R_function

R-funciton is used to optimized the cut on HRS acceptance. i.e. selects maximum region of “flat” acceptance.

We consider parameters: y_tg, theta_tg,phi_tg and delta_p_tg.
x_tg is bounded by the beam raster which is very small.

Two components:
I. the Initial acceptance cuts:
give the boundary for which only data within the cut of two parameters are accepted.

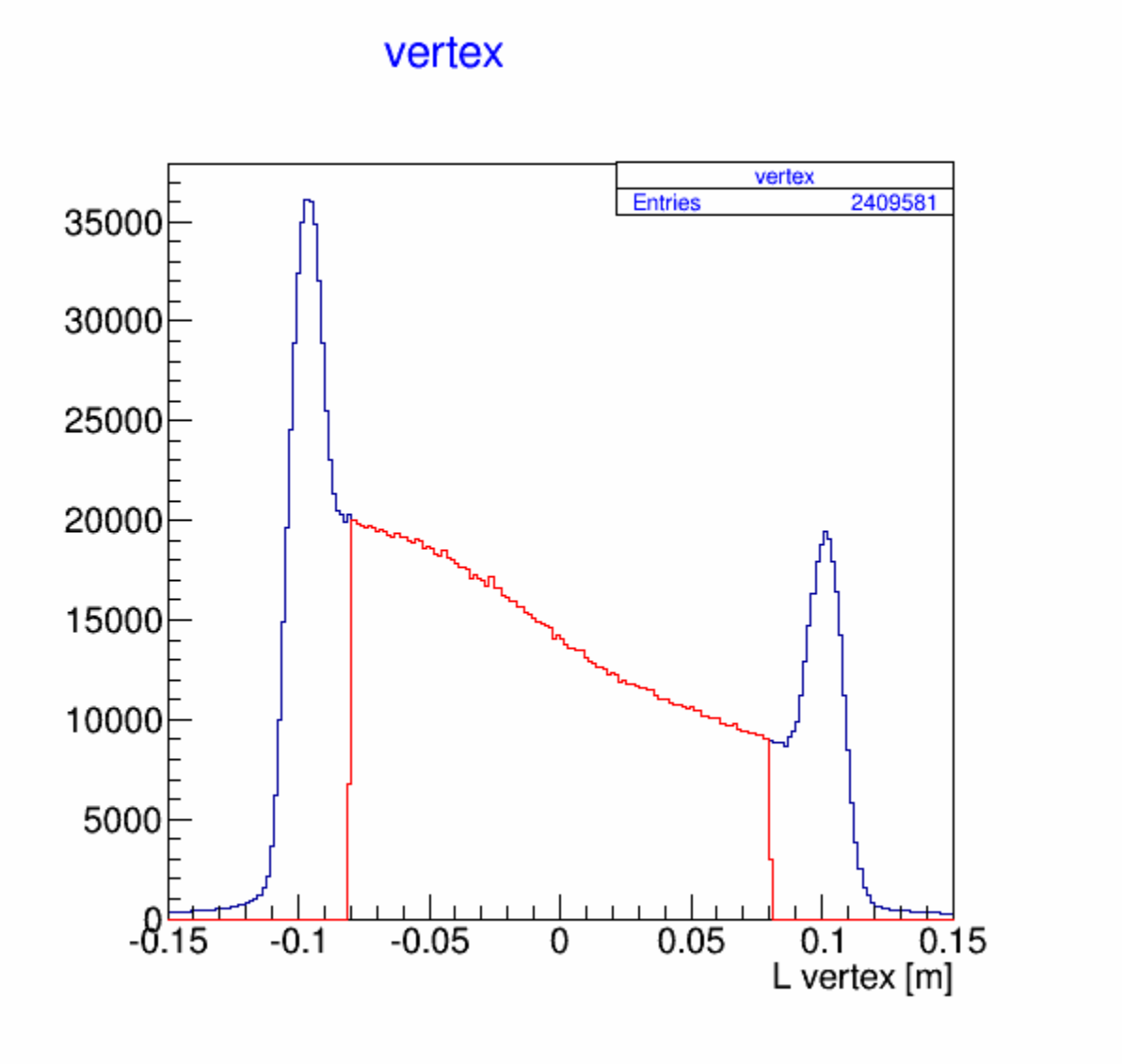
II. The calculation of f1 function
Let the mini-r-funtion call “prod” be
1. min(X,Y) or
2. X+Y-sqrt(X*X+Y*Y)

Let C_i be the function of all the line cuts.

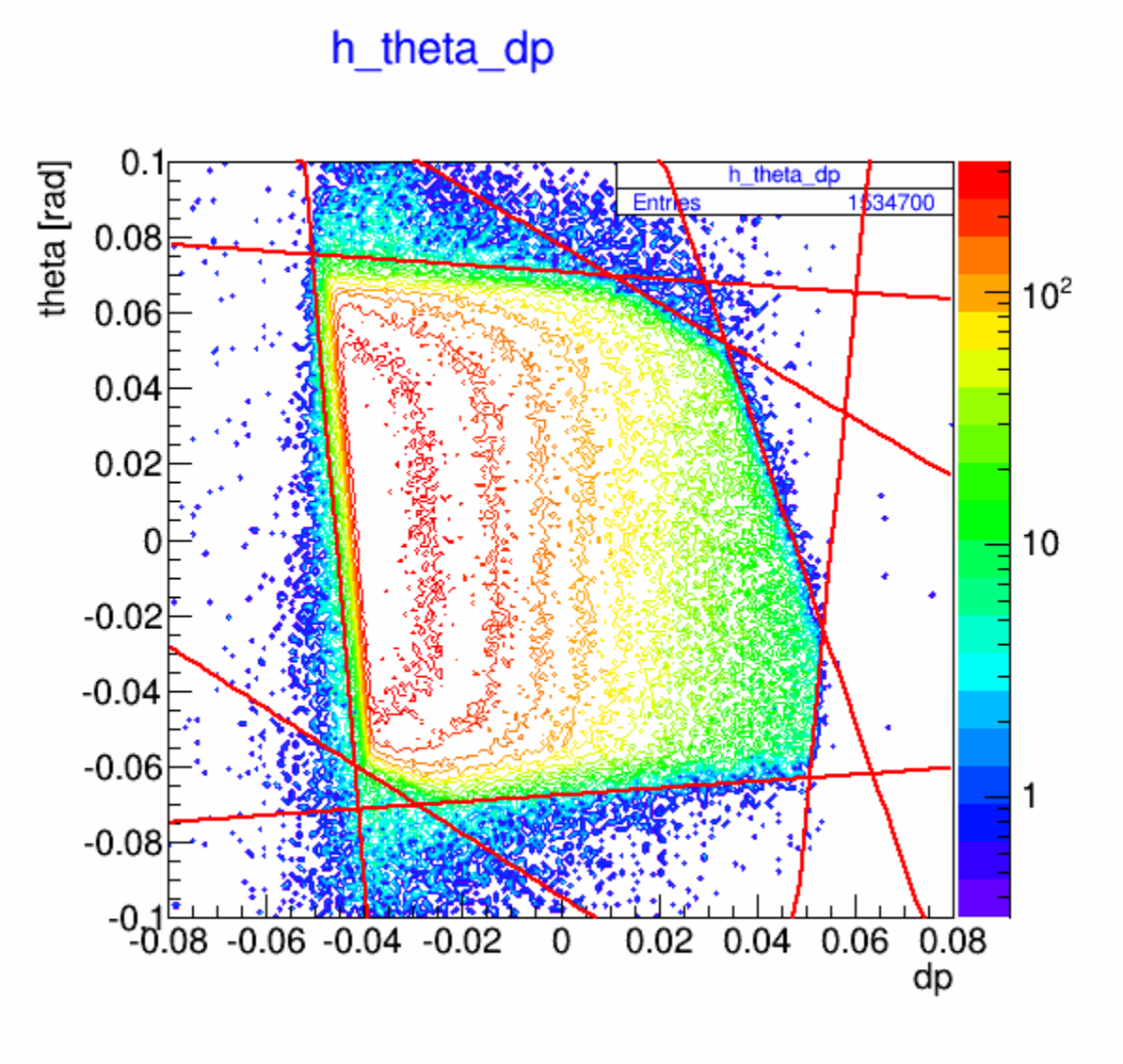
1. Start with identify the value of prod(prod(C_1,C_2) ,C_3) (from graph 1)
2. prod(C_10,C_11) (from graph 2)
and so on until the last value survise and it is call the f1

The selection of the f1 is on the other hand rely on some simulation but we can use what other people make a cut before at f1>0.001 or 0.002

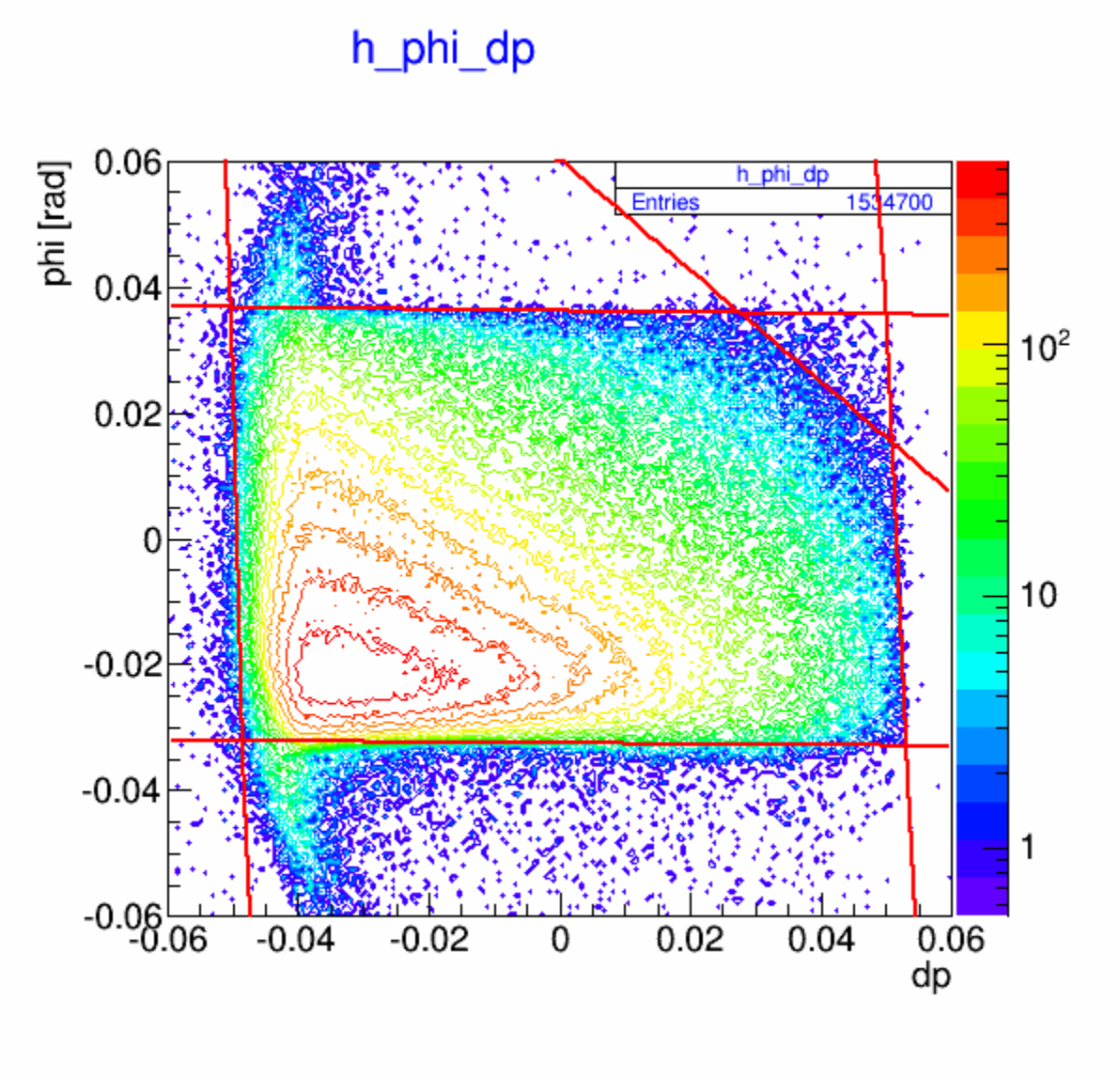
require as the event are electron from electron PID.
with additional requirement on |L.vertex| <=0.08 m.
*** add vertex cut figure.



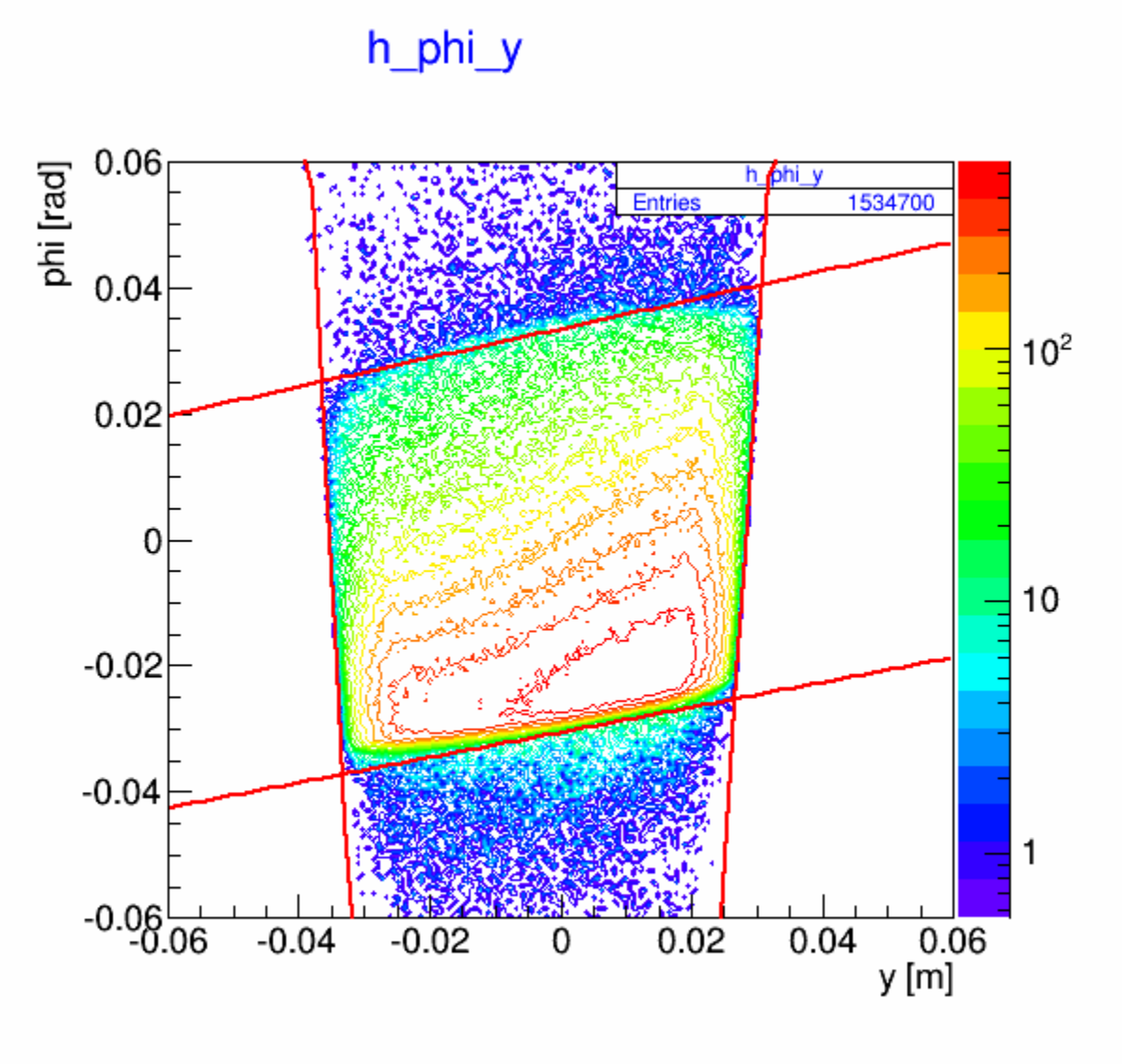
I0. vertex cut to eliminate the end caps.



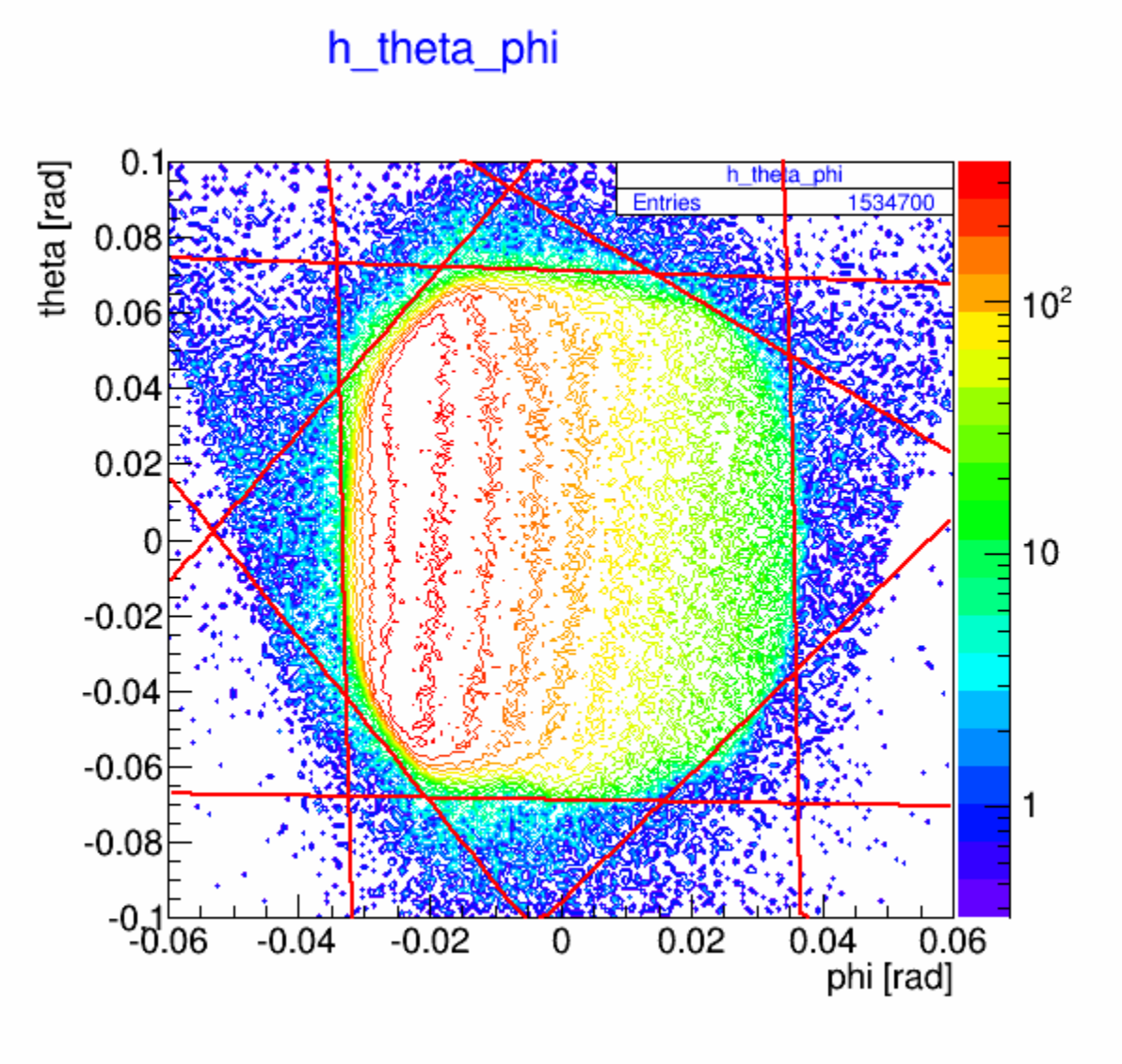
I1. Theta vs dp cut (still look the same with/without vertex cut)



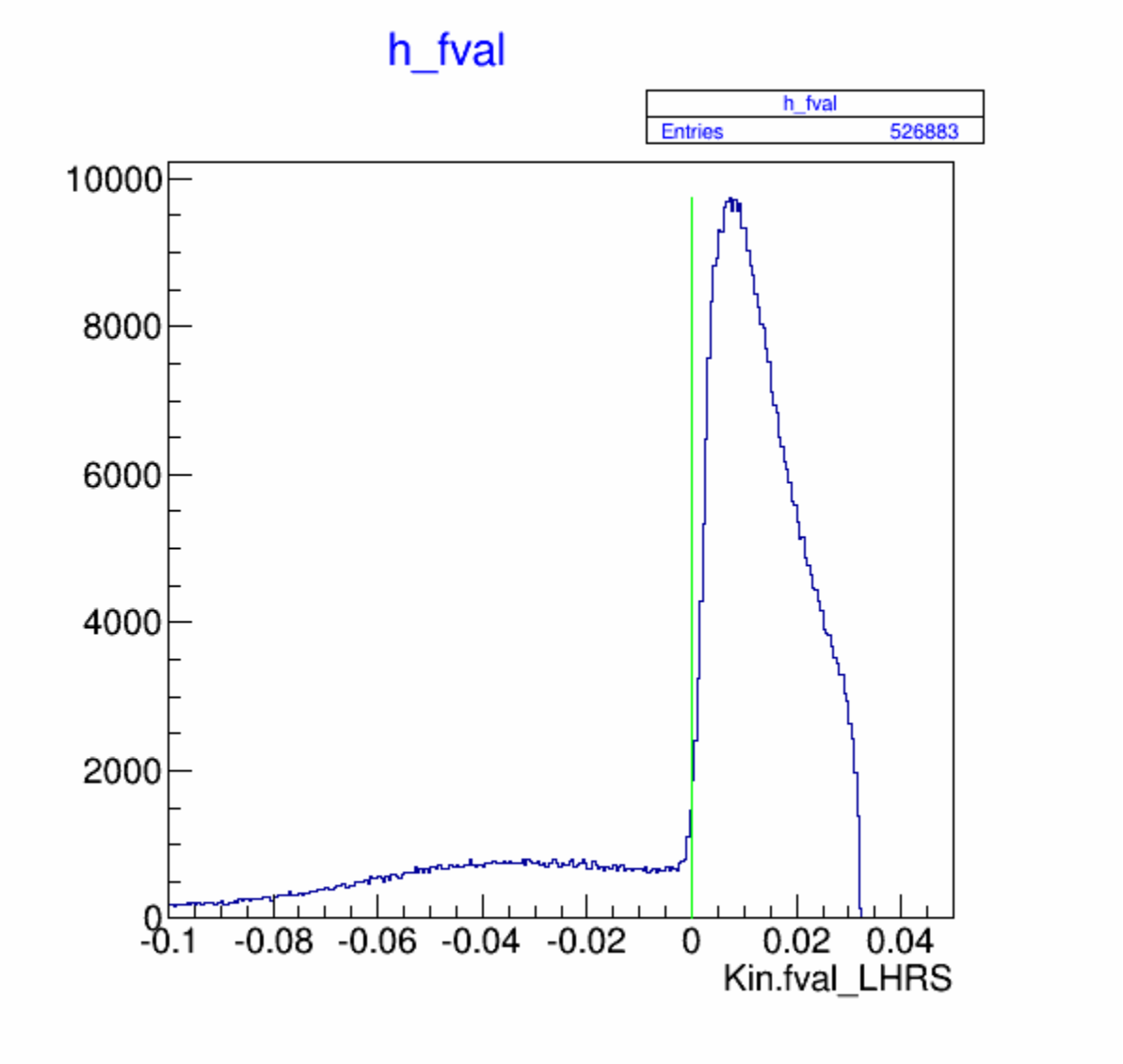
I2. phi and dp cut (still look the same with/without vertex cut)



I3. phi vs y cut change when the vertex cut were impost before making the initial cut.



I4. theta vs phi (still look the same with/without vertex cut)

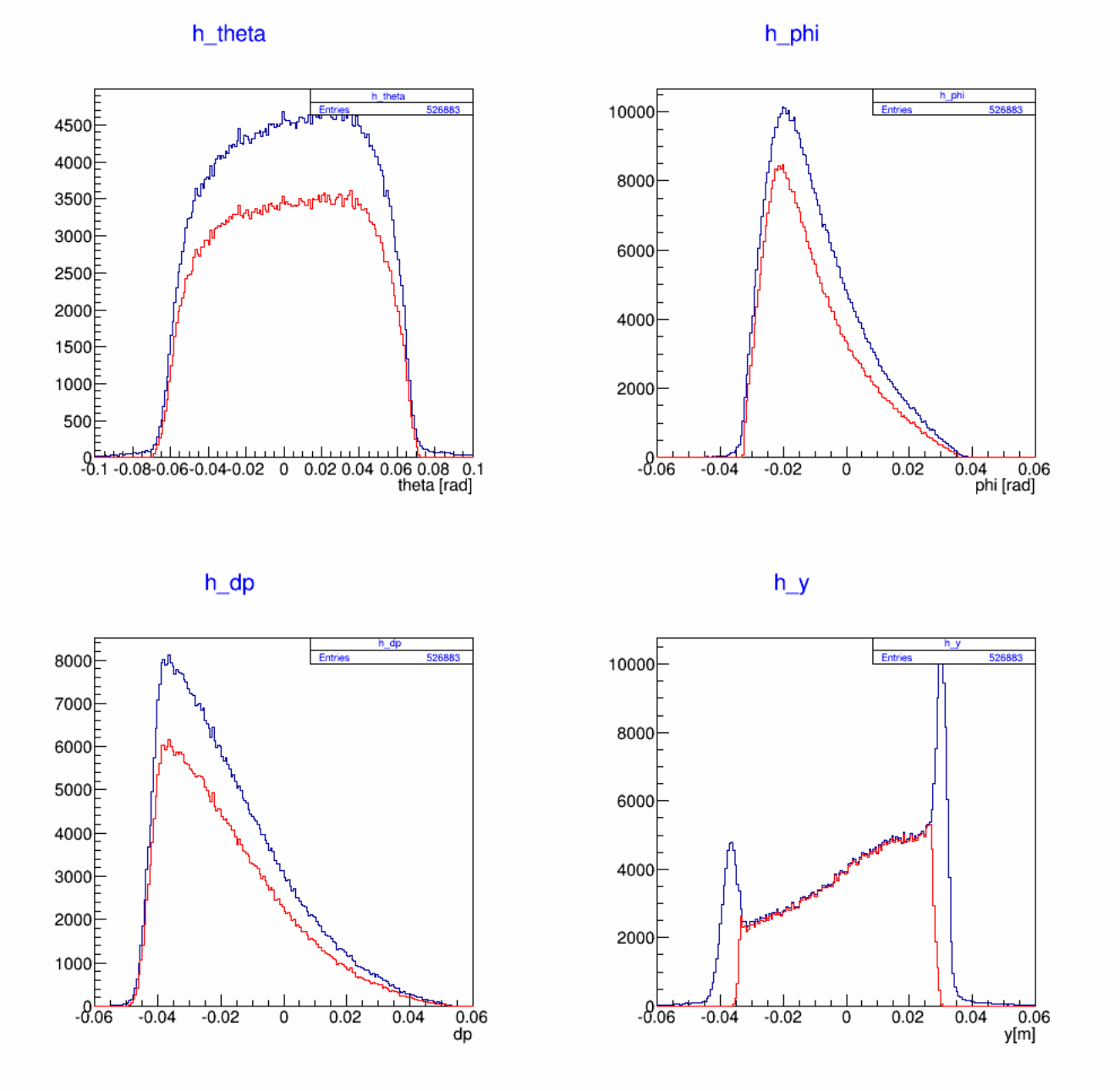


I5. the result of the r-fuction.

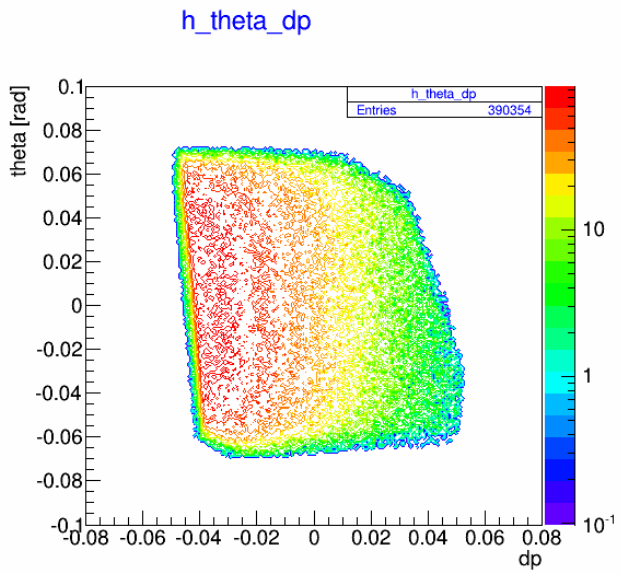
Let C_i be the function of all the intital line cuts such that it is **positive** if the value are within the interested area, **0** at the line, and **negative** outside the interested area.

Then using the min(C_i,C_j) for all j,i represent all the lines.
We have the final value as fval = min(C_i,C_j) for all j,i represent all the lines.

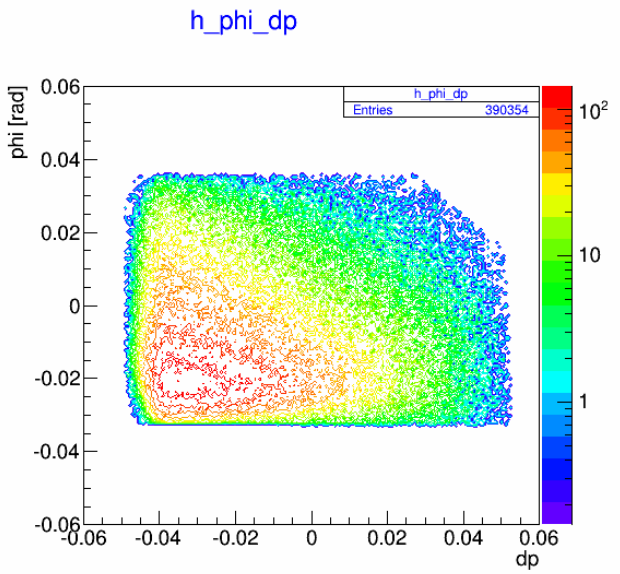
So for event with fval>=0, that event are within all the initial acceptance cuts in all 4 parameters combines.



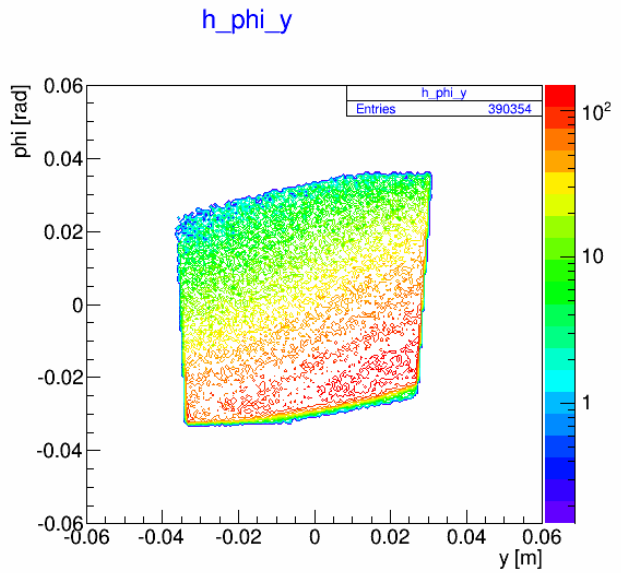
I5.1 theta, phi, dp, and y without fval cut (blue) and with fval>=0 cut (red).



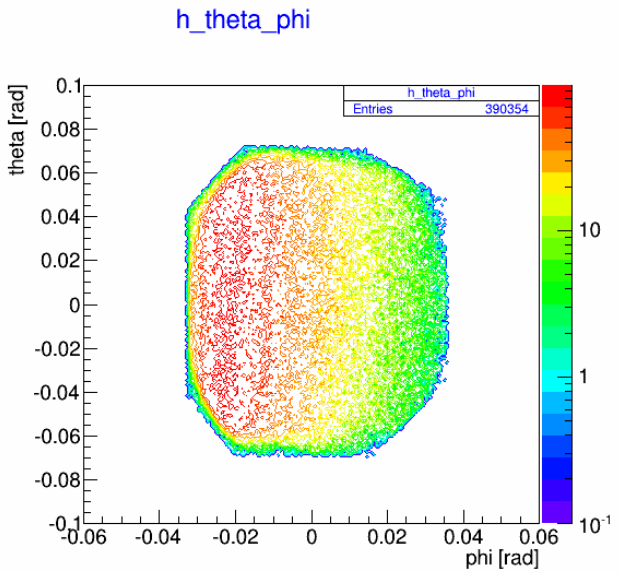
I6. Theta vs dp when required fval>=0



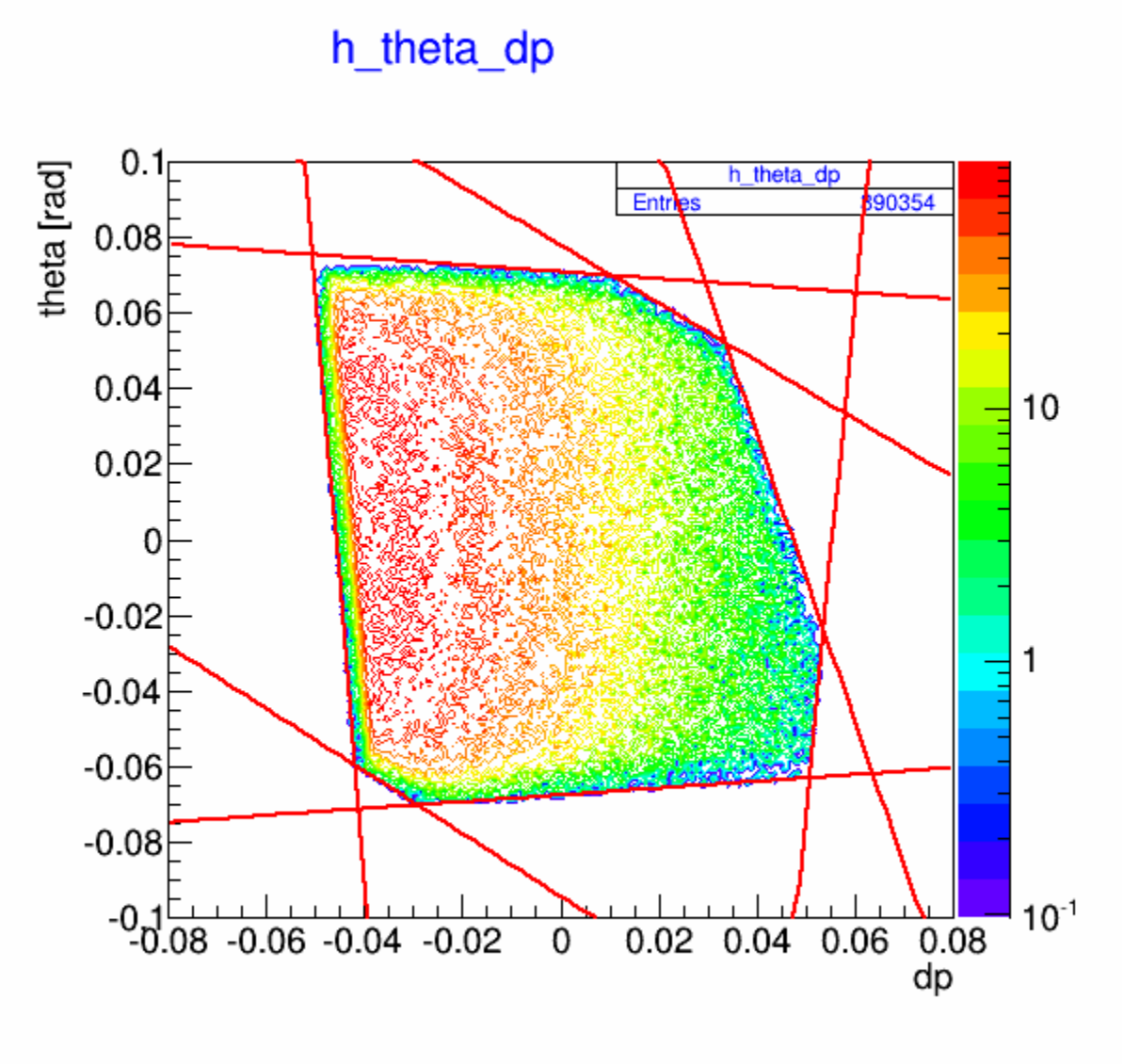
I7. phi vs dp when required fval>=0



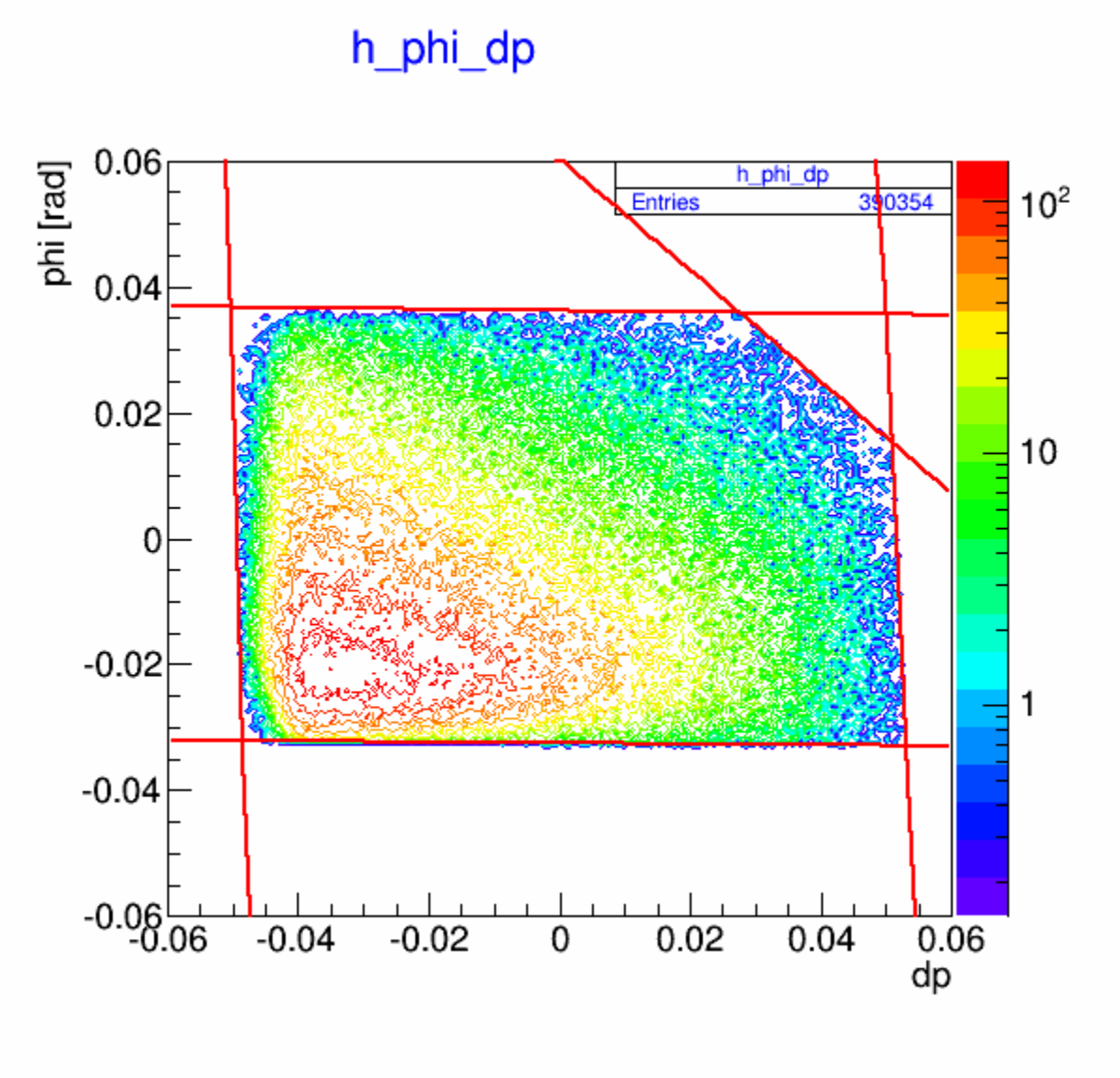
I8. phi vs y when required fval>=0



I9. Theta vs phi when required fval>=0

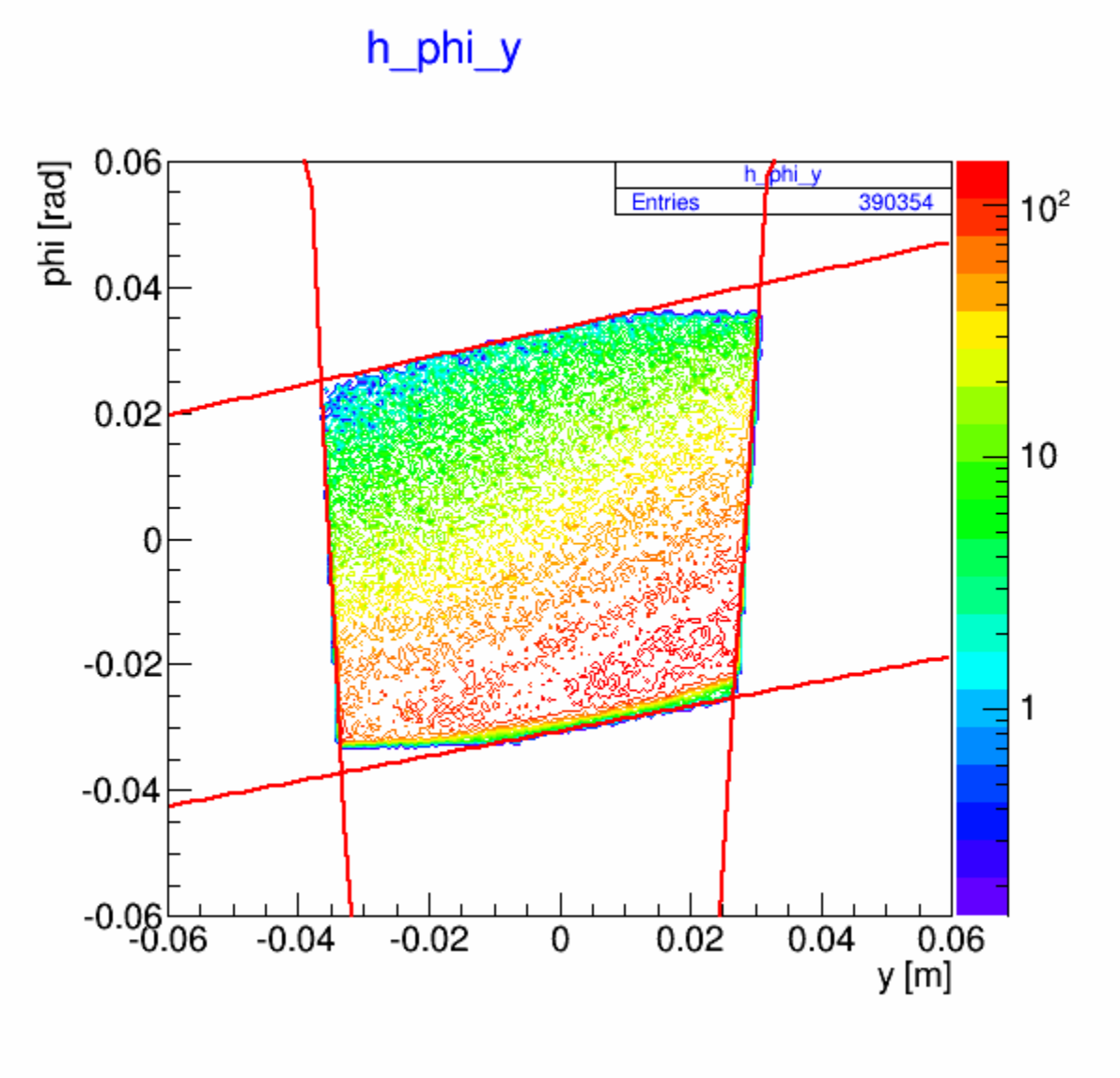


I6. Theta vs dp when required fval>=0 with the initial line cuts drawn.

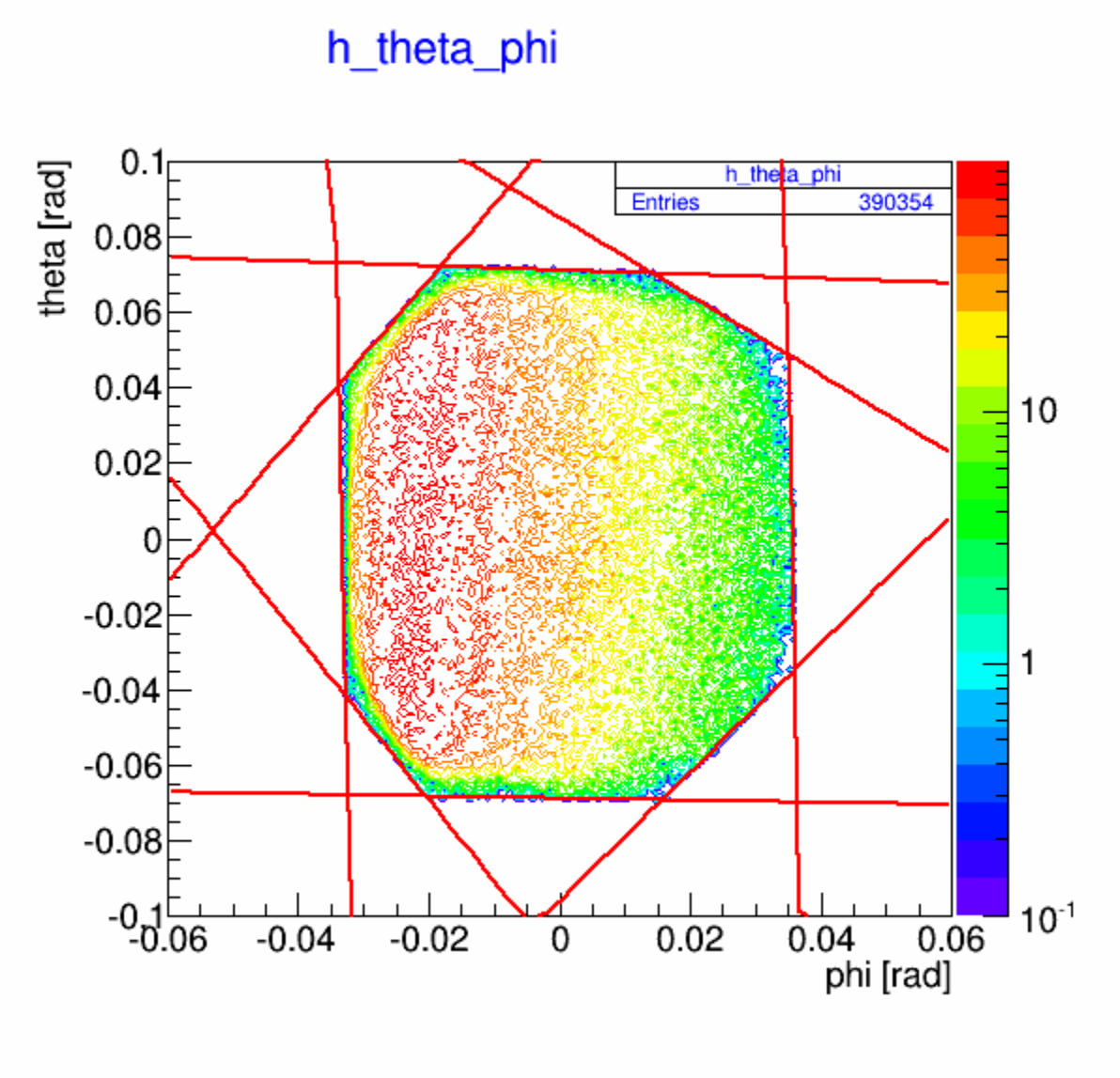


I7. phi vs dp when required fval>=0 with the initial line cuts drawn.

Tighten the conners.



I8. phi vs y when required fval>=0 with the initial line cuts drawn.



I9. theta vs phi when required fval>=0 with the initial line cuts drawn.