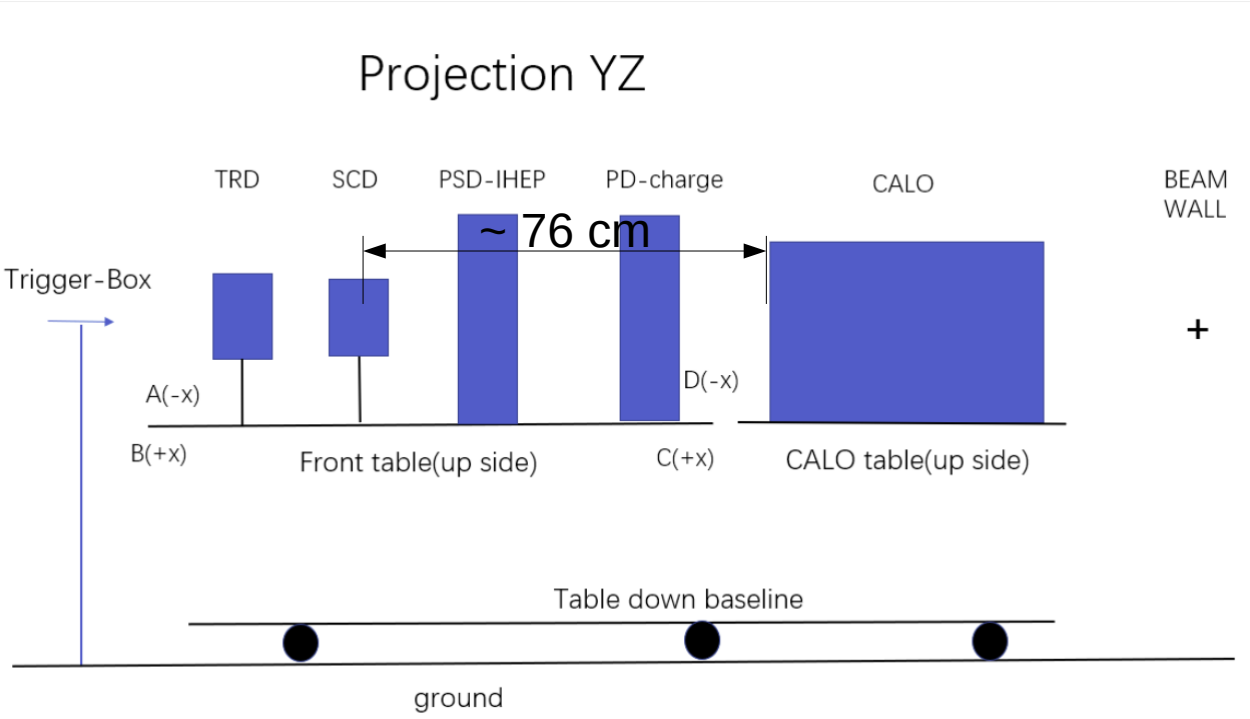
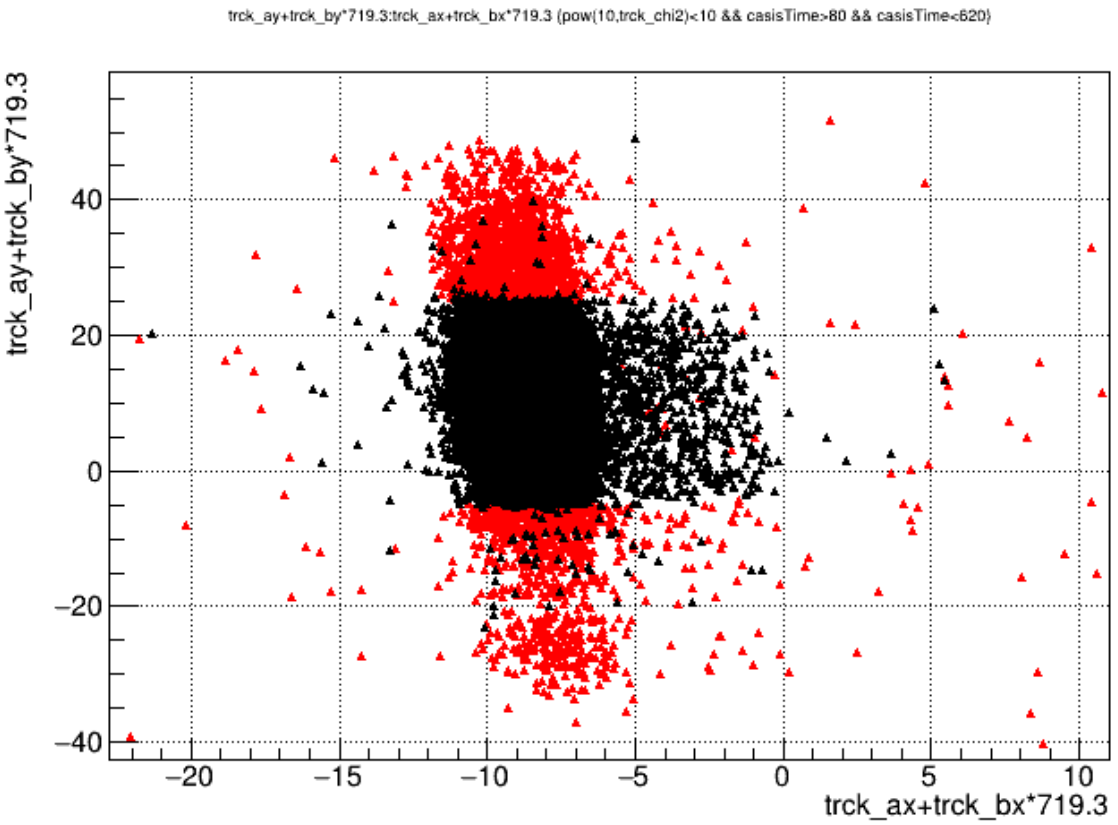
CALO – SCD alignment



Pietro Betti

PS-SPS2023 analysis meeting 12/03/2024

Beam Profile cube 0



All

First cube > 10 MIP

Cube coordinates y: (-5, 25) mm

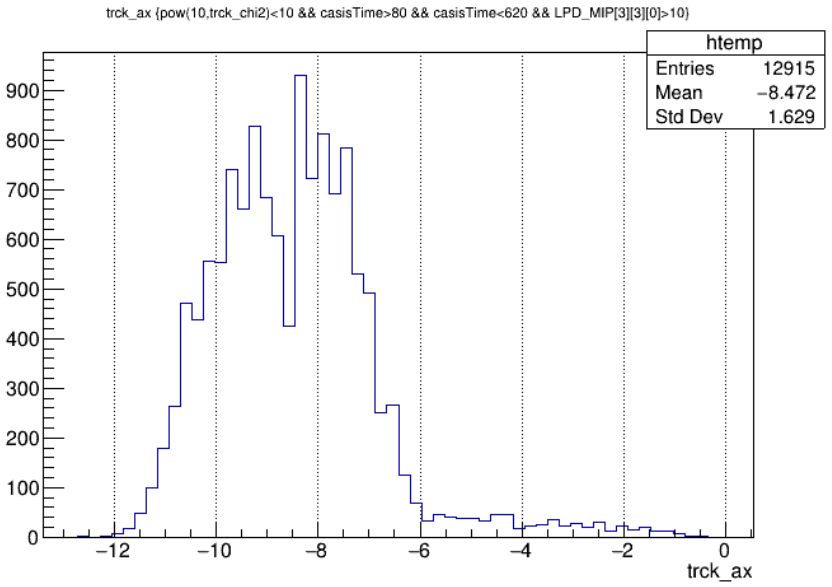
Cube center y: 10 mm

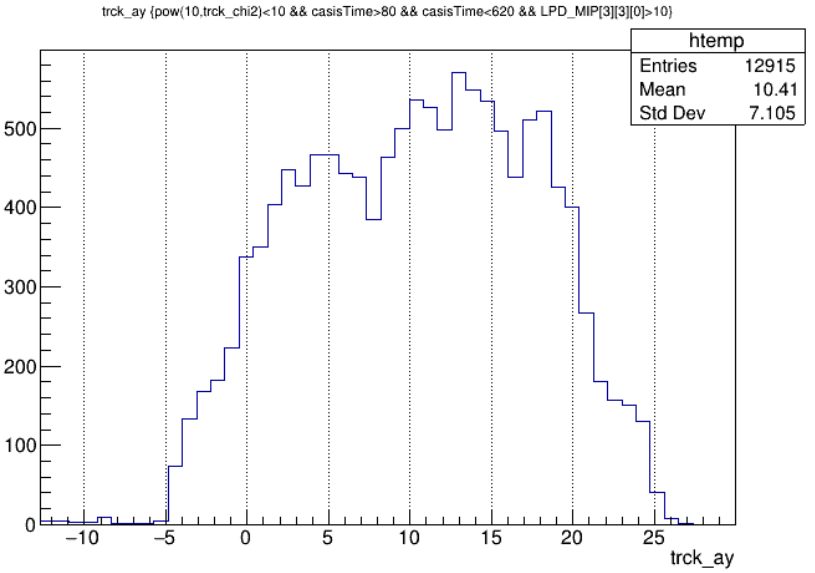
Beam narrow in x: no possible to delimit the cube

Beam coordinates x: (-12, -6) mm

Beam center x: -9 mm

Beam Profile SCD

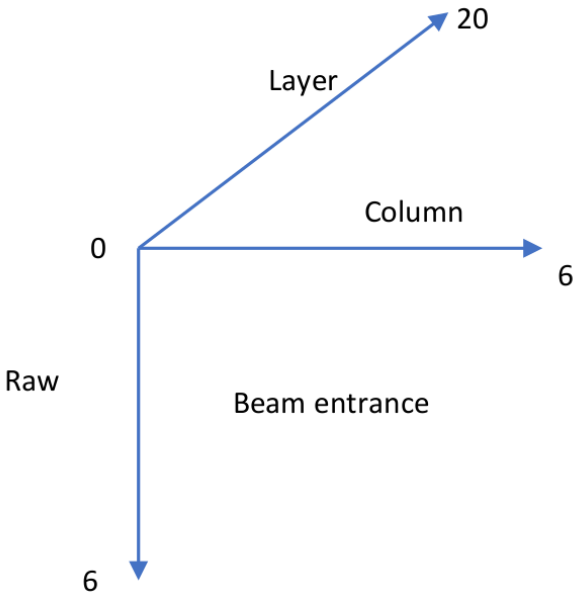


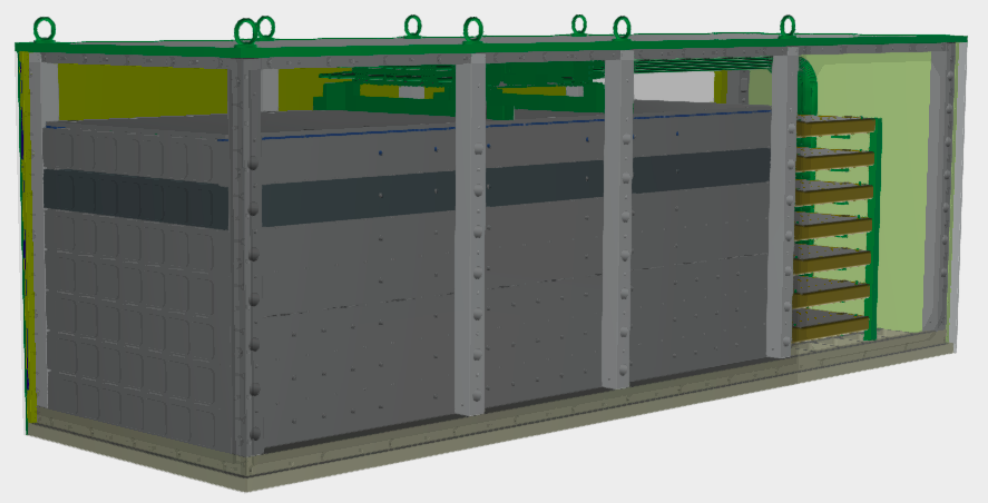


Tree->Draw("trck_ax","pow(10,trck_chi2)<10 && casisTime>80 && casisTime<620 && LPD_MIP[3][3][0]>10")

Method of Center of Gravity (CoG)

- Estimate the CoG of every layer of the calorimeter
- For alignment in x-direction

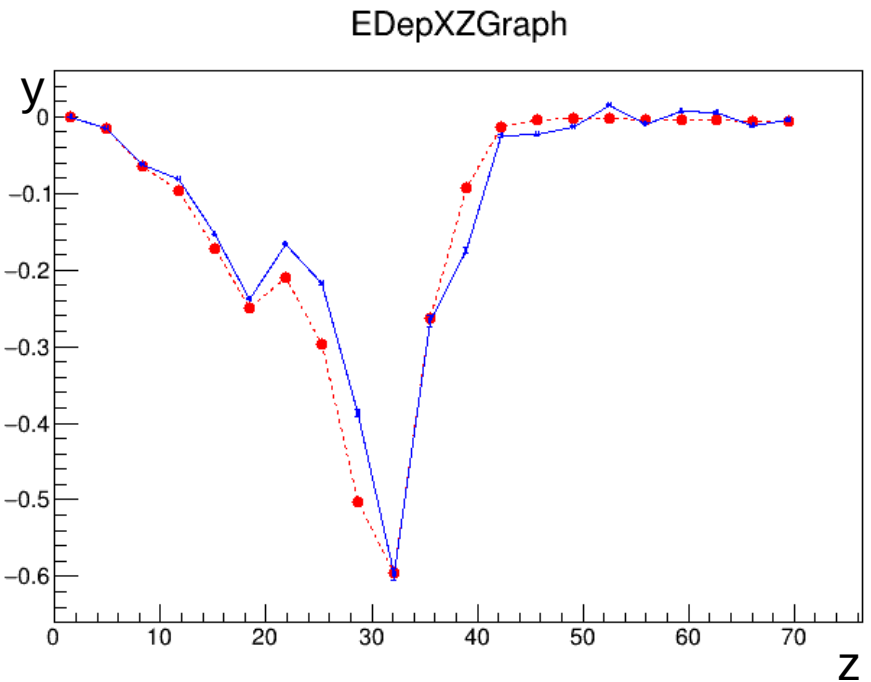




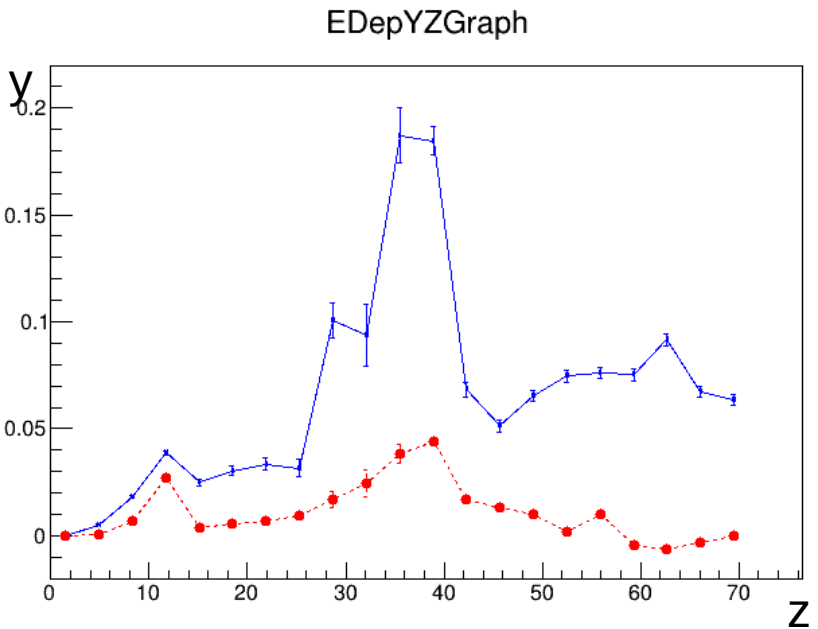
Run 302 250 GeV

i: crystals
j: coordinate

$$cog[j] = \frac{1}{E_{layer}} \cdot \sum_{crystals} E[i] \cdot x[j]$$



Data

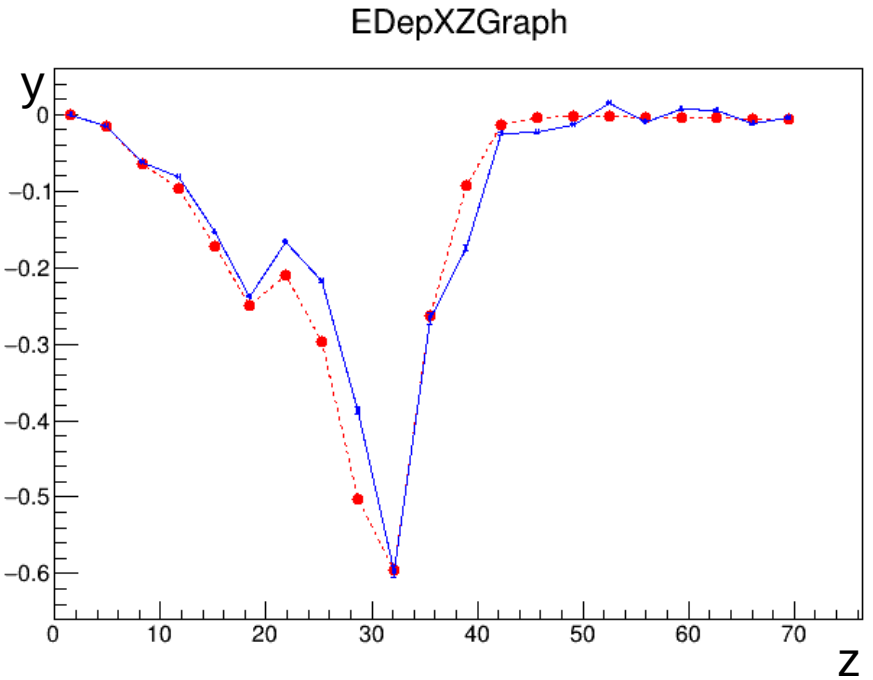


/home/pietro/PS-SPS-2023/analyzed/run_302.cogLayers.root

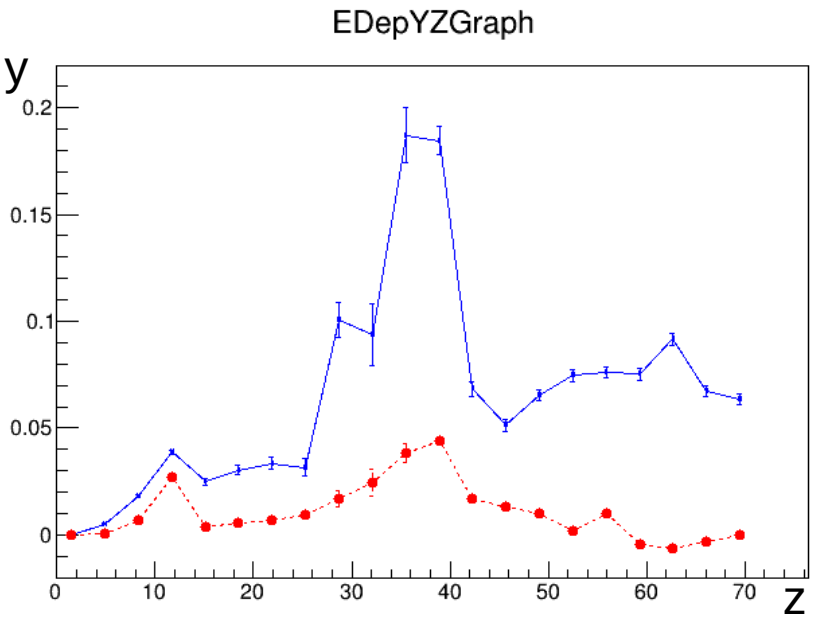
Simulations for COG

```
Simulations
Set xMin -0.65
Set xMax -0.15
```

SCD shifted to make data-MC CoG compatibles with same acceptance cut

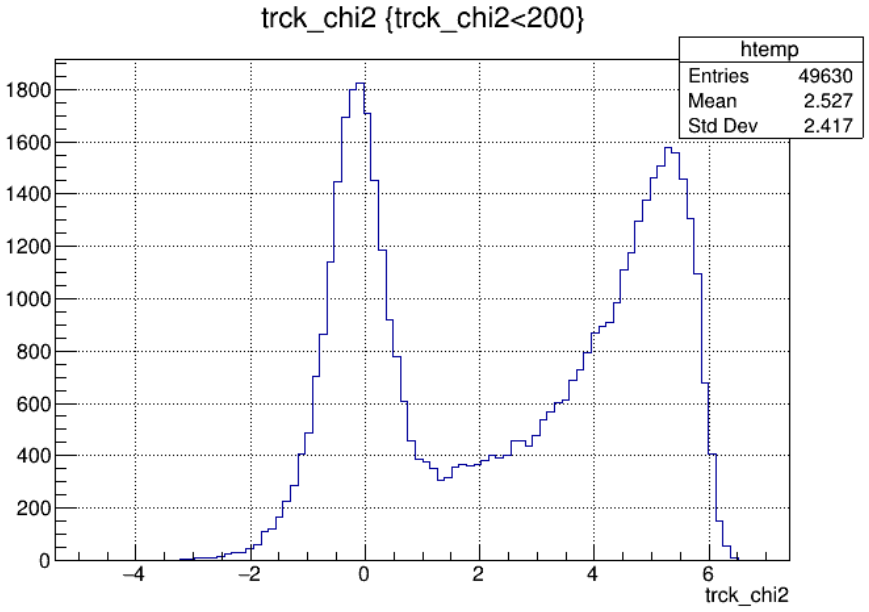


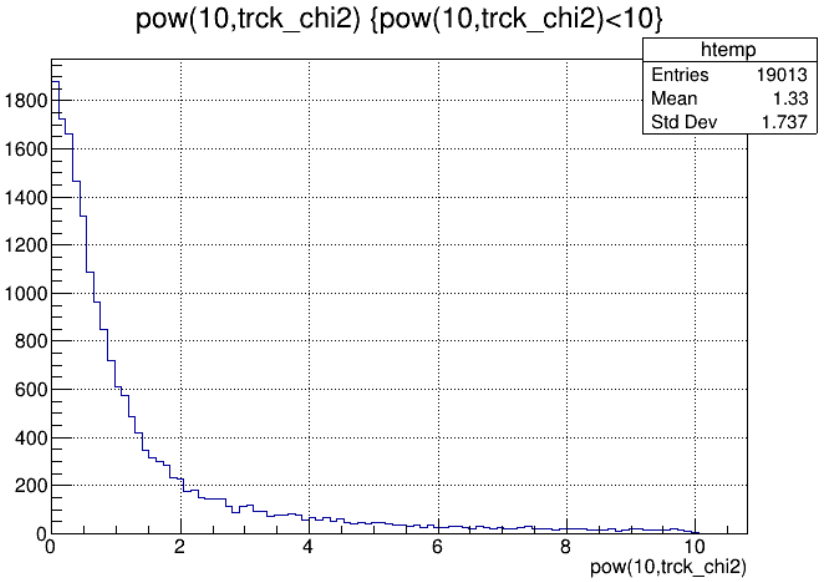
Data
MC



/home/pietro/PS-SPS-2023/simulated_files/electrons_250GeV_mipSiModified_lowGainNoiseModified/electrons_0_10.cog.root

Digitization of the tracks





Tracs selection: chi2/ndf < 10

```
if((casisTime<=80) || (casisTime>=620)){
	continue;
}
if(pow(10,trck_chi2)>=10){
	continue;
}

if(sigLPD_MIP[3][3][0]+sigLPD_MIP[3][3][1]+sigLPD_MIP[3][3][2]+sigLPD_MIP[3][3][3]+sigLPD_MIP[3][3][4]+sigLPD_MIP[3][3][5]<50){ //eliminate noise events
	continue;
}
bool flag = true; //flag to check if one of the crystals in the strange peak ignal region (due to electronics problem with HOLD)
for(int iRow = 0; iRow<7; iRow++){
	for(int iColumn = 0; iColumn<7; iColumn++){
		for(int iLayer = 0; iLayer<7; iLayer++){
			if((iColumn==3) && (iRow==2 || iRow == 3 || iRow==4)){
				if((iLayer == 1) && (sigLPD[iRow][iColumn][iLayer]>20000) && (sigLPD[iRow][iColumn][iLayer]<36000)){
					flag = false;
				}
				if((iLayer == 2) && (sigLPD[iRow][iColumn][iLayer]>27000) && (sigLPD[iRow][iColumn][iLayer]<37500)){
					flag = false;
				}
				if((iLayer == 3) && (sigLPD[iRow][iColumn][iLayer]>29000) && (sigLPD[iRow][iColumn][iLayer]<36000)){
					flag = false;
				}
				if((iLayer == 4) && (sigLPD[iRow][iColumn][iLayer]>27000) && (sigLPD[iRow][iColumn][iLayer]<45000)){
					flag = false;
				}
				if((iLayer == 5) && (sigLPD[iRow][iColumn][iLayer]>25000) && (sigLPD[iRow][iColumn][iLayer]<37000)){
					flag = false;
				}
				if((iLayer == 6) && (iRow == 3 || iRow == 4) && (sigLPD[iRow][iColumn][iLayer]>30000) && (sigLPD[iRow][iColumn][iLayer]<35000)){
					flag = false;
				}
				if((iLayer == 7) && (iRow == 3) && (sigLPD[iRow][iColumn][iLayer]>33000) && (sigLPD[iRow][iColumn][iLayer]<34000)){
					flag = false;
				}
				if((iLayer == 10) && (iRow == 3) && (sigLPD[iRow][iColumn][iLayer]>26000) && (sigLPD[iRow][iColumn][iLayer]<32000)){
					flag = false;
				}
			}
		}
	}
}
if(flag){
	tree->Fill();
	NeV++;
}
```

Track: $y = ay + by * z$
$x = ax + bx * z$

Errors on: ay, ax, by, bx

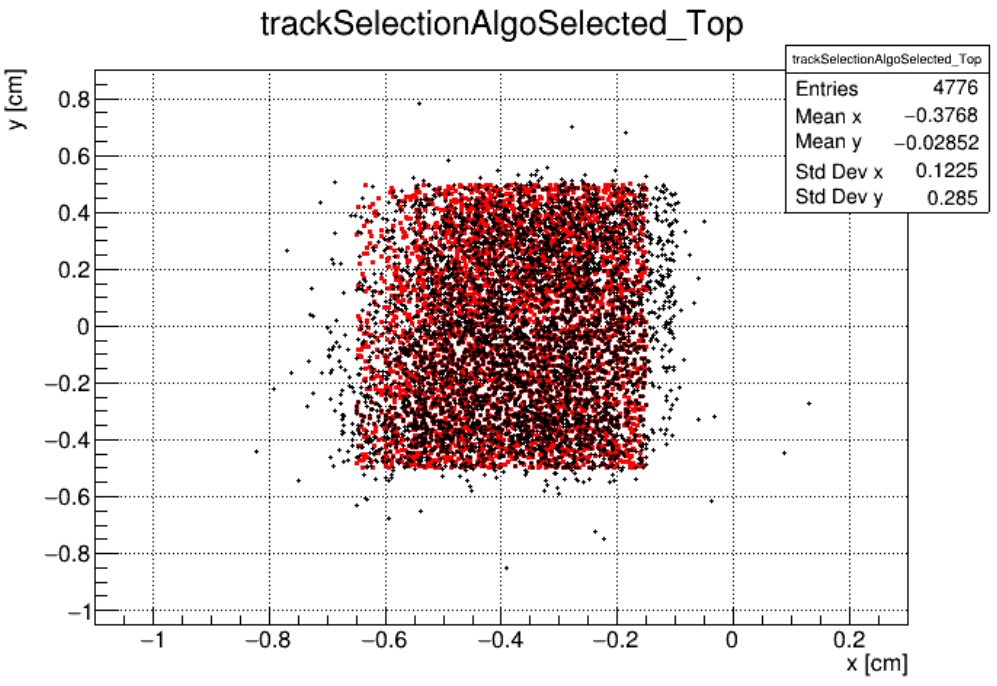
Project MC tracks on XZ and YZ planes

Smeared ax,ay,bx,by with Gaussian centered on zero with sigma equal to the associated error

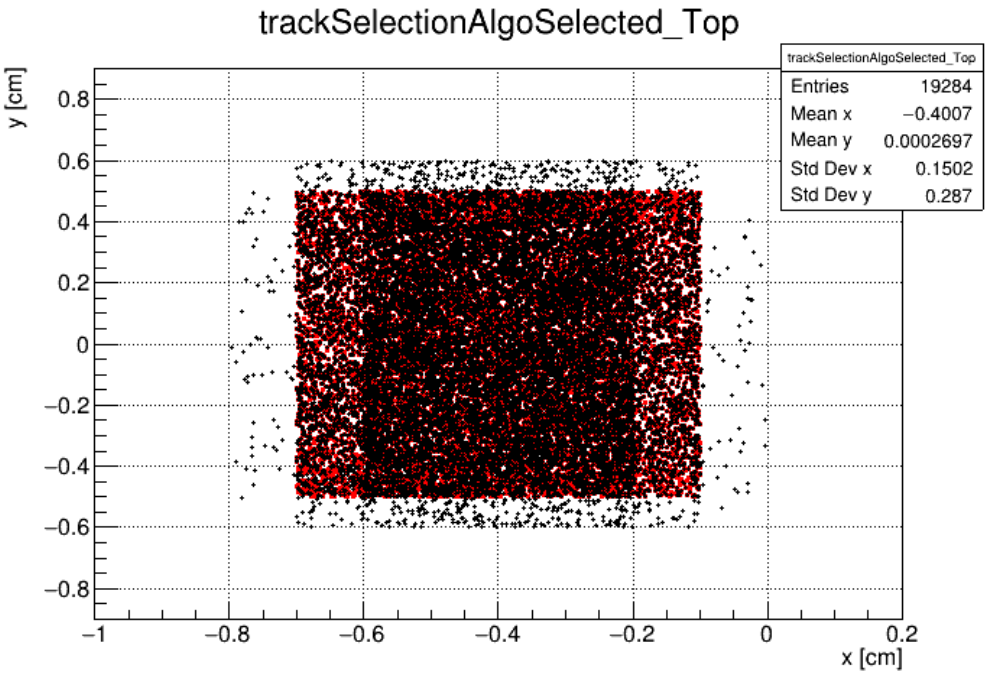
Rebuild a 3D track

Run 302 250 GeV

Data



MC

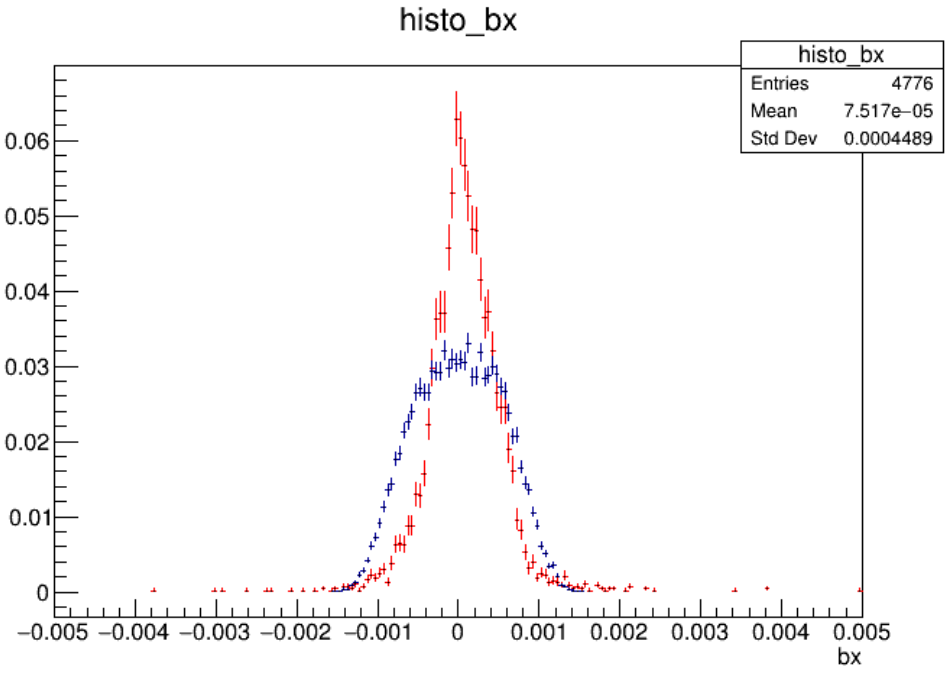


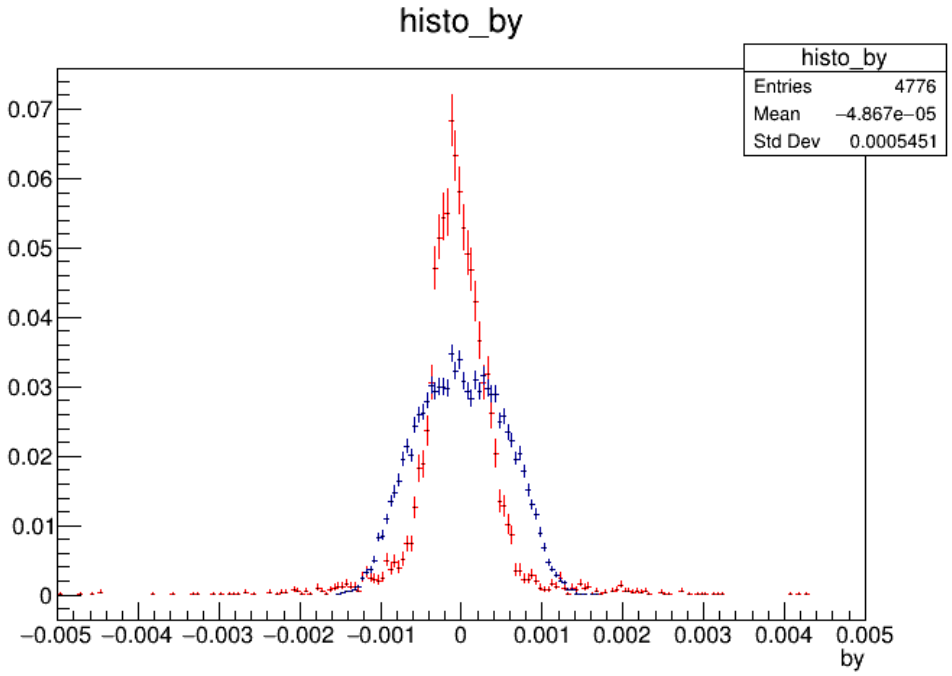
Top

Bottom

Data

MC


histo_bx
histo_bx
Entries 4776
Mean 7.517e−05
Std Dev 0.0004489
0.06
0.05
0.04
0.03
0.02
0.01
0
−0.005 −0.004 −0.003 −0.002 −0.001 0 0.001 0.002 0.003 0.004 0.005
bx


histo_by
histo_by
Entries 4776
Mean −4.867e−05
Std Dev 0.0005451
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
−0.005 −0.004 −0.003 −0.002 −0.001 0 0.001 0.002 0.003 0.004 0.005
by