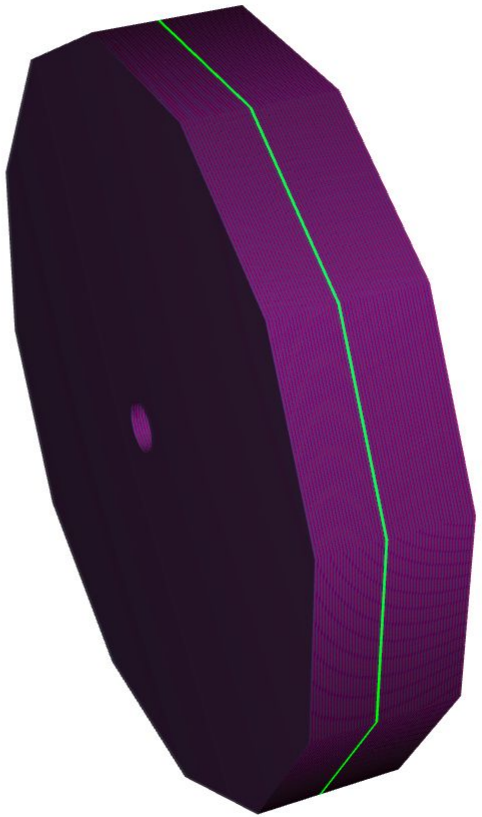
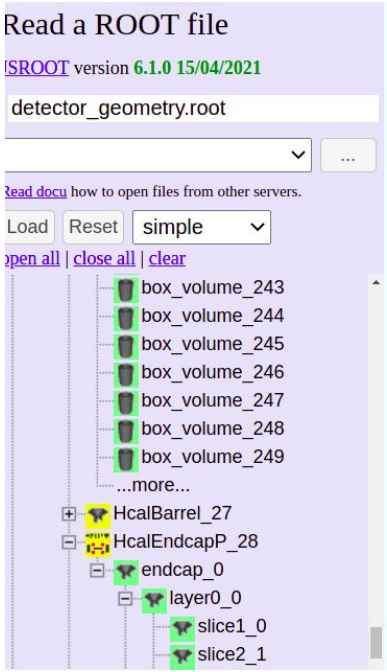
Status of HCAL Model and reconstruction Within DD4HEP

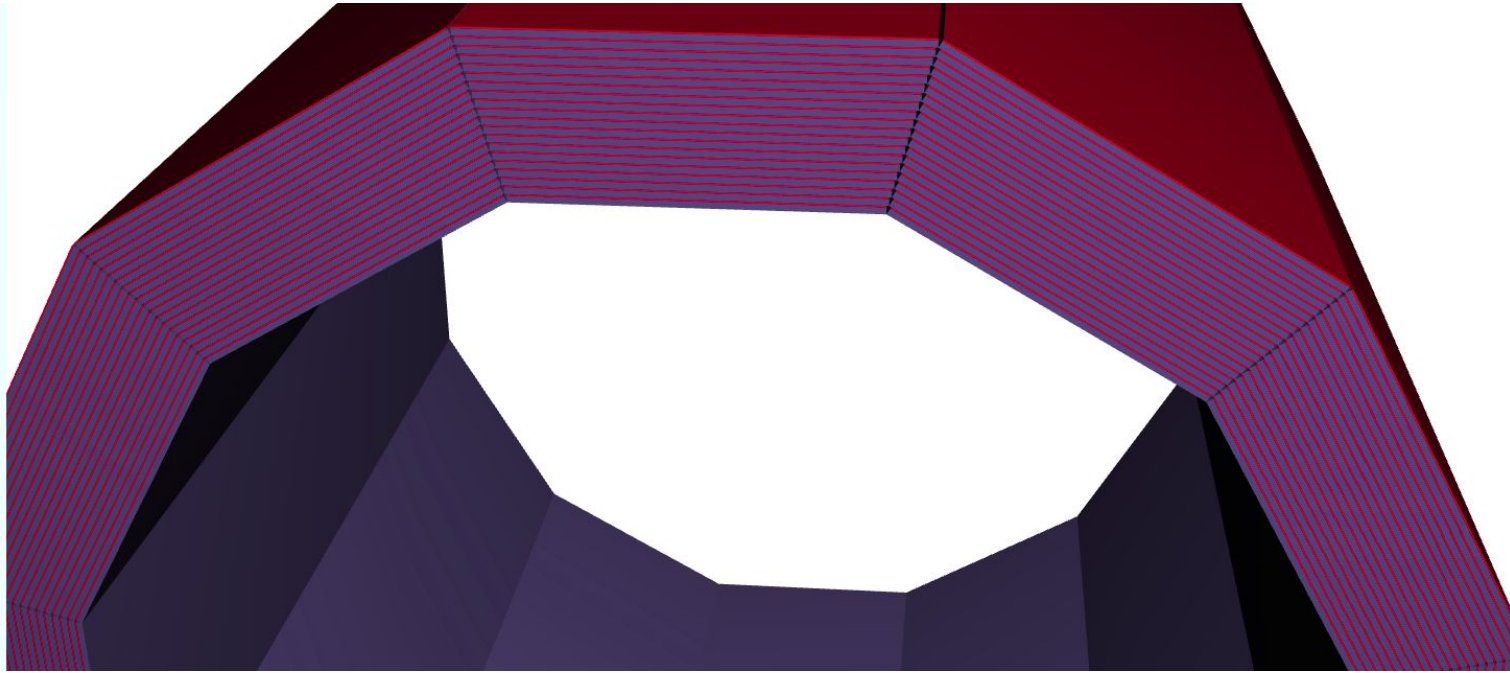
Miguel Arratia (UCR),
June 7 2021
(T-177 days)



Barrel HCAL

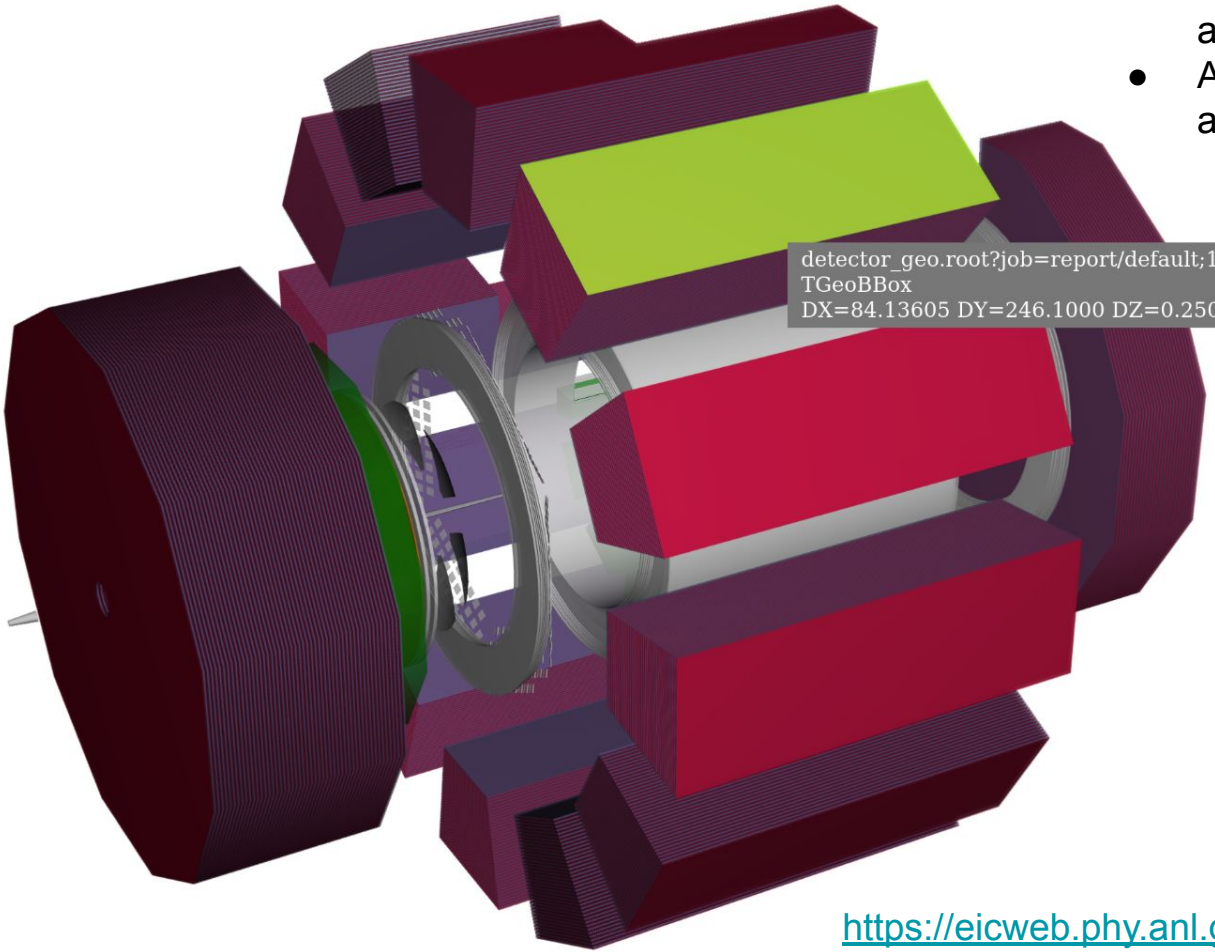
20 mm Fe and 5 mm plastic scintillator layers; 10x10 cm2 cells





Forward HCAL

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

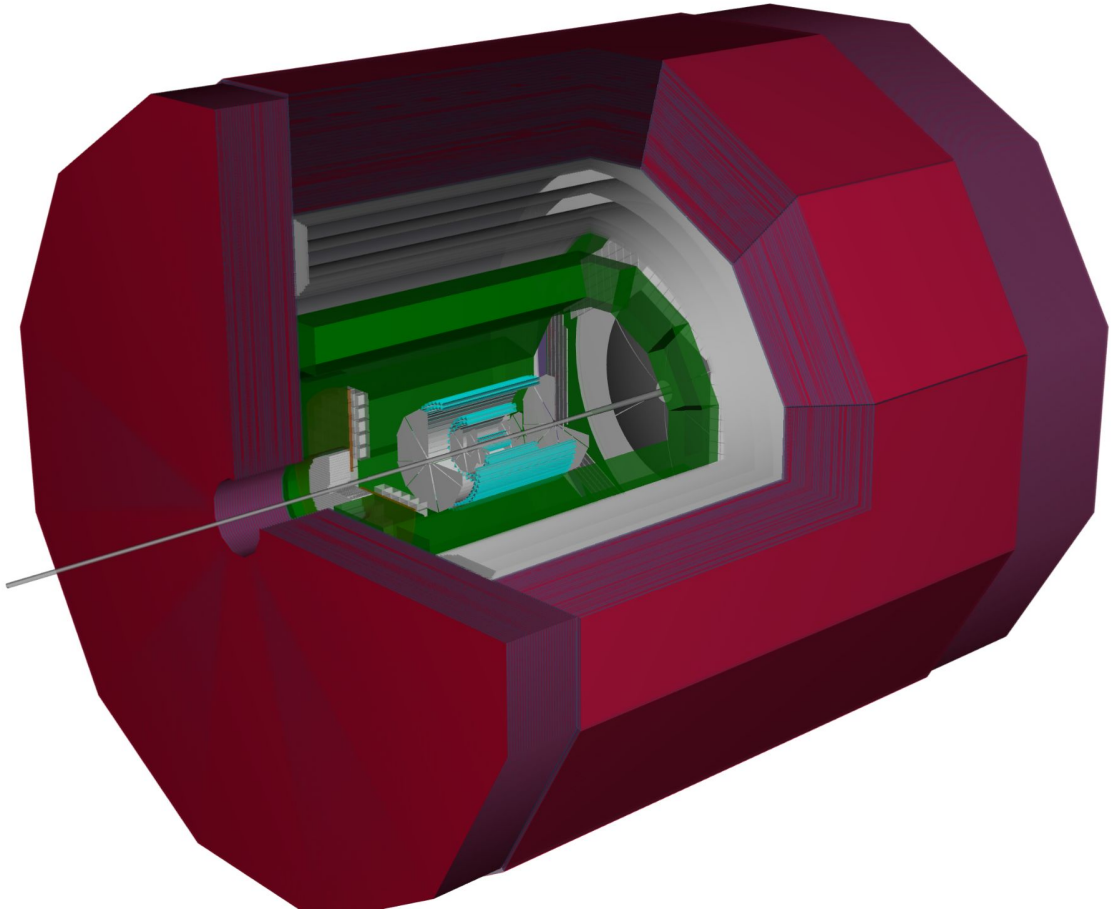


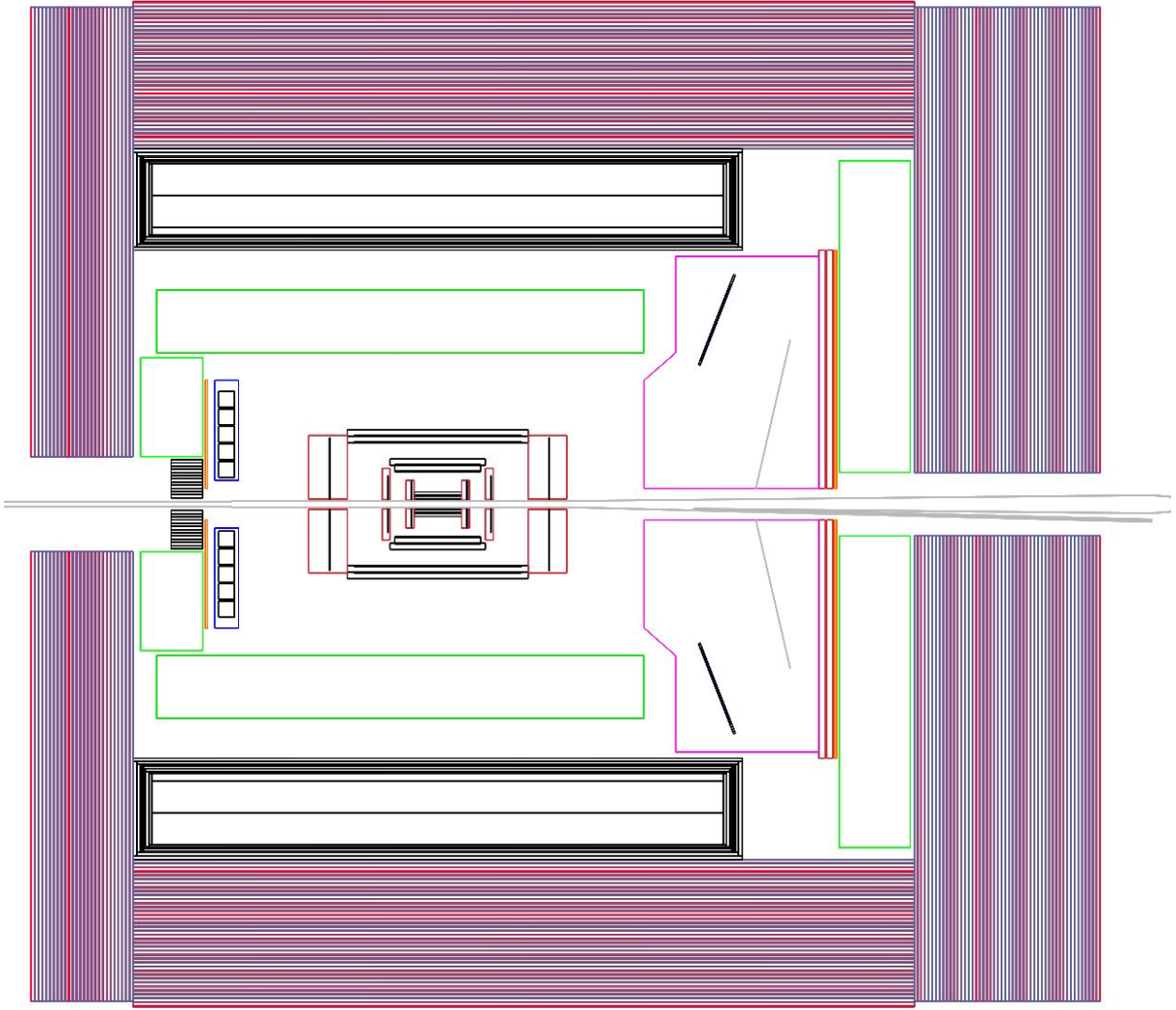
- HCal barrel, both endcaps are in DD4HEP
- Already “registered” with the athena master branch

https://eicweb.phy.anl.gov/EIC/detectors/athena

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&





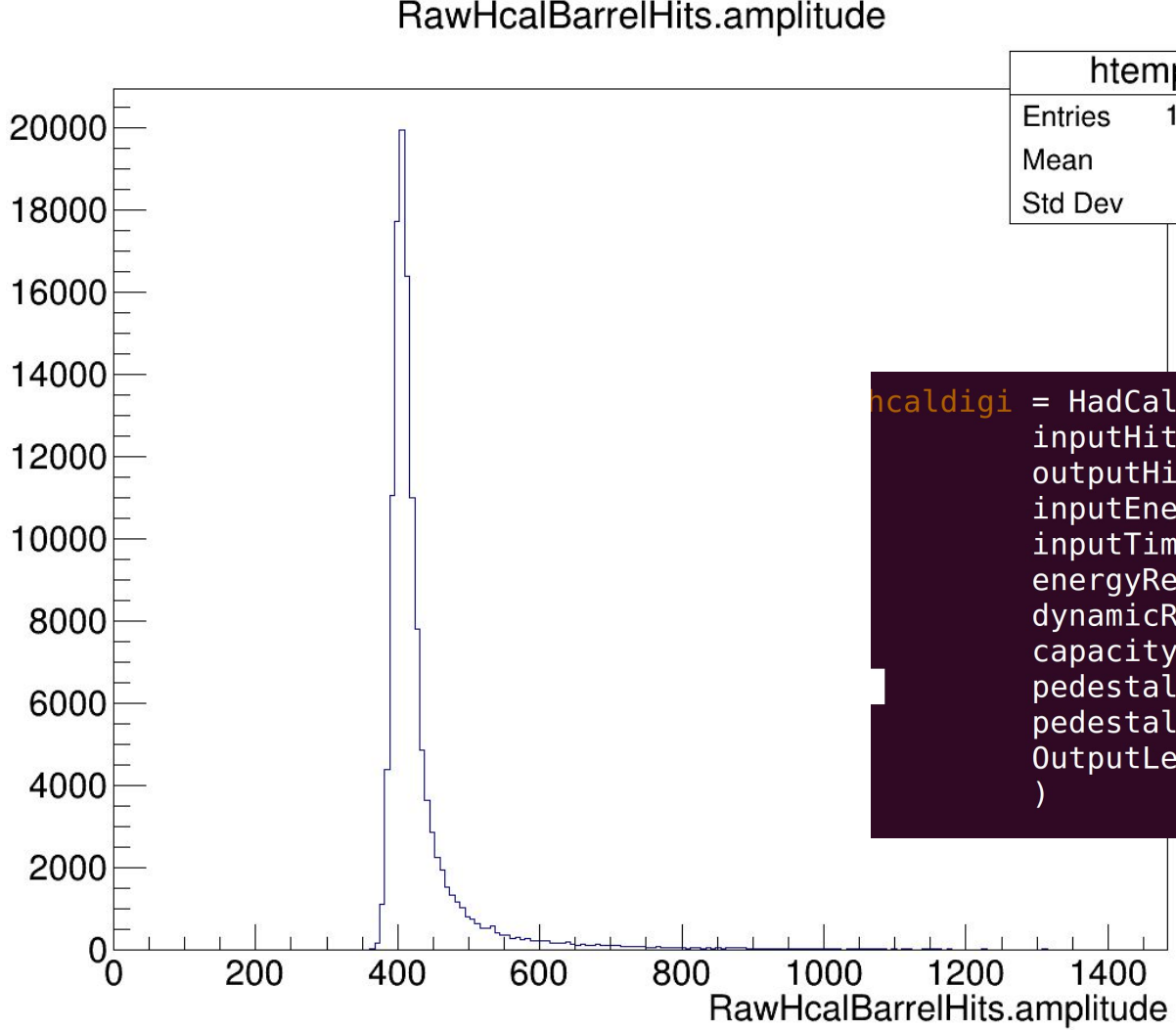
Still to be done:
Check dimensions against project detector

(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.



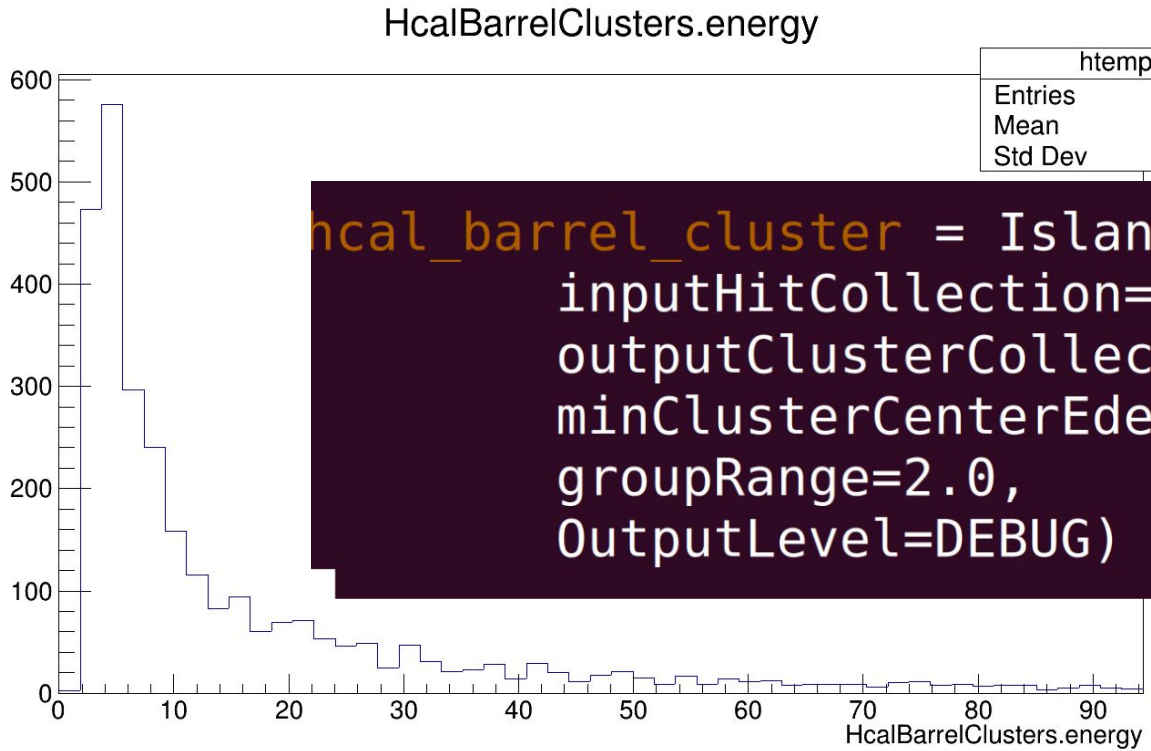
Parameters need update, taken verbatim from C. Peng's ECAL code

```
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)




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

Cluster positions make sense given parameters