

Muon system's studies: background analysis

C. Aimè, C. Riccardi, P. Salvini, I. Vai

Background files

16 files:

```
sim_muyl-1e3x500-26m-lowth-excl_j5.slcio  
sim_mumi-1e3x500-26m-lowth-excl_j1.slcio  
sim_mumi-1e3x500-26m-lowth-excl_j2.slcio  
sim_mumi-1e3x500-26m-lowth-excl_j3.slcio  
sim_mumi-1e3x500-26m-lowth-excl_j4.slcio  
sim_mumi-1e3x500-26m-lowth-excl_j5.slcio  
sim_mumi-1e3x500-26m-lowth-excl_j6.slcio  
sim_mumi-1e3x500-26m-lowth-excl_j7.slcio  
sim_mumi-1e3x500-26m-lowth-excl_j8.slcio  
sim_muyl-1e3x500-26m-lowth-excl_j1.slcio  
sim_muyl-1e3x500-26m-lowth-excl_j2.slcio  
sim_muyl-1e3x500-26m-lowth-excl_j3.slcio  
sim_muyl-1e3x500-26m-lowth-excl_j4.slcio  
sim_muyl-1e3x500-26m-lowth-excl_j6.slcio  
sim_muyl-1e3x500-26m-lowth-excl_j7.slcio  
sim_muyl-1e3x500-26m-lowth-excl_j8.slcio
```

Total number of events: **2993**

Background in IP coming from muons (25 to -1 m) arcs.

NDECAY=1e3x500=5e5 is number of simulated decays.

Thresholds:

- 100 keV for charged
hadrons,muons,electrons,positrons and gammas
- 1e-12 GeV for neutrons

Analysis restricted to muons

Reduced analysis: only muon

Few **processors** used:

- AIDAProcessor
- InitializeDD4hep → geometry: CLIC_o3_v14_mod1/CLIC_o3_v14.xml
- DDSimpleMuonDigi → Muon calibration factor = 70.1
Muon threshold = 1 keV
- MuonAnalyzer

Collections used:

- MCParticle
- MUON (class CalorimeterHit)

Generated particles

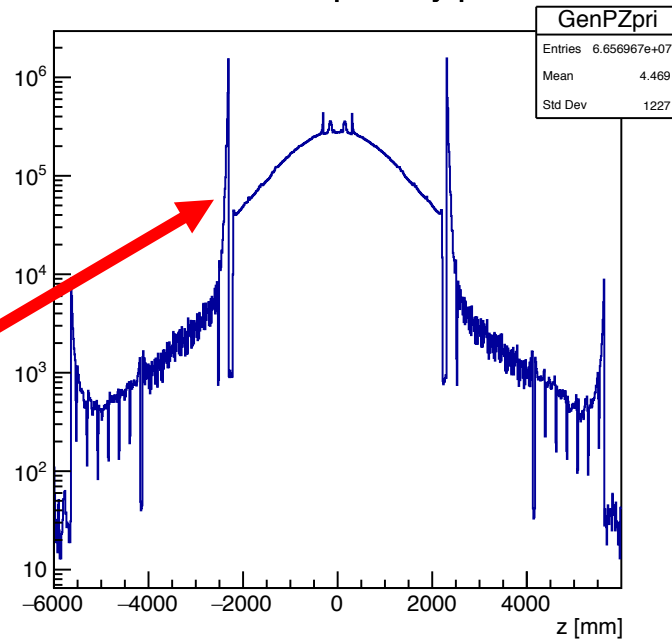
	Primary particles	Secondary particles
total	6.656967e+07	242476
in muon	5658635	5529
fraction in muon	8.5%	2.3%

Particles in muon system geometrically selected

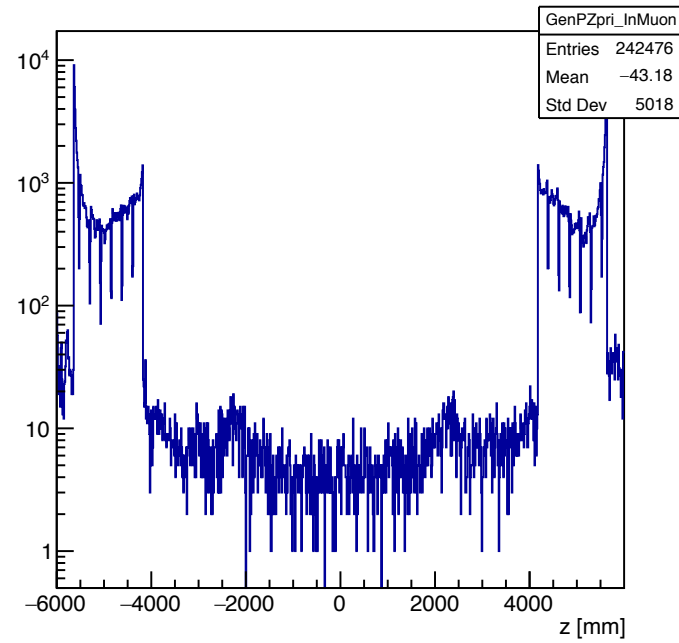
In muon = `if( abs(z) > 4179 && rad > 446 ) //endcap` `z= getEndpoint()`
`if( abs(z) < 4179 && rad > 4461) //barrel`

With such a selection just 0.4% of the particles are out of the acceptance

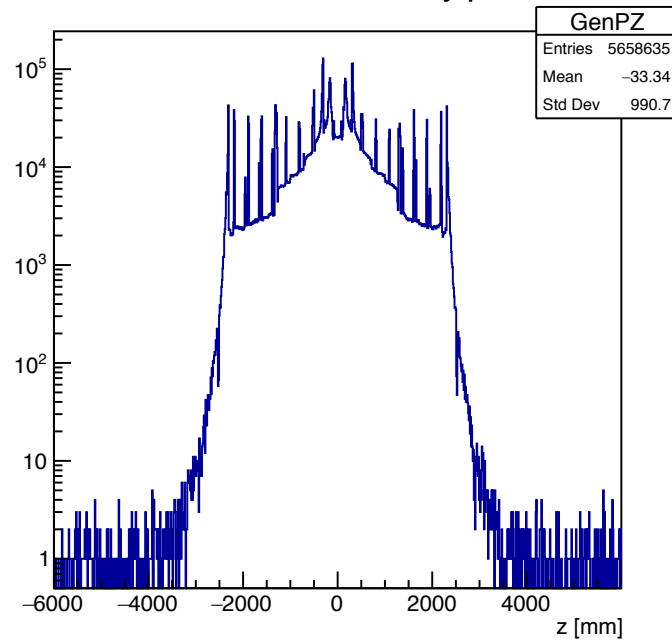
GenP Z end - primary particle



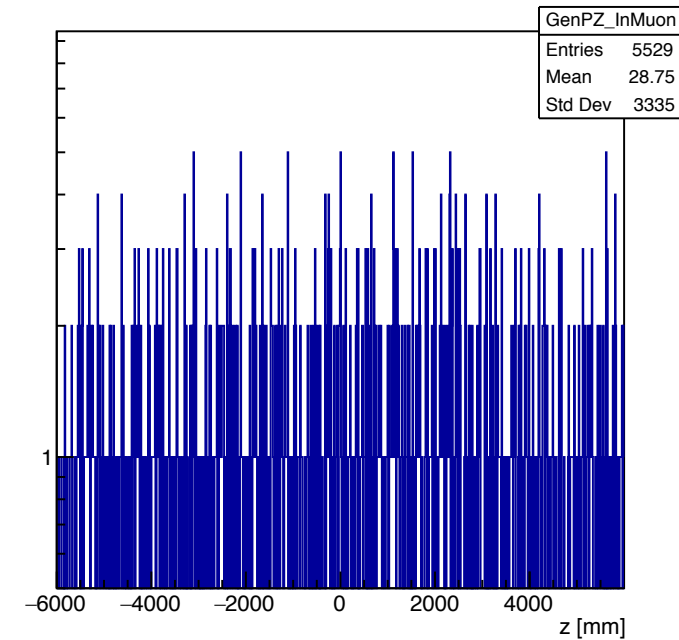
GenP Z end - InMuon - primary particle



GenP Z end - secondary particle

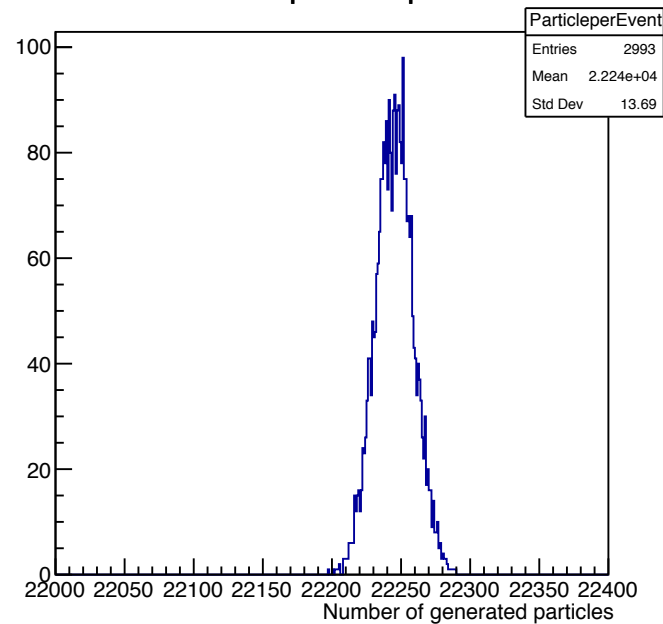


GenP Z end - InMuon - secondary particle

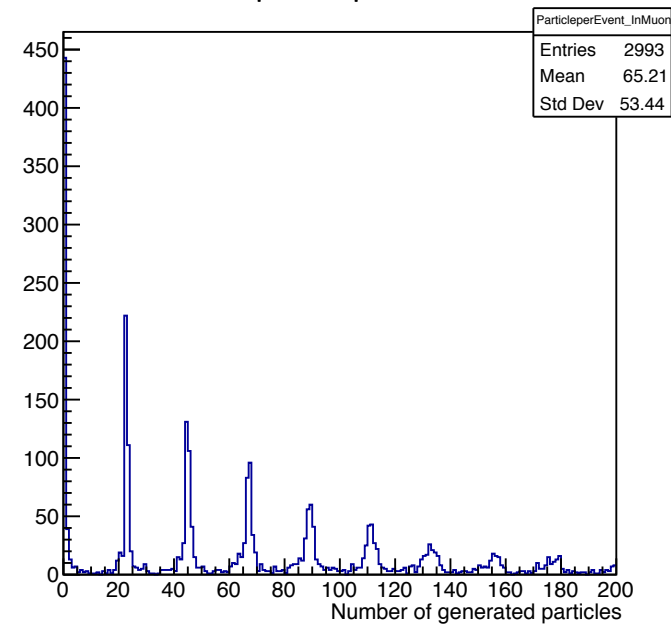


Just one event is out of range with ~19000 particles

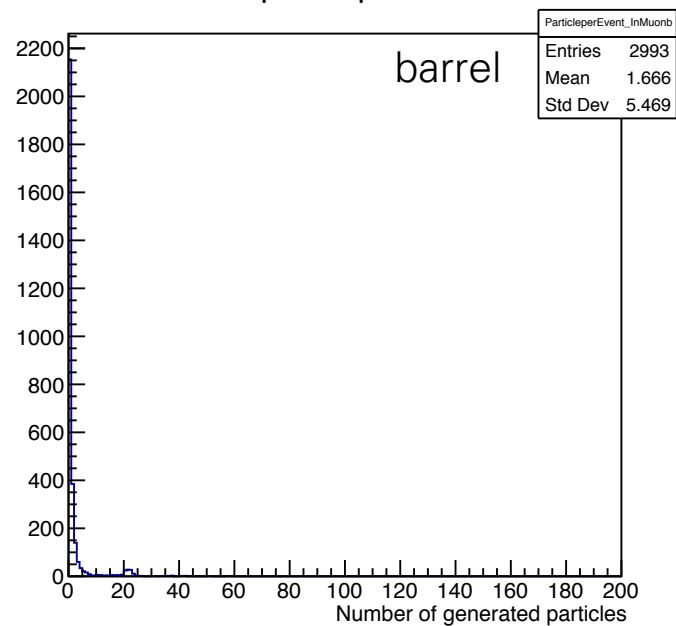
Generated particle per Event



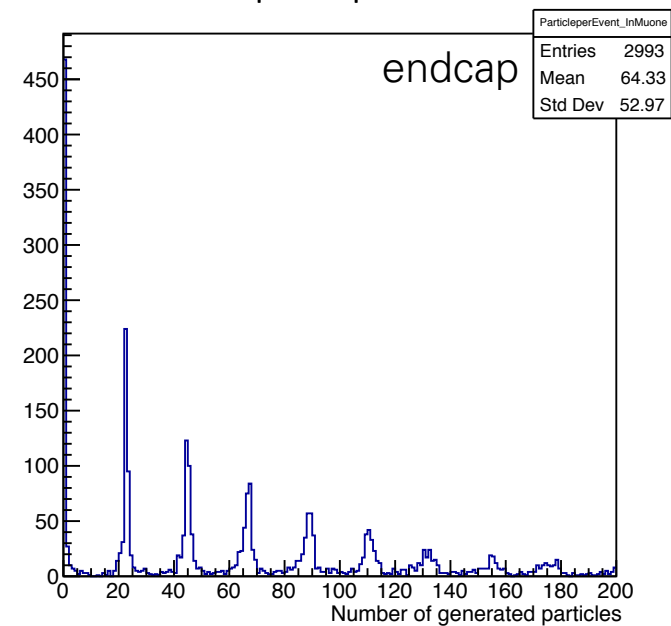
Generated particle per Event InMuon



Generated particle per Event InMuon

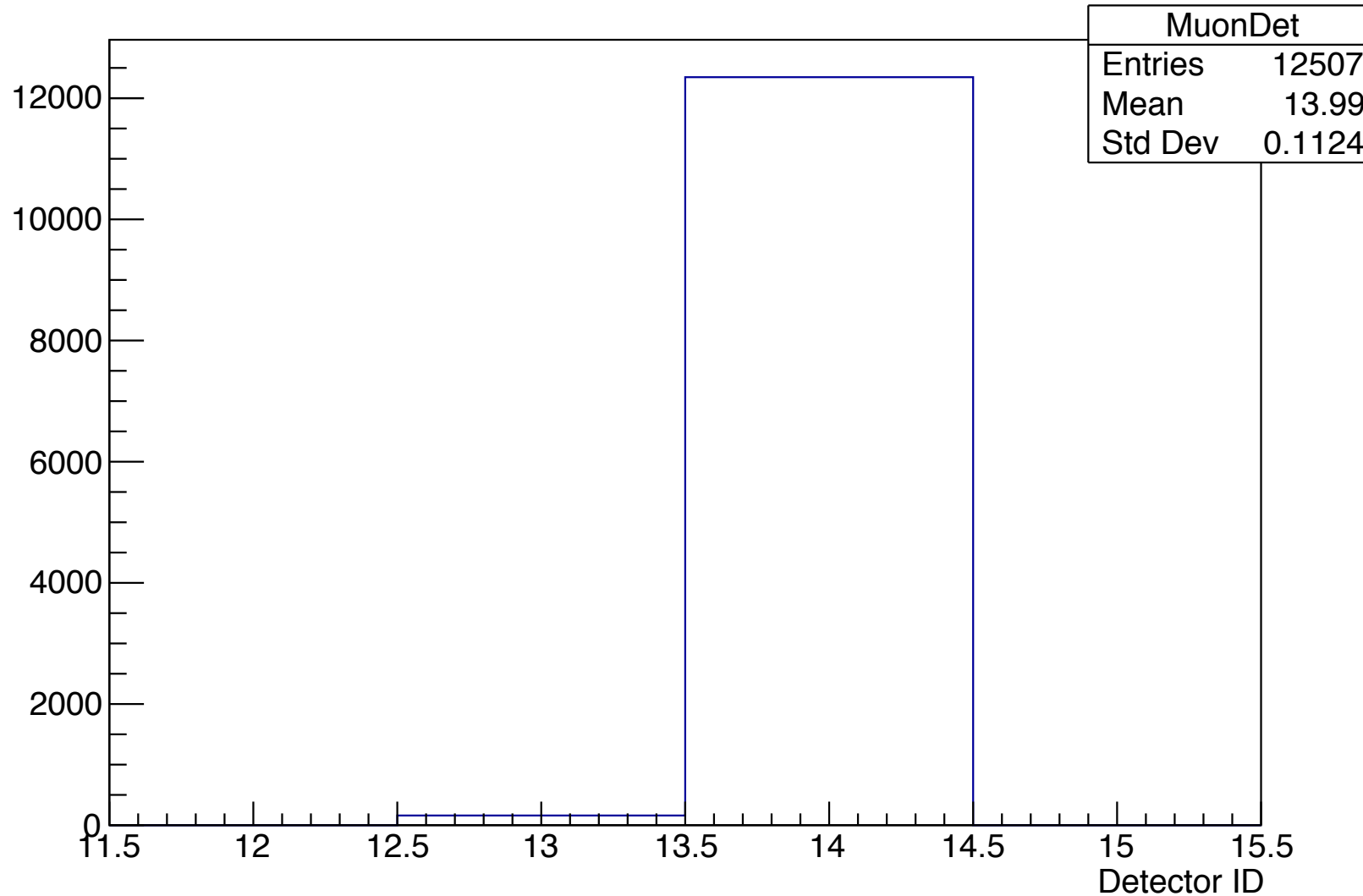


Generated particle per Event InMuon



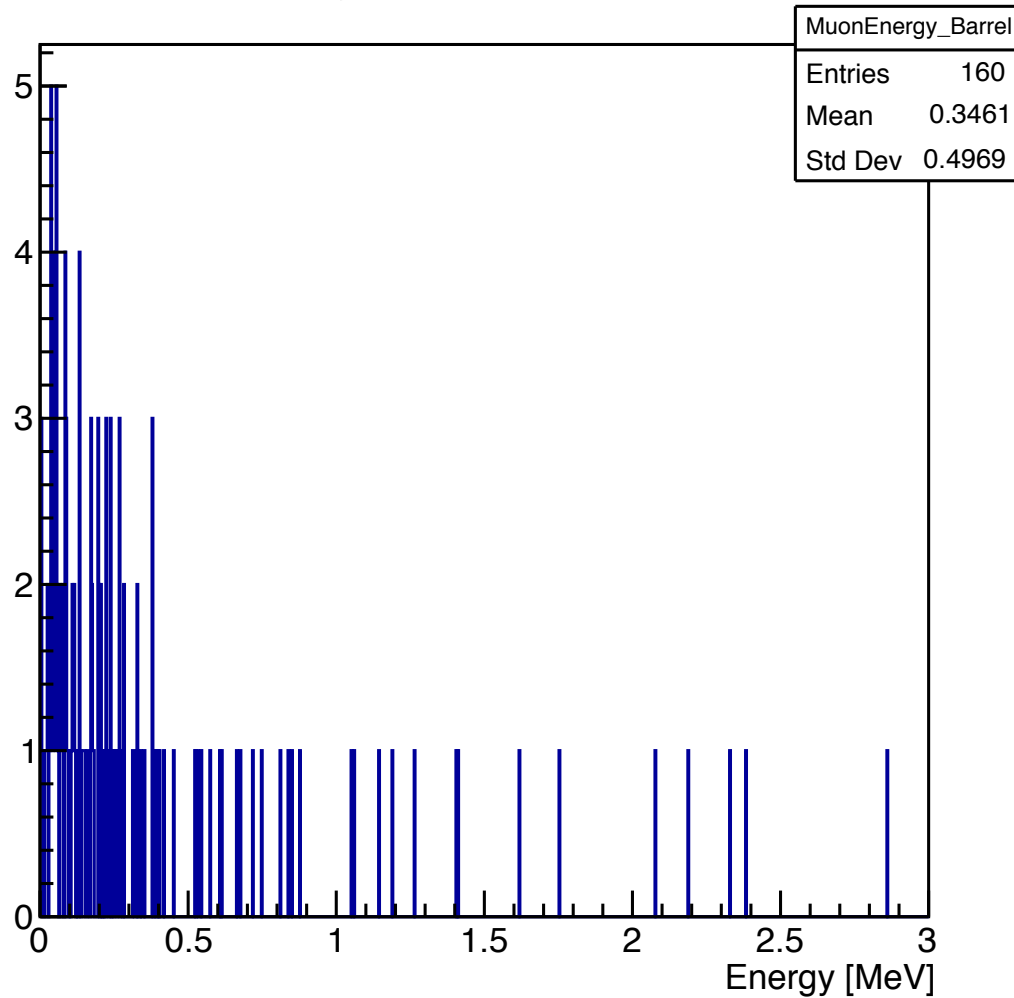
Barrel & endcap

Barrel 13- Endcap 14

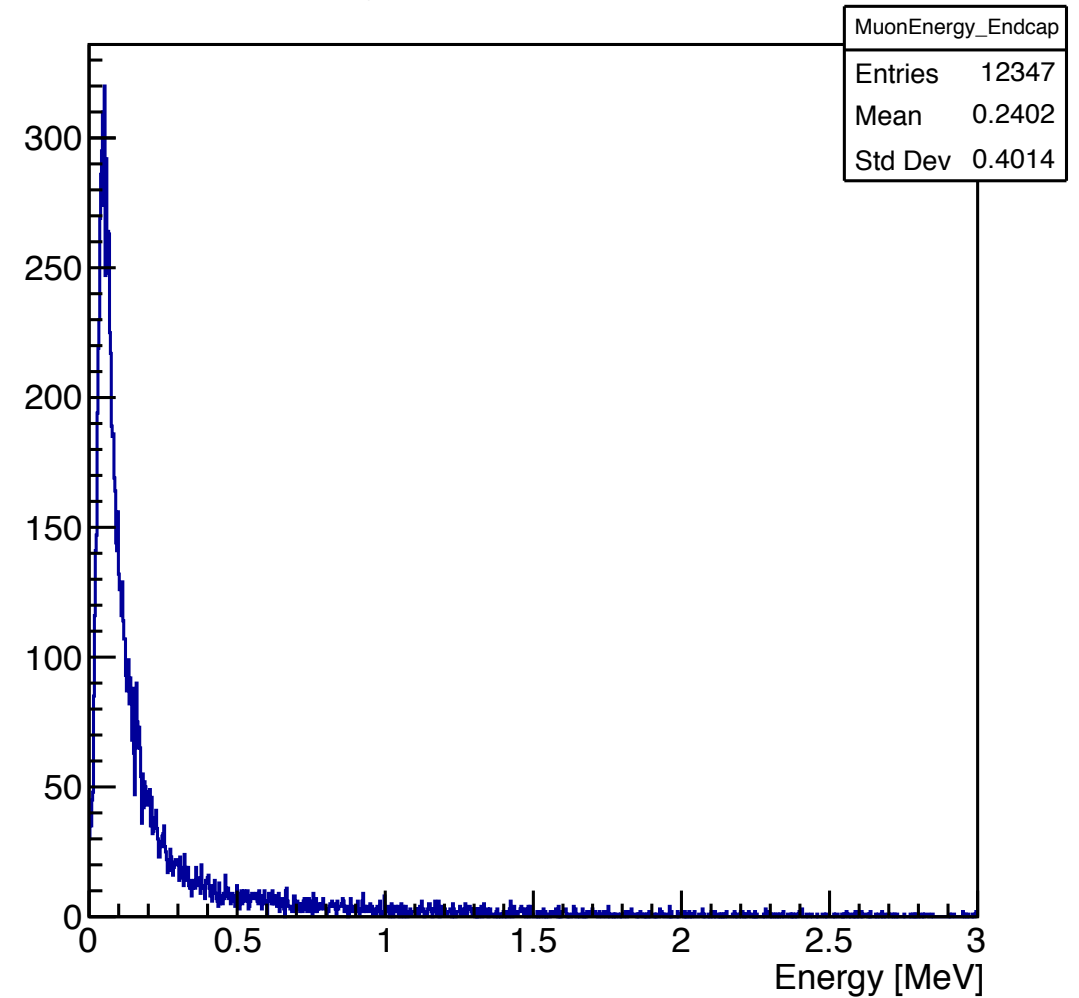


Particle energy

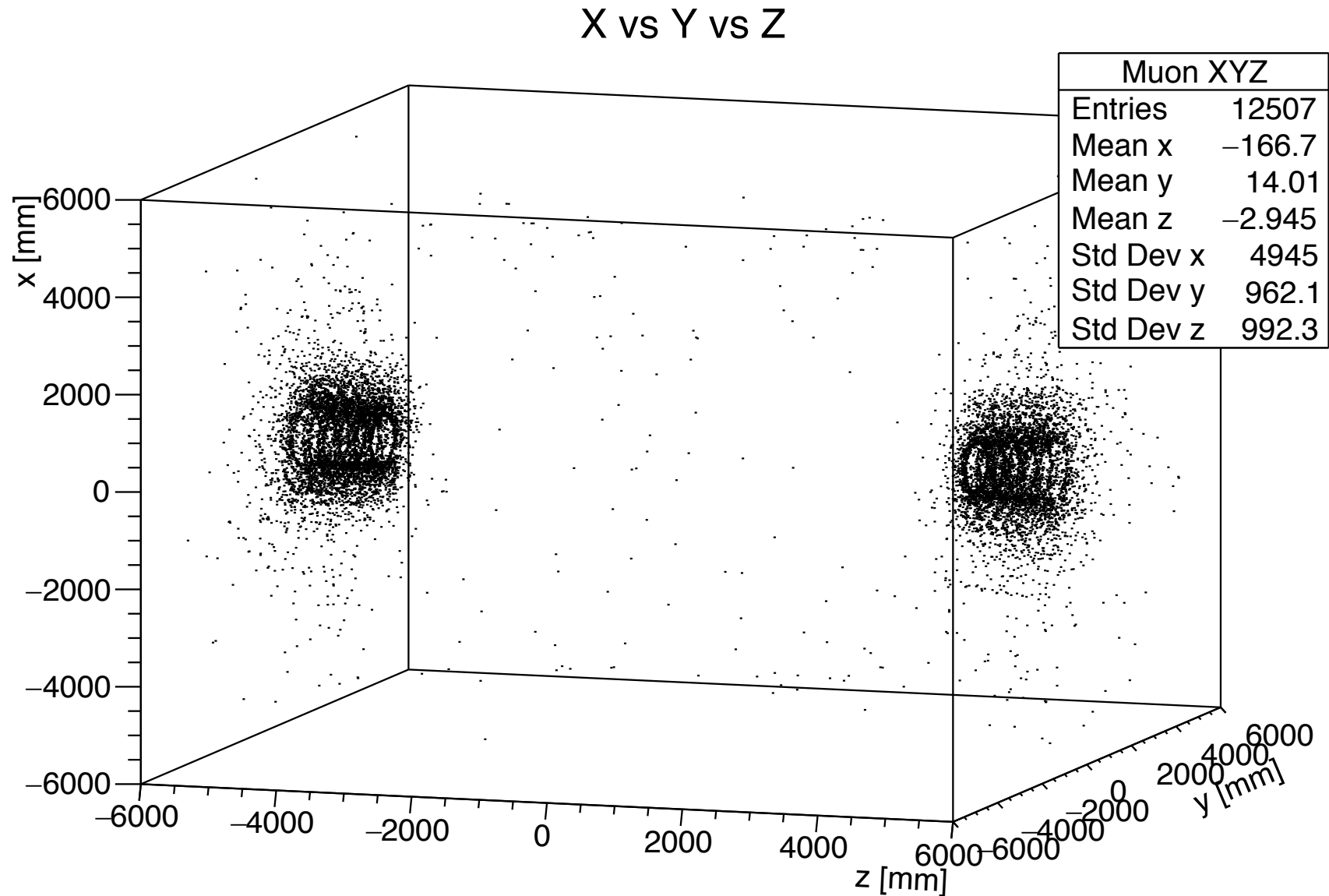
Energy InMuon - Barrel



Energy InMuon - Endcap

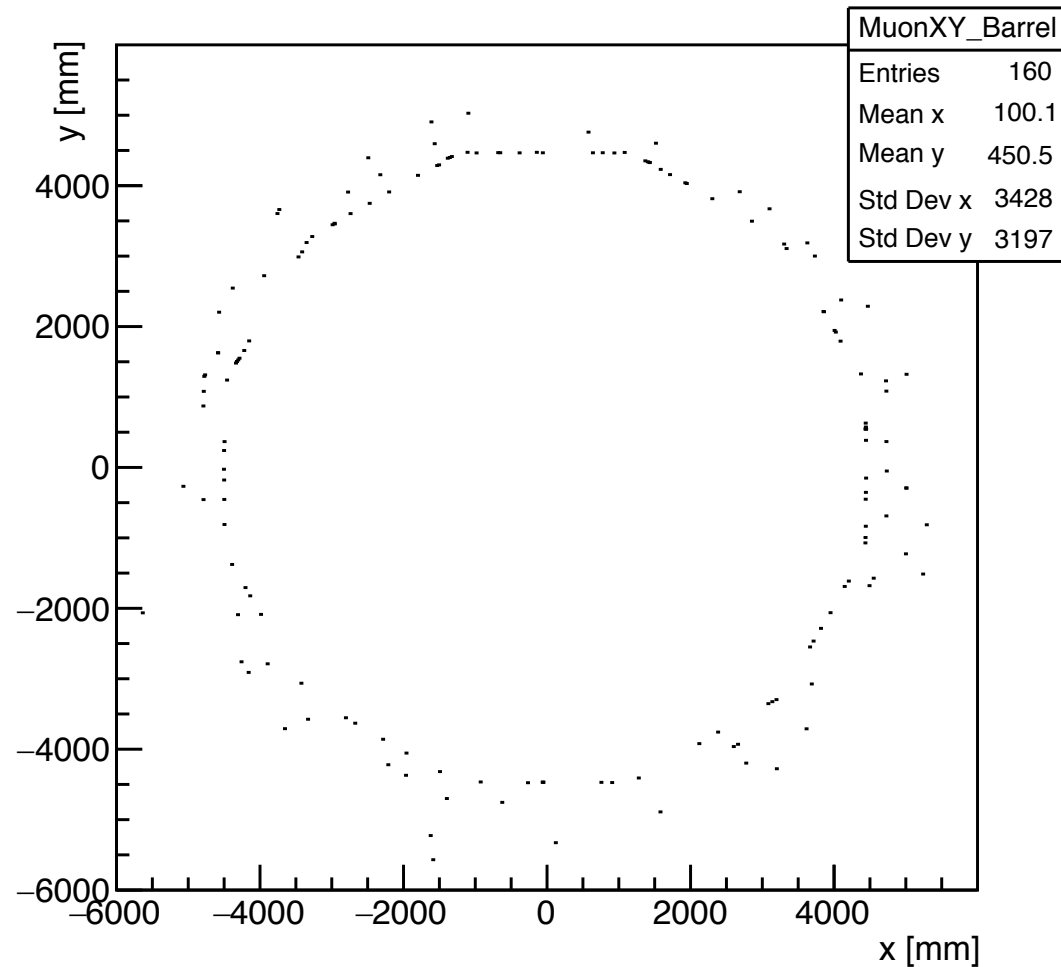


Hits distribution in the muon system

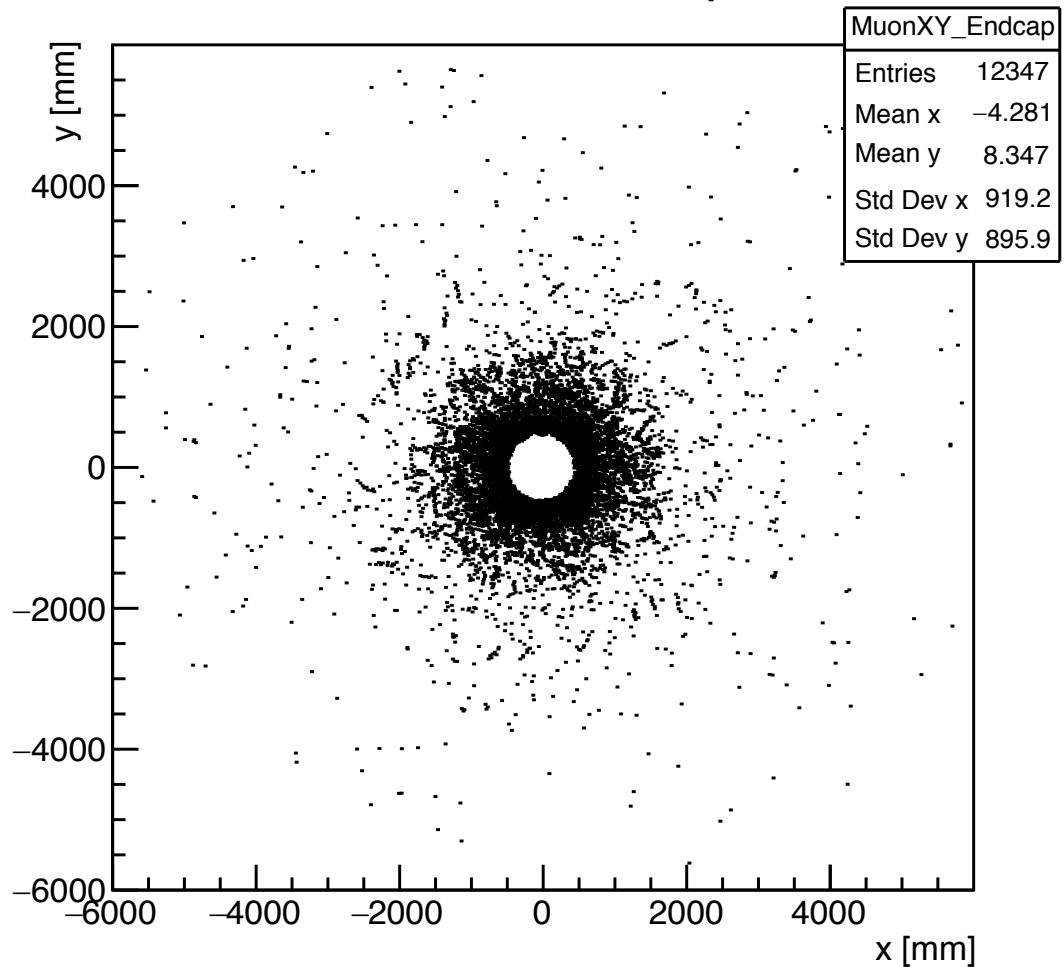


Hits distribution in barrel and endcap

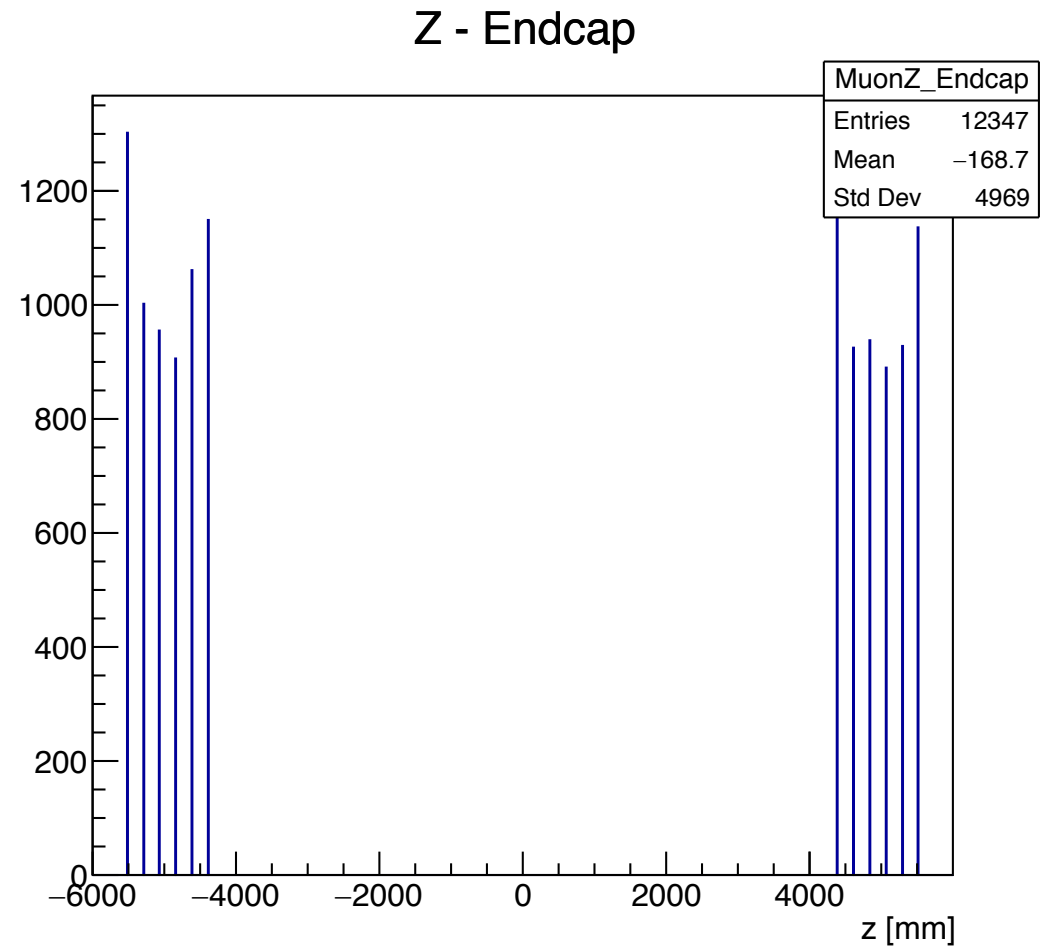
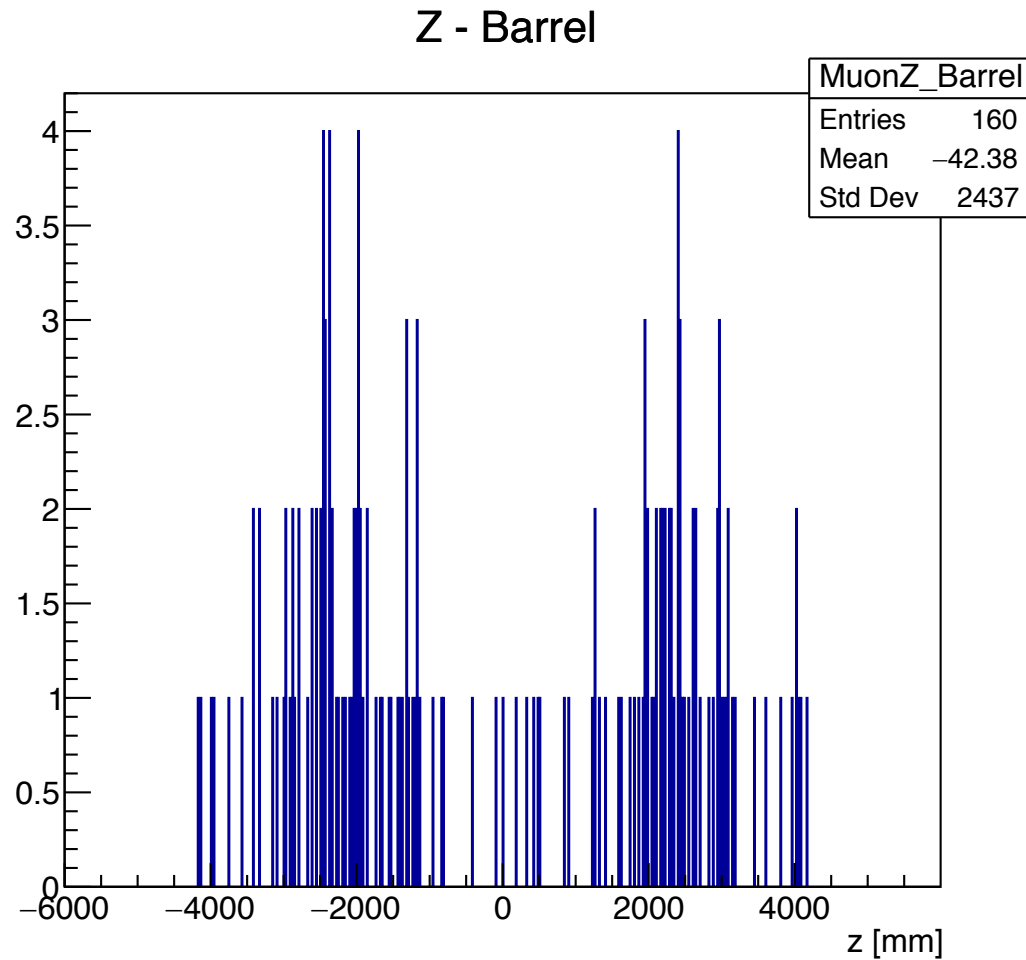
Y vs X - Barrel



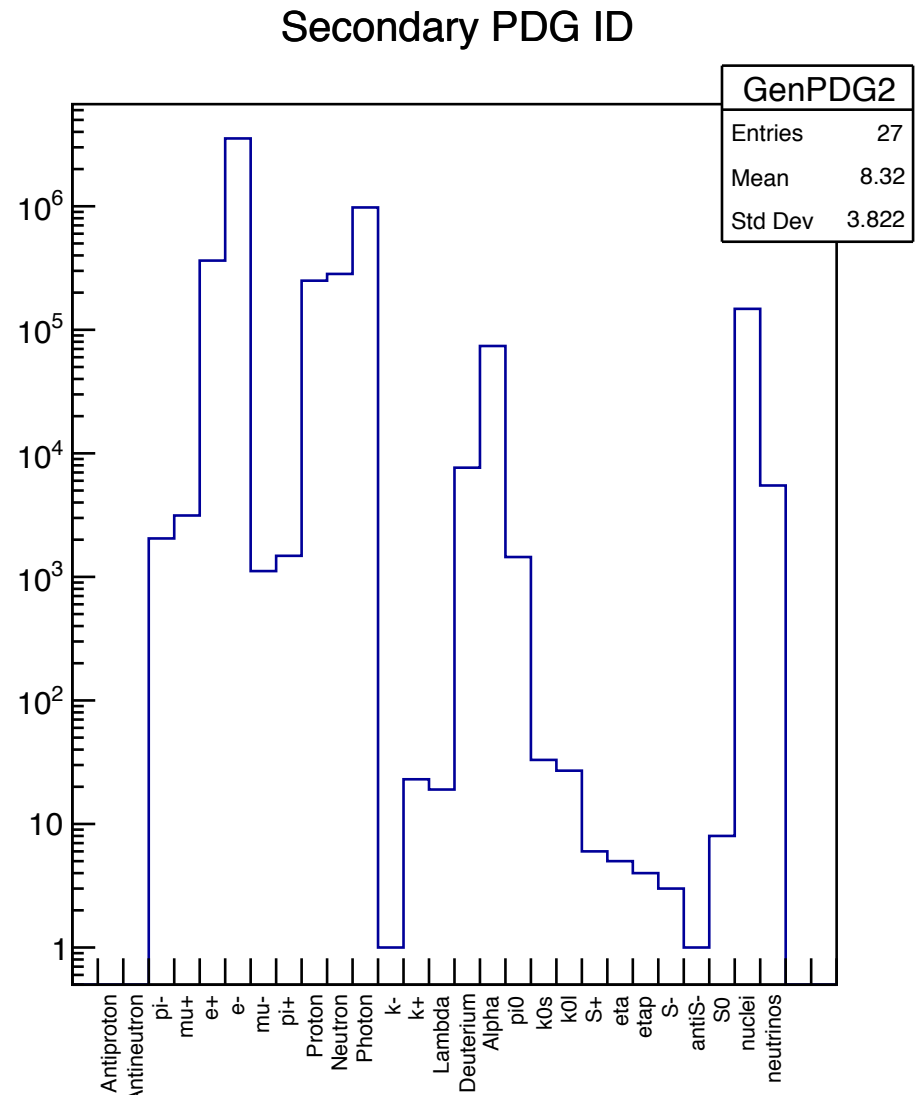
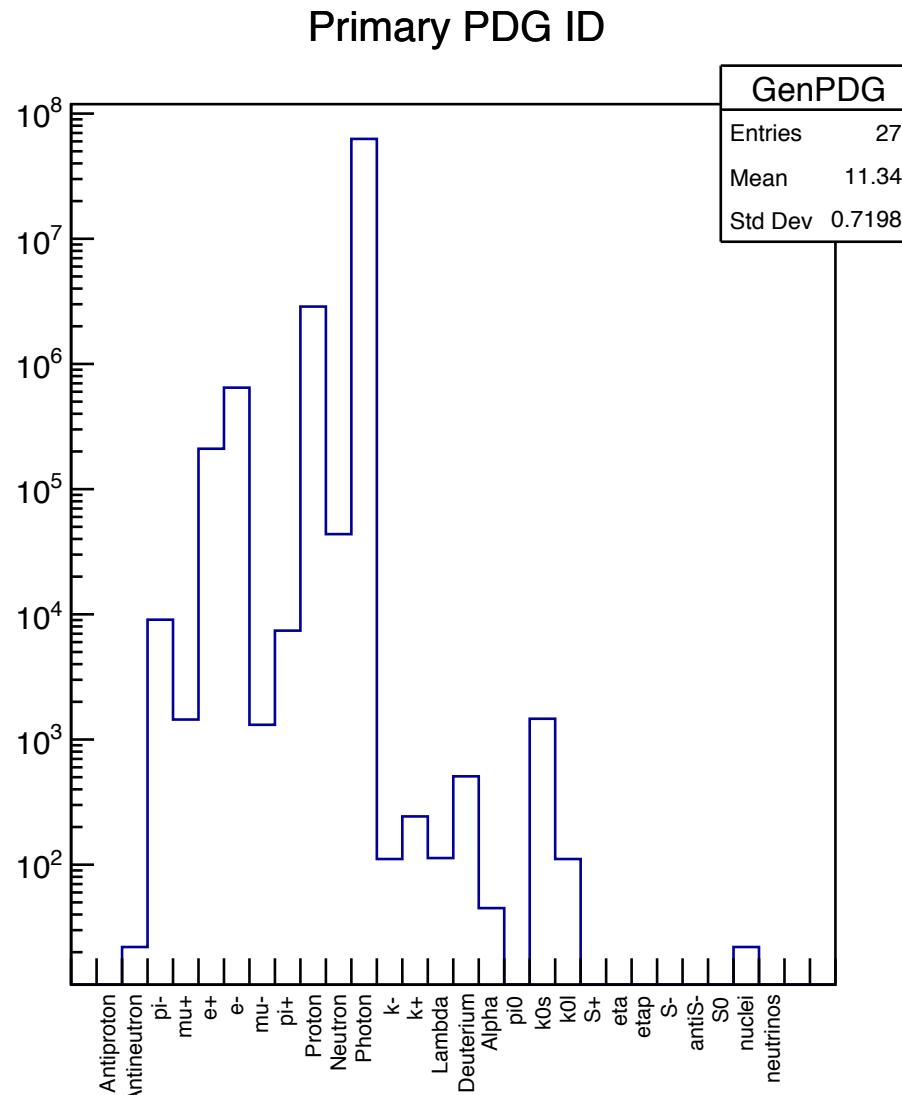
Y vs X - Endcap



Hits distribution in barrel and endcap

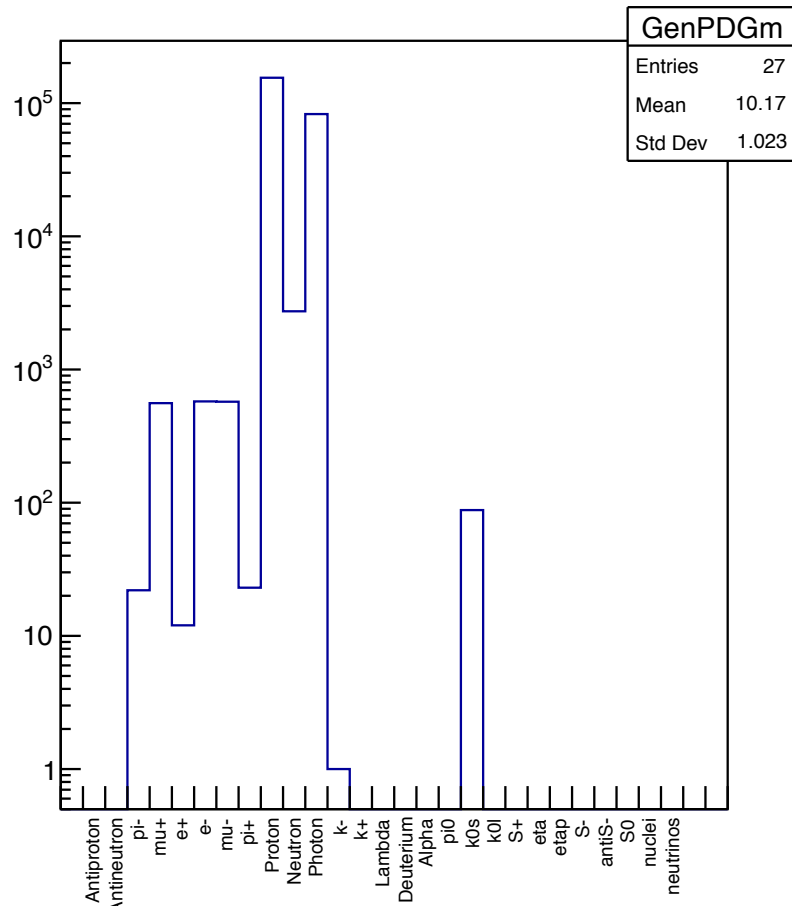


Type of total generated particles

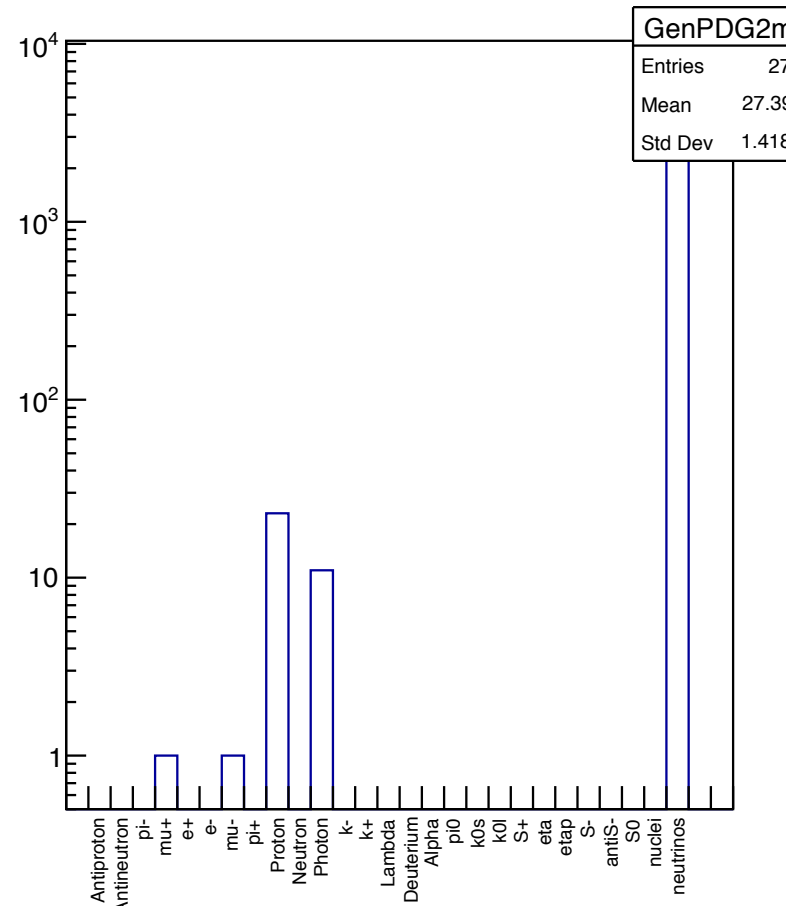


Type of generated particles in muon

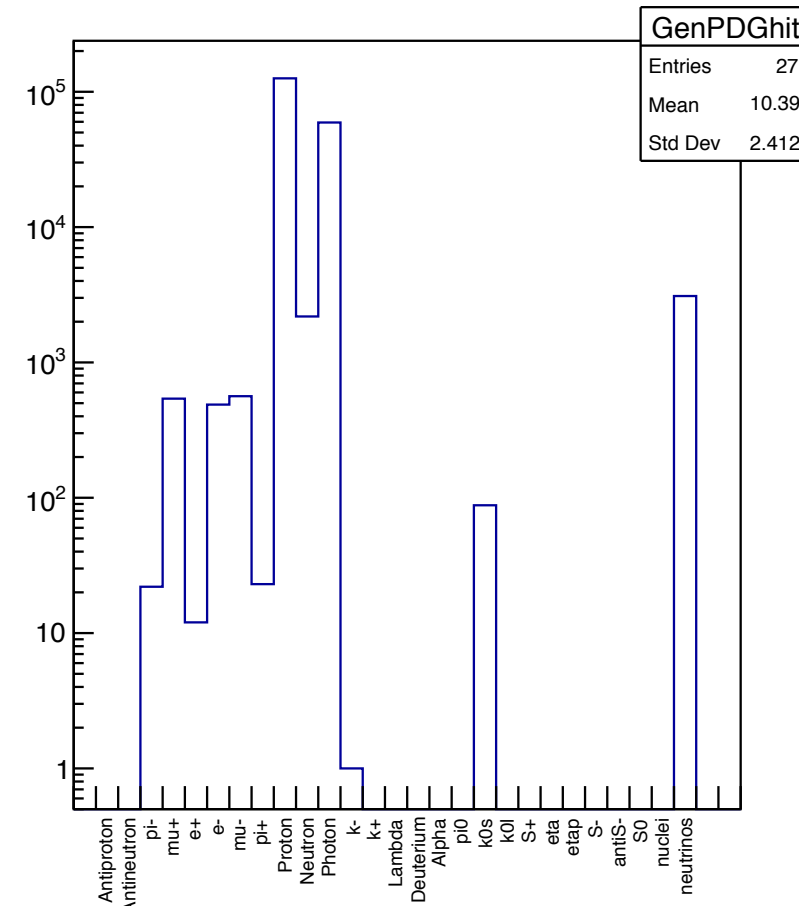
Primary PDG ID - InMuon



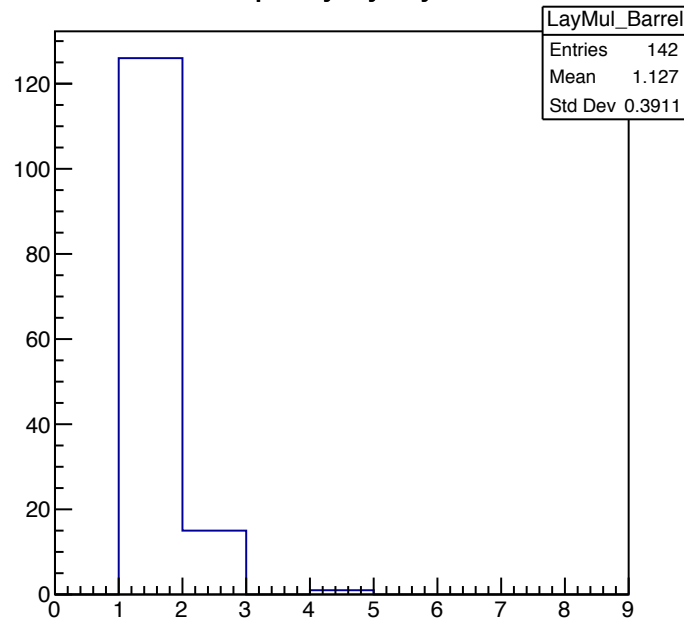
Secondary PDG ID - InMuon



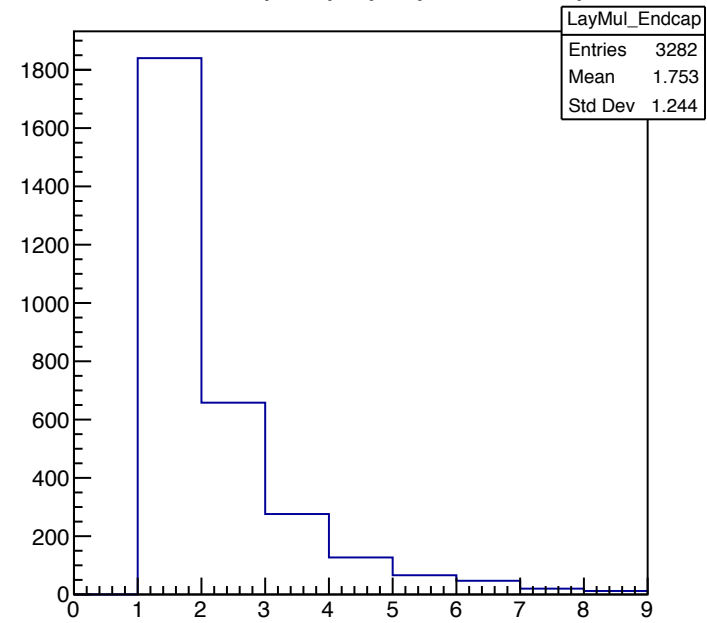
PDG ID when hits



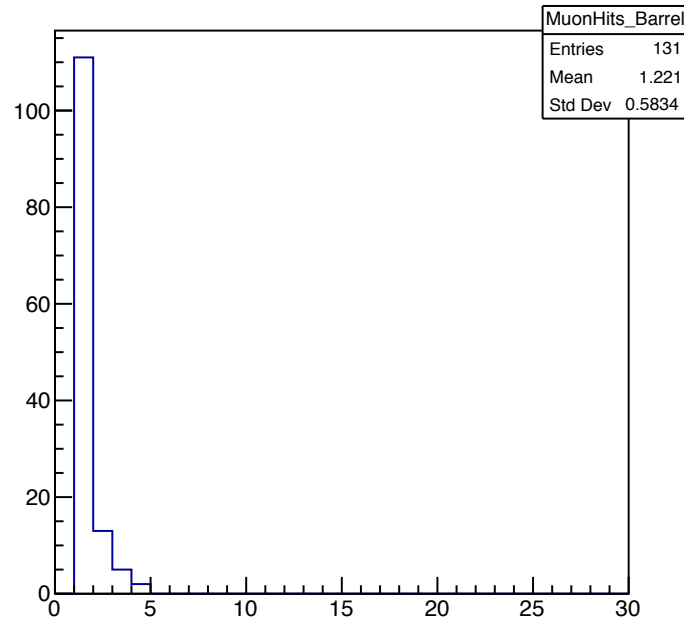
Hits Multiplicity by layer- Barrel



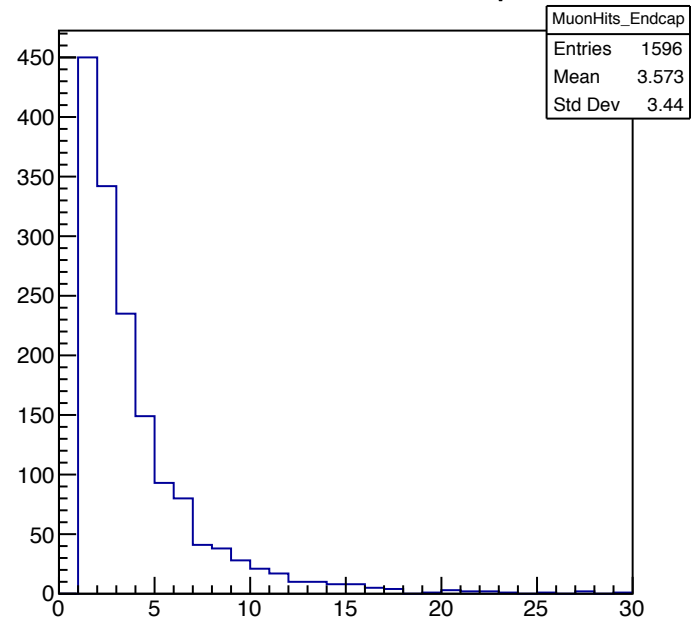
Hits Multiplicity by layer - Endcap



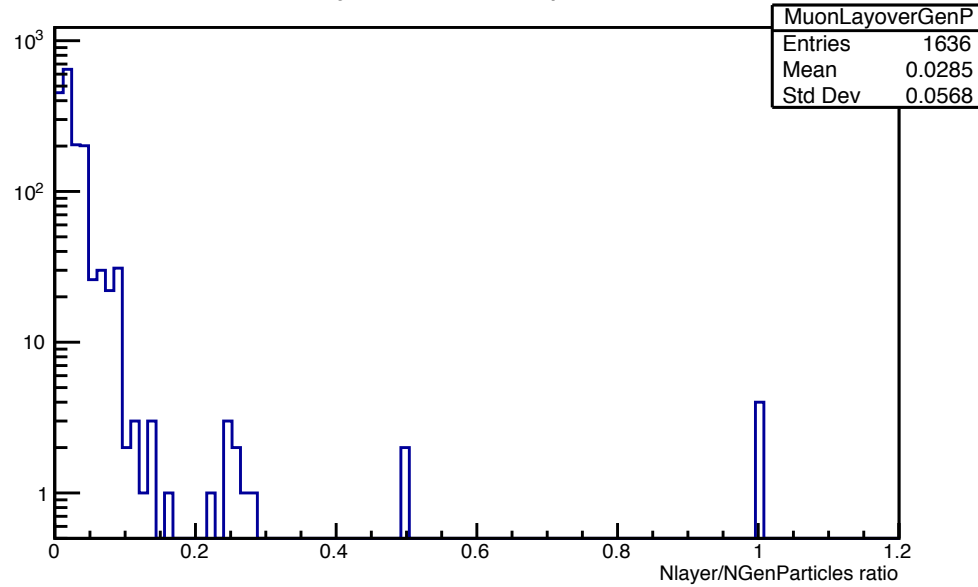
Particle Hits - Barrel



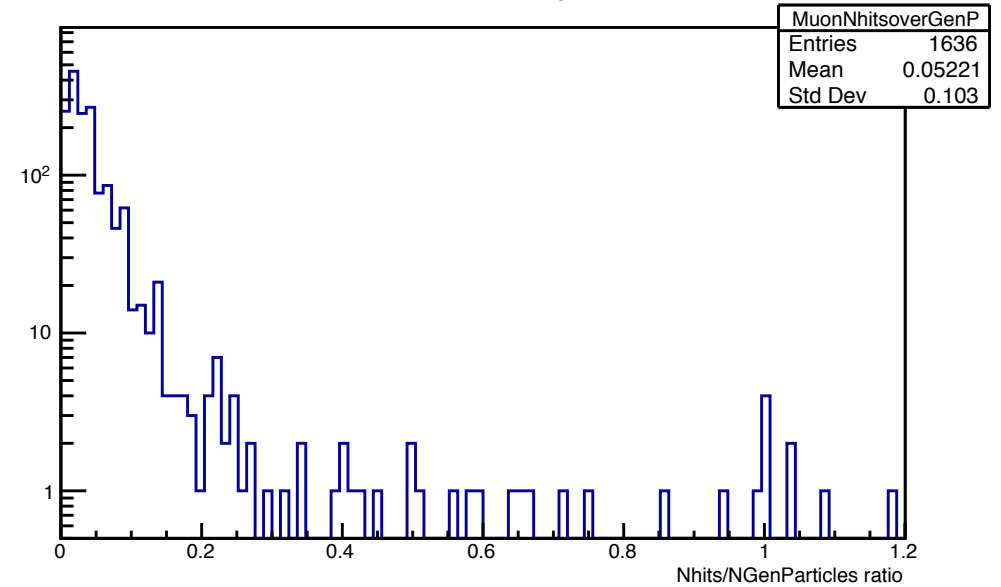
Particle Hits - Endcap



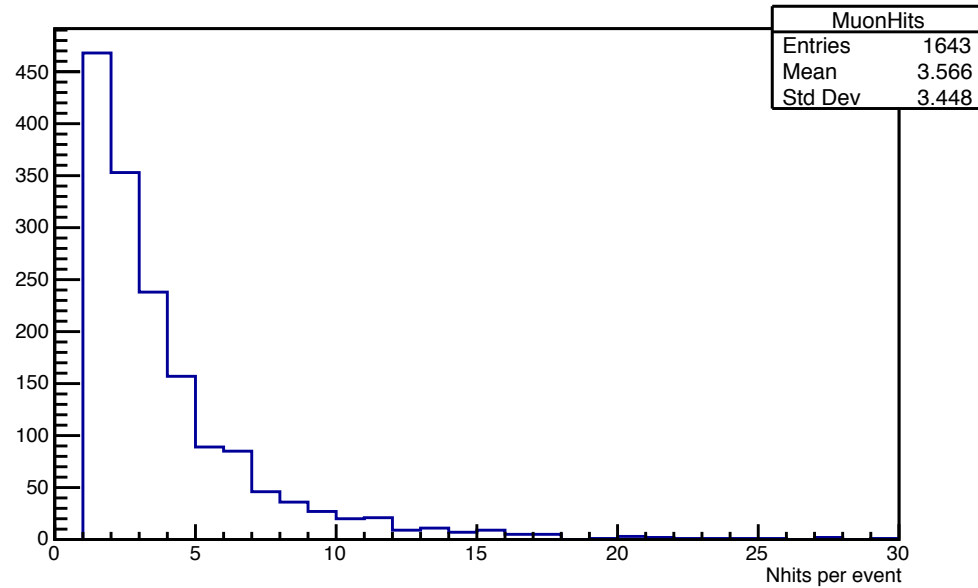
NLayer over NGenP per Event



NHits over NGenP per Event



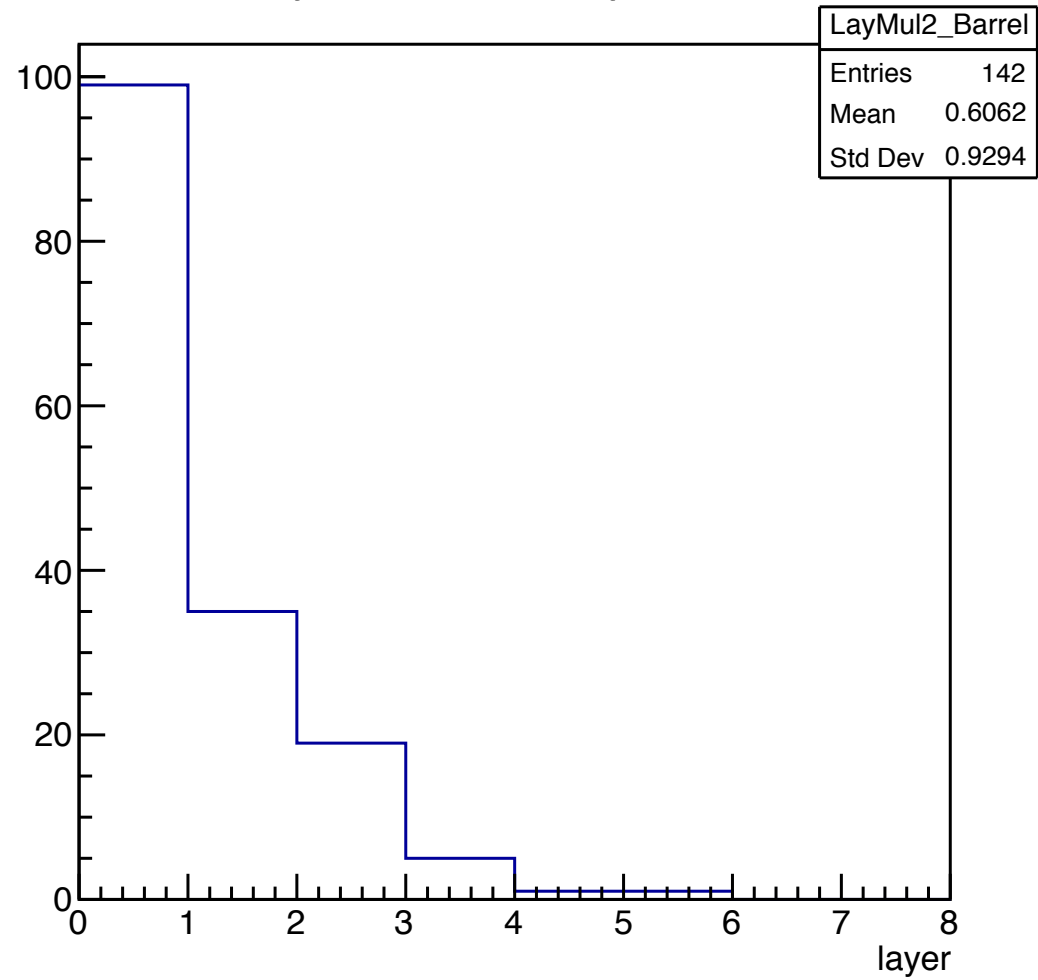
Particle Hits



Particles in muon with hits in

- at least one layer: 1643
- at least two layers: 930
- at least three layers: 480
- both barrel and endcap: 84

layer occupancy- Barrel



layer occupancy- Endcap

