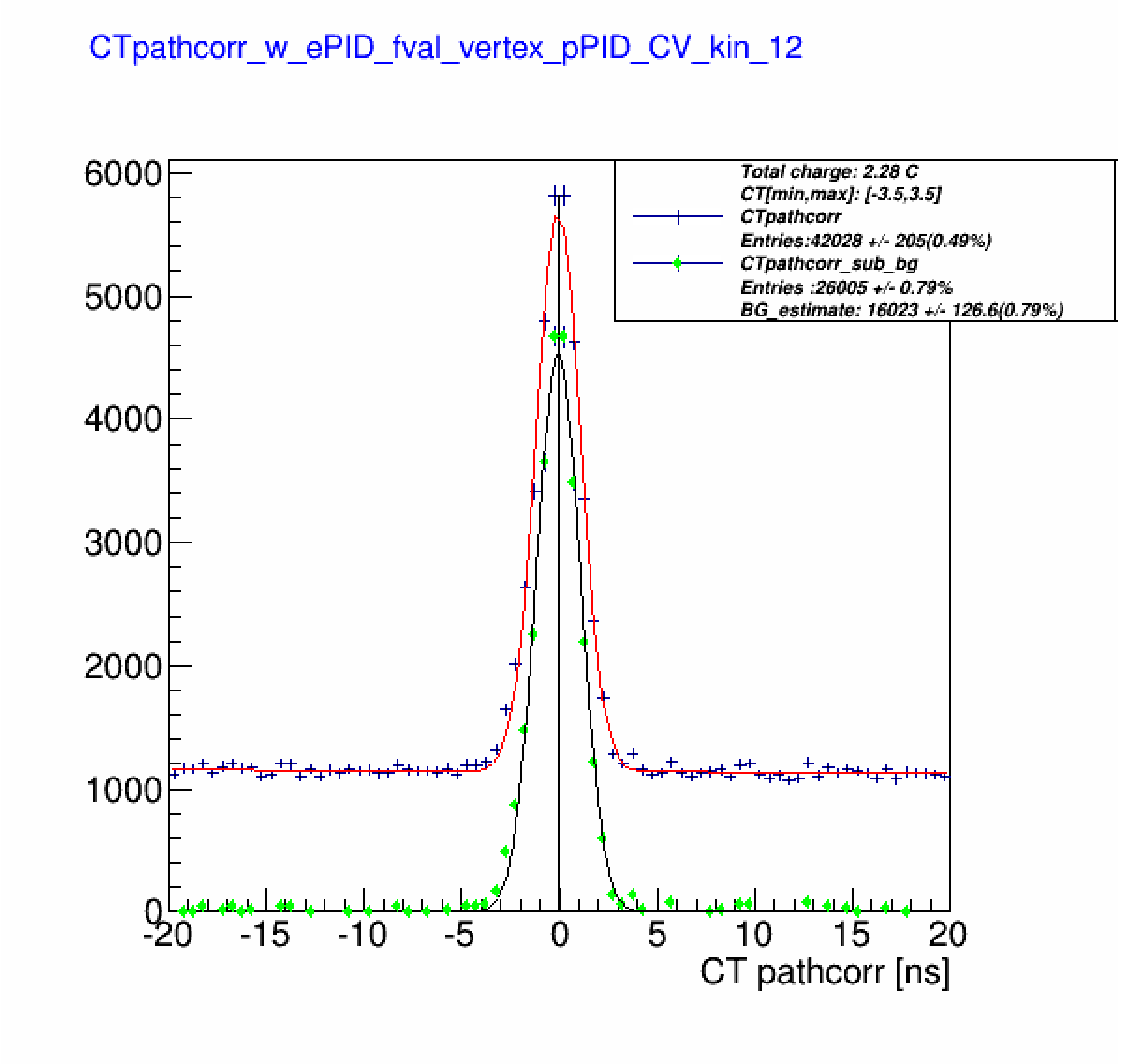


Figure B_2 :(Zoom) CT pathcorr with all cuts: e-pid,fval>=0,|vertex|<=7.5 cm, p-pid, coincidence vertex cut

But the previous cut did not give a well define dOmega_e or dOmega_p.
So I do need to make additional cut in that respected.

Now to get the cross section I need to get the result with all the cuts and all data.

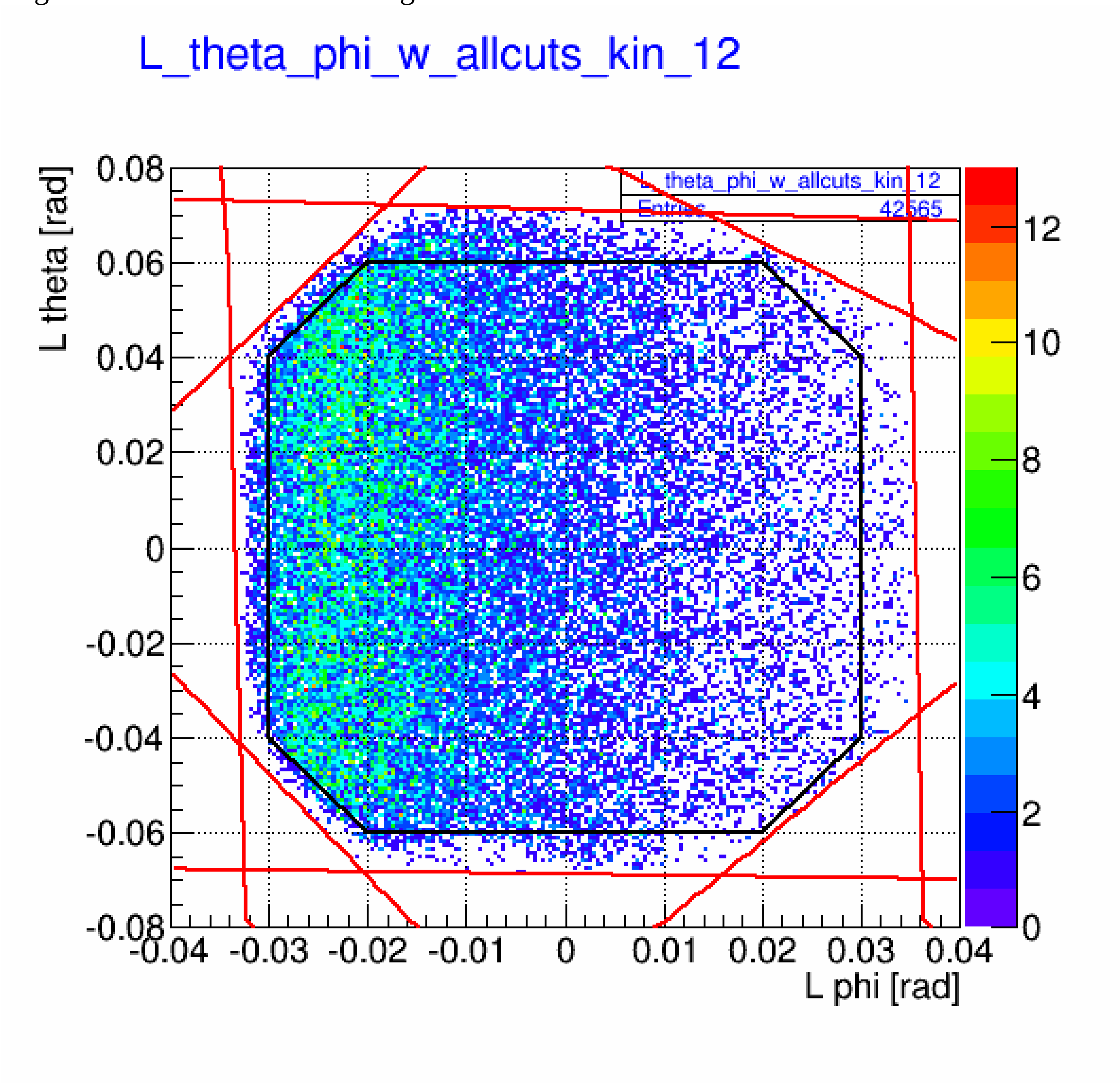


Figure A_1.1: d_theta*d_phi of electron to get dOmega_e with all the cuts
all red-line cuts come from the r-function.
This clearly shown that the area get smaller with the other cuts in BigBite.
The new Cut that I impose are in **black-line.**

Note: d^2 Omega_e = sin(theta_0)*d_theta*d_phi

Add 1D for theta and phi*

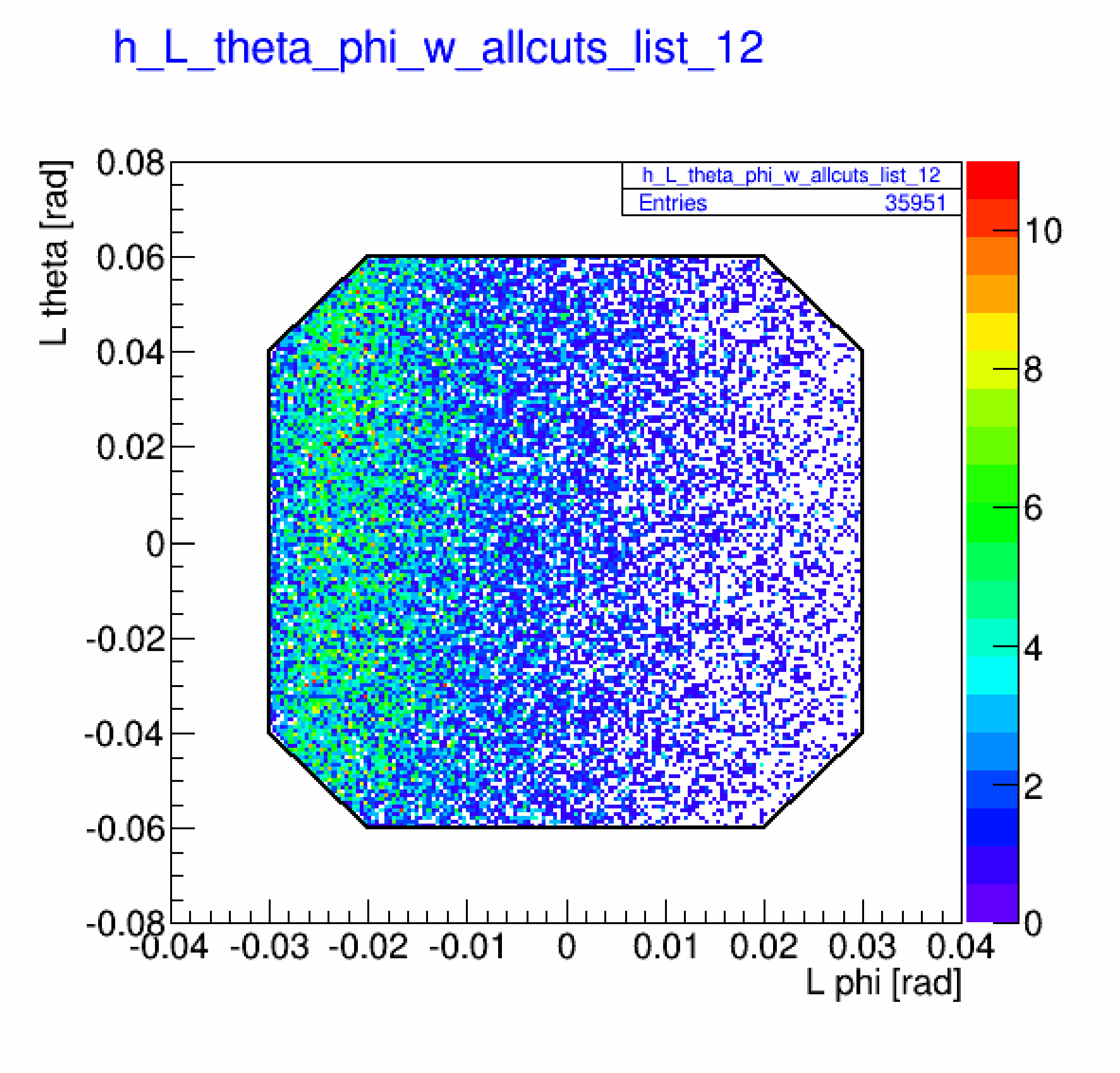


Figure A_1.2: d_theta*d_phi of electron to get dOmega_e

where

*dtheta*dphi = box-4*conner*

*=(theta: 2*0.06)*(phi:2*0.03) - 4*1/2*(theta:0.06-0.04)*(phi:0.03-0.02)*

=7.2e-3 – 0.4e-3 rad^2

=6.8e-3 rad^2

so dOmega_electron

*= sin(20.3)*dtheta*dphi*

=2.359e-3 srad.

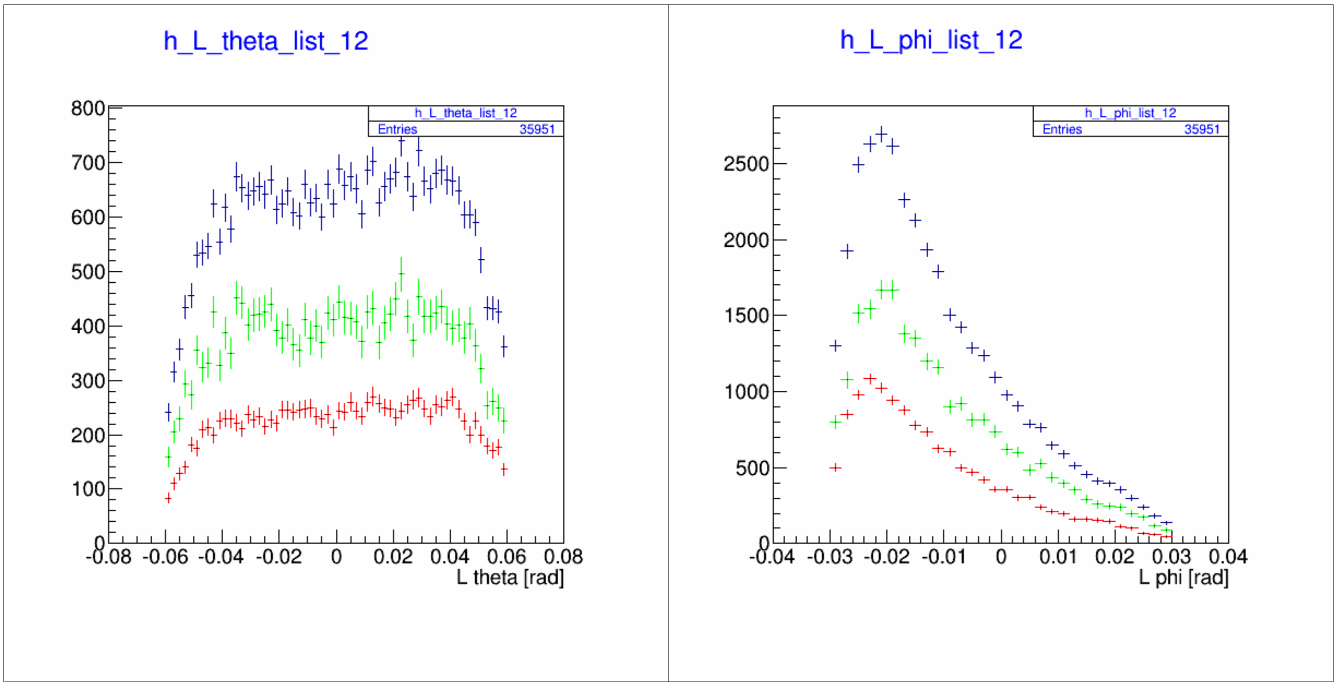


Figure A_1.3: L theta, L phi distribution with the cut in theta vs phi

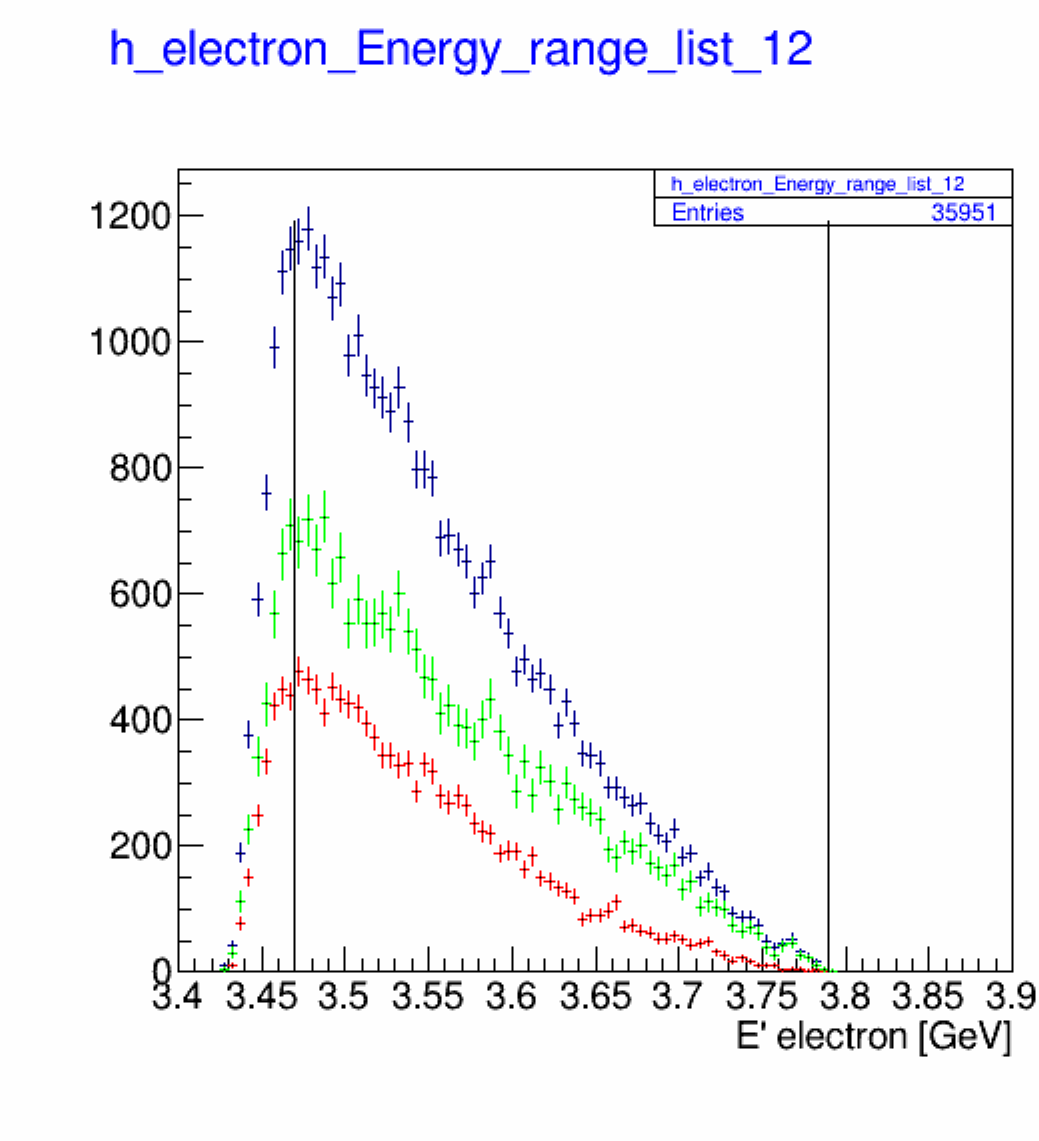


Figure A_2. dE'_e with the cut in d_theta*d_phi in previous page
Option cuts:

The cut on the left should cut out the acceptance dependent.: 3.47 GeV
The cut on the right side is kept as much as possible to get the high momentum tail: 3.79 GeV

dE'_e = 0.32 GeV

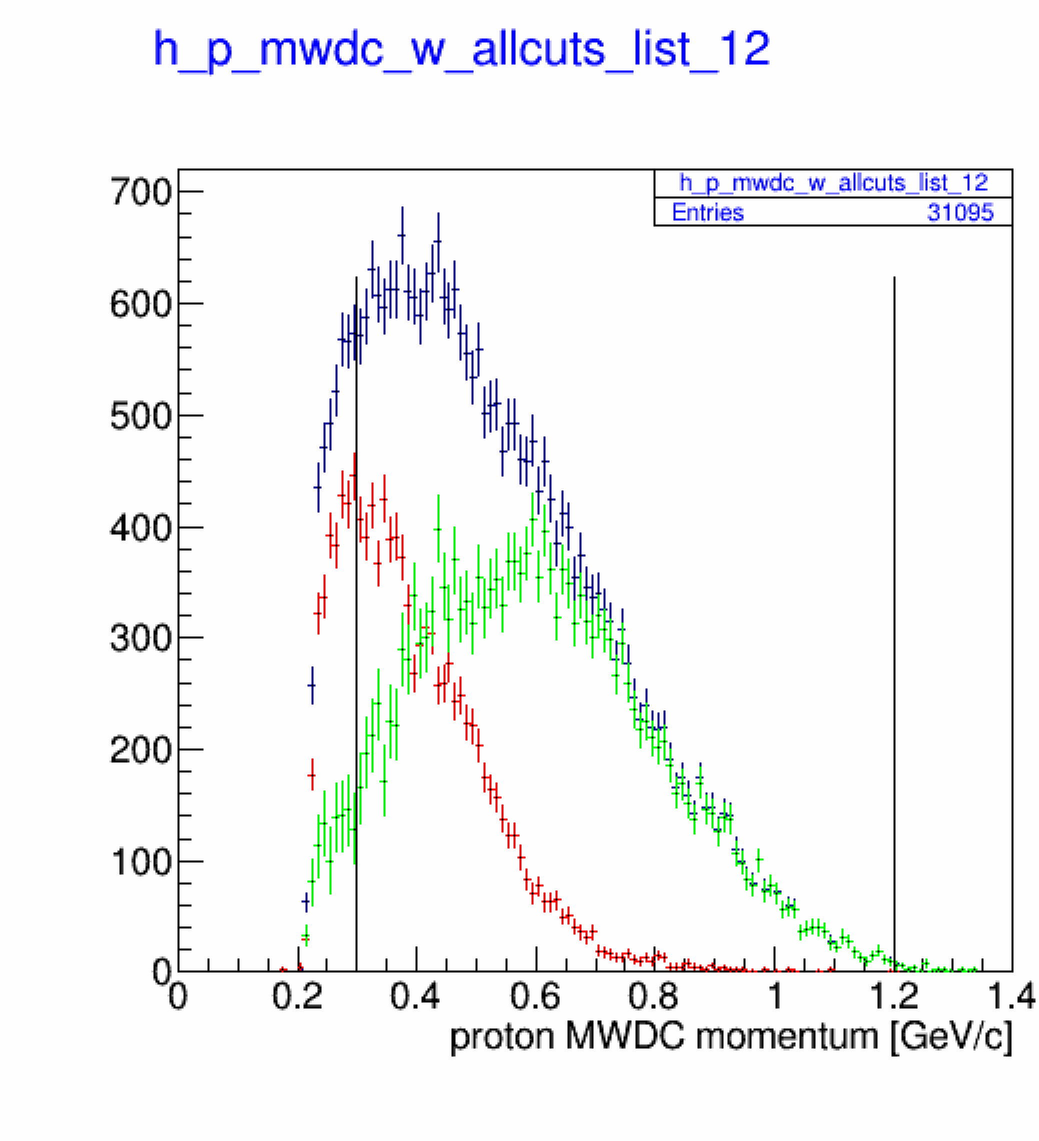


Figure A_3: d_momentum_p after d_theta*d_phi and dE'_e.

The cut on the left should cut out the acceptance dependent.: 0.3 GeV/c
The cut on the right side is kept as much as possible to get the high momentum tail: 1.2 GeV/c

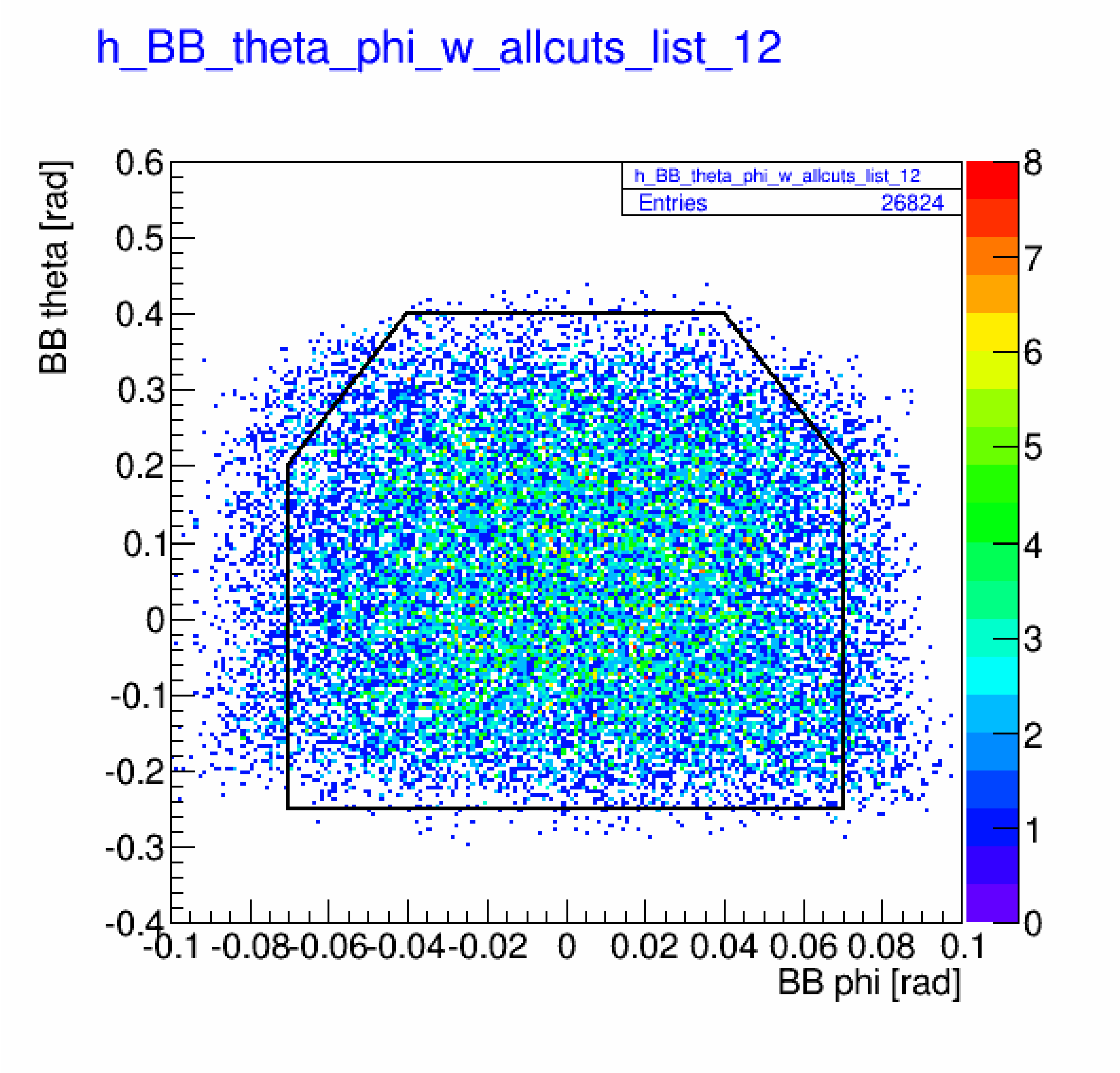


Figure A_4.1: dtheta_p*dphi_p
making additional cut to get dOmega_p

the cut on negative theta: make sure not cut the high momentum from theta

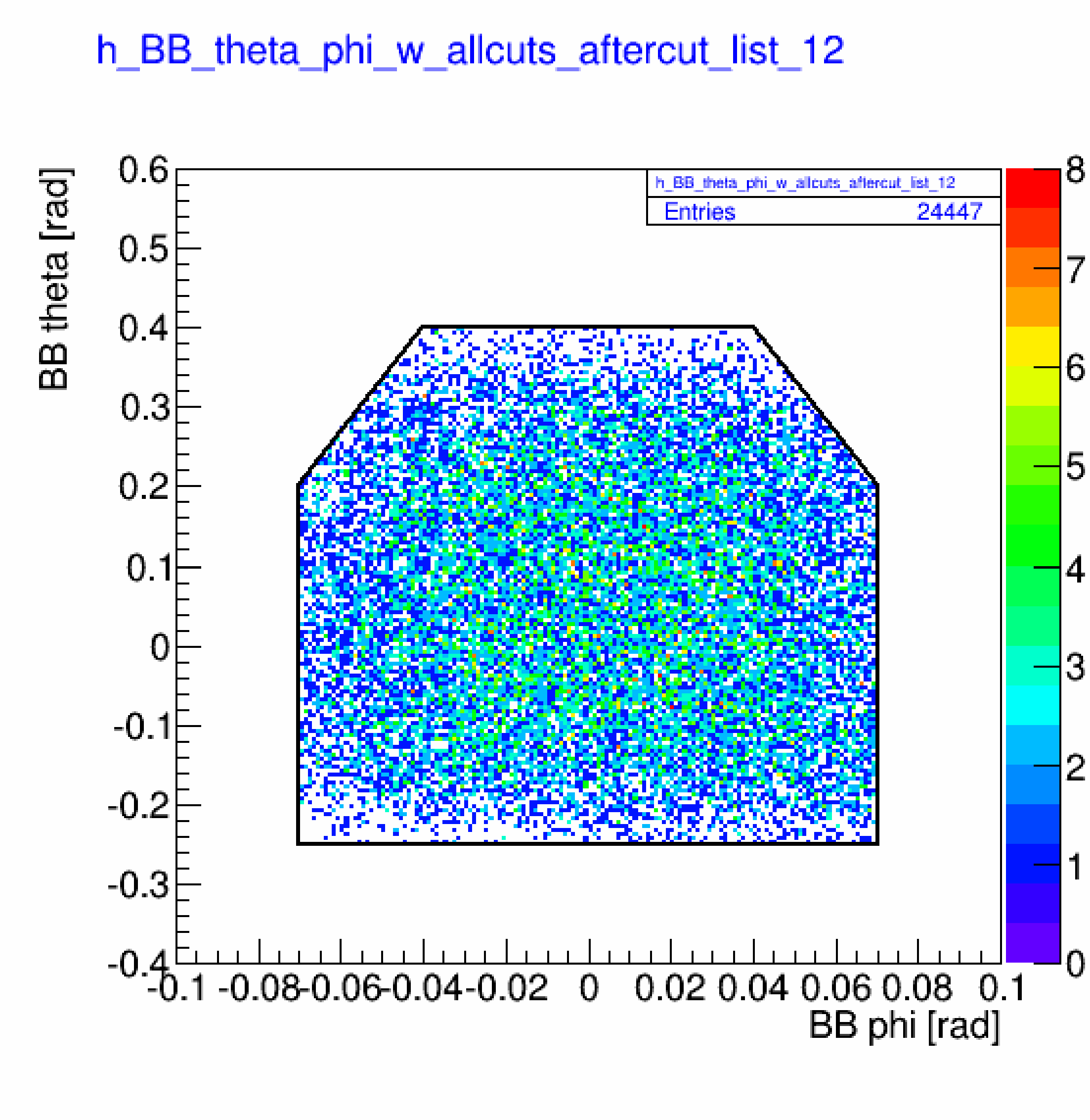


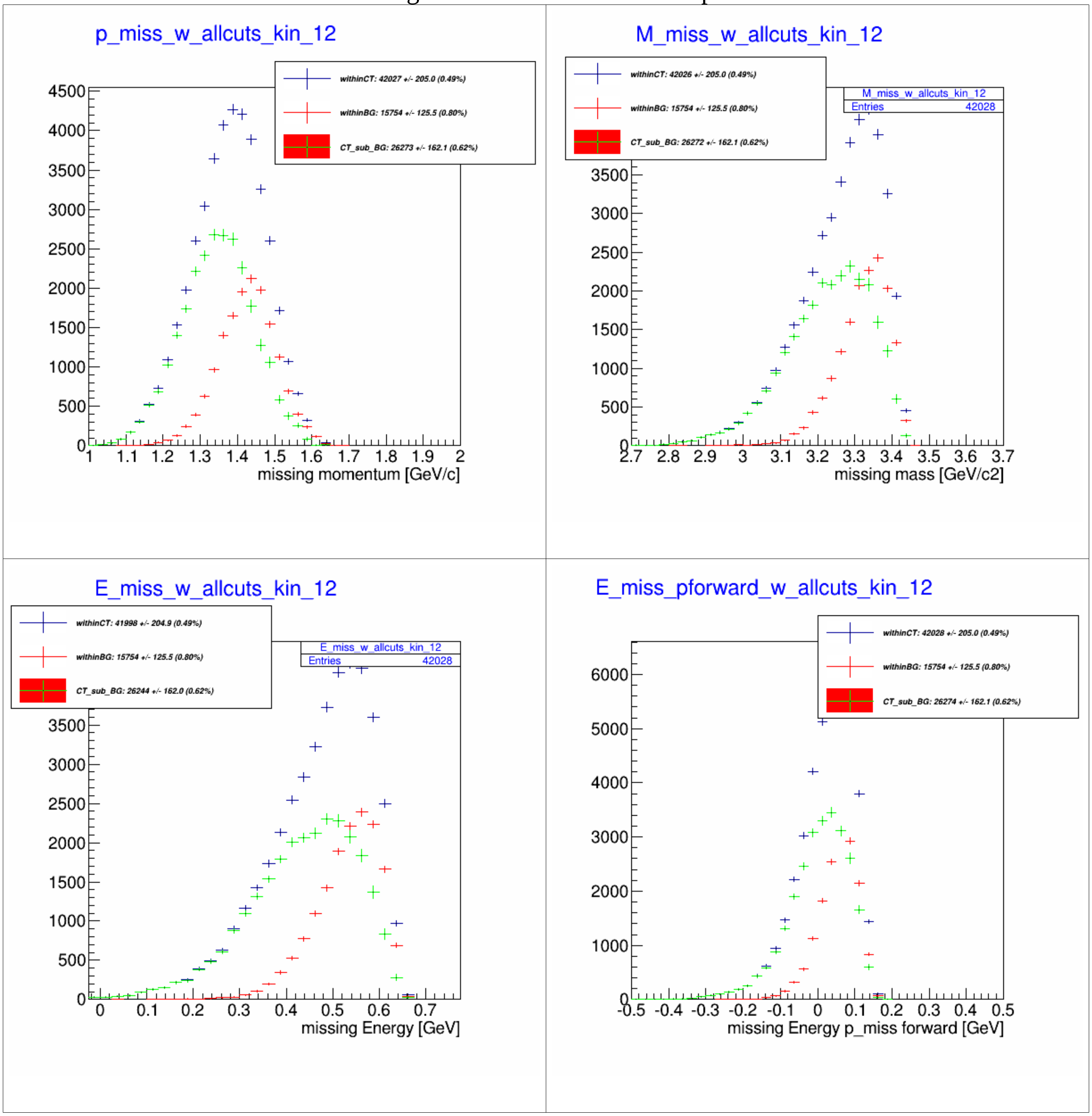
Figure A_4.2: dtheta_p*dphi_p
after cut.

With the additional cut the number of entries does change.

8	sin(L_angle) cos(L_angle)		Sin(20.3) = 0.3469 Cos(20.3) = 0.9379
9.	**d_E'_electron**	**GeV**	**3.47 to 3.79 GeV**
10.	sin(BB_angle) |cos(BB_angle)		Sin(97) = 0.9925 |cos(97)| = 0.1219
11.	**d_momentum_proton**	**GeV/c**	**from 0.3 to 1.2 GeV/c**

12	dOmega_electron =sin(L_angle)*d_theta *d_phi	srad	*Within the propose cut:* *dtheta*dphi =* *box-4*conner* *(theta: 2*0.06)*(phi:2*0.03)* *-4*1/2*(theta:0.06-0.04)*(phi:0.03-0.02)* *=7.2e-3 – 0.4e-3 rad^2* *=6.8e-3 rad^2* *dOmega_electron* *= sin(20.3)*dtheta*dphi* *=2.359e-3 srad.*
13	**dOmega_proton =sin(BB_angle)*d_th eta*d_phi**	**srad**	***Within the propose cut:*** *dtheta*dphi =* *box-2*conner* *=(0.4 + 0.2)*(2*0.08) – 2*1/2*(0.4-0.2)*(0.08-0.04)* *=8.8e-2 rad^2* ***dOmega_proton*** ***= sin(97)*dtheta*dphi*** ***= 8.74e-2 srad.***

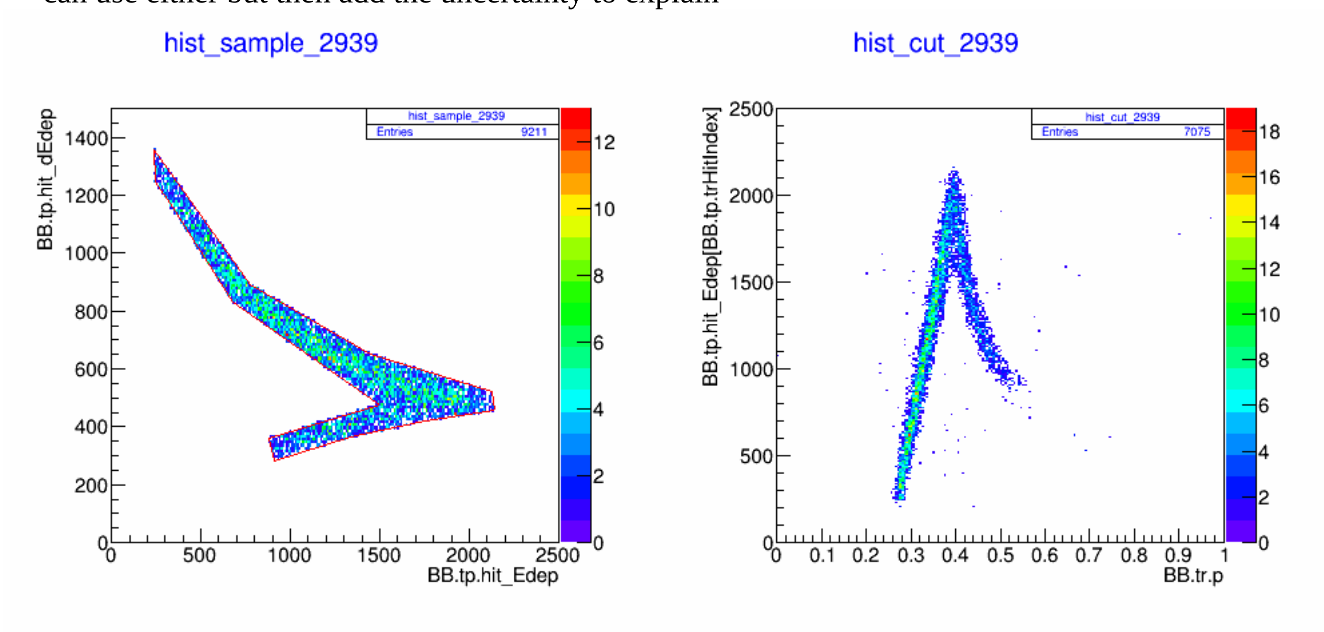
current distribution: without the dOmega cut for both electron and proton



2. other parameter needed.

2. Identify “flat” region for BB acceptance:XXXX
3. Identify “flat” region for LHRS acceptance:XXX
make sure that with all the cut the change in p-distribution not change
4. electronic dead-time factor***
check the computer deadtime this is not much differ than the online one

3. already have:
3.1 BB tracking efficiency:
Eff: 79.2% before the turning point in dE vs E (low p)
Eff: 72.2% after the turning point in dE vs E (high p)
over all Eff: 77.8%
** can use either but then add the uncertainty to explain



The **sample data** is within the rough coincidence time **<u>without</u>** 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.

Sensitivity***---> into the uncertainty not the correcting factor.
3.2 Effect/correction factor for making the electron PID??
3.2 Effect/correction factor for making the proton PID??
make sure not rejecting the proton.
3.3 correction factor for requiring a single track in LHRS
Eff: 99.4% has a single track