Statistical Analysis of Primary Vertex

UrQMD Input File

```
pro 124 54          //Proyectile Atomic_mass Atomic_number
tar 184 74          //Target Atomic_mass Atomic_number

nev 200             //Number of Events
imp -14.71             //Impact Parameter
ene 2.5             //Kinetic Energy
tim 200 200         //Time

cto 27 1            //Target Mode Option

rsd 16537010       //Random Number
f13
#f14                //Output File
f15
f16
f19
f20

xxx
```

RunMC File

On the runMC.C file was modified:

```
primGen->SetBeam(0.0, 0.0, 1e-6, 1e-6);
primGen->SetTarget(-85.0, 0.0);
primGen->SmearGausVertexZ(kFALSE);
primGen->SmearVertexXY(kFALSE);
```

Branches for Primary Vertex

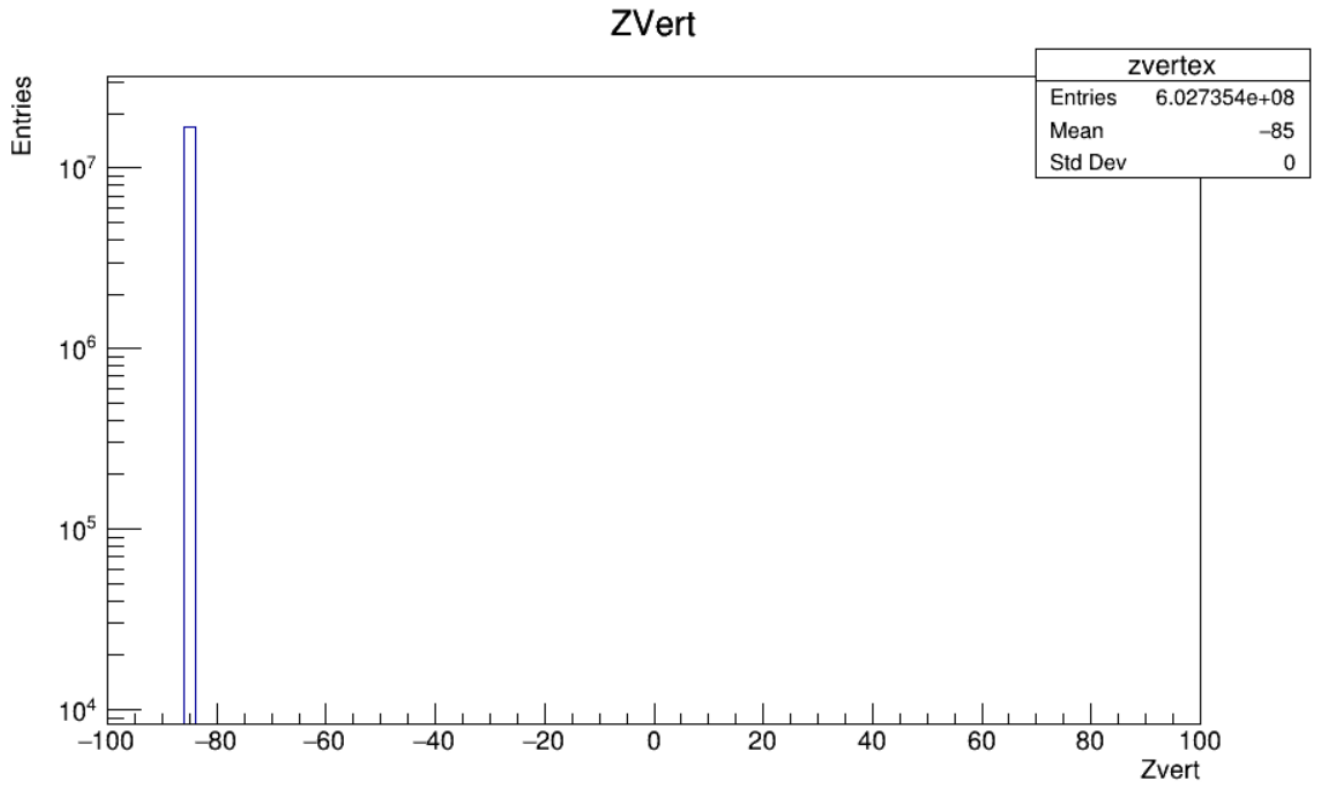
```
TChain *dstTree = new TChain("mpdsim");
dstTree->Add(inputfile.Data());

// Activate branches
MpdEvent *event = nullptr;
dstTree->SetBranchAddress("MPDEvent.", &event);
TClonesArray *fMCTracks = nullptr;
dstTree->SetBranchAddress("MCTrack", &fMCTracks);

FairMCEventHeader *mchead = 0x0;
dstTree->SetBranchAddress("MCEventHeader.", &mchead);
```

```
TClonesArray *vertex = nullptr;
dstTree->SetBranchAddress("Vertex", &vertex);
cout<<vertex->GetEntries()<<endl;
```

```
FairMCEventHeader *MCHeader;
MCHeader = nullptr;
dstTree->SetBranchAddress("MCEventHeader.",&MCHeader);
```

MonteCarlo Primary Vertex Z

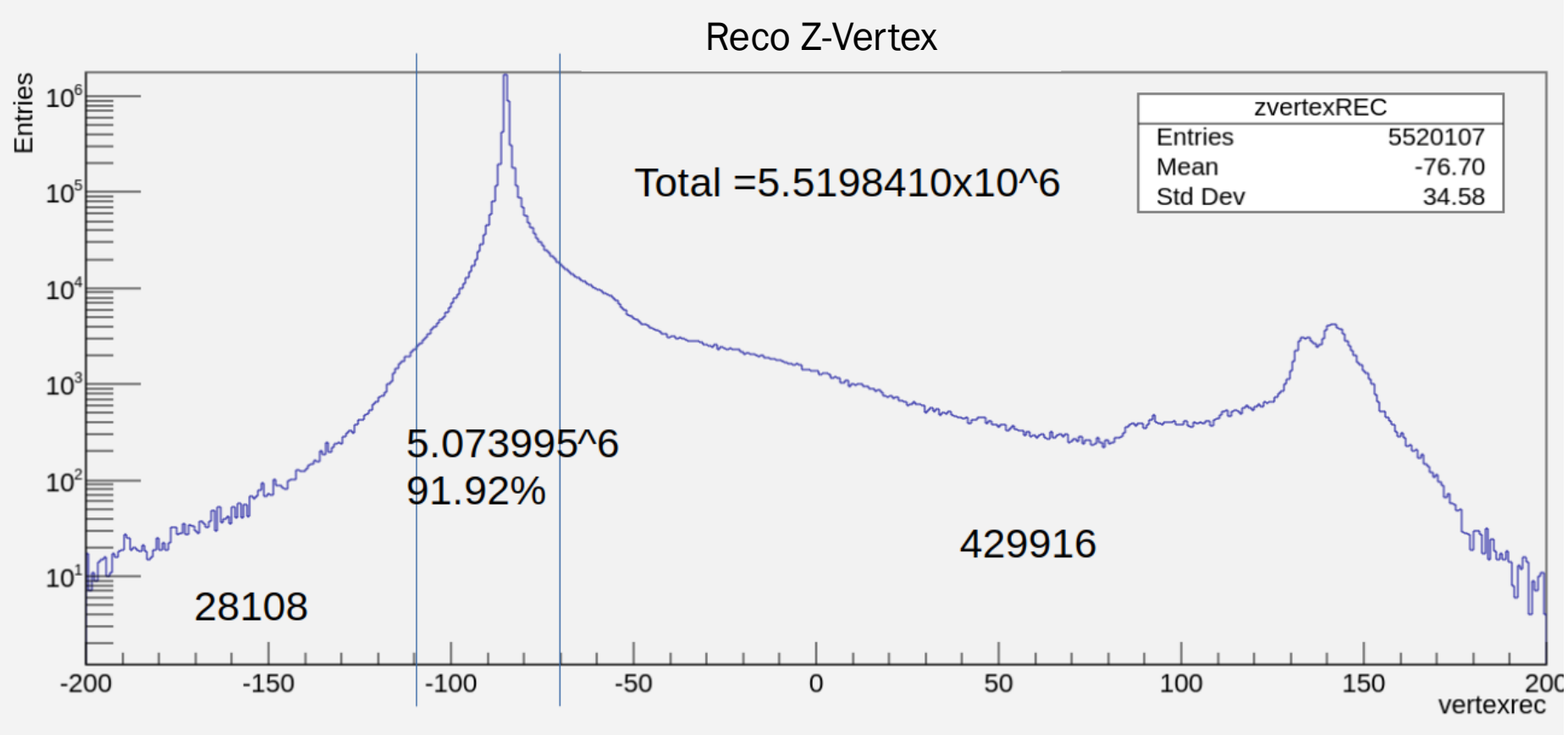
For 200k Events



Histograms were obtained for the reconstructed primary vertex and monte carlo, noting that in the case of monte carlo the distribution is obvious

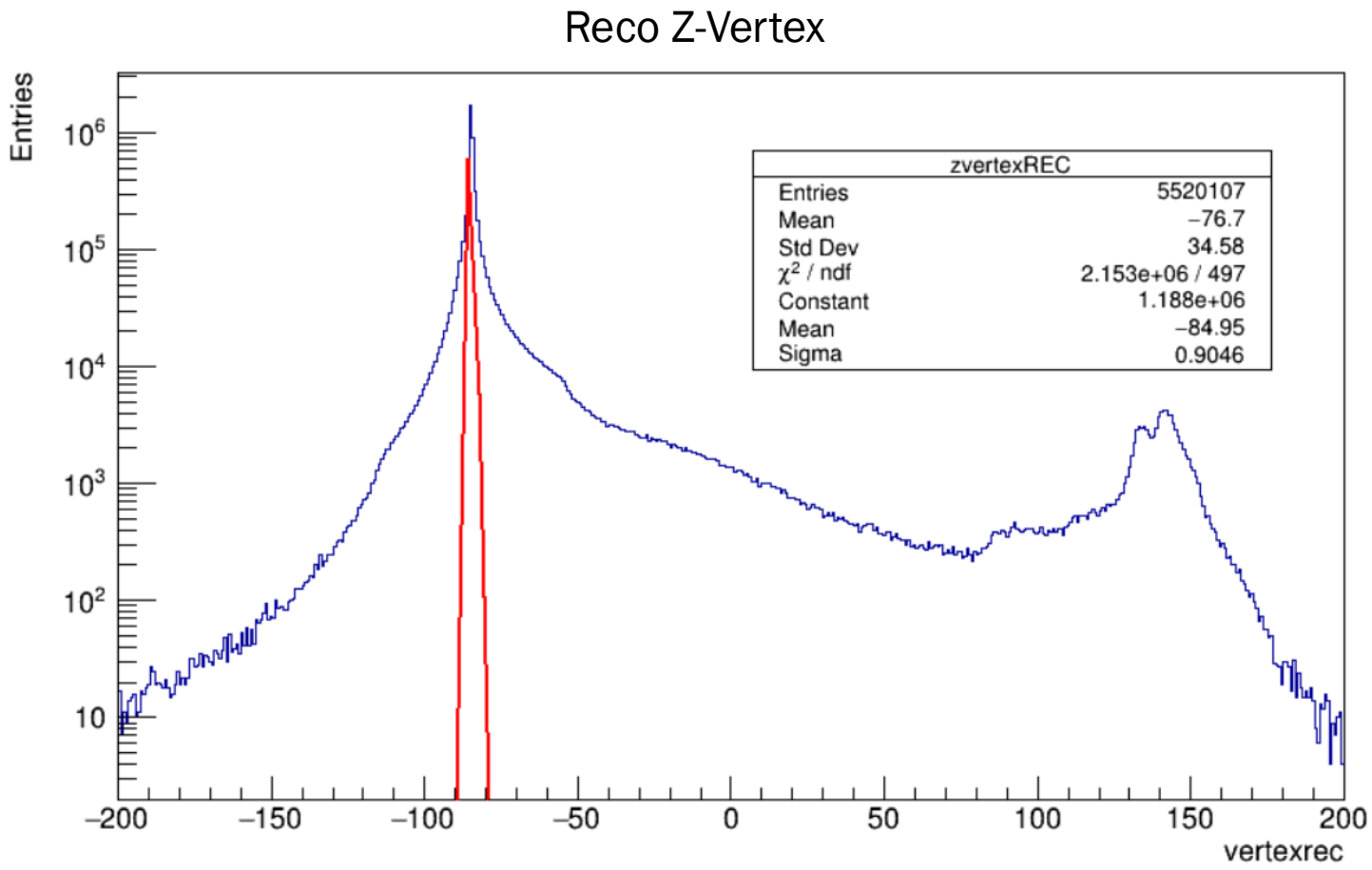
Reconstructed Primary Vertex Z

For 200k Events



For the reconstructed there is a different distribution, so it is integrated seeing that where mpd is in -85 cm is 91.92% of events

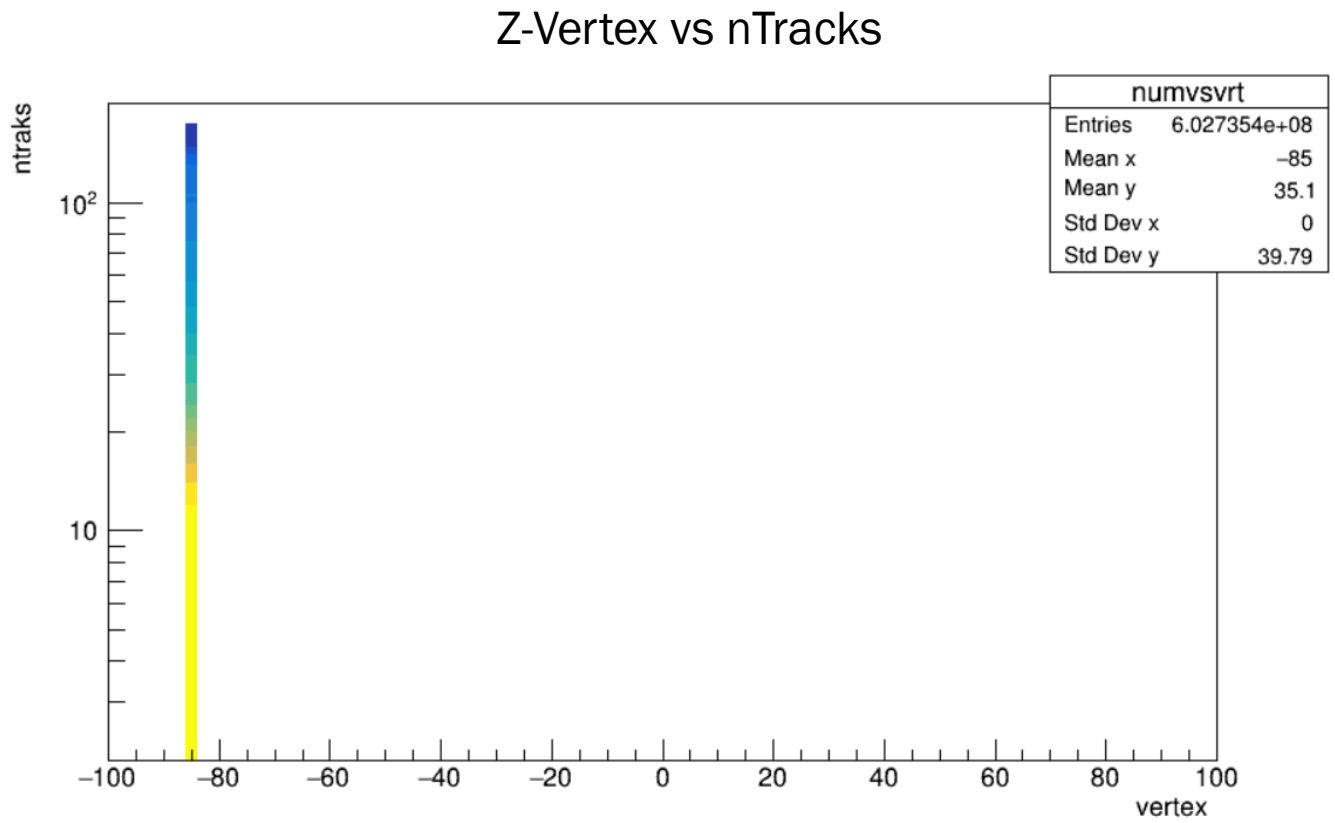
Reconstructed Primary Vertex Z



Using a gaussian setting we find the peak at approximately 85 cm

For 200k Events

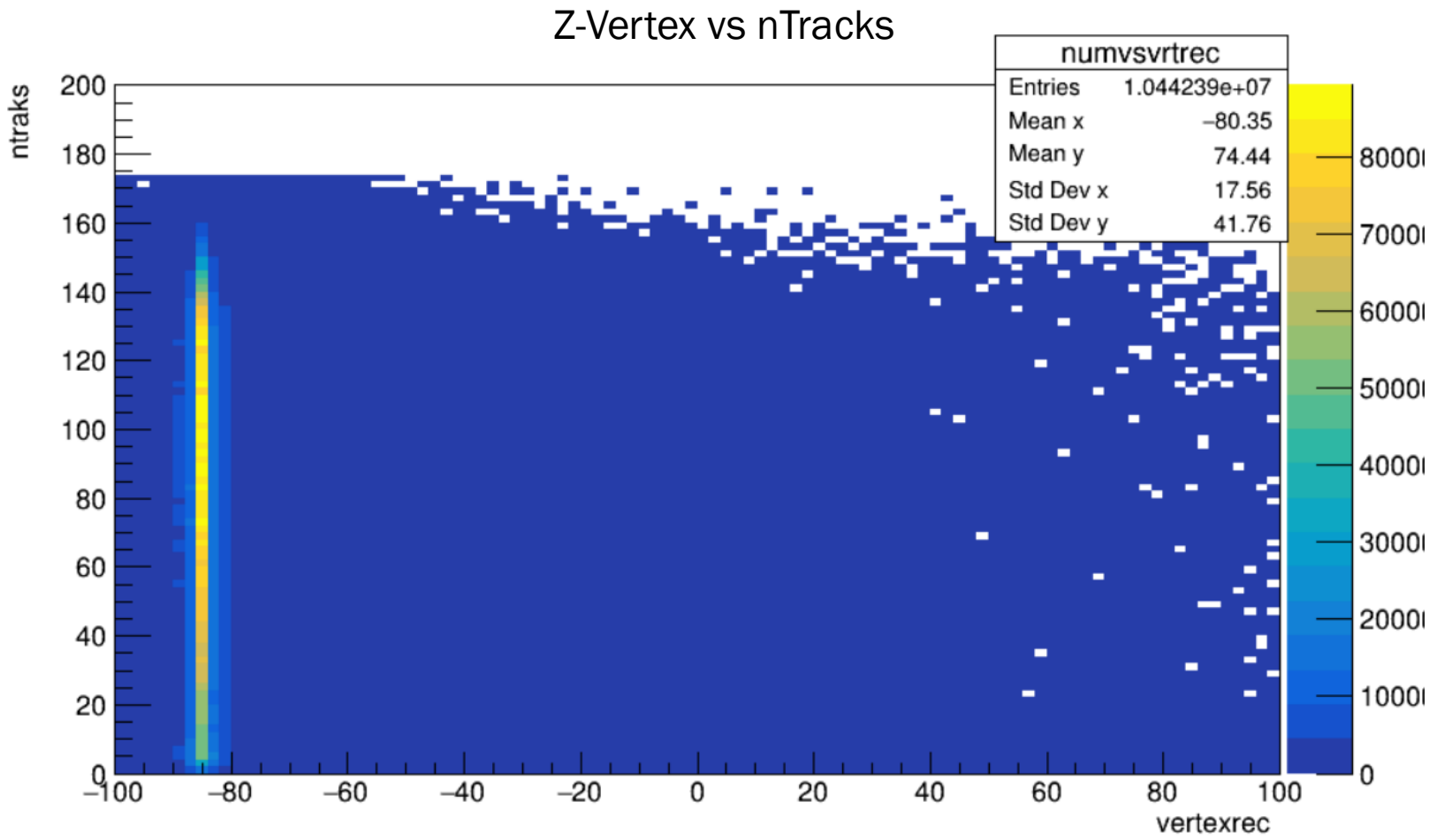
MC Z-Vertex vs nTracks



Also plotted the number of tracks as function of the primary vertex, MC and reconstructed

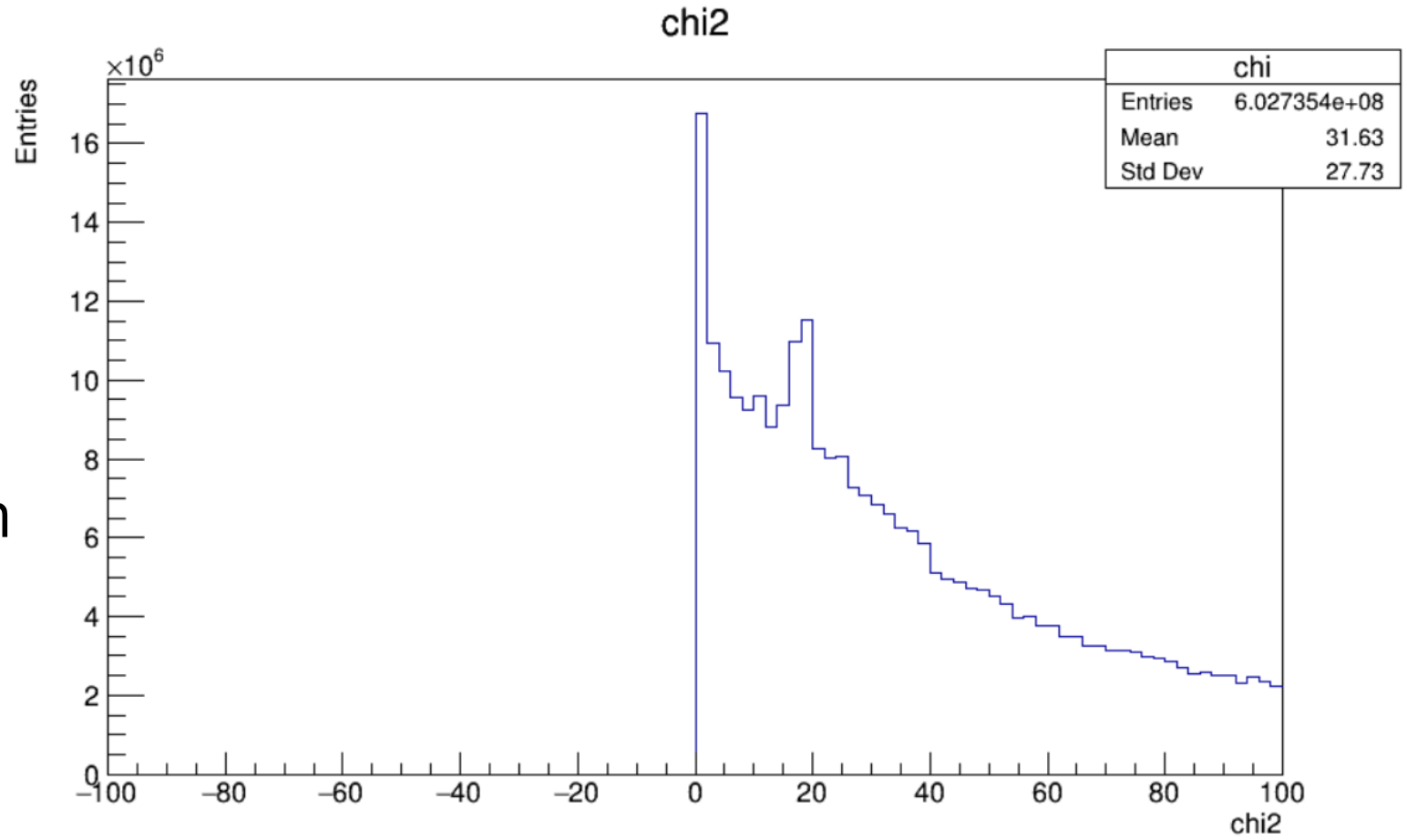
For 200k Events

Reco Z-Vertex vs nTracks

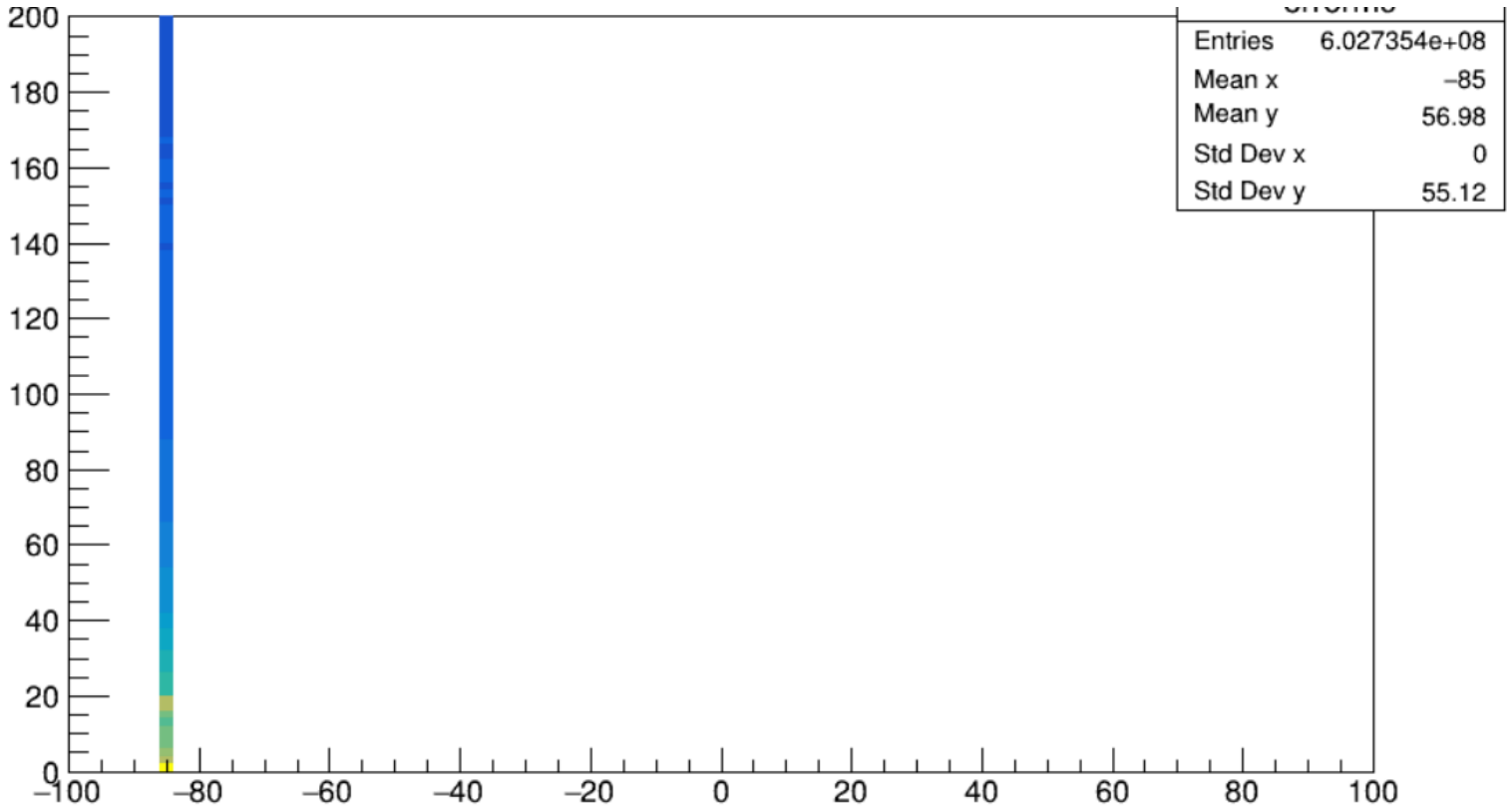


Chi 2

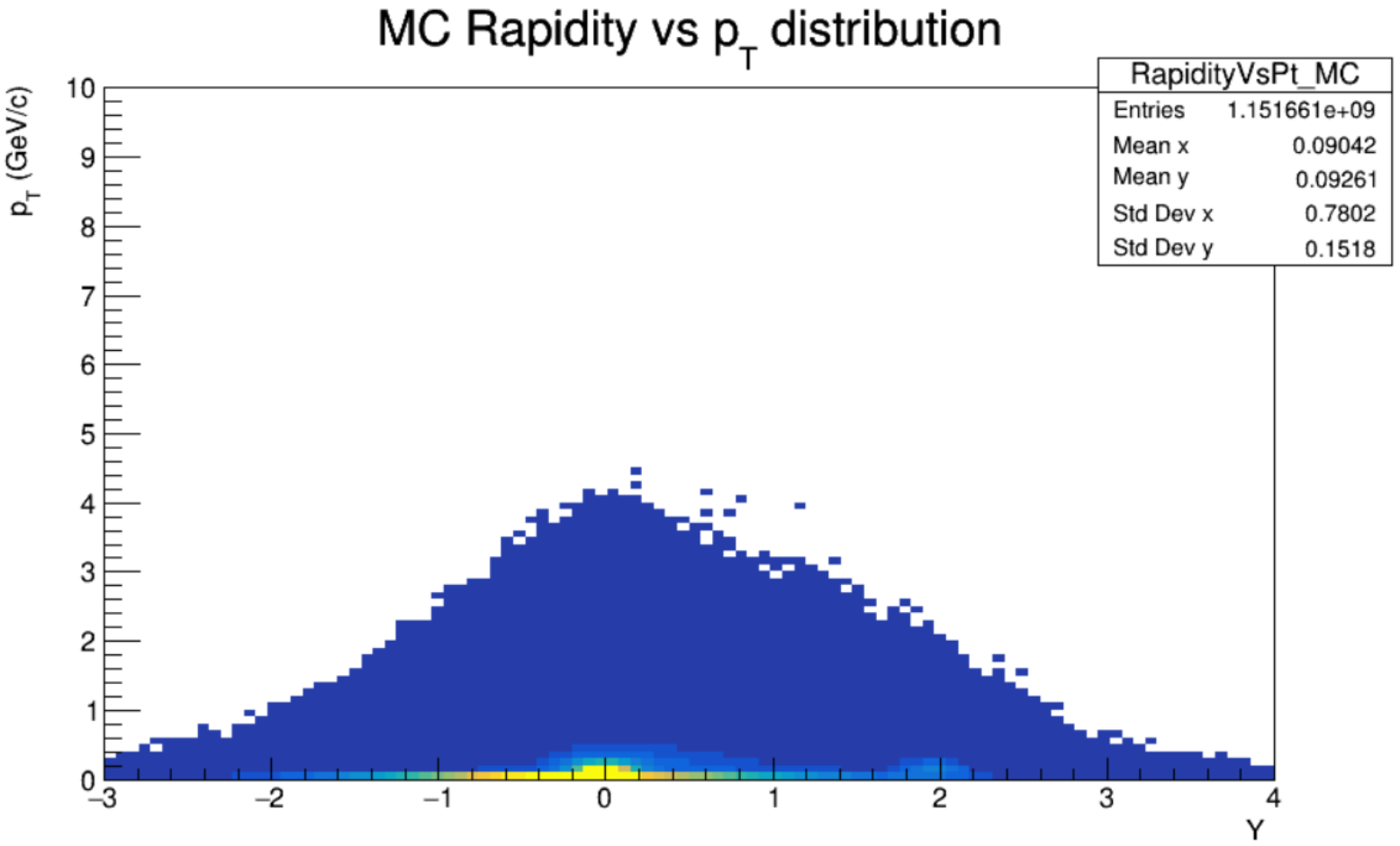
In addition, the chi-square distribution was added and implemented to the reconstructed vertex but the histrogram did not look good



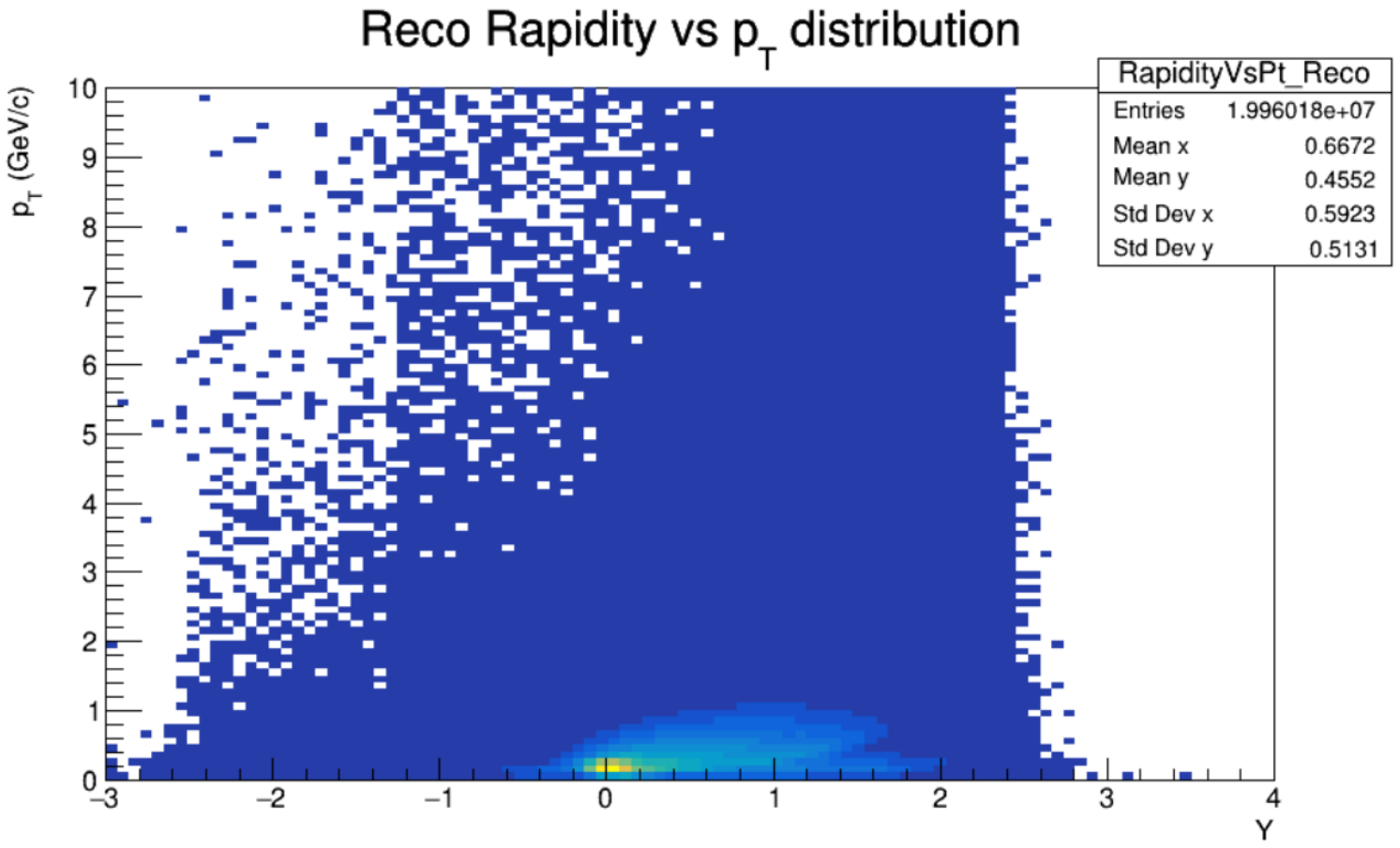
Chi^2 for the funcion in the Zvertex



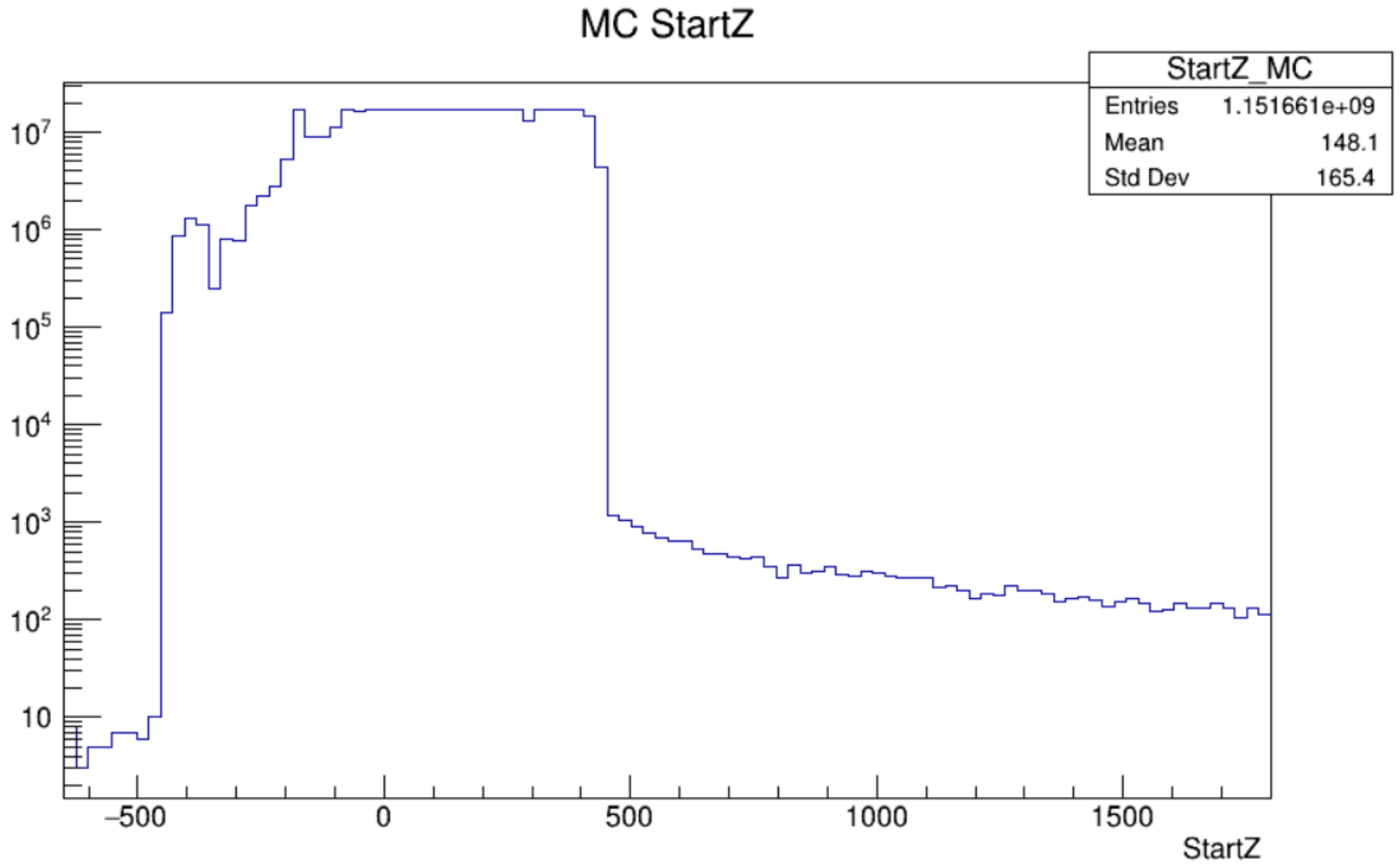
MonteCarlo Rapidity vs pT



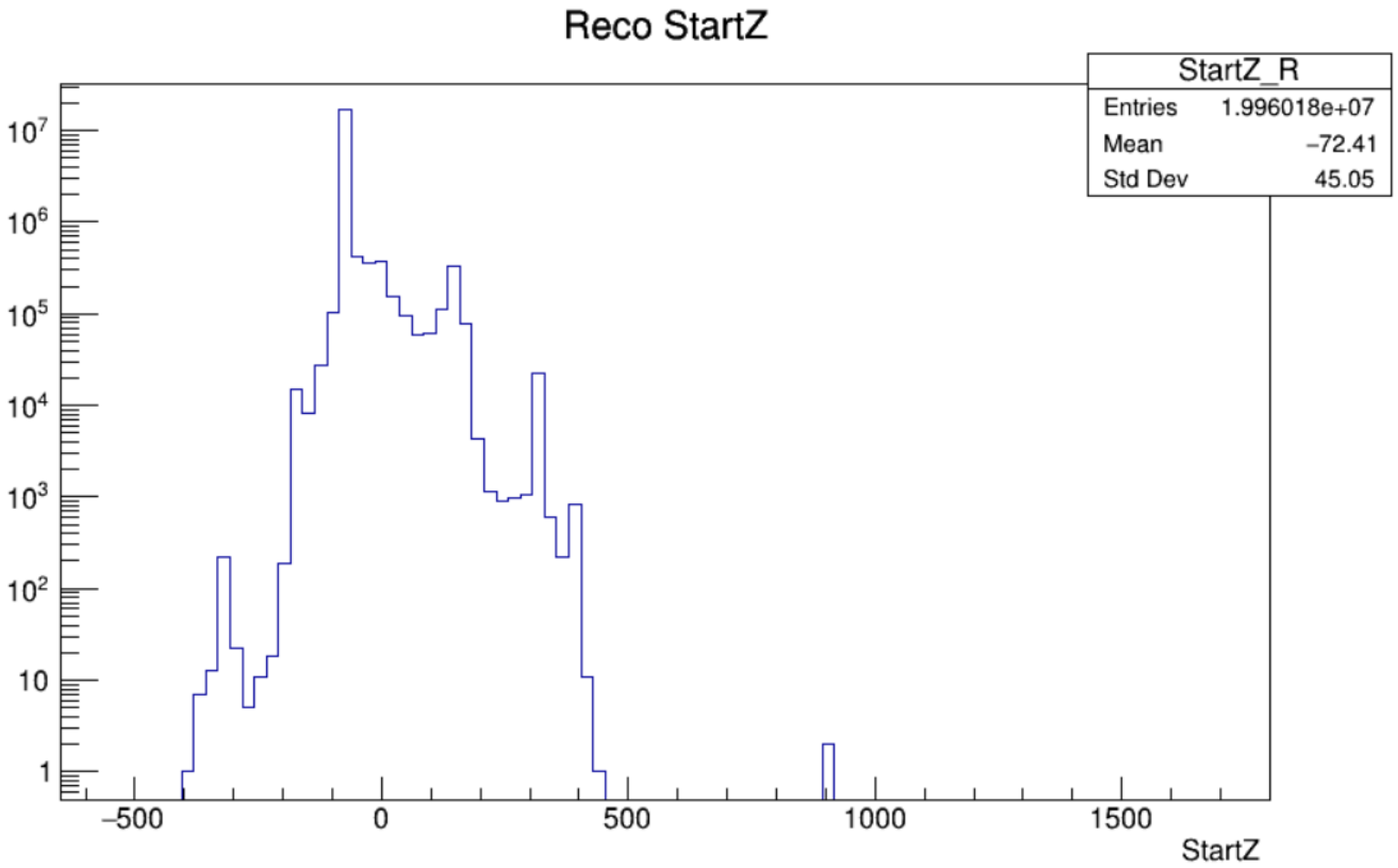
Reconstructed Rapidity vs pT



MonteCarlo Start Z



Reconstructed Start Z



Thank you