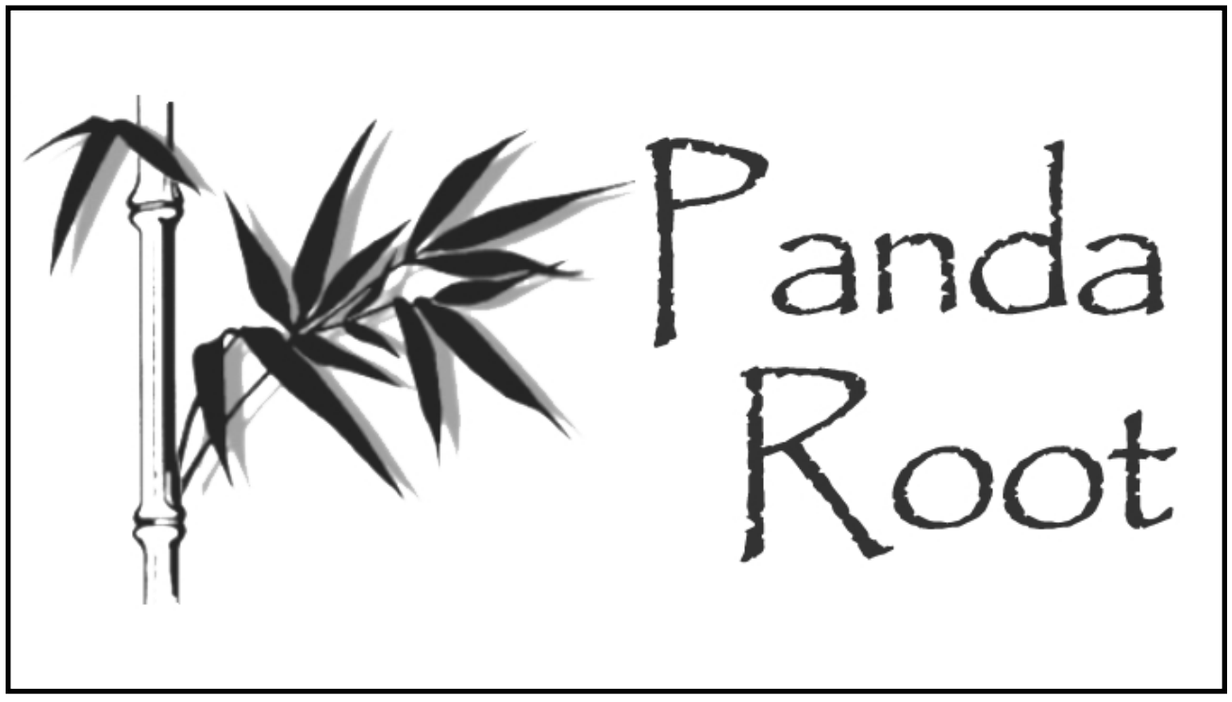
Master Tasks - Options



Ralf Kliemt

Panda Collaboration Meeting 5.Nov.2019

MasterTasks - Concept

- Low-threshold entry point to PandaRoot:
  —> Analysts should start immediately
- Encapsulate default and common configurations into short macros
- Options passed as a string for all stages:
  event generation, geometry, sim, digi, reco & pid
- Classes in `tools/MasterTasks`

Example Simulation Macro

```
int sim_complete(Int_t nEvents = 100, TString  SimEngine ="TGeant3", Double_t
  BeamMomentum = 6.231552, TString prefix= "data/evtcomplete")
{
  // -----   Create the Simulation run manager ---------------------------
  PndMasterRunSim *fRun = new PndMasterRunSim();
  fRun->SetInput("psi2s_Jpsi2pi_Jpsi_mumu.dec");
  fRun->SetName(SimEngine);
  fRun->SetParamAsciiFile("all.par");
  fRun->SetNumberOfEvents(nEvents);
  fRun->SetBeamMom(BeamMomentum);
  fRun->SetStoreTraj(kTRUE);
  fRun->SetOptions("");
  // -----  Initialization   ----------------------------------------------
  fRun->Setup(prefix);
  fRun->CreateGeometry();
  fRun->SetGenerator();
  fRun->AddSimTasks();
  // -----   Intialise and run   -------------------------------------------
  fRun->Init();
  fRun->Run(nEvents);
  fRun->Finish();
  return 0;
}
```

Generator setup string

Geometry setup options

file names prefix

Example Full Reco Macro

```
int full_complete(Int_t nEvents = 0, TString  prefix = "data/evtcomplete")
{
  // -----   Initial Settings   ----------------------------------------
  PndMasterRunAna *fRun= new PndMasterRunAna();
  fRun->SetInput("psi2s_Jpsi2pi_Jpsi_mumu.dec");
  fRun->SetOutput("pid");
  fRun->SetParamAsciiFile("all.par");
  fRun->SetOptions("");
  fRun->Setup(prefix);
  // -----   Add tasks   ----------------------------------------------
  fRun->AddDigiTasks(kFALSE);
  fRun->AddRecoTasks(kFALSE);
  fRun->AddPidTasks();
  // -----   Intialise and run   --------------------------------------
  fRun->Init();
  fRun->Run(0, nEvents);
  fRun->Finish();
  return 0;
}
```

Reconstruction setup options

set of default algorithms, some not written to file

Option	SIM	DIGI	RECO	PID
phase1	no RICH/DISK	no RICH digi		
day1	no RICH/DISK, GEM2, FTS1234	no RICH digi		
nopixels	no MVD pixels			
nogem	no GEM	no GEM digi	GEM off in barreltracker	
gem3	full GEM			
fts1256	FTS 12 & 56			
barreltrack			other central tracking	
ftsca			CA tracking FTS	
filtered			p_z cleaning	
multikalman			5x track fits	5x track propagation
electron			restrict multikalman	restrict multikalman
muon			restrict multikalman	restrict multikalman
pion			restrict multikalman	restrict multikalman
kaon			restrict multikalman	restrict multikalman
proton			restrict multikalman	restrict multikalman
genfit2			GENFIT 2 Kalman	
fakeonline		extra smear EMC	extra track smear	
pidnoswim				tracks not at IP
pidfast				?
piddebug				debug output

Geometry Settings

PndRunSim

- `CreateGeometry()`: select by option string
- “” or `CreateGeometryDefault()`
- “`phase1`” or `CreateGeometryPhase1()`
  - No RICH, no DISC
- “`day1`” or `CreateGeometryDay1()`
  - No RICH, no DISK, FTS 12&34, GEM 2 stations
  - Option to switch off MVD pixels
  - Option to use 0 or 3 GEMs

Generator Settings

PndRunSim

- `SetGenerator()`: select by option string
- `SetGenerator/AddGenerator(FairGenerator*)`: set/add any generator
- Activate generator with a setup string:
  - `UseAsciiGenerator(filename)`
  - `UseBoxGenerator(setup)`
  - `UseEvtGenGenerator(decfile)`
  - `UseDpmGenerator()`
  - `UseFtfGenerator(datastring)`
  - `UsePiPiGenerator(options)`
  - `UseLepLepGenerator(options)`

Tracking Default Settings

PndRunAna / PndMasterRecoTask

Pattern recognition:

- PndTrkTracking2 (Gianluigi)
- PndSttMvdGemTracking (Gianluigi)
- PndIdealTrackFinder (FtsTrackFunctor)

Fitting:

- PndRecoKalmanTask (genfit1)

```
int reco(TString prefix="",int nevt=0)
{
  // -----   Initial Settings   ---------------
  PndMasterRunAna *fRun= new PndMasterRunAna();
  fRun->SetInput("dummy");
  fRun->SetOutput("rec");
  fRun->AddFriend("sim");
  fRun->AddFriend("digi");
  fRun->SetParamAsciiFile("all.par");
  fRun->Setup(prefix);
  // -----   Add tasks   ----------------------
  //fRun->AddRecoIdealTasks();
  fRun->AddRecoTasks();
  // -----   Intialise and run   --------------
  PndEmcMapper::Init(1);
  fRun->Init();
  fRun->Run(nevt);
  fRun->Finish();
  return 0;
}
```

Note: STT is needed to form tracks in the barrel

Tracking Default Settings

PndRunAna / PndMasterRecoTask

- “`filtered`”
  for PndMissingPzCleanerTask together with standard tracking

- “`barreltrack`”
  for Radeks tracking: Uses Stt/Mvd/Gem, but no Stt hits required

- “`ftsca`”
  Cellular automaton tracking for FTS

```
int reco(TString prefix="",int nevt=0)
{
  // -----   Initial Settings   ------------------
  PndMasterRunAna *fRun= new PndMasterRunAna();
  fRun->SetInput("dummy");
  fRun->SetOutput("reco");
  fRun->AddFriend("sim");
  fRun->AddFriend("digi");
  fRun->SetParamAsciiFile("all.par");
  fRun->Setup(prefix);
  fRun->SetOptions("barreltrack;multikalman;kaon");
  // -----   Add tasks   -------------------------
  fRun->AddRecoTasks();
  // -----   Intialise and run   -----------------
  PndEmcMapper::Init(1);
  fRun->Init();
  fRun->Run(nevt);
  fRun->Finish();
  return 0;
}
```

Tracking Default Settings

PndRunAna / PndMasterRecoTask

- `"multikalman"`
  activates 5 output branches with particle suffixes. Use any combination of “electron”, “muon”, “pion”, “kaon”, “proton” to increase speed.

- `"genfit2"`
  activate Genfit2 with Geane as track follower

- `"fakeonline"`
  extra smearing to worsen performance as an online case may look like

```
int reco(TString prefix="",int nevt=0)
{
  // -----   Initial Settings   -------------------
  PndMasterRunAna *fRun= new PndMasterRunAna();
  fRun->SetInput("dummy");
  fRun->SetOutput("reco");
  fRun->AddFriend("sim");
  fRun->AddFriend("digi");
  fRun->SetParamAsciiFile("all.par");
  fRun->Setup(prefix);
  fRun->SetOptions("barreltrack;multikalman;kaon");
  // -----   Add tasks   --------------------------
  fRun->AddRecoTasks();
  // -----   Intialise and run   ------------------
  PndEmcMapper::Init(1);
  fRun->Init();
  fRun->Run(nevt);
  fRun->Finish();
  return 0;
}
```

`"barreltrack;ftsca;genfit2;multikalman"`

Remarks:

- **This Release**: Oct19
  - Fixes in Multikalman & forward CA tracking
  - New options in Master tasks: "barreltrack" & "ftsca"
  - Default tracking:

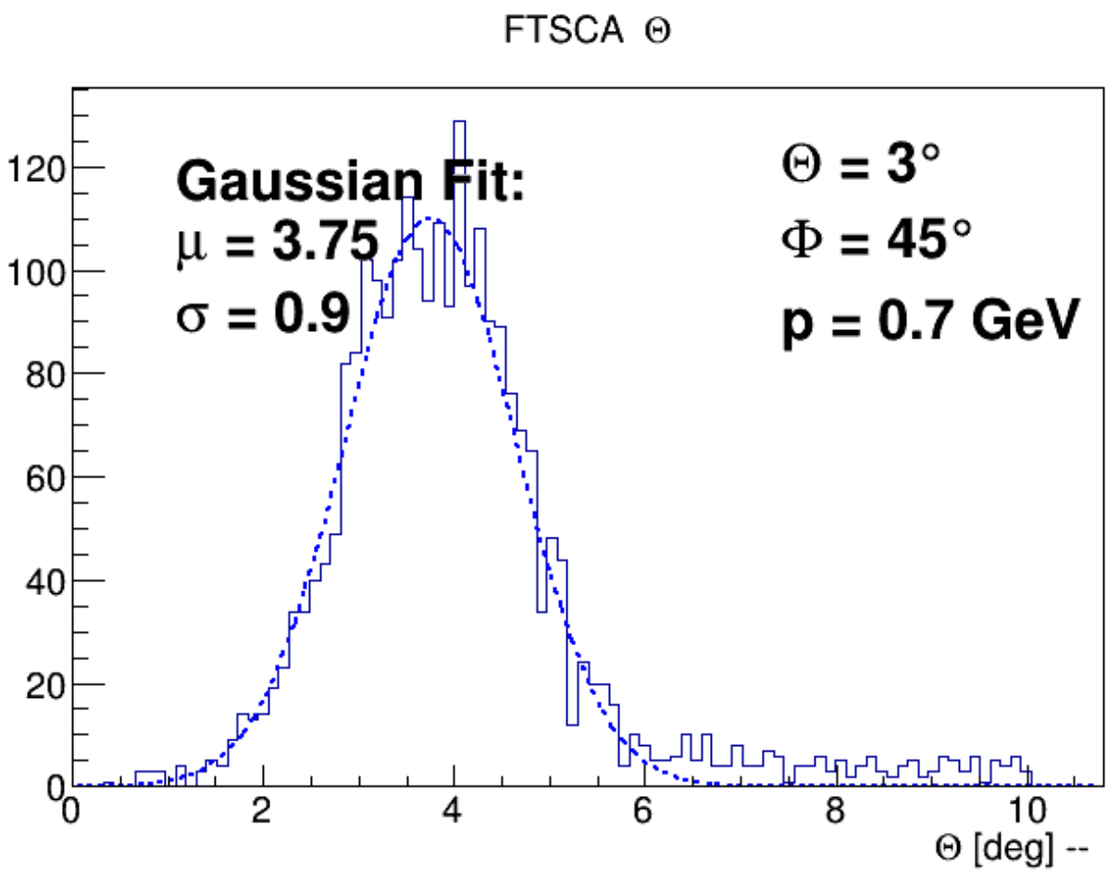
    PndTrkTrackig2 & PndSttMvdGemTracking + IdealTracking(Fts)

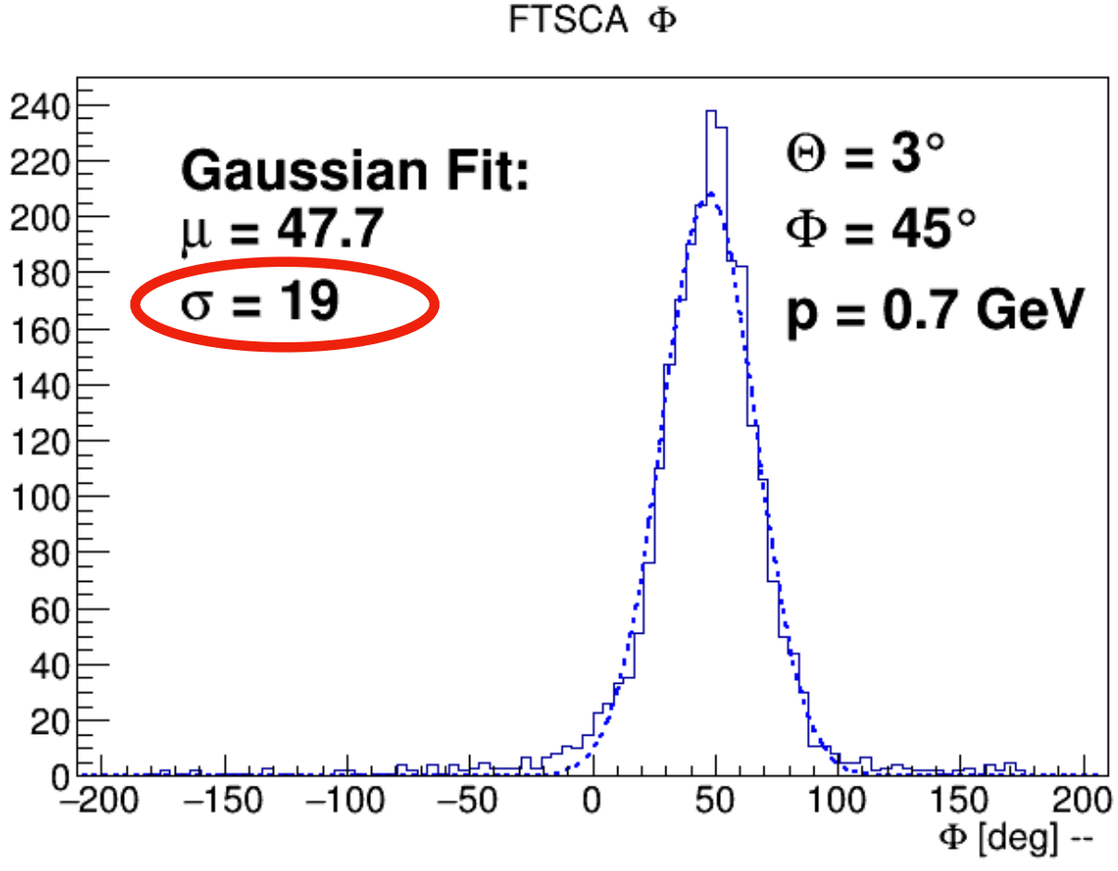
- **Open Issues**:
  - Option storage in the root files
  - Bad performance of back-propagated forward tracks
  - Genfit2 new version
  - Alternative track propagator to GEANE

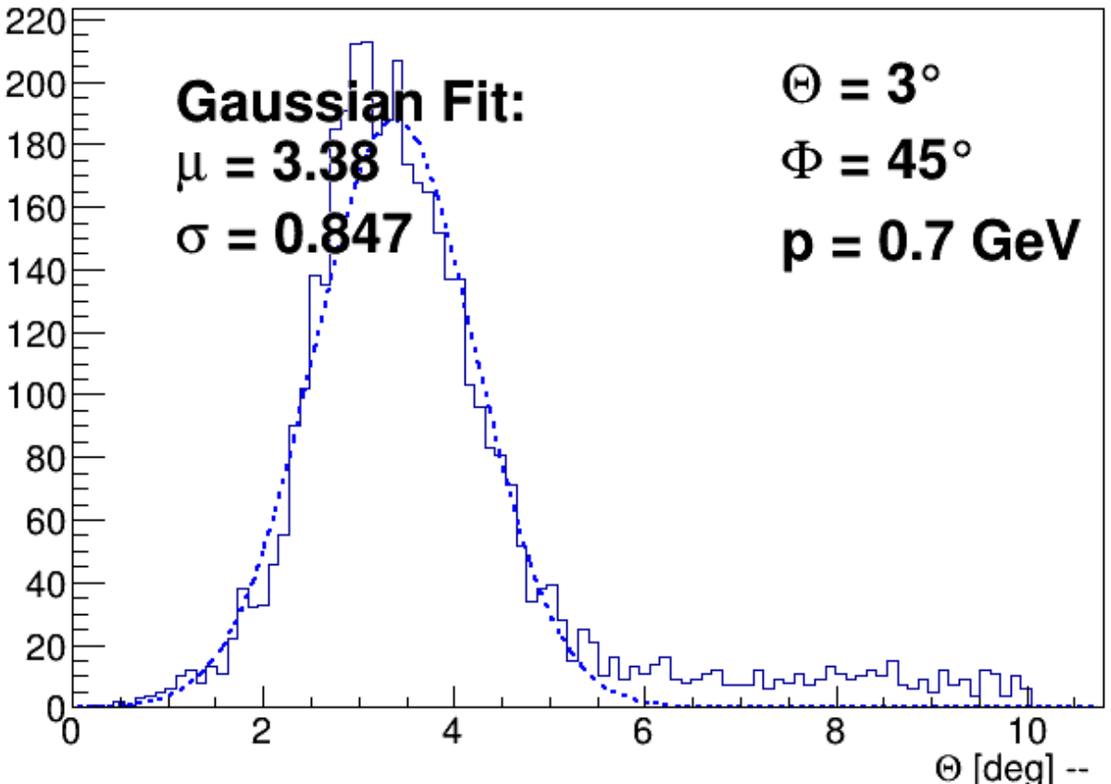
- **Future release plan**:
  - Make PndBarrelTracking + PndFtsCATracking default
  - Maybe make Genfit2 default

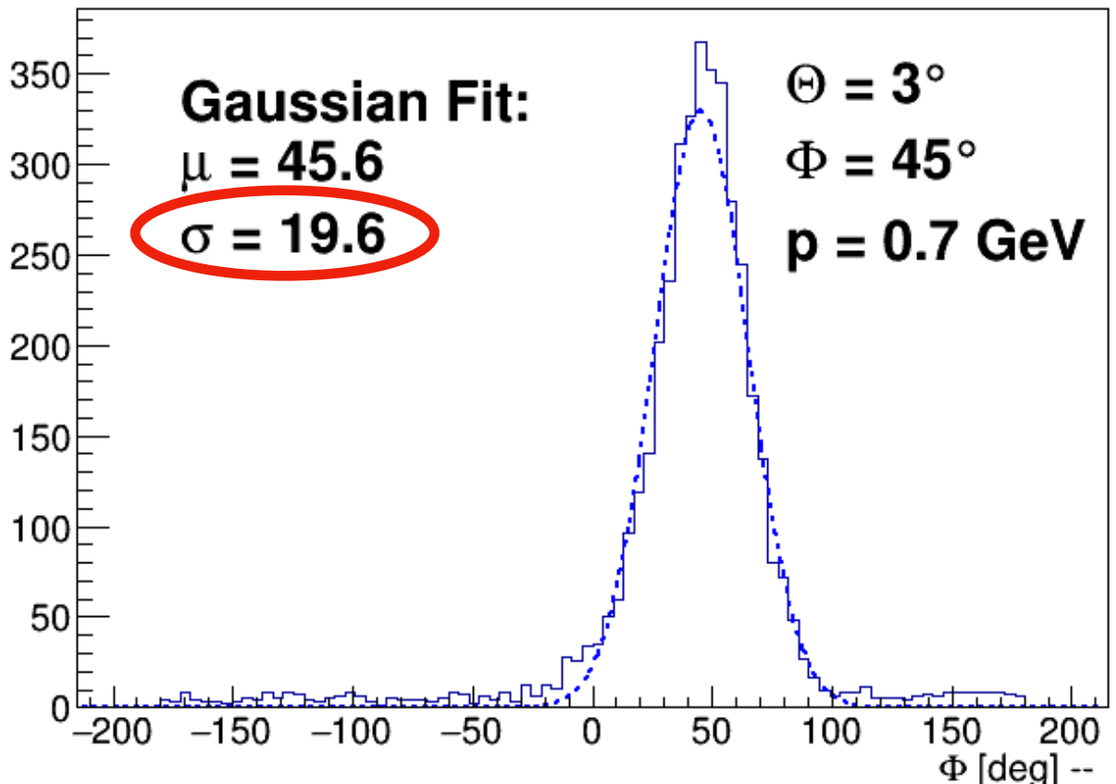
Backup

FWD Angular Resolution with K+

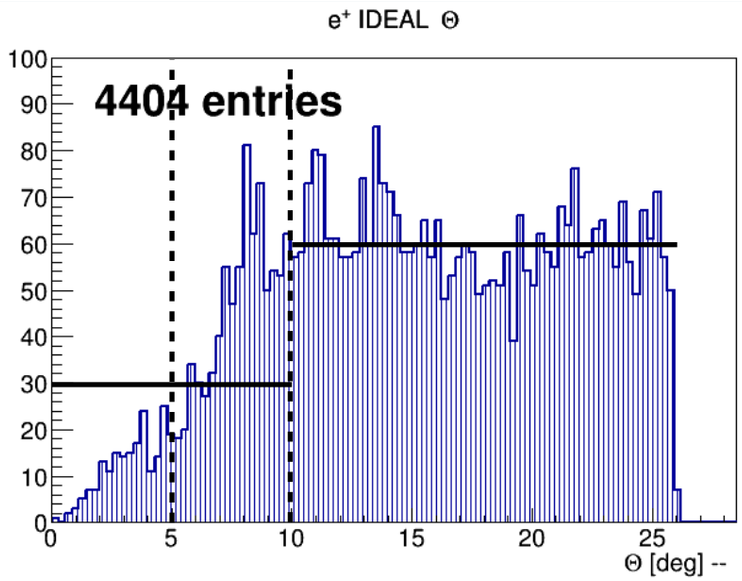
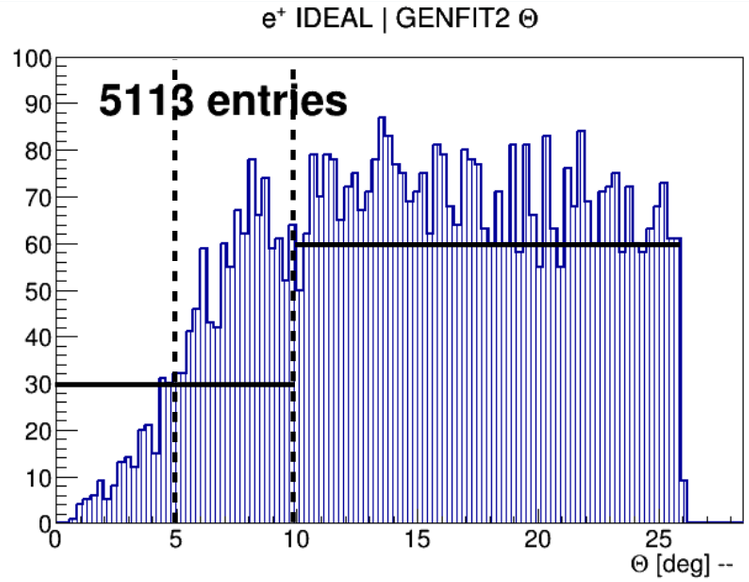
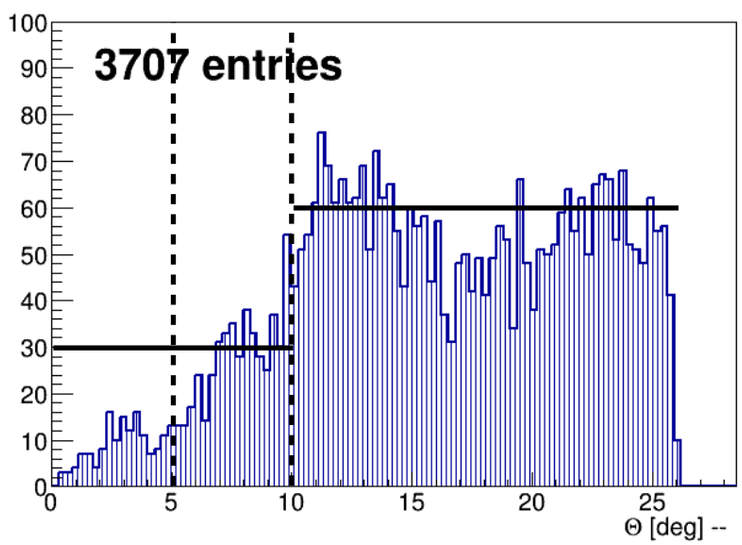
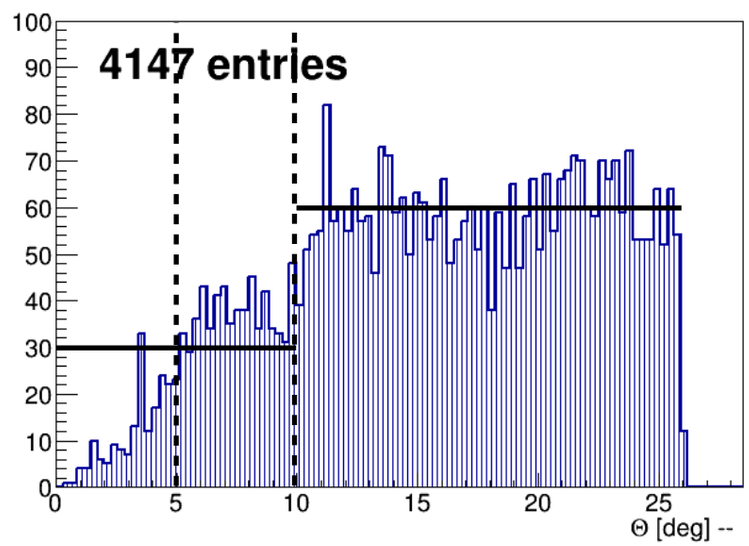
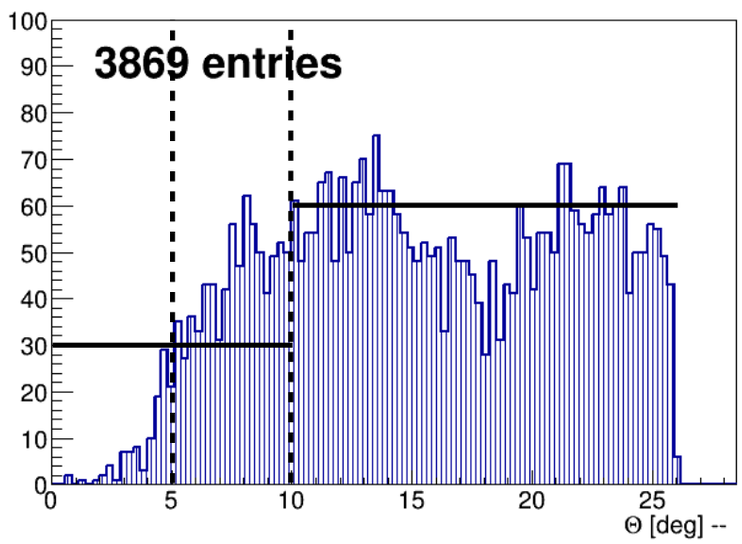
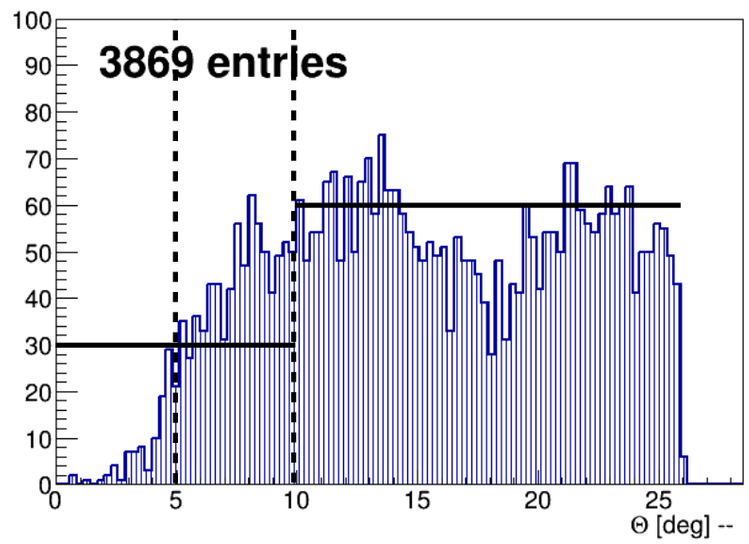




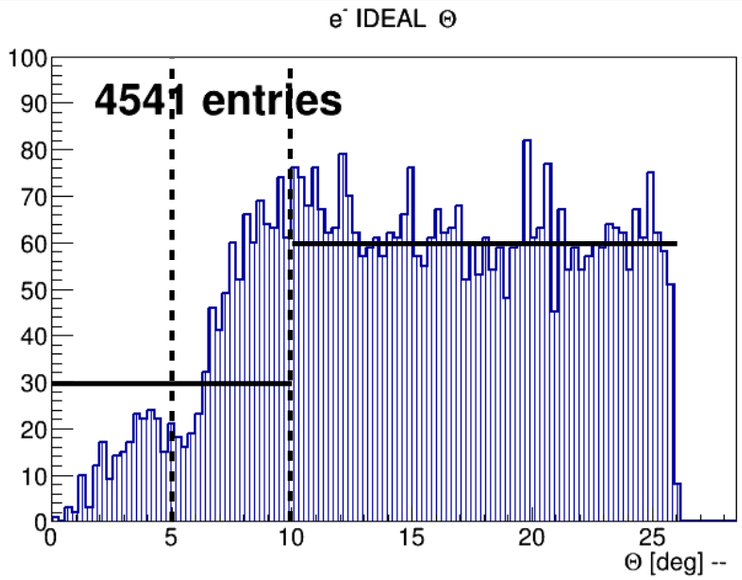
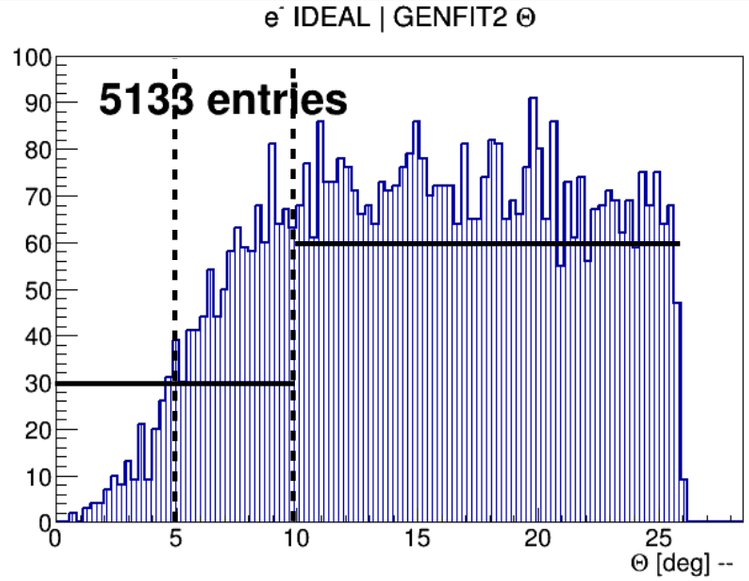
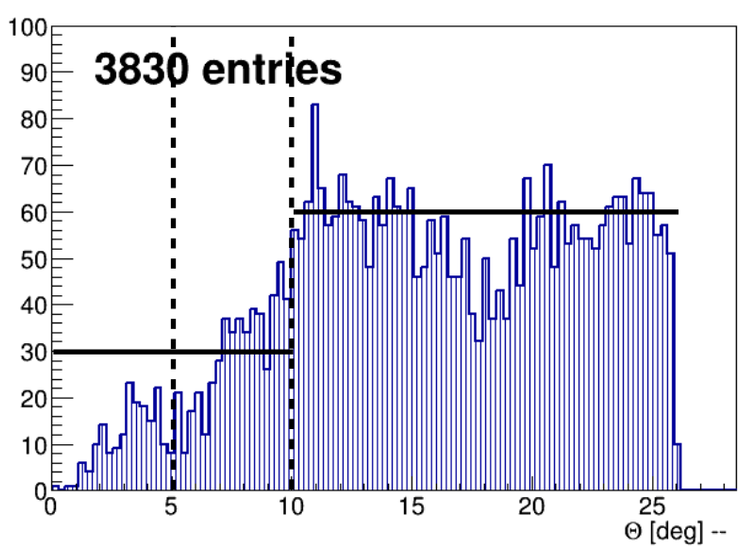
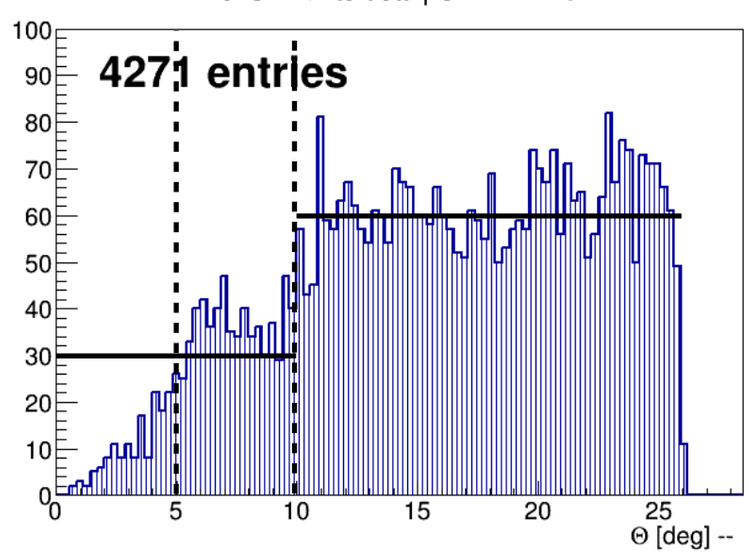
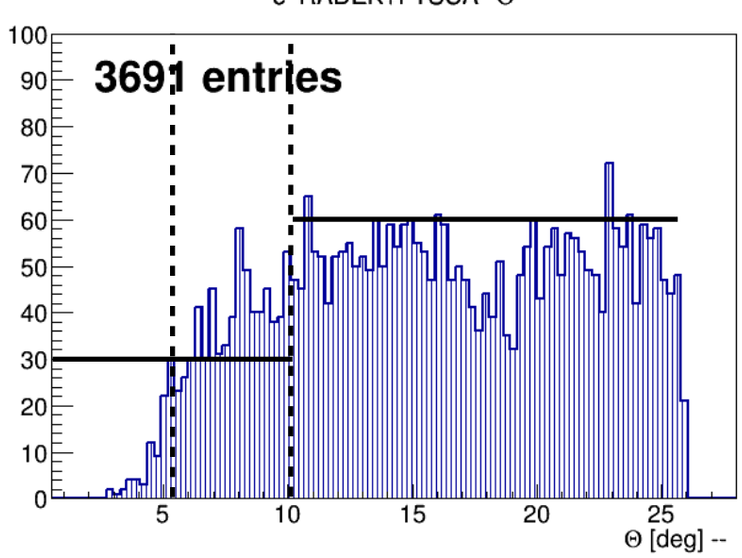
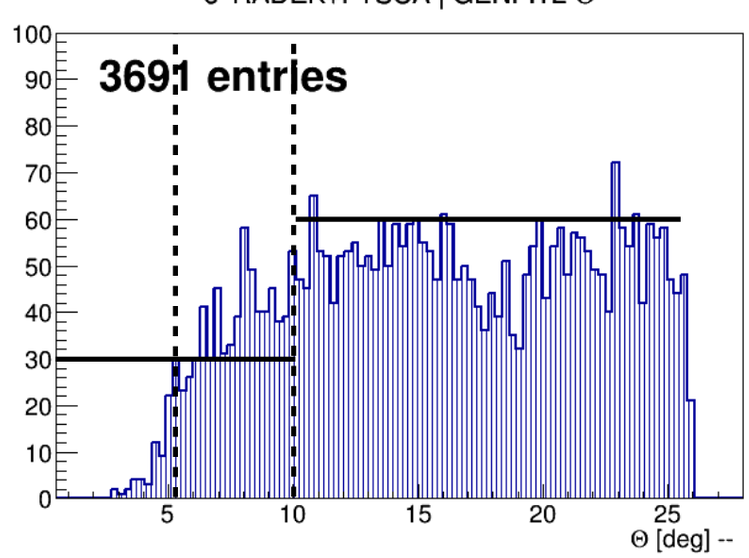




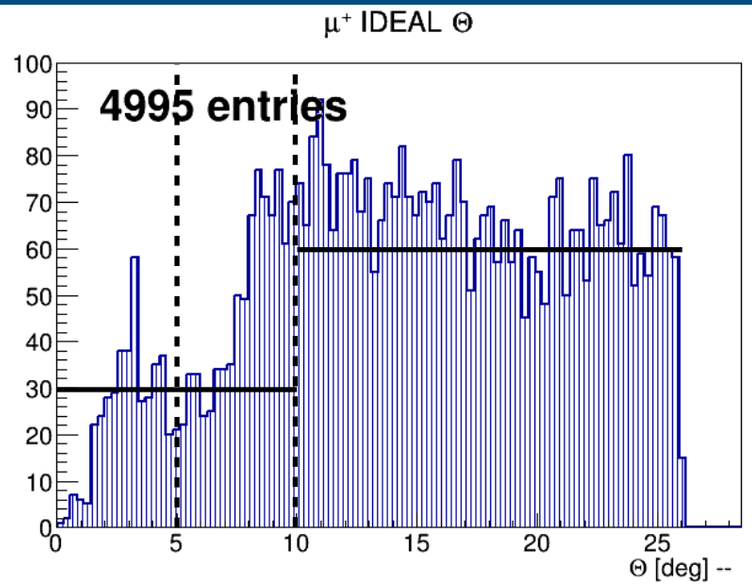
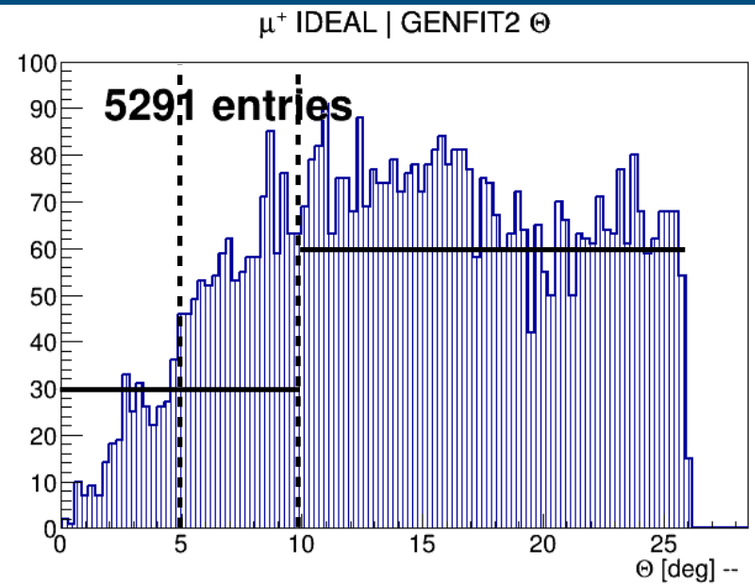
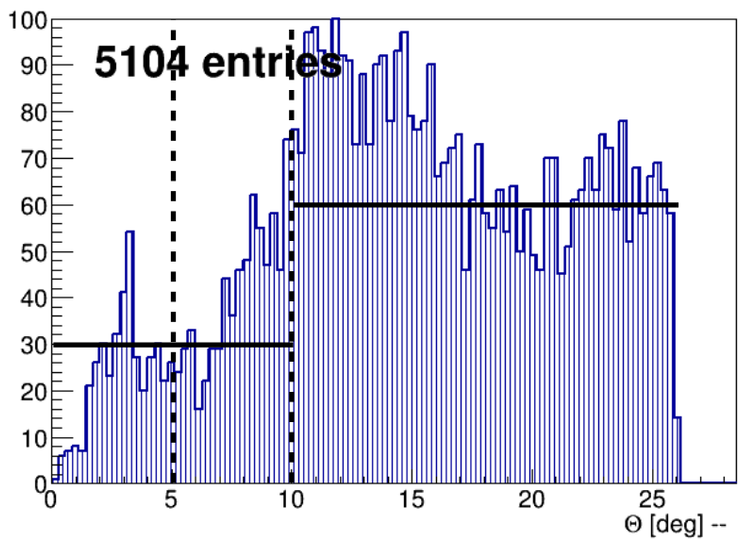
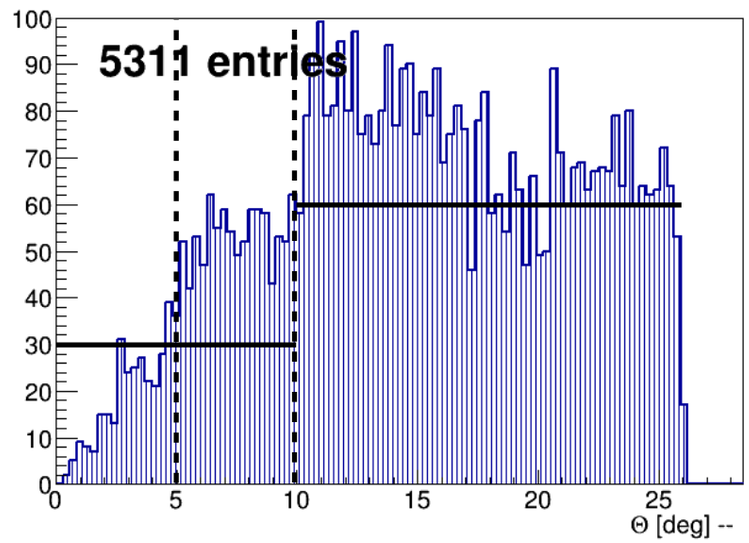
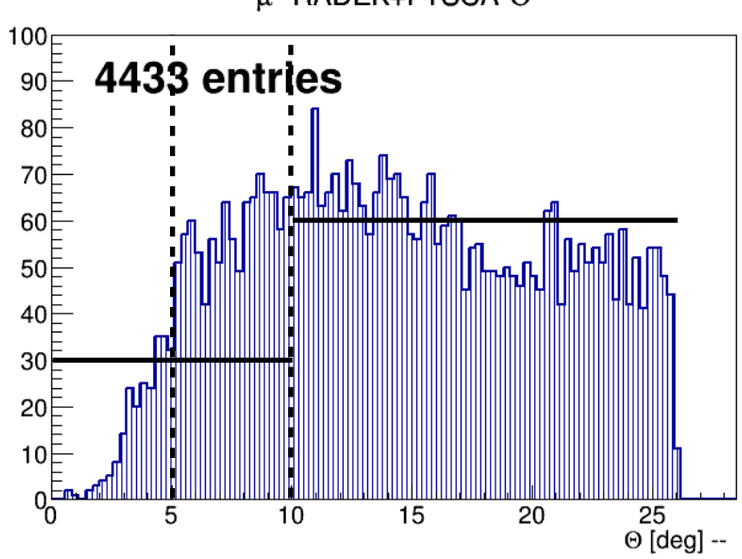
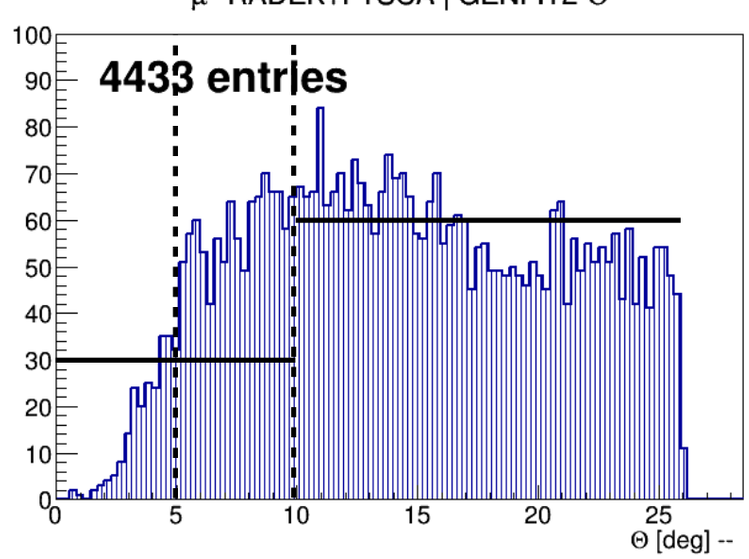
Tracking efficiencies in forward and overlap region

	Genfit 1	Genfit 2
Ideal		
SttMvdGem + FtsIdeal		
“barreltrack" + “ftsca”		

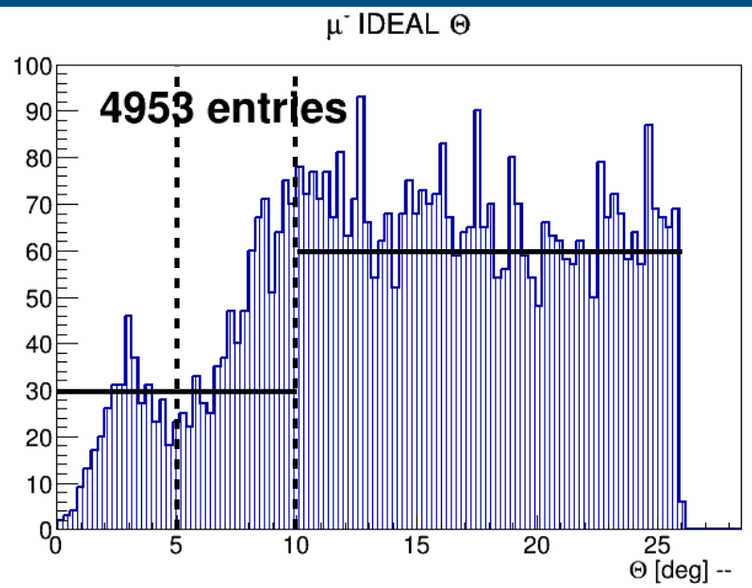
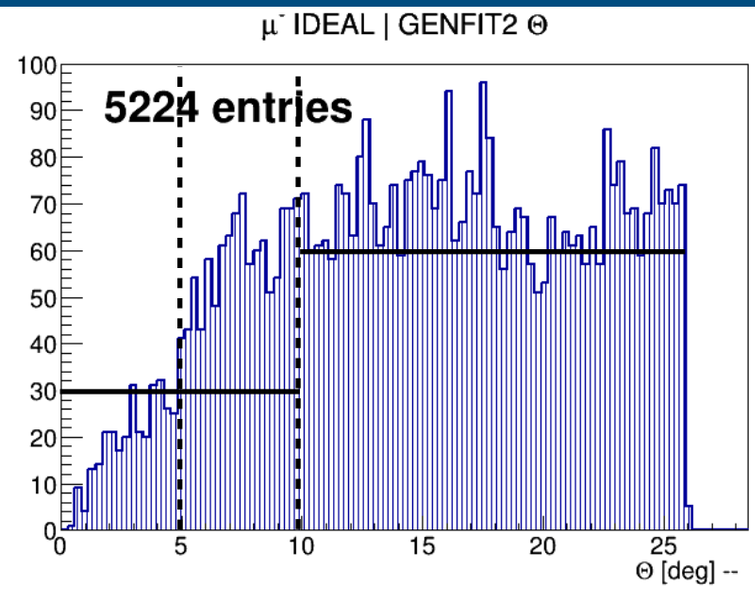
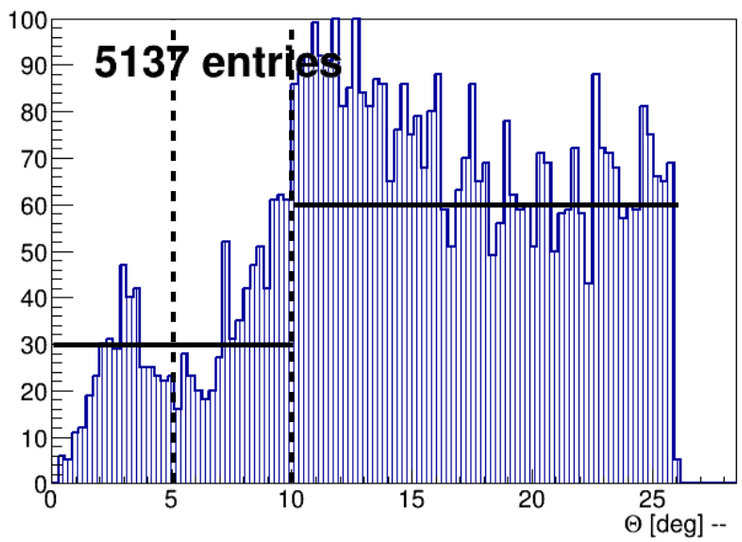
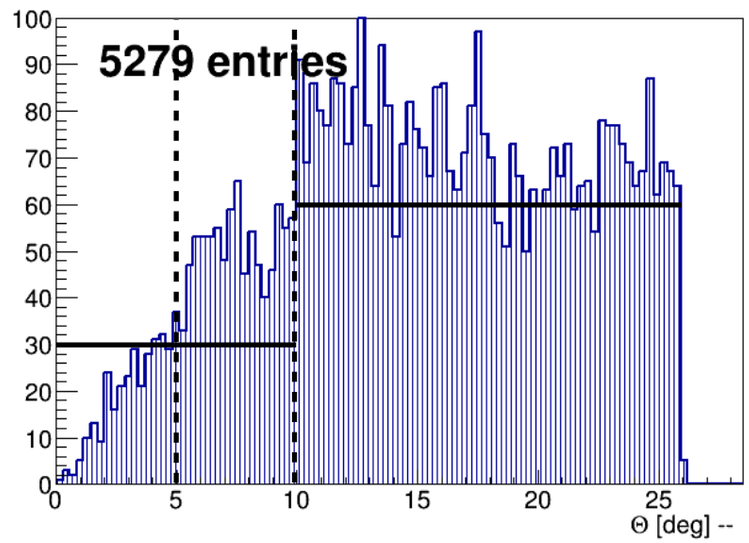
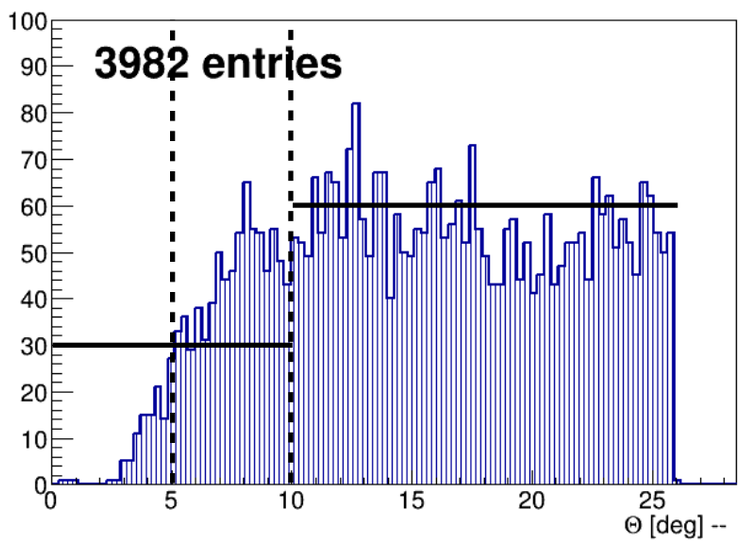
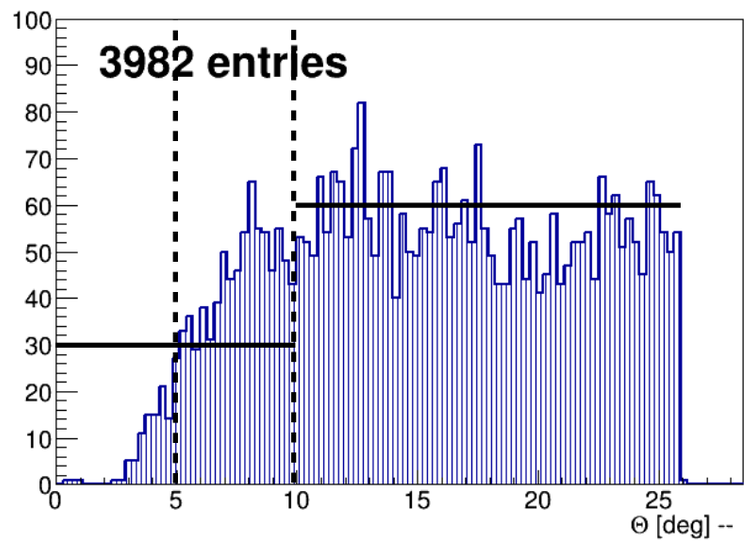
BoxGen, 10000 evts, p [0;0.9]GeV theta [0;26]deg, phi [0;360]deg

	Genfit 1	Genfit 2
Ideal		
SttMvdGem + FtsIdeal		
“barreltrack" + “ftsca”		

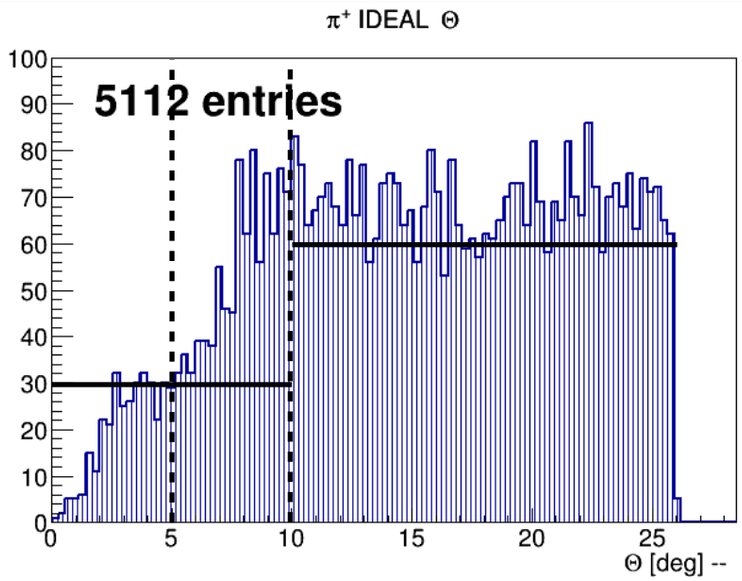
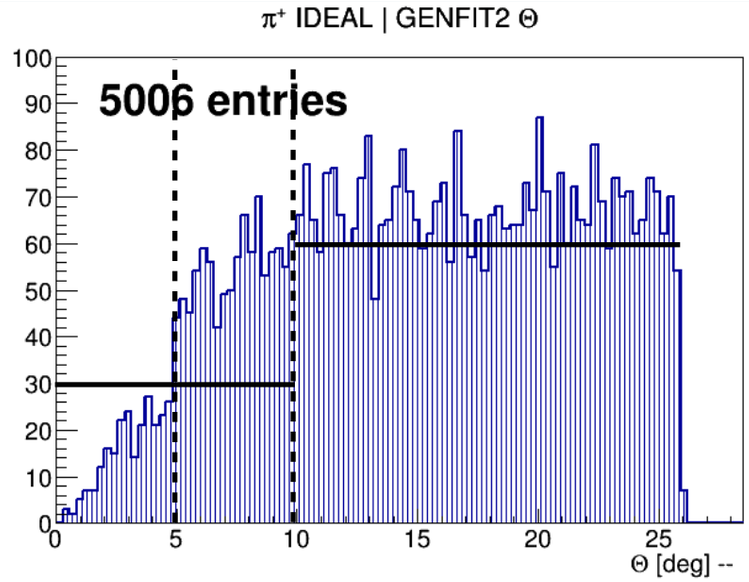
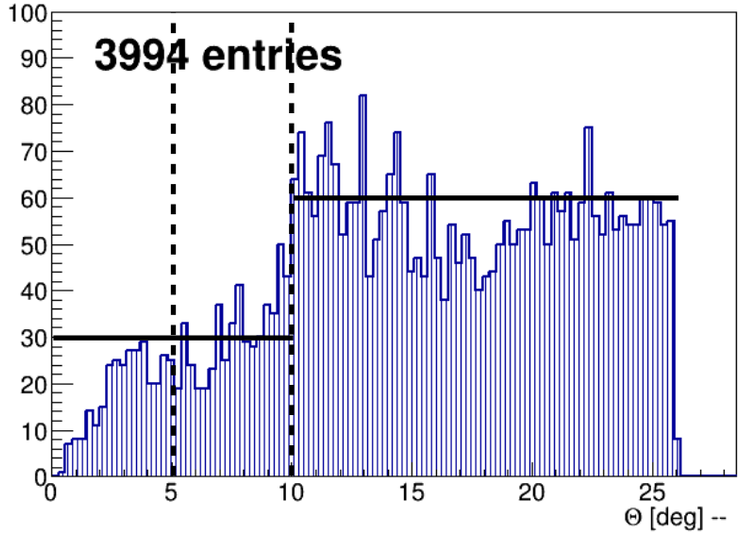
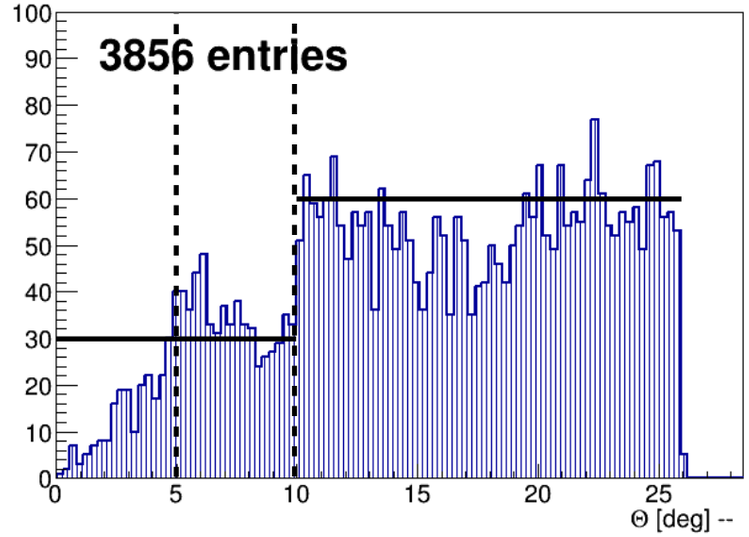
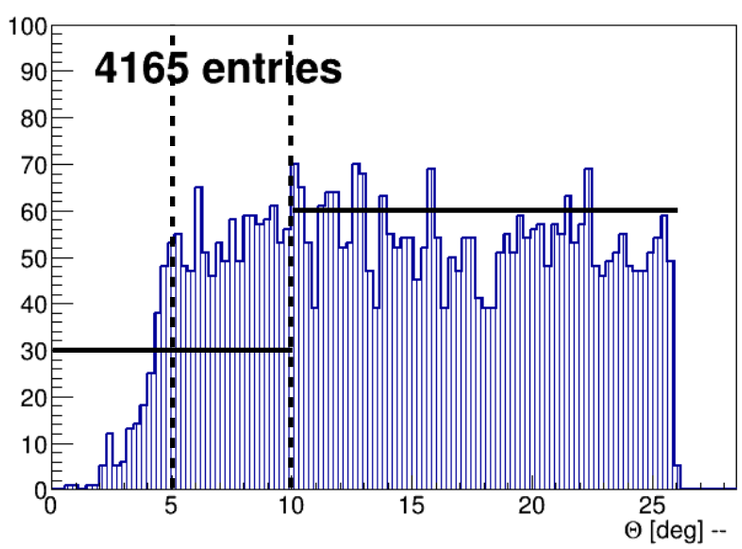
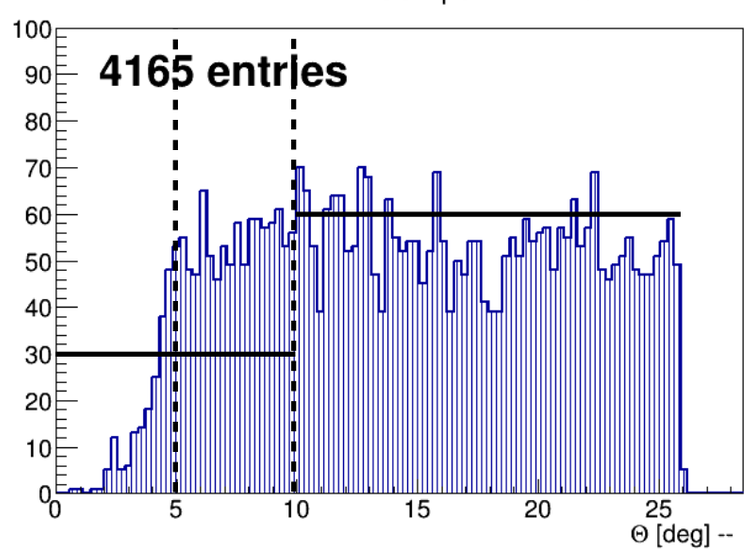
BoxGen, 10000 evts, e⁻, p [0;0.9]GeV theta [0;26]deg, phi [0;360]deg

	Genfit 1	Genfit 2
Ideal		
SttMvdGem + FtsIdeal		
“barreltrack" + “ftsca”		

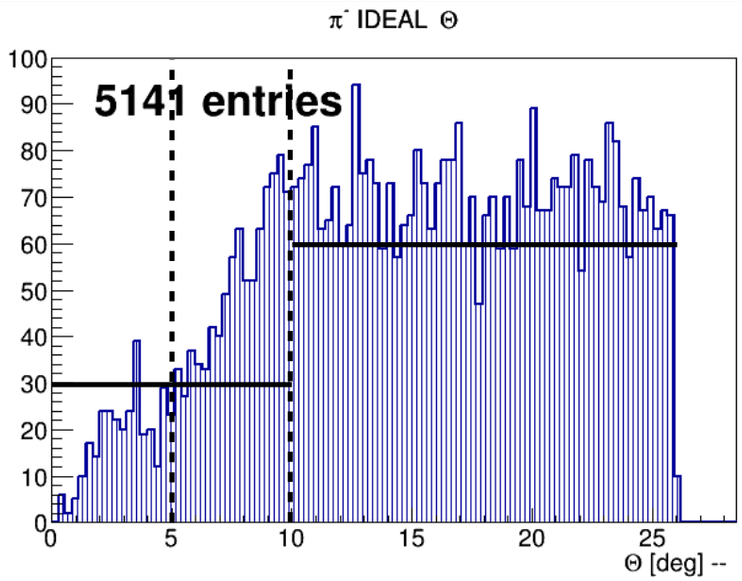
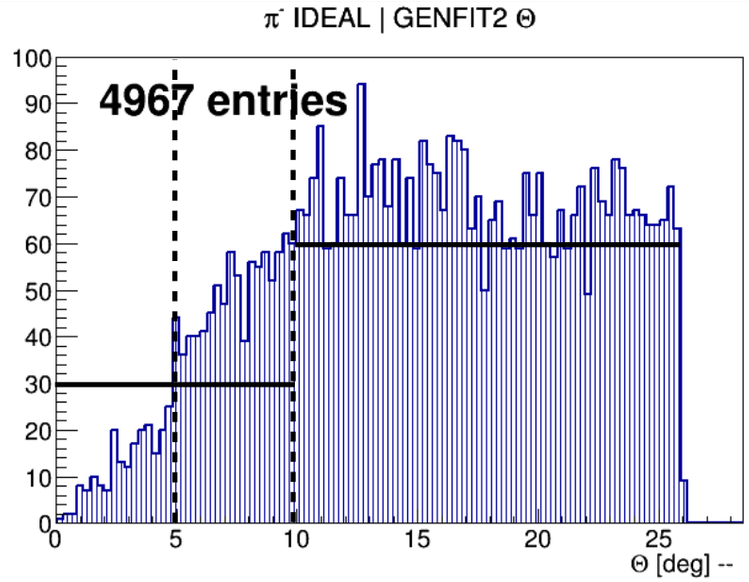
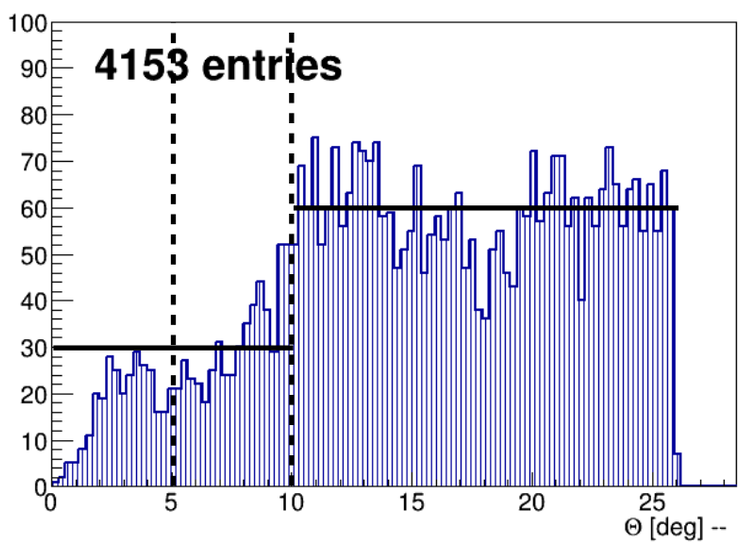
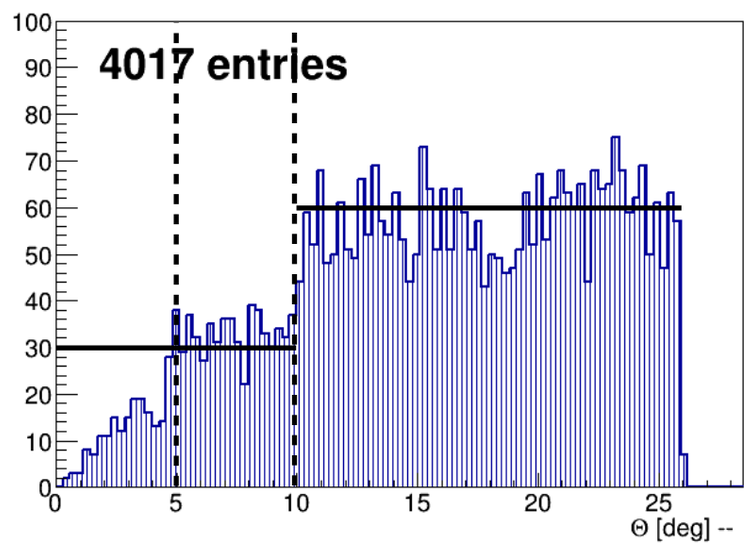
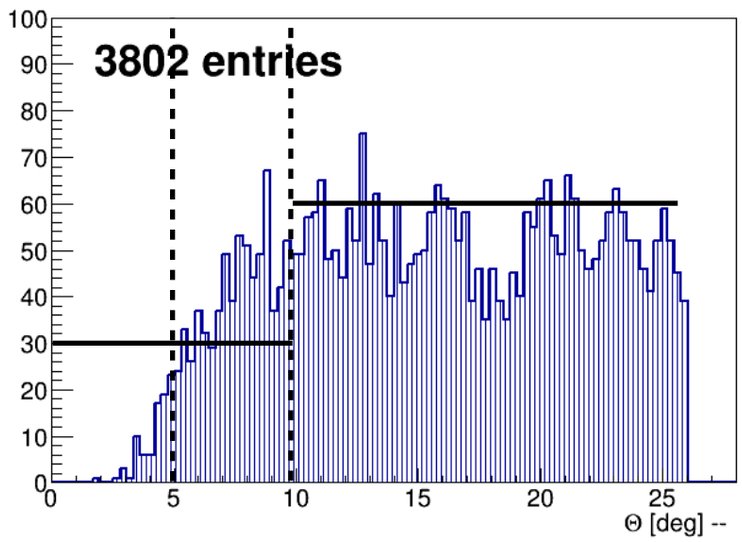
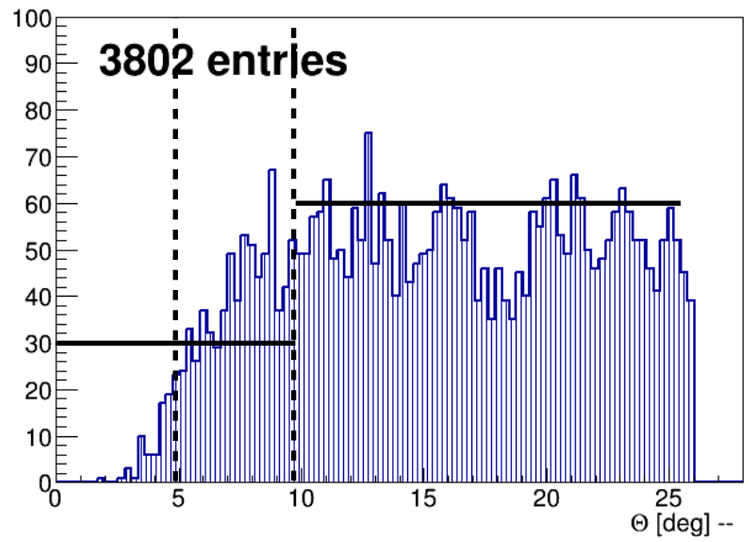
BoxGen, 10000 evts, p [0;0.9]GeV theta [0;26]deg, phi [0;360]deg

	Genfit 1	Genfit 2
Ideal		
SttMvdGem + FtsIdeal		
“barreltrack" + “ftsca”		

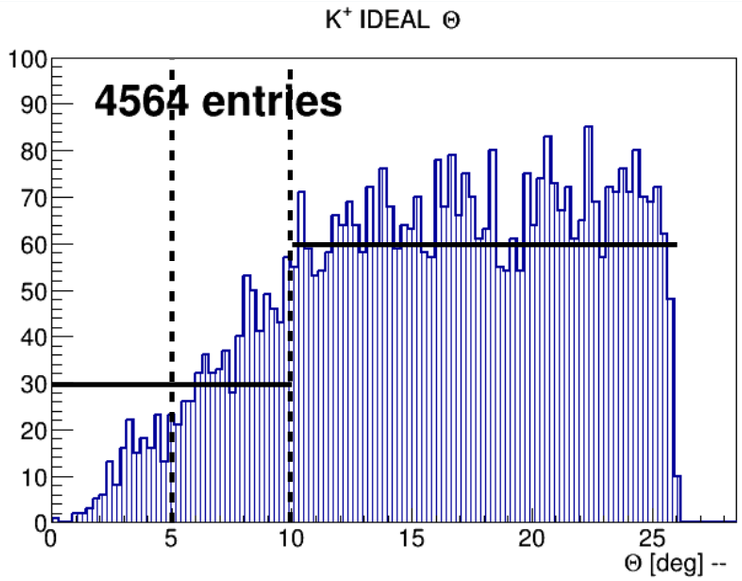
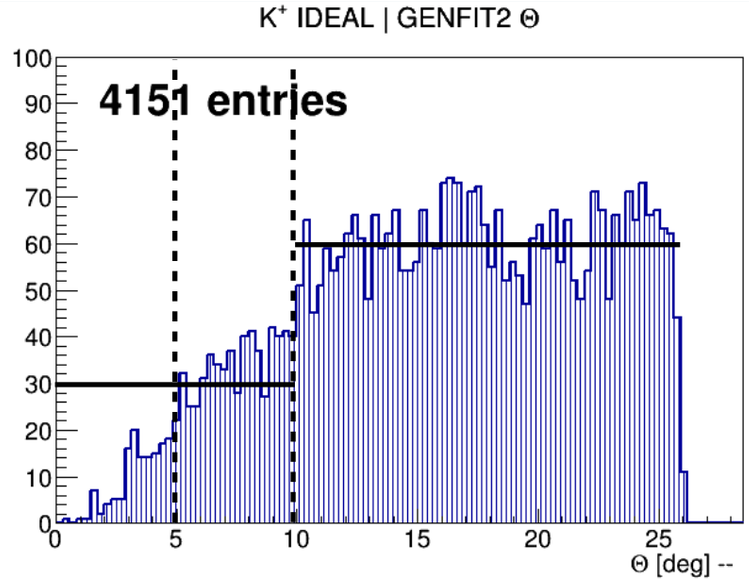
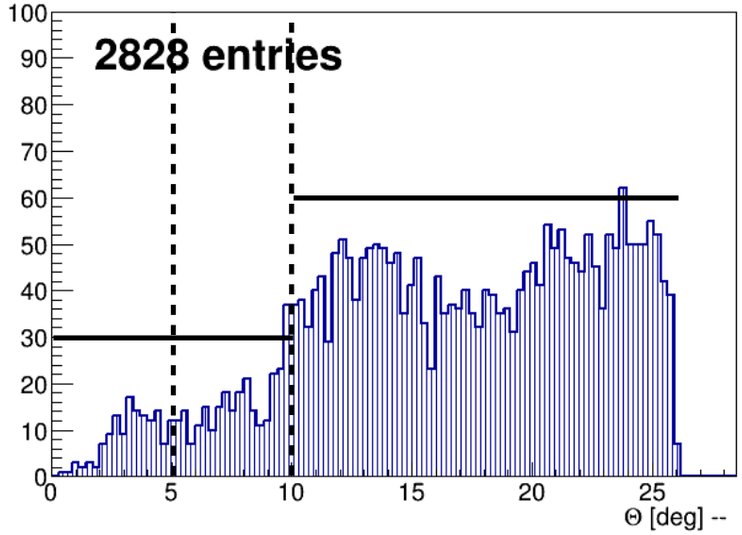
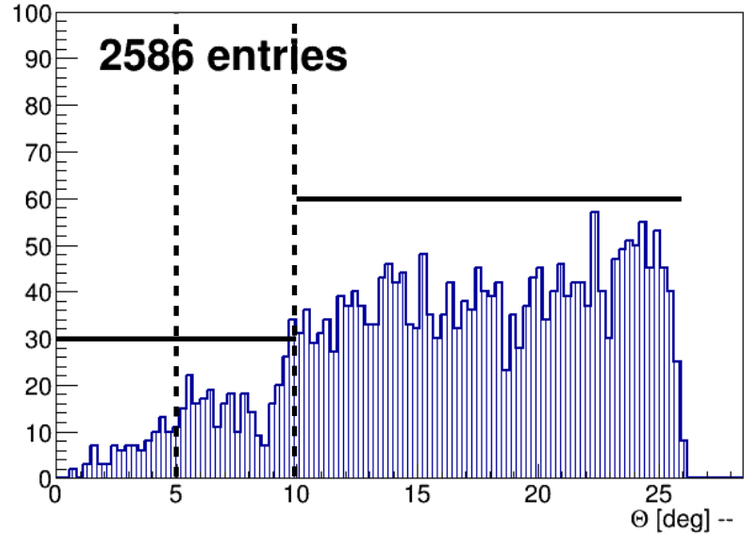
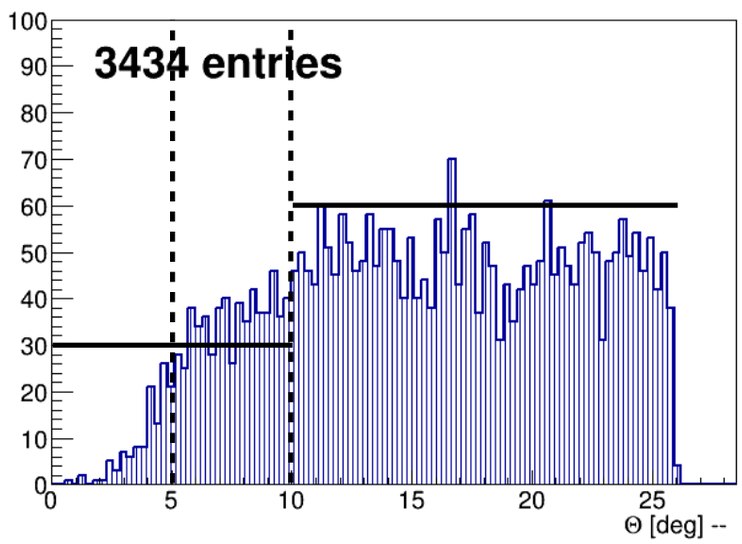
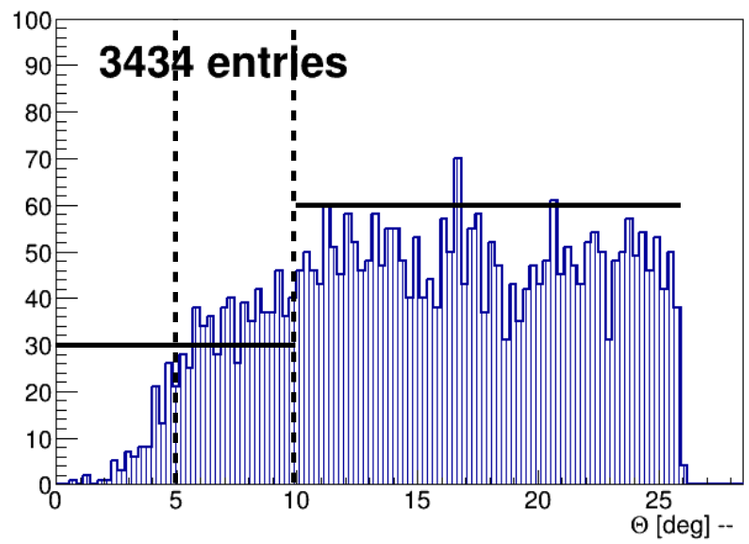
BoxGen, 10000 evts, p [0;0.9]GeV theta [0;26]deg, phi [0;360]deg

	Genfit 1	Genfit 2
Ideal		
SttMvdGem + FtsIdeal		
“barreltrack" + “ftsca”		

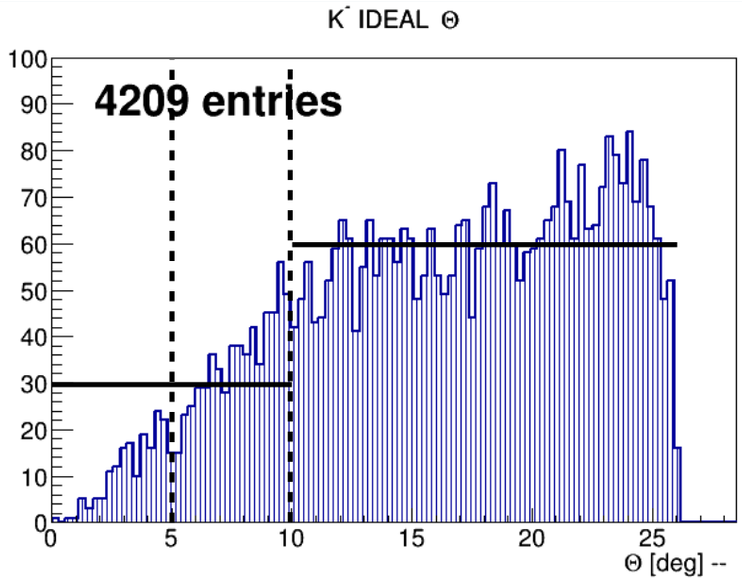
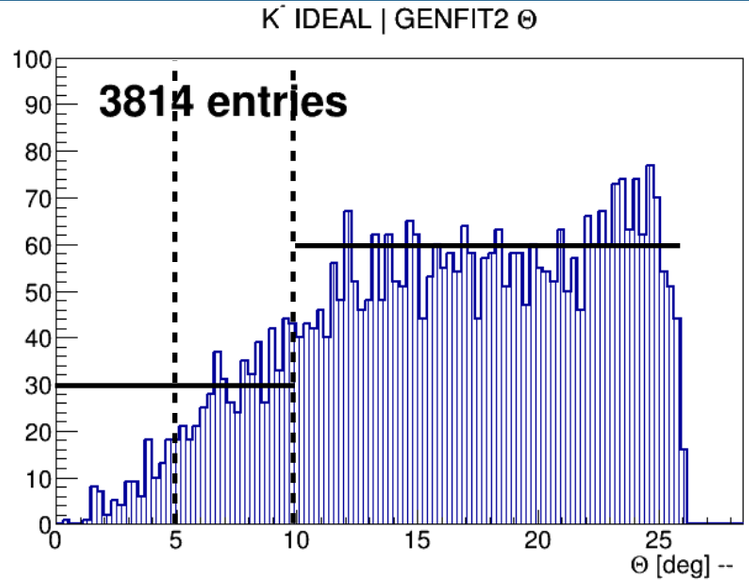
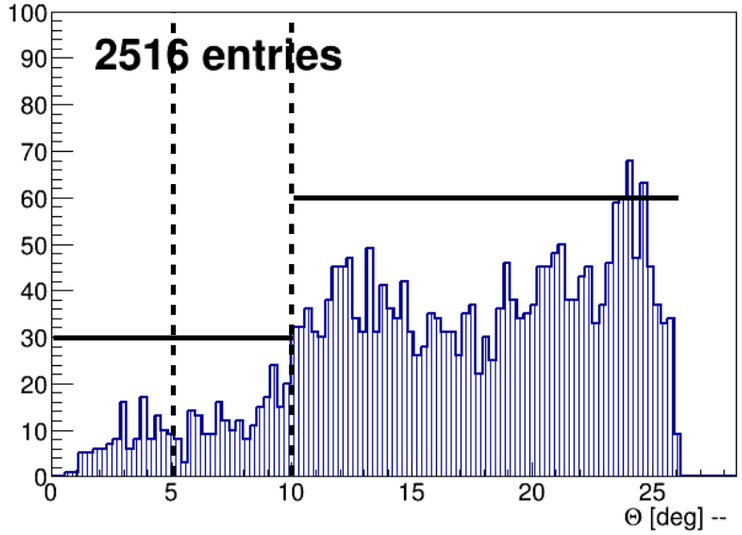
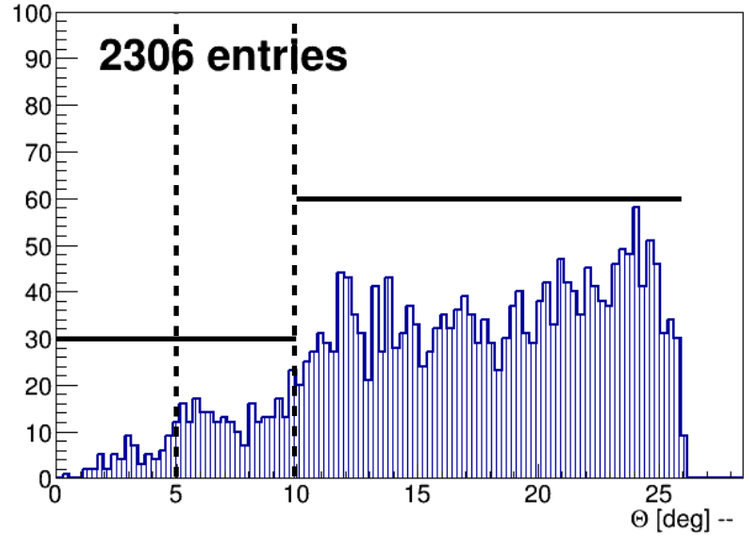
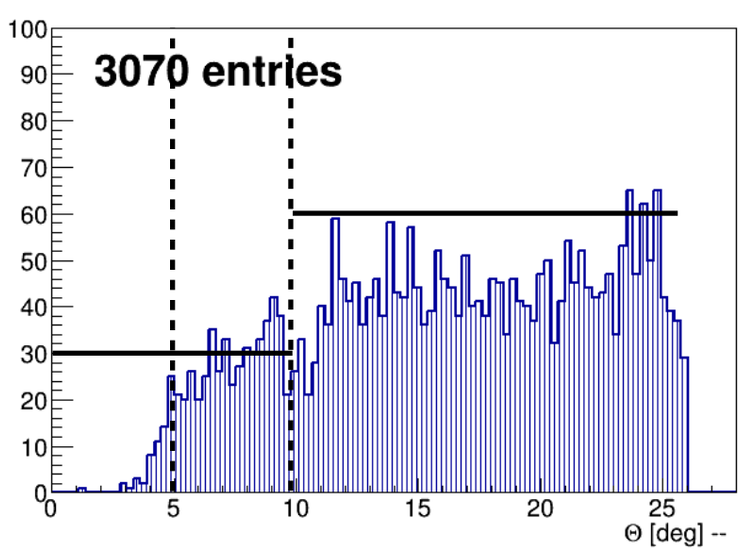
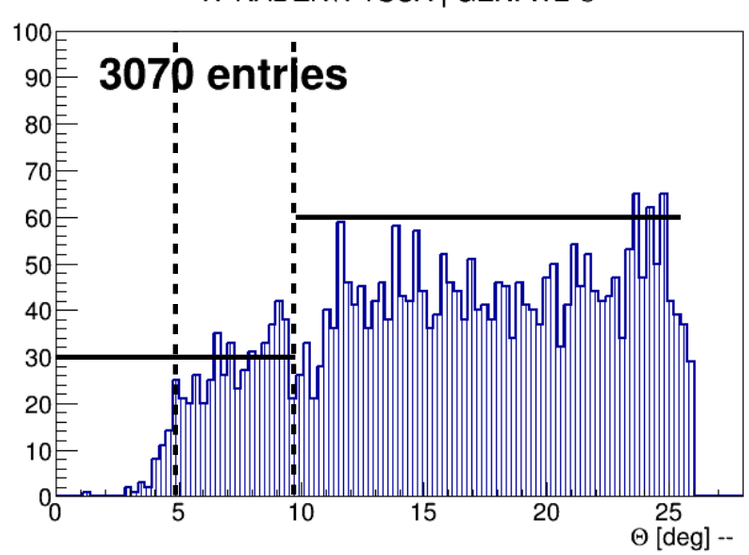
BoxGen, 10000 evts, p [0;0.9]GeV
theta [0;26]deg, phi [0;360]deg

	Genfit 1	Genfit 2
Ideal		
SttMvdGem + FtsIdeal		
“barreltrack" + “ftsca”		

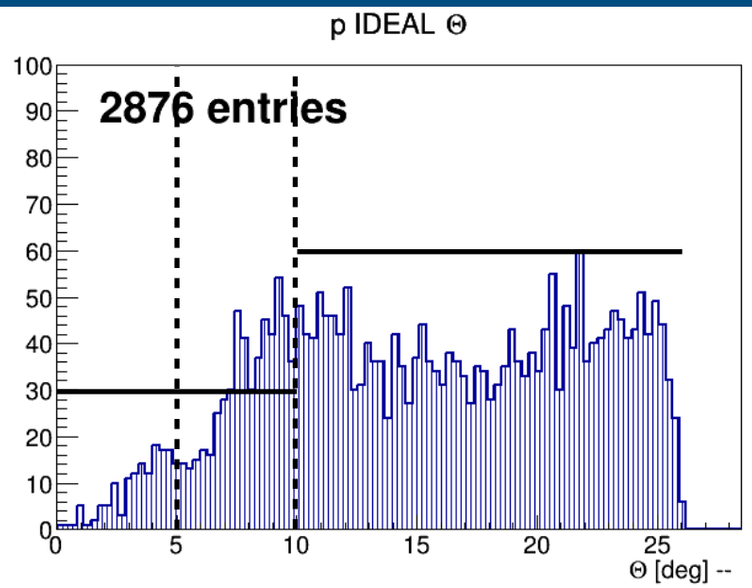
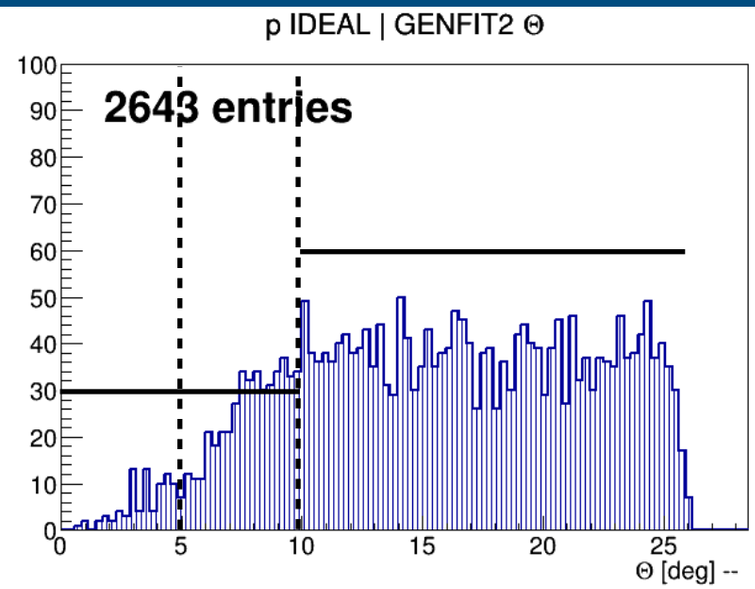
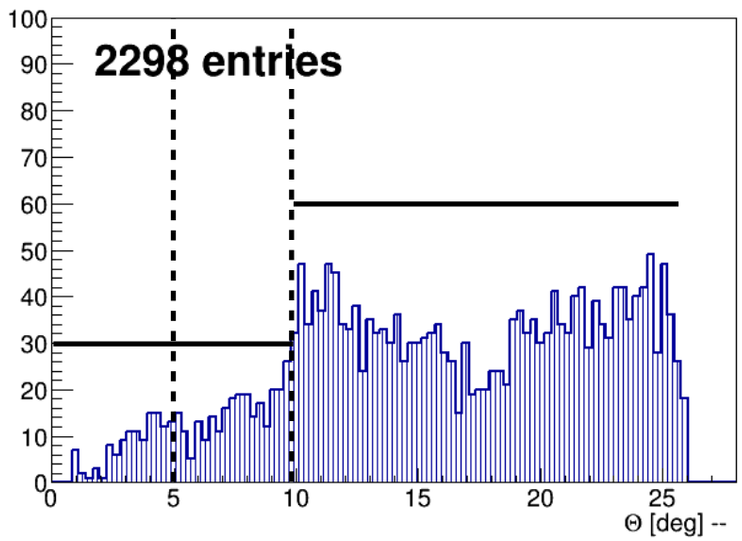
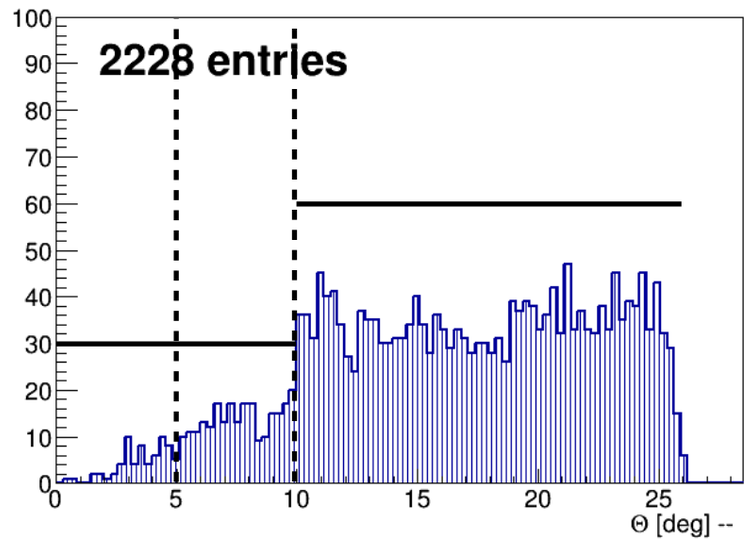
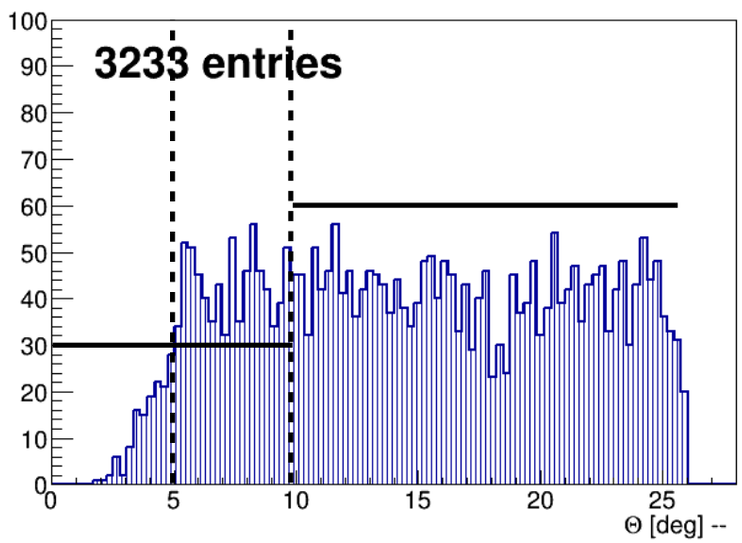
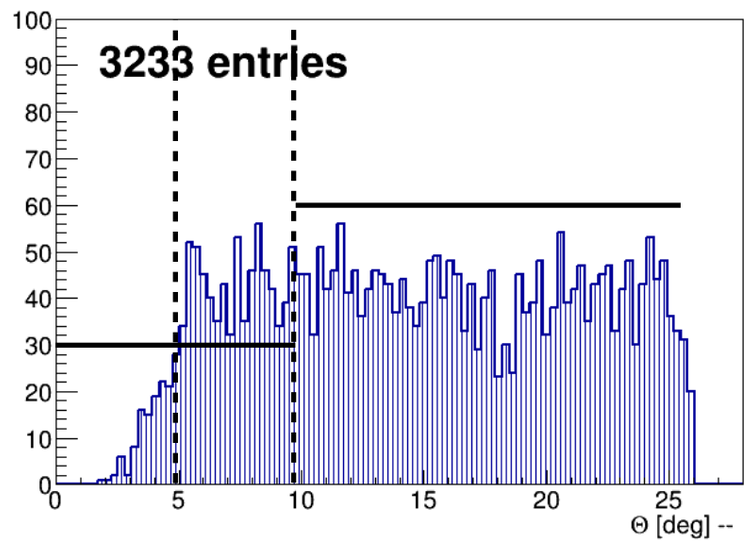
BoxGen, 10000 evts, p [0;0.9]GeV theta [0;26]deg, phi [0;360]deg

	Genfit 1	Genfit 2
Ideal		
SttMvdGem + FtsIdeal		
“barreltrack" + “ftsca”		

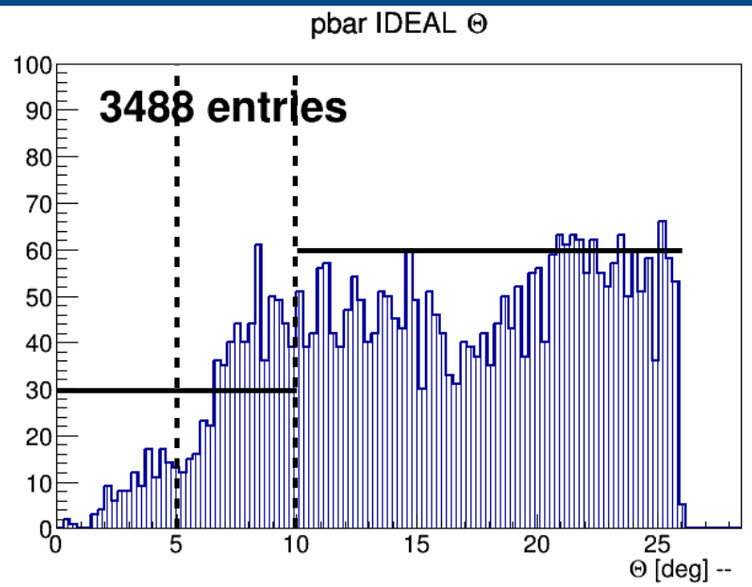
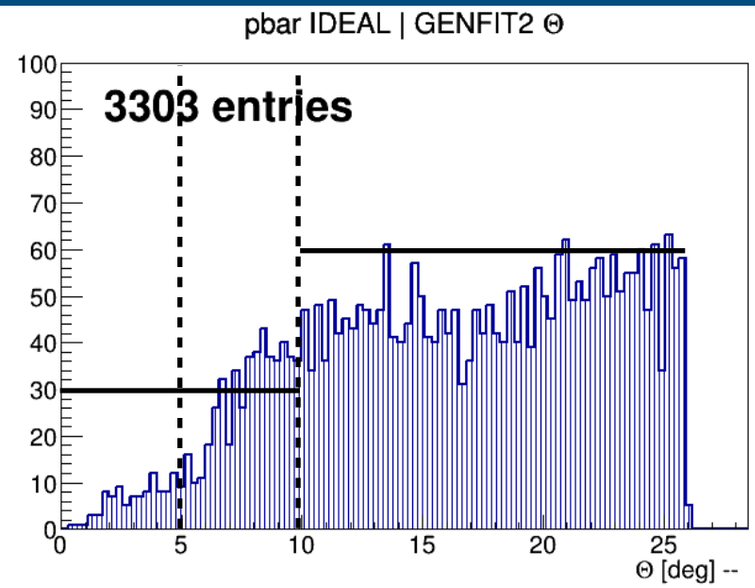
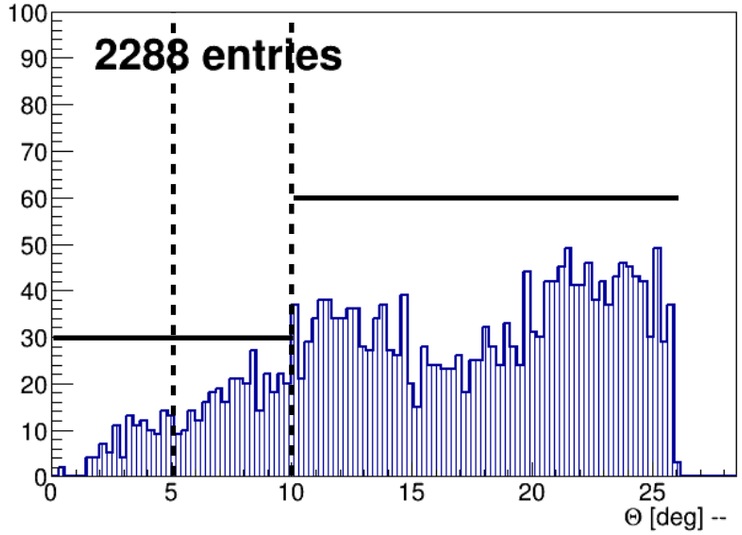
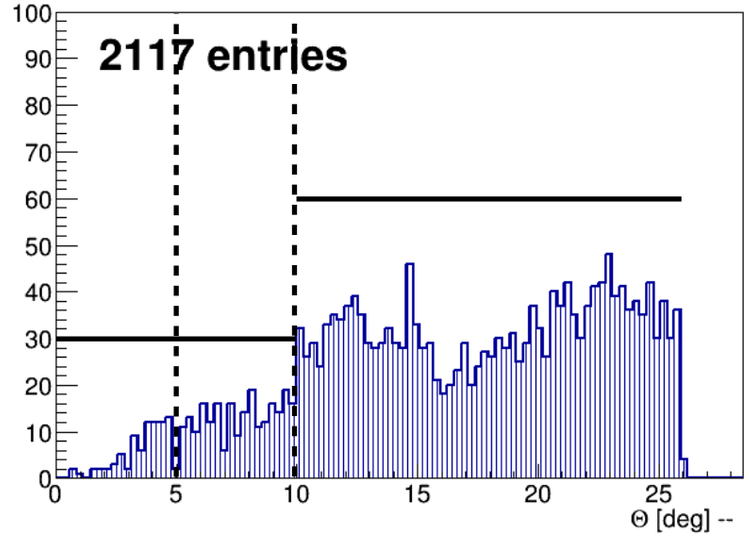
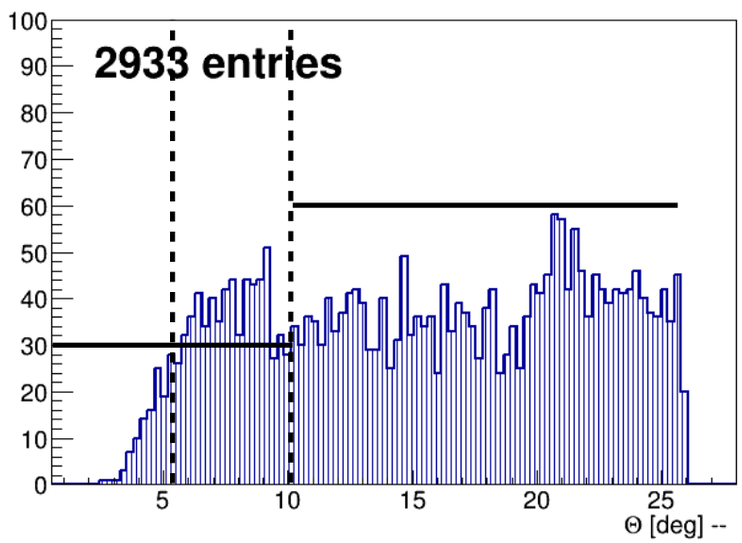
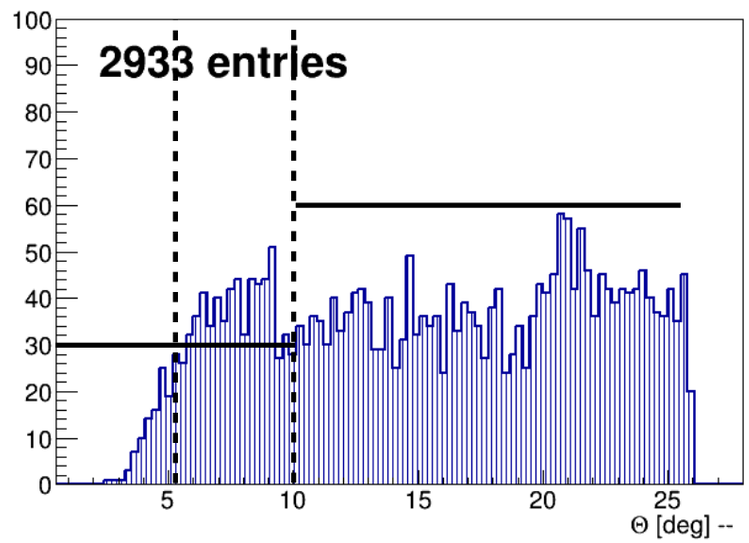
BoxGen, 10000 evts, p [0;0.9]GeV theta [0;26]deg, phi [0;360]deg

	Genfit 1	Genfit 2
Ideal		
SttMvdGem + FtsIdeal		
“barreltrack" + “ftsca”		

BoxGen, 10000 evts, p [0;0.9]GeV theta [0;26]deg, phi [0;360]deg

	Genfit 1	Genfit 2
Ideal		
SttMvdGem + FtsIdeal		
“barreltrack" + “ftsca”		

BoxGen, 10000 evts, p [0;0.9]GeV theta [0;26]deg, phi [0;360]deg

	Genfit 1	Genfit 2
Ideal		
SttMvdGem + FtsIdeal		
“barreltrack" + “ftsca”		

BoxGen, 10000 evts, p [0;0.9]GeV theta [0;26]deg, phi [0;360]deg