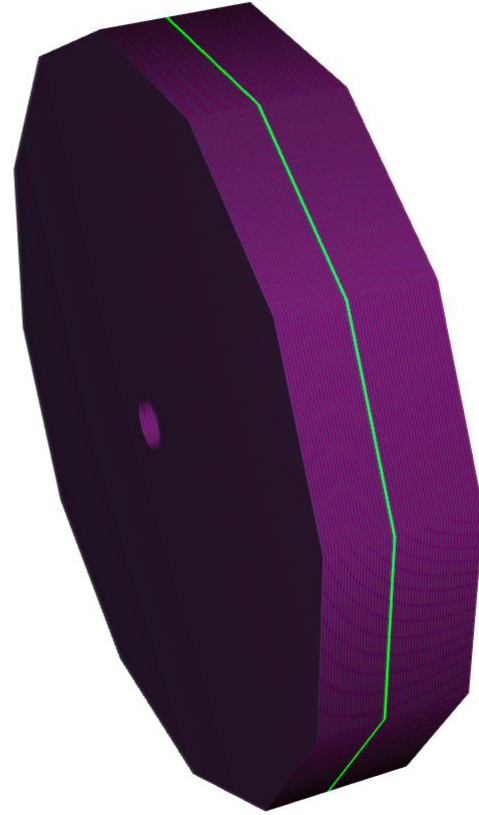


Status of HCAL Model and reconstruction Within DD4HEP

Miguel Arratia (UCR),
June 7 2021
(T-177 days)



Barrel HCAL

20 mm Fe and 5 mm plastic scintillator layers; 10x10 cm² cells

Read a ROOT file

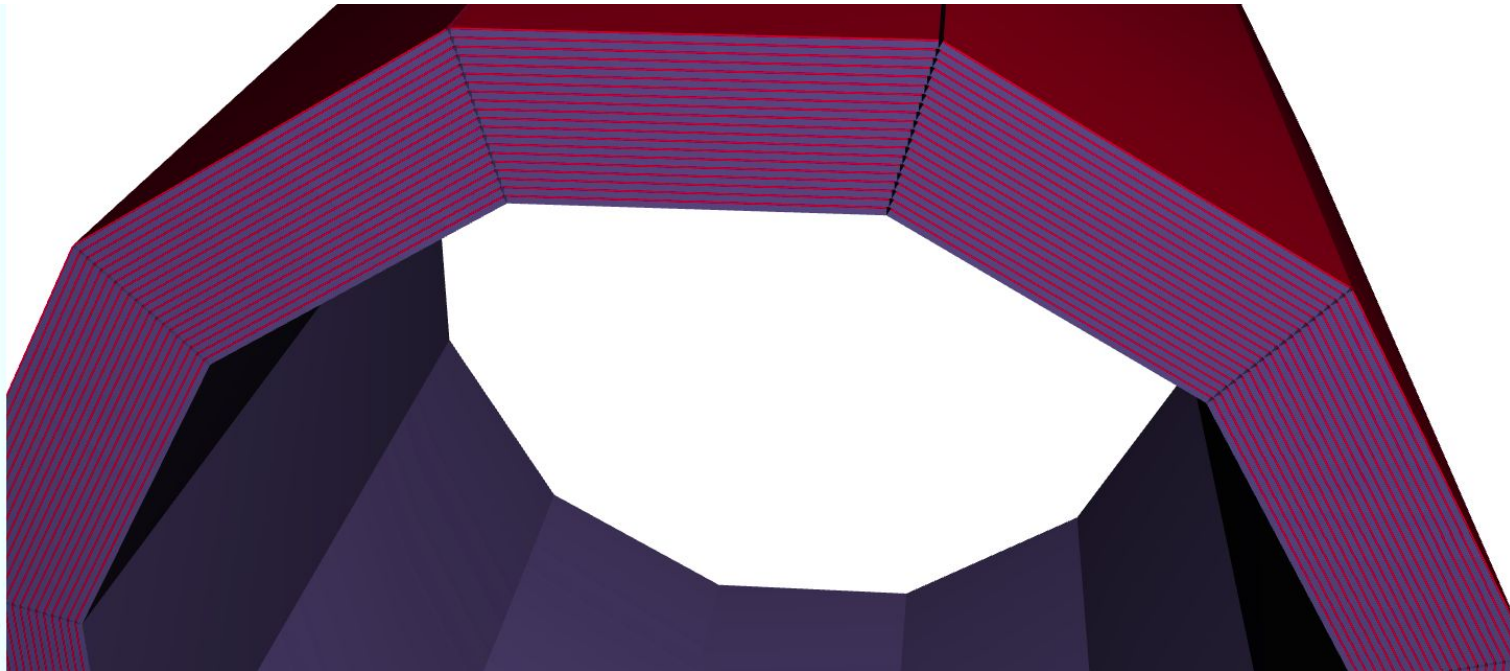
[SROOT](#) version 6.1.0 15/04/2021

detector_geometry.root

Load simple

[open all](#) | [close all](#) | [clear](#)

- box_volume_243
- box_volume_244
- box_volume_245
- box_volume_246
- box_volume_247
- box_volume_248
- box_volume_249
- ...more...
- HcalBarrel_27
 - HcalEndcapP_28
 - endcap_0
 - layer0_0
 - slice1_0
 - slice2_1



Forward HCAL

51 layers (6 lambda), 20 mm Fe and 3 mm plastic scintillator layers; 10x10 cm² cells

Read a ROOT file

JSROOT version 6.1.0 15/04/2021

detector_geometry.root

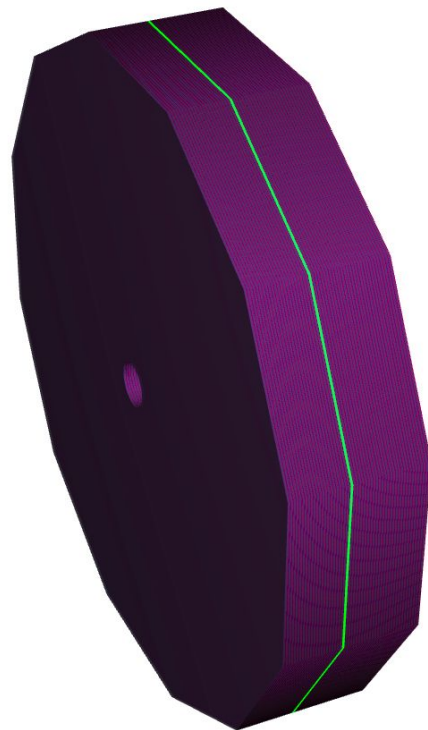
[Read docu](#) how to open files from other servers.

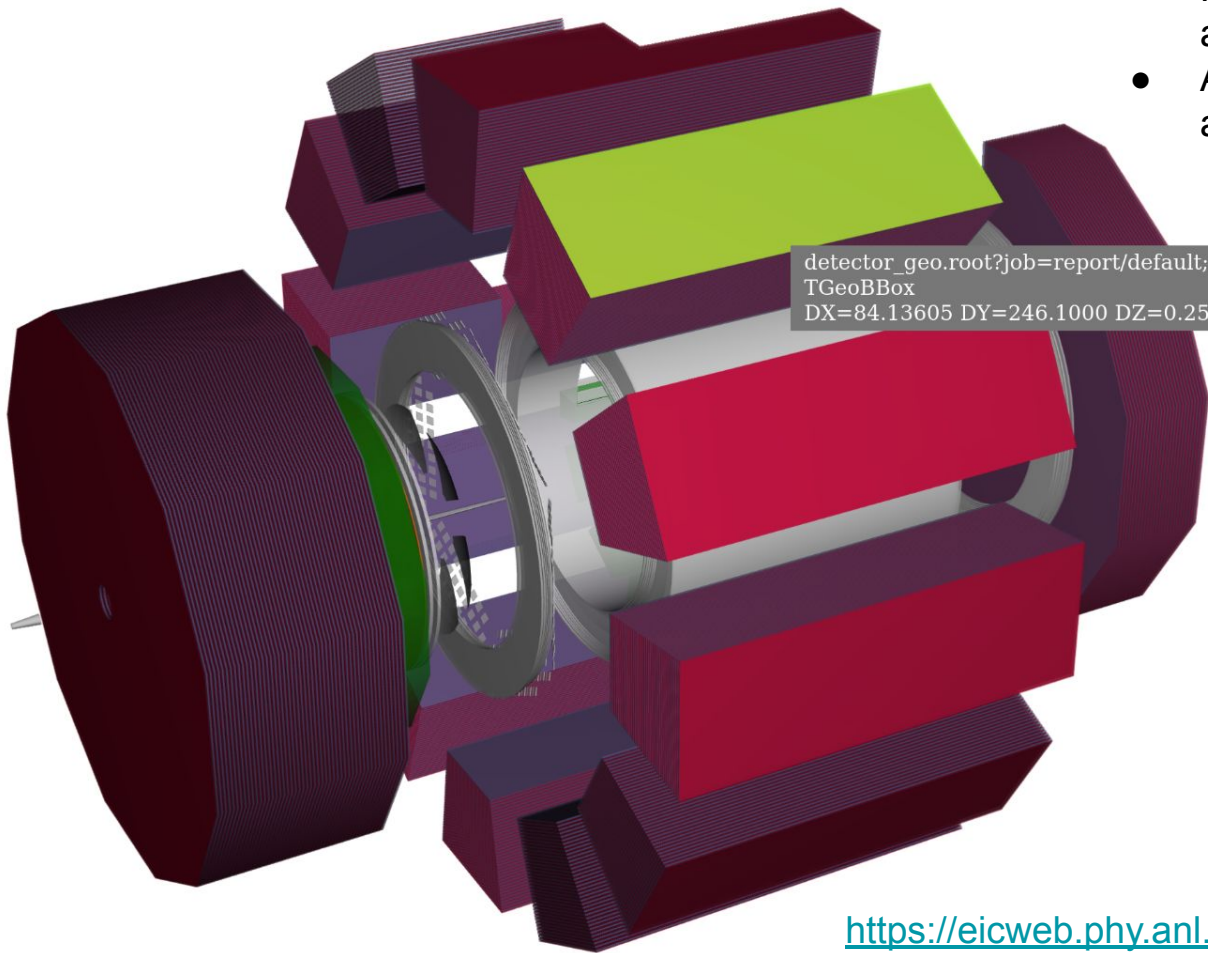
Load Reset simple

[open all](#) | [close all](#) | [clear](#)

- Materials
- Media
- world_volume
 - B0PF_BeamlineMagnet_asser
 - B0APF_BeamlineMagnet_asse
 - Q1APF_BeamlineMagnet_ass
 - Q1BPF_BeamlineMagnet_ass
 - Q2PF_BeamlineMagnet_asser
 - B1PF_BeamlineMagnet_asser
 - B1APF_BeamlineMagnet_asse
 - B2PF_BeamlineMagnet_asser
 - QPFC1_BeamlineMagnet_ass
 - QPFC2_BeamlineMagnet_ass
 - QPFC3_BeamlineMagnet_ass
 - QPFC4_BeamlineMagnet_ass
 - QPFR1_BeamlineMagnet_ass
 - BPFR1_BeamlineMagnet_ass
 - QPFR2_BeamlineMagnet_ass
 - BeamPipe_assembly_15
 - SolenoidCoilBarrel_assembly_
 - SolenoidCoilEnds_17
 - HcalBarrel_18
 - HcalEndcapP_19
 - endcap_0
 - HcalEndcapN_20

StreamerInfo



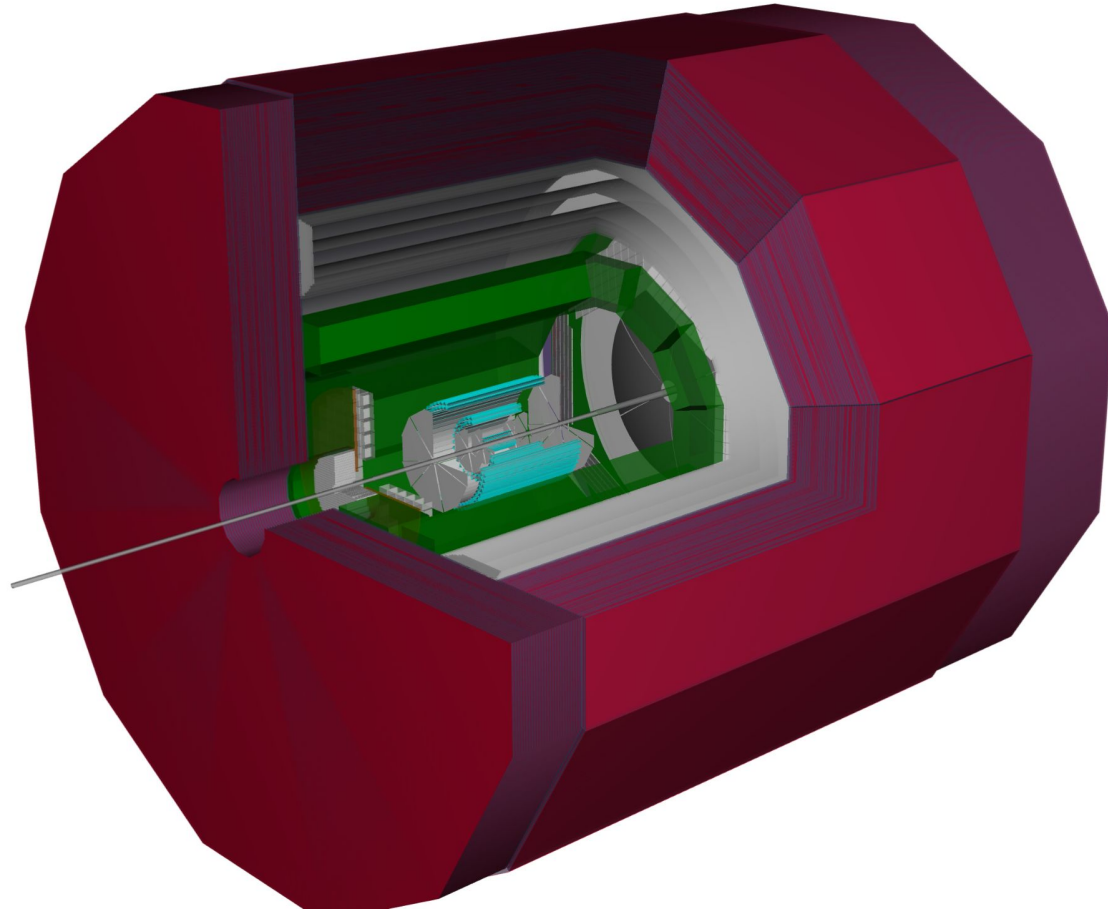


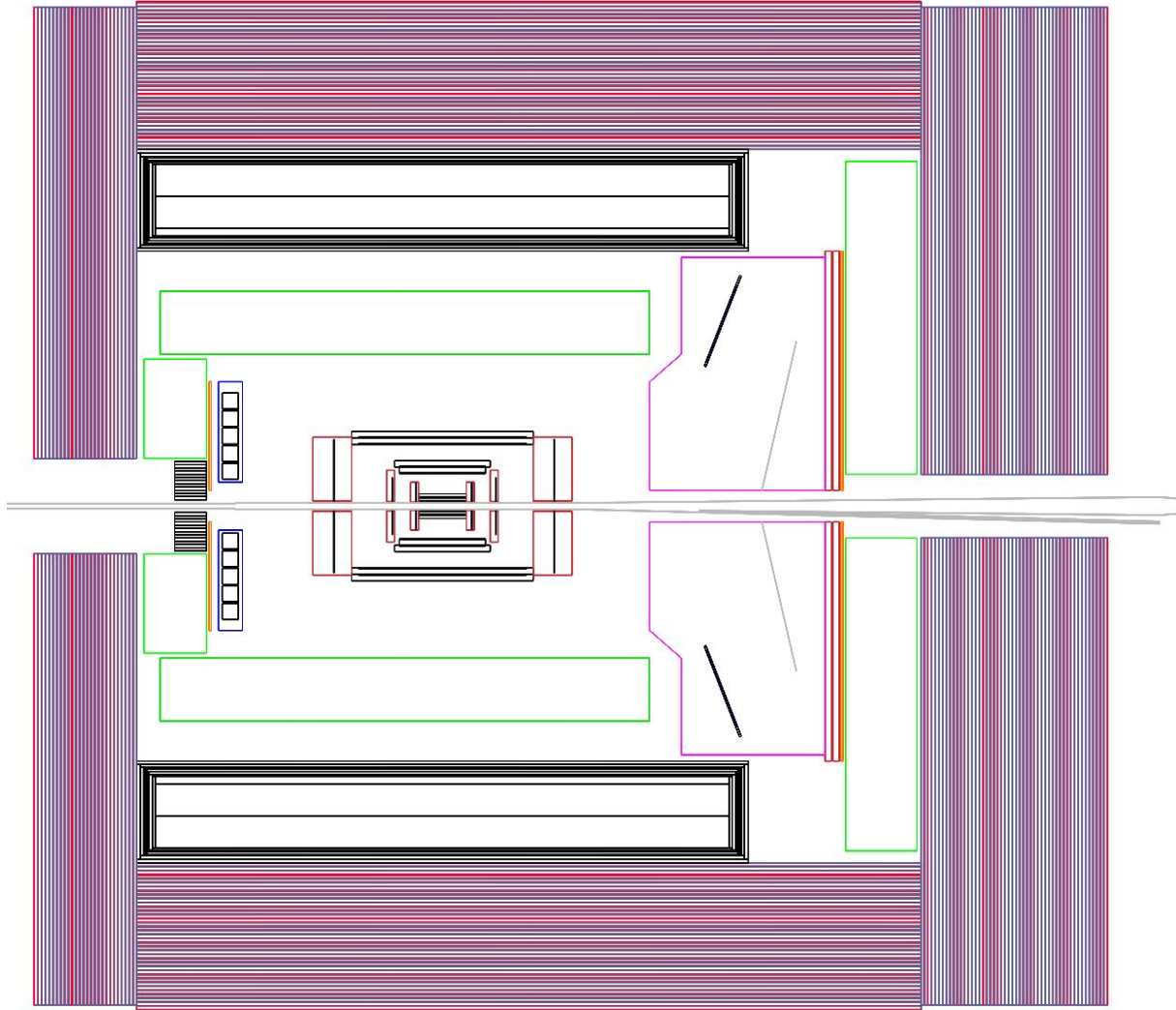
detector_geo.root?job=report/default;1/world_volume/HcalBarrel_12/stave_8/layer37_36/slice2_1
TGeoBBox
DX=84.13605 DY=246.1000 DZ=0.2500000

- HCal barrel, both endcaps are in DD4HEP
- Already “registered” with the athena master branch

You can see the current status of ATHENA here:

https://eic.phy.anl.gov/geoviewer/index.htm?nobrowser&file=https://eicweb.phy.anl.gov/api/v4/projects/473/jobs/artifacts/master/raw/geo/detector_geo.root?job=report&item=default;1&opt=clipxyz:transp30;zoom100;ROTY0;ROTZ0;trz100;trr0;ctrl:all&





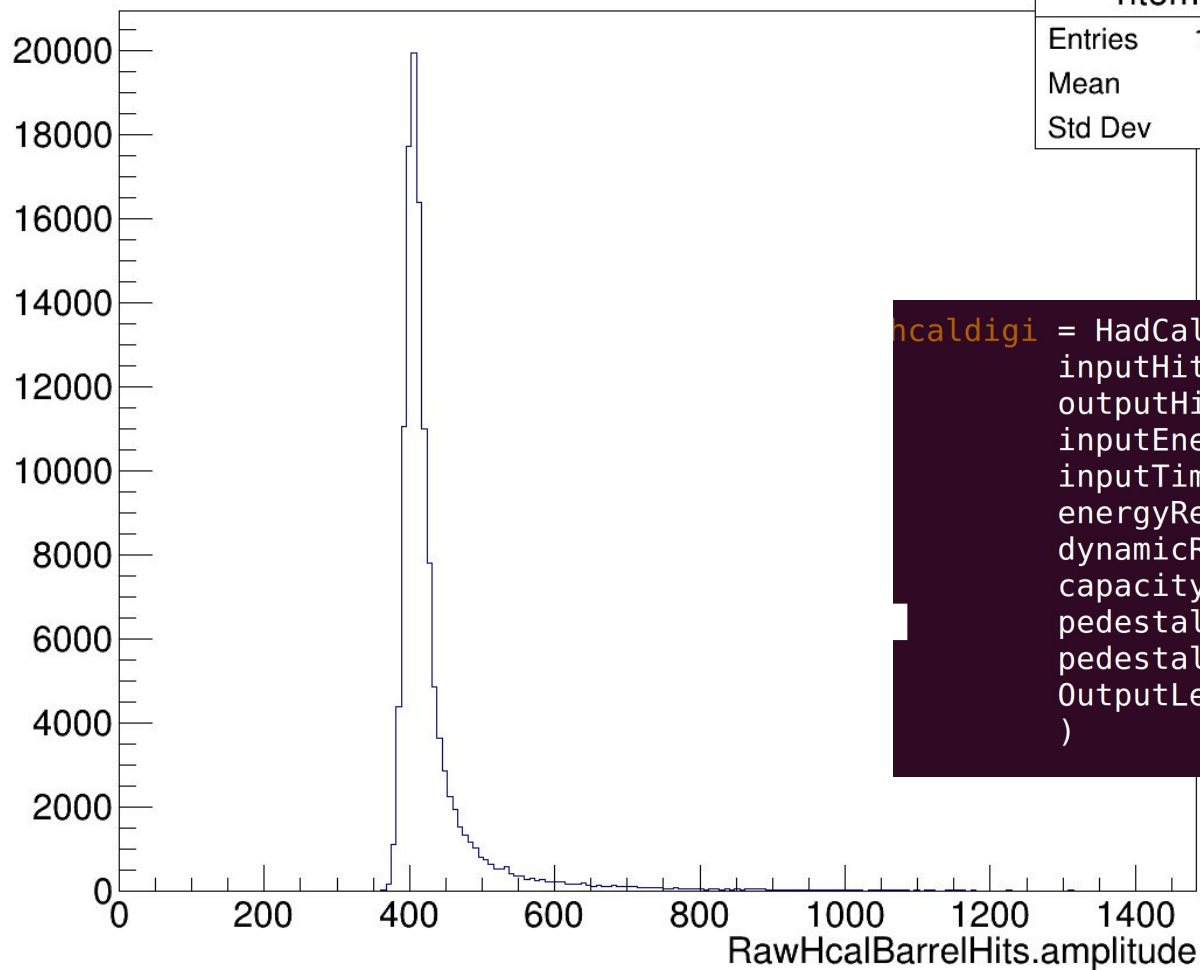
Still to be done:
Check dimensions
against project detector
(although consistency is
handled through global
variables in DD4HEP)

Reconstruction code

- digitalization,
- clustering
- truth matching, etc

(this is heavily based on ECAL reco code from C. Peng et al.)

RawHcalBarrelHits.amplitude



htemp	
Entries	123982
Mean	440.9
Std Dev	103.4

Parameters need update, taken verbatim from C. Peng's ECAL code

```
hcaldigi = HadCalorimeterDigi("hcal_barrel_digi",  
    inputHitCollection="HcalBarrelHits",  
    outputHitCollection="RawHcalBarrelHits",  
    inputEnergyUnit=units.GeV,  
    inputTimeUnit=units.ns,  
    energyResolutions=[0.07, 0., 0.],  
    dynamicRangeADC=2.*units.GeV,  
    capacityADC=32768,  
    pedestalMean=400,  
    pedestalSigma=10,  
    OutputLevel=DEBUG  
)
```



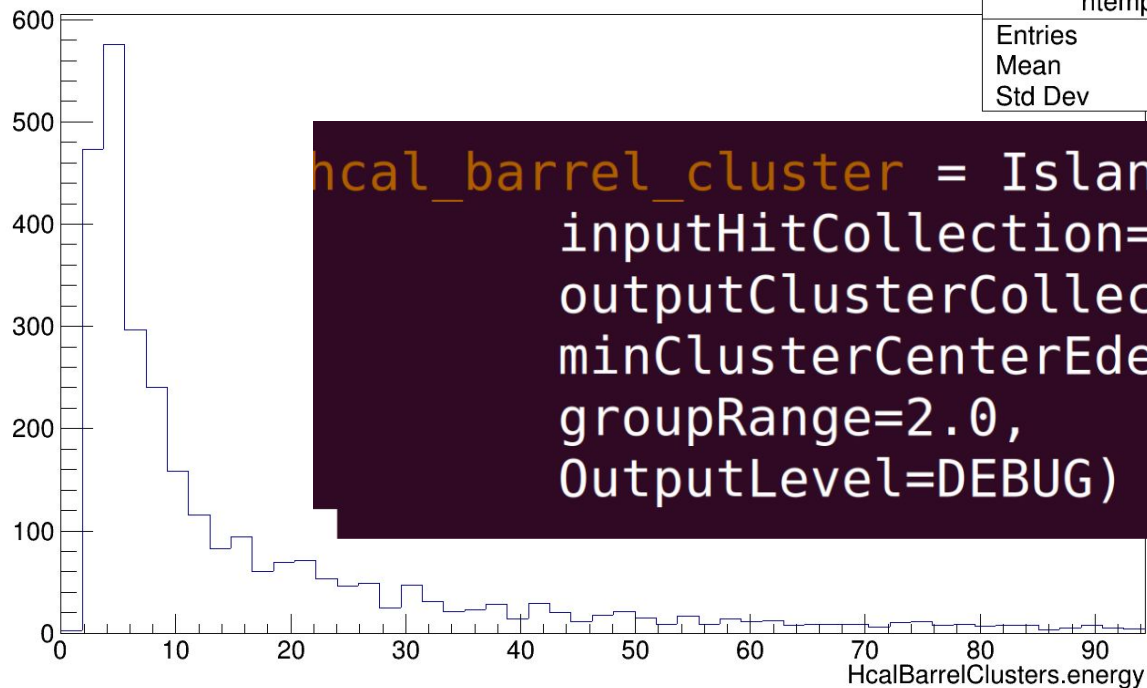
```
#reconstructed hits
```

```
hcal_reco = HCalReconstruction("hcal_reco",  
    inputHitCollection="RawHcalBarrelHits",  
    outputHitCollection="RecHcalBarrelHits",  
    dynamicRangeADC=2.*units.GeV,  
    capacityADC=32768,  
    pedestalMean=400,  
    pedestalSigma=10,  
    thresholdFactor=5.0,  
    OutputLevel=DEBUG)
```

Clusters (needs checking on energy)

HcalBarrelClusters.energy

htemp	
Entries	34
Mean	16.
Std Dev	18.



```
hcal_barrel_cluster = IslandCluster("hcal_barrel",  
    inputHitCollection="RecHcalBarrelHits",  
    outputClusterCollection="HcalBarrelClusters",  
    minClusterCenterEdep=500*units.MeV,  
    groupRange=2.0,  
    OutputLevel=DEBUG)
```

Cluster positions make sense given parameters

