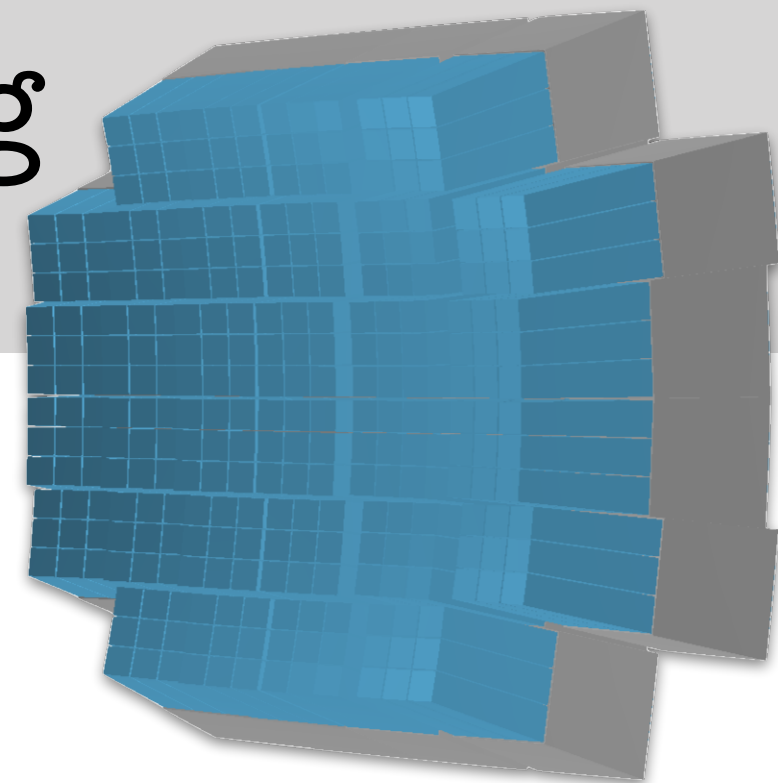


25/03/2020

Status of Calorimeter

Software Meeting

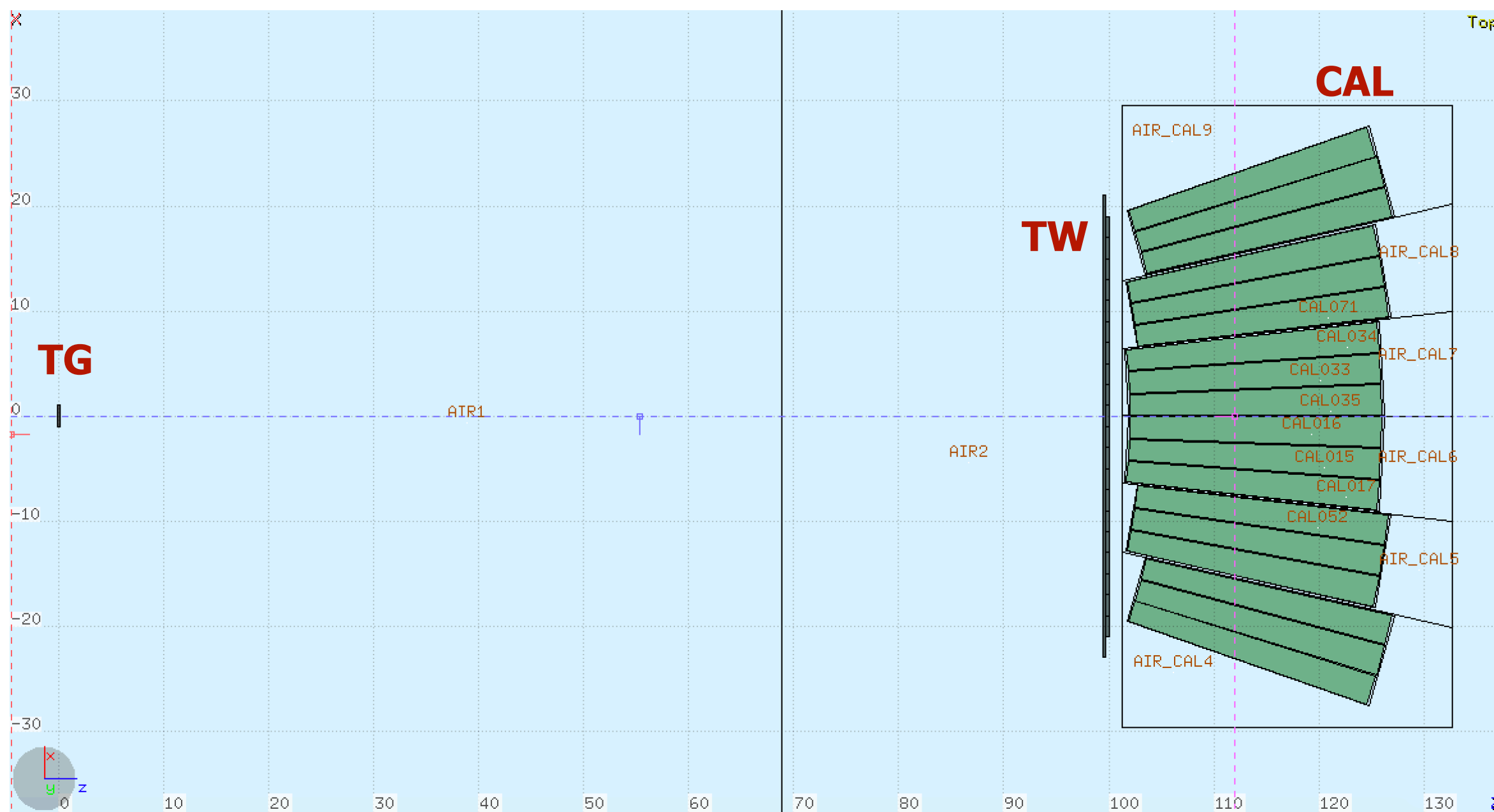
F. Cavanna, L. Scavarda



What has been done



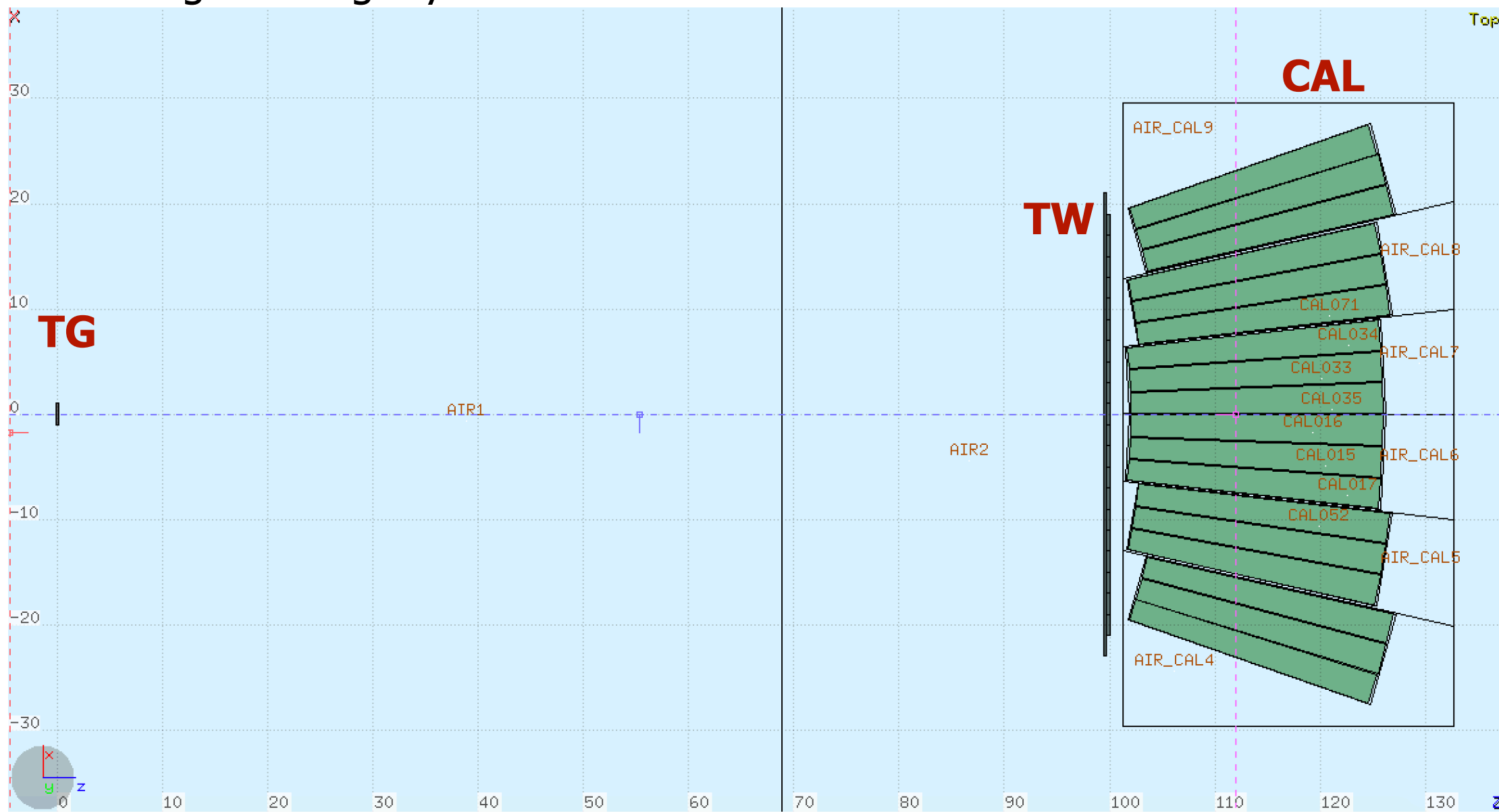
- Study of the cluster classes of [TACAbase/TACAcluster.cxx-hxx](#) and [TACAactNtuCluster.cxx-hxx](#)
- Test of the validity and efficiency of the cluster algorithm
- FLUKA simulation including Target (TG), Tof Wall (TW) and Calorimeter (CAL)





Cluster typologies

- Valid cluster:
 - a particle enters in one crystal and propagate into a second
 - a particle enters in one crystal and fragment into other crystals
 - a particle enters in one crystal and stops inside
- Not valid cluster:
 - two particles produced before the calorimeter enter in two neighbouring crystals



Example of bad clusterization



1 cluster \longrightarrow 3 hit (=3 crystals hit)

cry 16

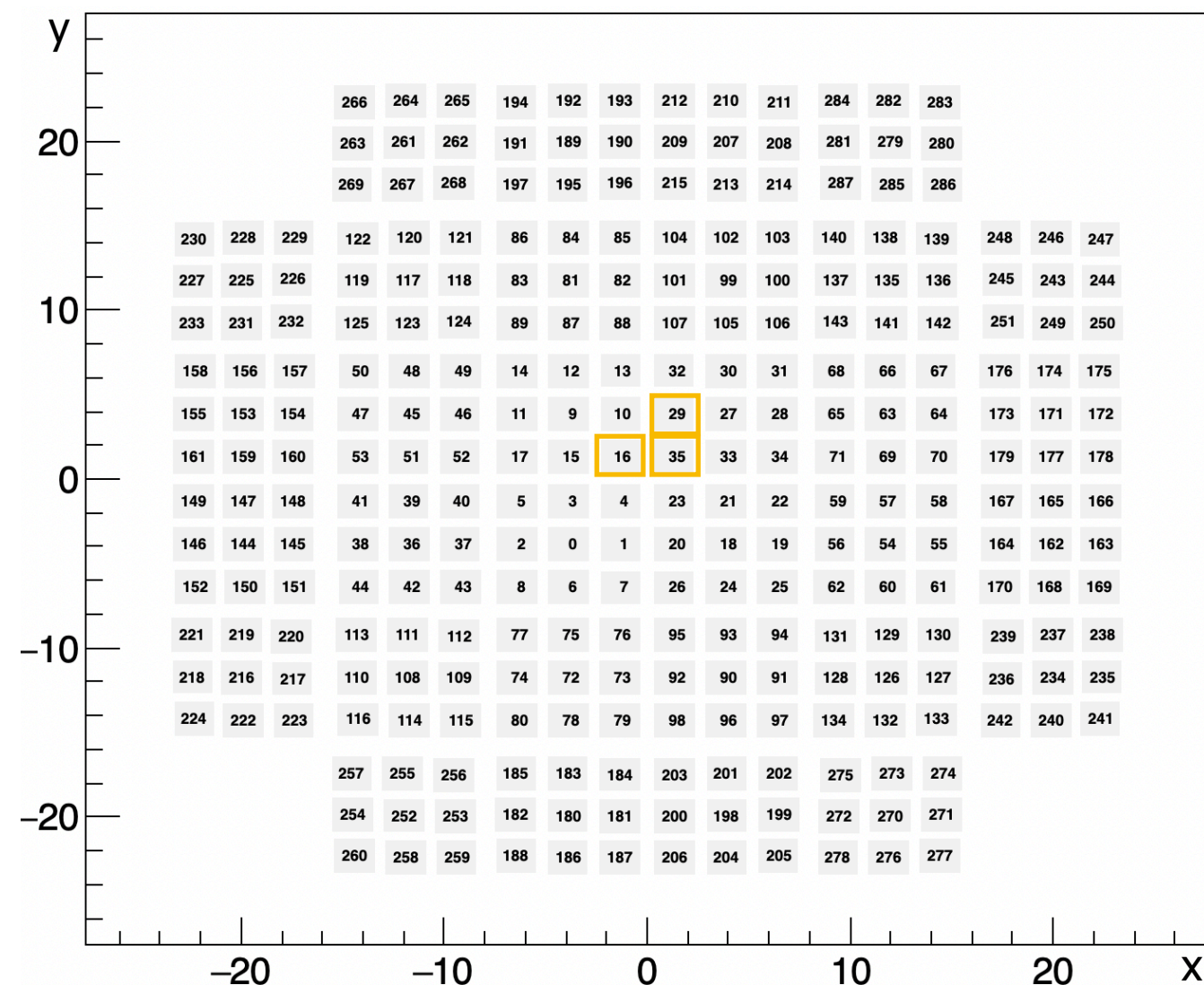
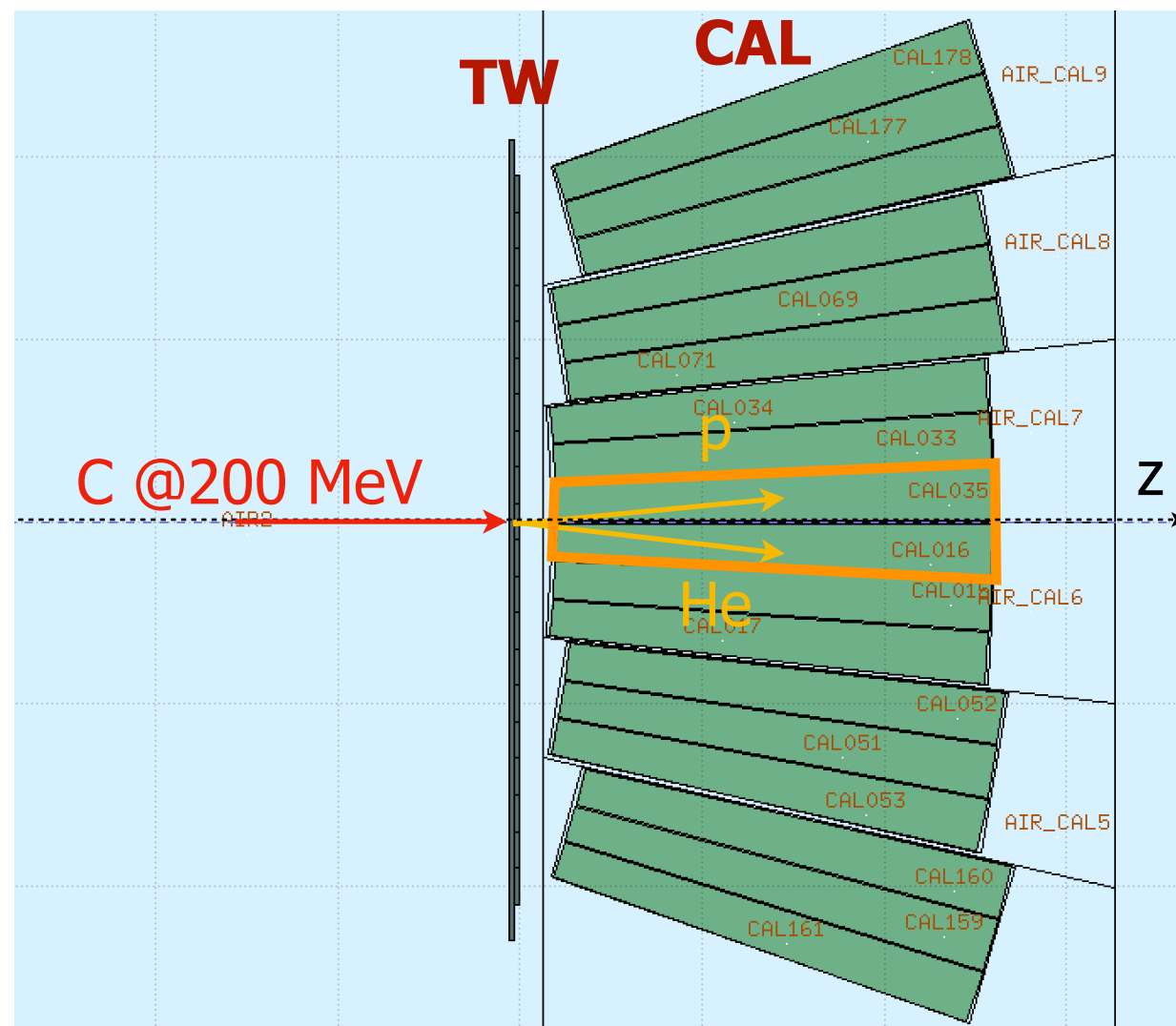
Index of daughter: 2 | charge: 2 | mass: 3.72738 | pos in: -0.170499 0.028635 99.514732 | pos out: 0.250462 0.807141 110.424698
Index of mother: 0 | charge: 6 | mass: 11.1749 | pos in: -0.086752 0.013430 -30.000000 | pos out: -0.170499 0.028635 99.514732

cry 35

Index of daughter: 37 | charge: 1 | mass: 0.938272 | pos in: -0.170499 0.028635 99.514732 | pos out: 0.579096 2.516474 105.081200
Index of mother: 0 | charge: 6 | mass: 11.1749 | pos in: -0.086752 0.013430 -30.000000 | pos out: -0.170499 0.028635 99.514732

cry 29

Index of daughter: 39 | charge: 1 | mass: 0.938272 | pos in: -0.170499 0.028635 99.514732 | pos out: 2.015326 3.288280 102.927856
Index of mother: 0 | charge: 6 | mass: 11.1749 | pos in: -0.086752 0.013430 -30.000000 | pos out: -0.170499 0.028635 99.514732



Example of bad clusterization



1 cluster \longrightarrow 3 hit (=3 crystals hit)

cry 16

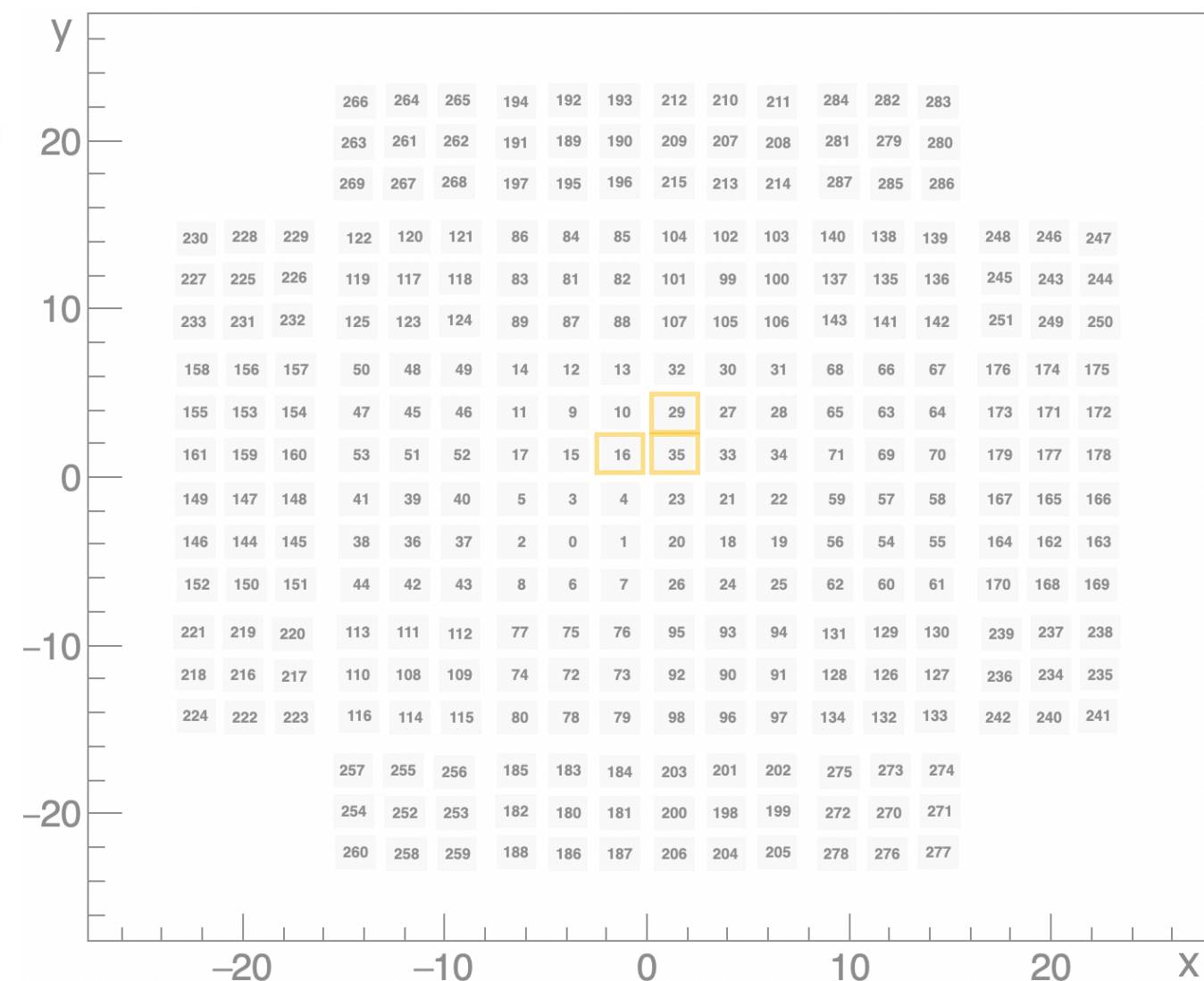
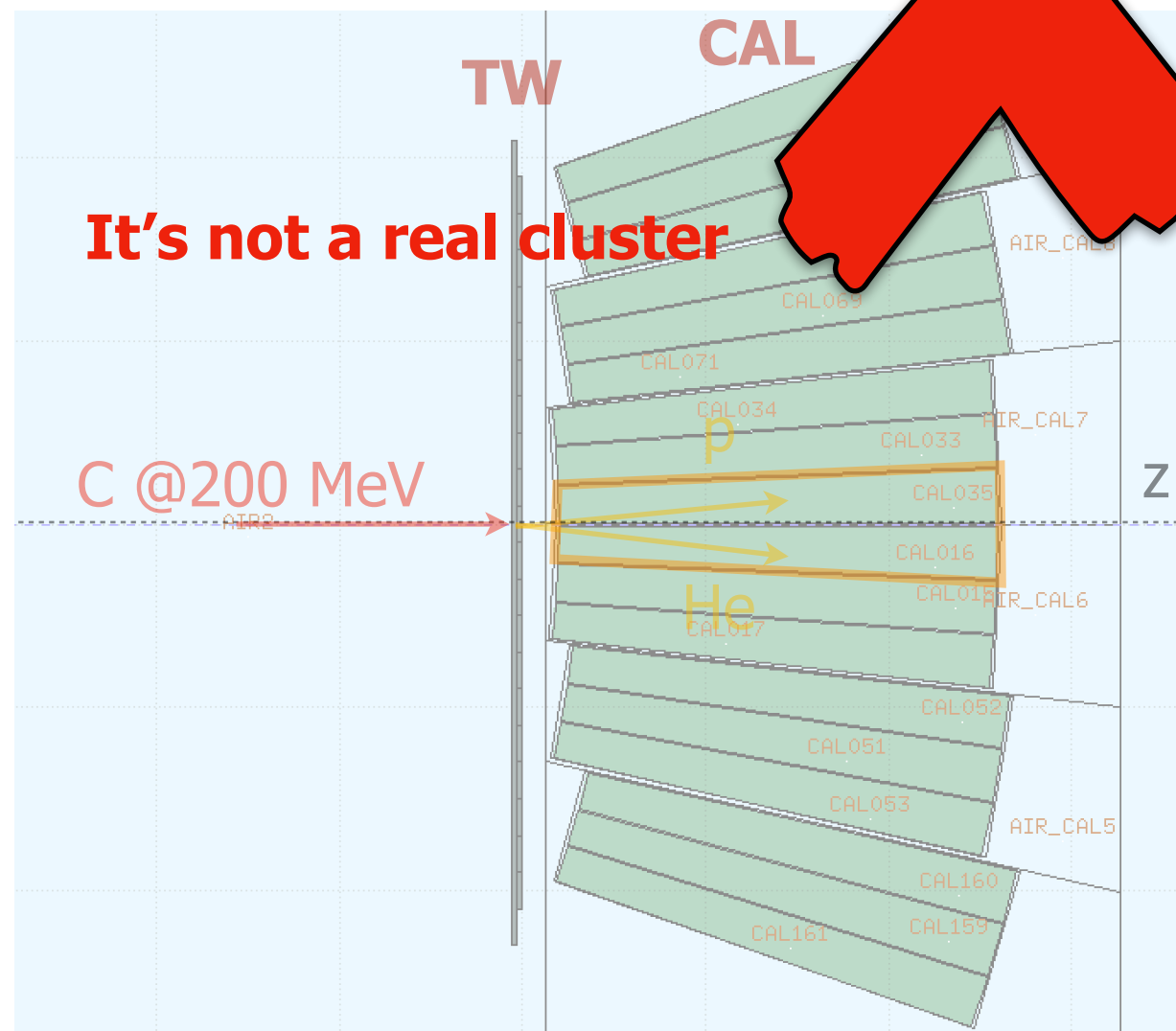
Index of daughter: 2 | charge: 2 | mass: 3.72738 | pos in: -0.170499 0.028635 99.514732 | pos out: 0.250462 0.807141 110.424698
Index of mother: 0 | charge: 6 | mass: 11.1749 | pos in: -0.086752 0.013430 -30.000000 | pos out: -0.170499 0.028635 99.514732

cry 35

Index of daughter: 37 | charge: 1 | mass: 1.007276 | pos in: -0.170499 0.028635 99.514732 | pos out: 0.579096 2.516474 105.081200
Index of mother: 0 | charge: 6 | mass: 11.1749 | pos in: -0.086752 0.013430 -30.000000 | pos out: -0.170499 0.028635 99.514732

cry 29

Index of daughter: 39 | charge: 1 | mass: 4.001506 | pos in: -0.170499 0.028635 99.514732 | pos out: 2.015326 3.288280 102.927856
Index of mother: 0 | charge: 6 | mass: 11.1749 | pos in: -0.086752 0.013430 -30.000000 | pos out: -0.170499 0.028635 99.514732



Cluster algorithm efficiency



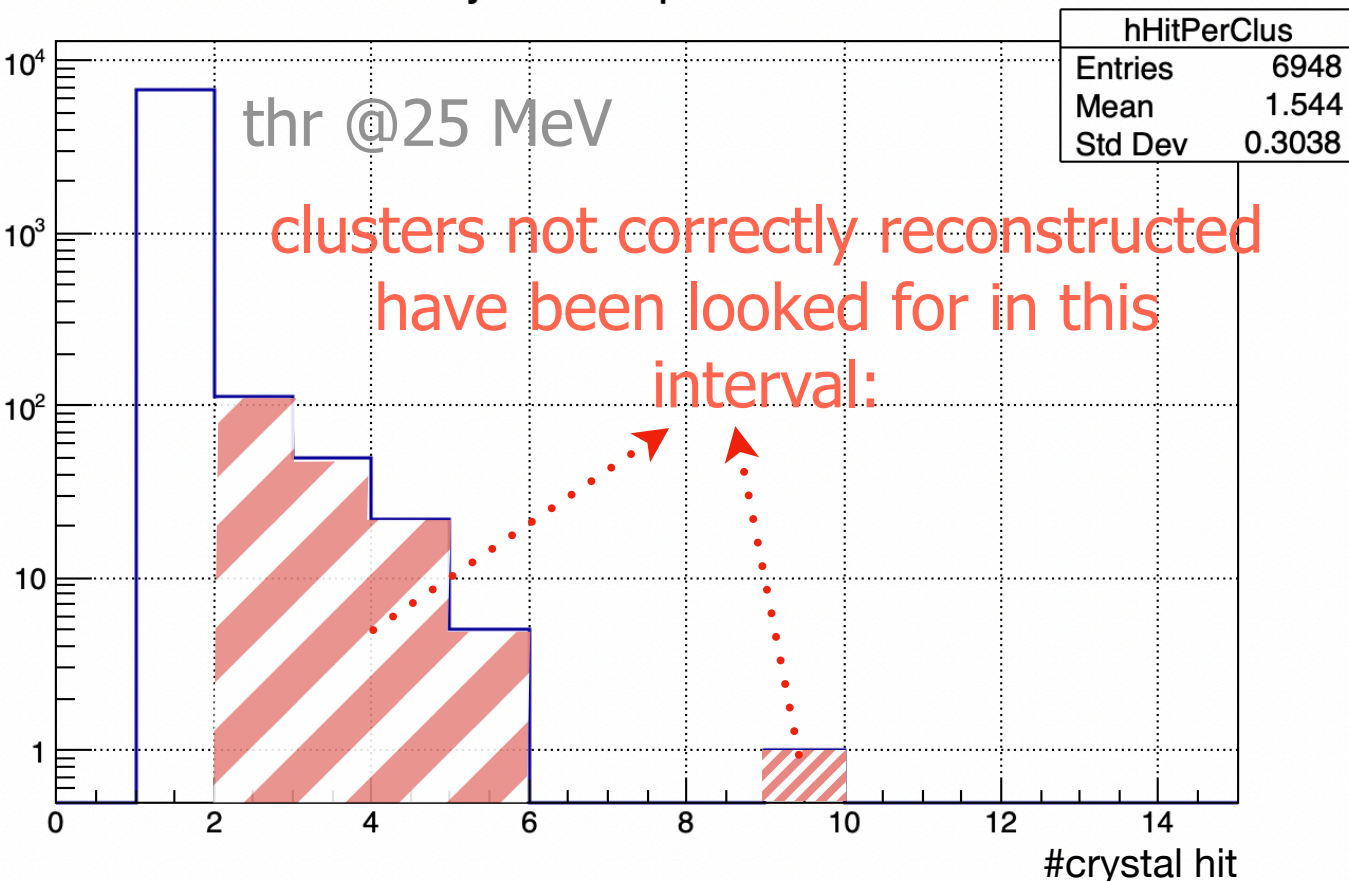
- In order to test the reliability of the algorithm, events with $n\text{Hits} > 1$ and particles originated before the calorimeter ($z < 102$ cm) were looked for changing the threshold values.

```
#include "TACAdigitizer.hxx"

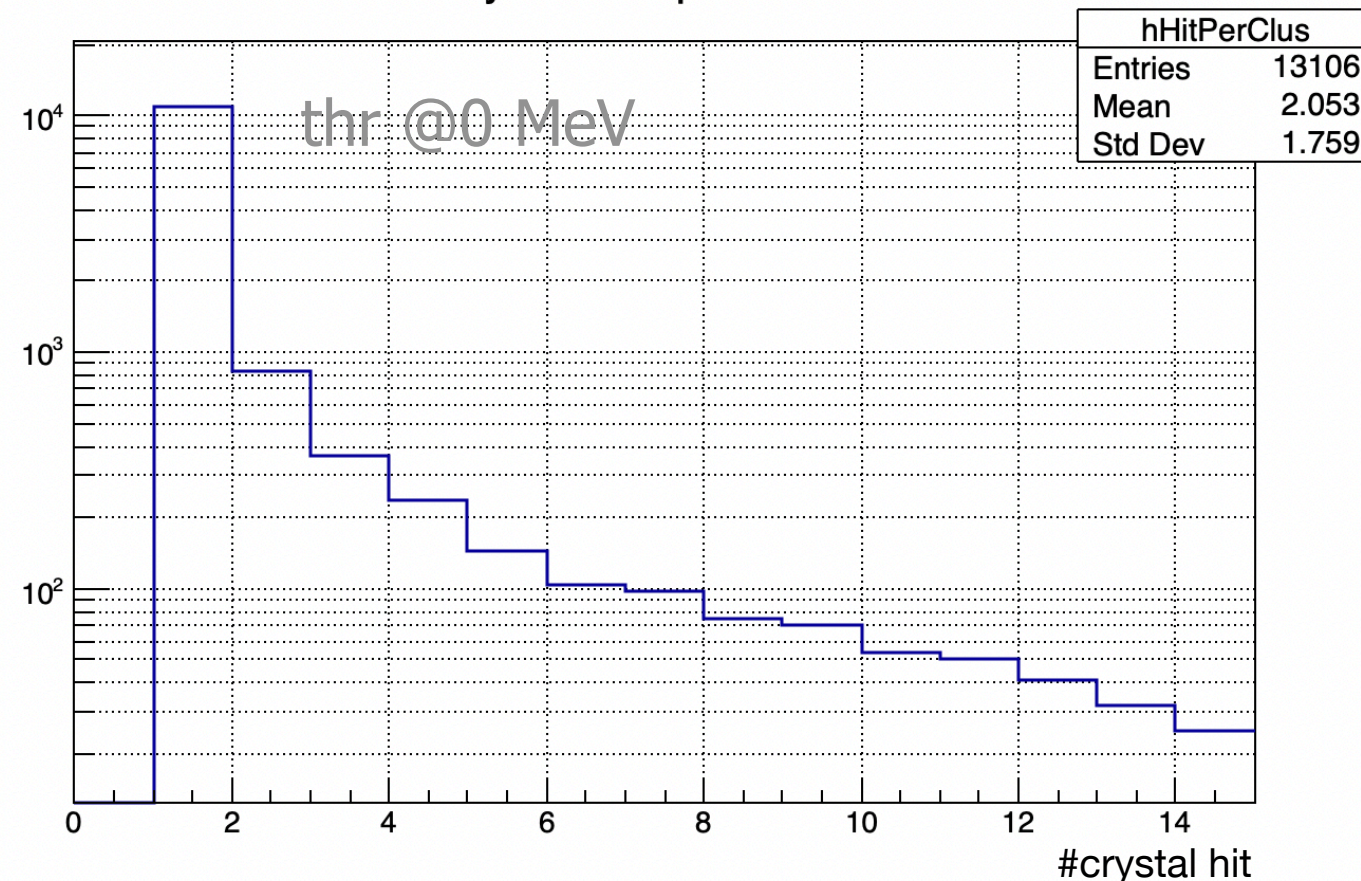
Float_t TACAdigitizer::fgThreshold = 25; // MeV

// -----
TACAdigitizer::TACAdigitizer(TACAntuRaw* pNtuRaw)
: TAGbaseDigitizer(),
  fpNtuRaw(pNtuRaw),
  fGain(1e-4),
  fResPar0(1.21),
  fResErrPar0(7e-3),
```

Crystals Hit per Cluster



Crystals Hit per Cluster



Cluster algorithm efficiency

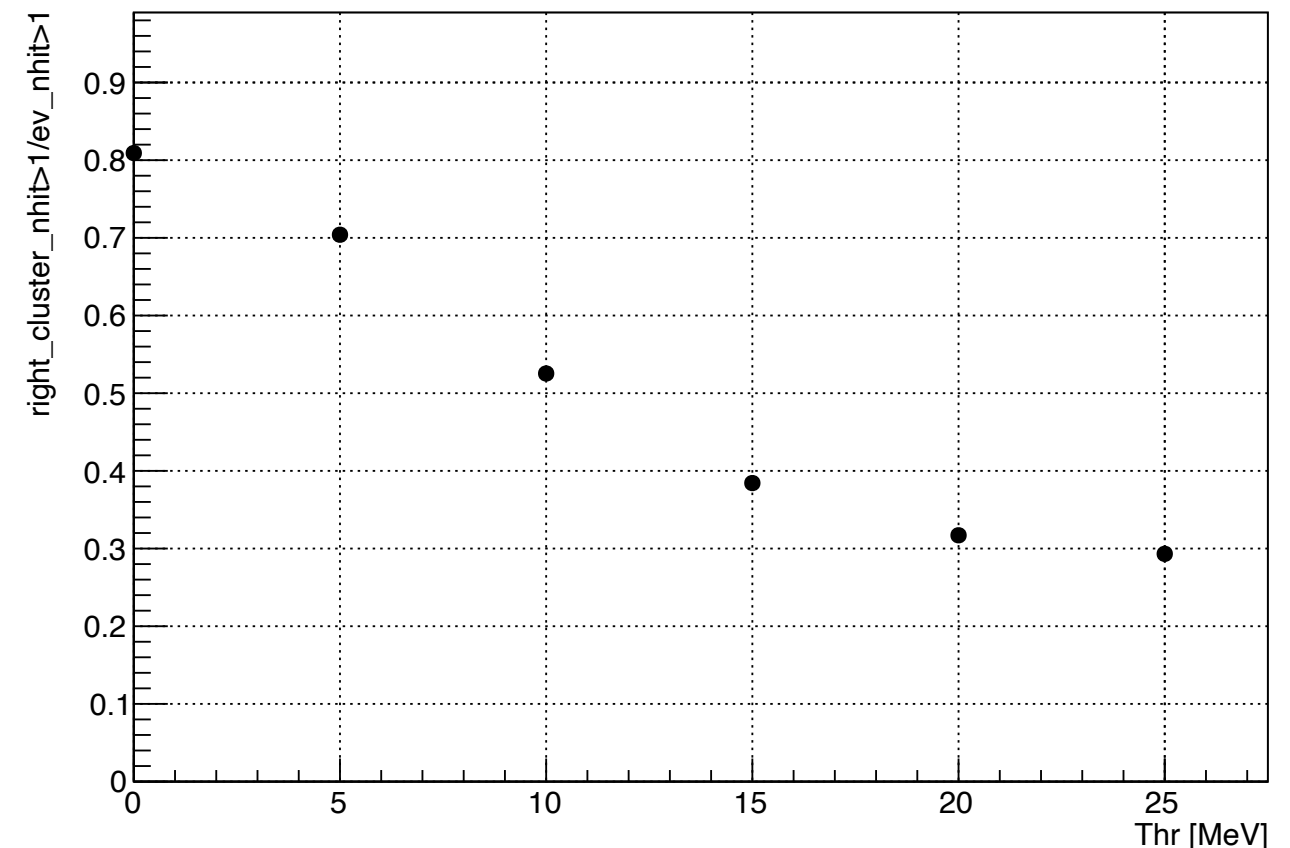
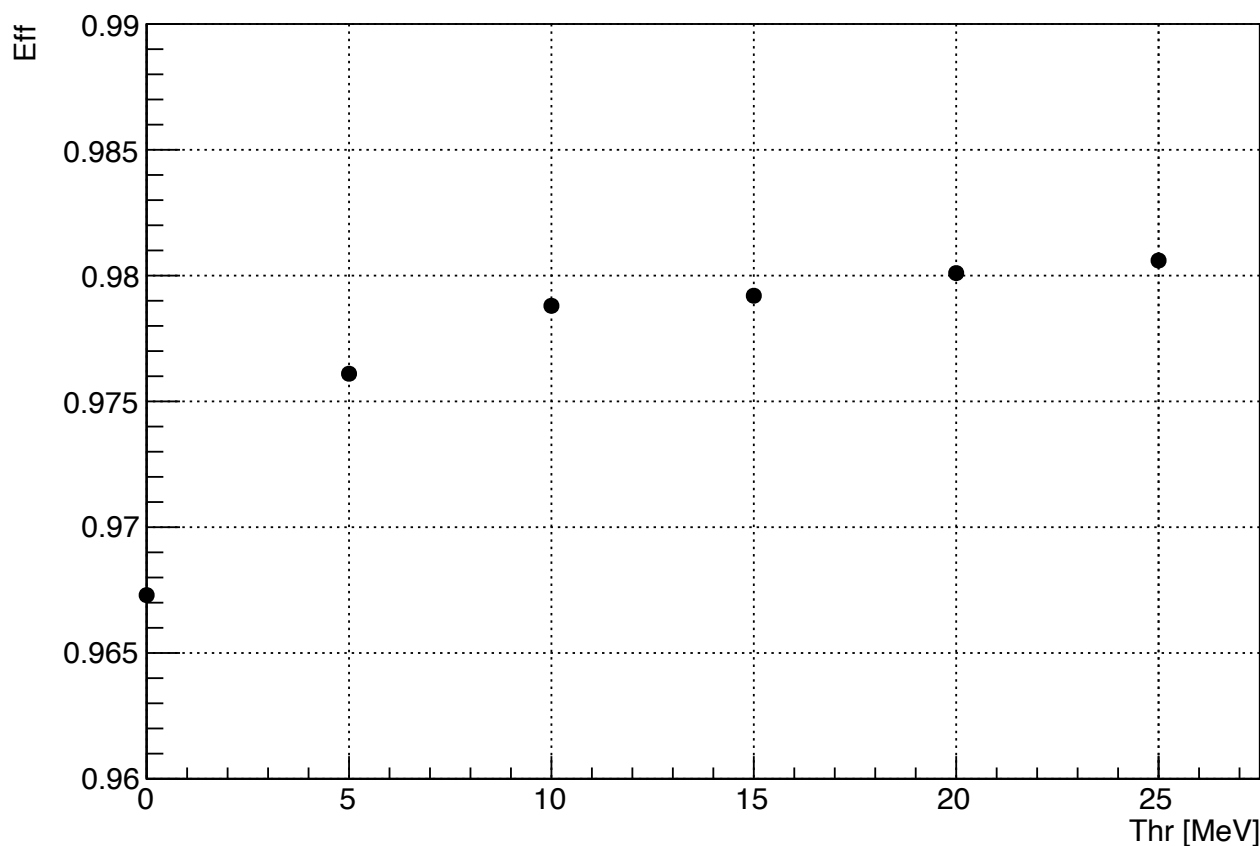


- In order to test the reliability of the algorithm, events with $n_{\text{Hits}} > 1$ and particles originated before the calorimeter ($z < 102$ cm) were looked for changing the threshold values.

```
#include "TACAdigitizer.hxx"

Float_t TACAdigitizer::fgThreshold = 25; // MeV

// -----
TACAdigitizer::TACAdigitizer(TACAntuRaw* pNtuRaw)
: TAGbaseDigitizer(),
  fpNtuRaw(pNtuRaw),
  fGain(1e-4),
  fResPar0(1.21),
  fResErrPar0(7e-3),
```







- Why including the TW in FootGlobal.par the command `../bin/DecodeMC` etc ... returns errors:

```
===== Input Parameters =====  
  
Global debug level: 0  
Detectors included:  
-Target - ToF Wall - Calorimeter -
```

It seems that a "calibration file" is missing. Could be related to the "makeGeo" problem?



```
Error in <TATWcalibrationMap::LoadEnergyCalibrationMap(): File doesn't exist  
Info in <TATWcalibrationMap::LoadEnergyCalibrationMap(): File Calibration Energy not open!!  
Error in <TATWcalibrationMap::LoadEnergyCalibrationMap(): Layer -1 doesn't exist  
Error in <TATWcalibrationMap::LoadEnergyCalibrationMap(): Layer -1 doesn't exist  
Error in <TATWcalibrationMap::LoadEnergyCalibrationMap(): Layer 32655 doesn't exist  
Error in <TATWcalibrationMap::LoadEnergyCalibrationMap(): Layer -466227664 doesn't exist  
Error in <TATWcalibrationMap::LoadEnergyCalibrationMap(): Layer 32766 doesn't exist  
Error in <TATWcalibrationMap::LoadEnergyCalibrationMap(): Layer -2008023040 doesn't exist  
Error in <TATWcalibrationMap::LoadEnergyCalibrationMap(): Layer 32655 doesn't exist  
Error in <TATWcalibrationMap::LoadEnergyCalibrationMap(): Layer -2007855232 doesn't exist
```



```
Error in <TATWcalibrationMap::LoadToFCalibrationMap(): Layer -1529806741 doesn't exist  
Error in <TATWcalibrationMap::LoadToFCalibrationMap(): Layer -1966448055 doesn't exist  
Info in <TATWparCal::FromCalibFile(): Open file for calibration  
  
Warning in <TAGcampaign::GetFile(): Empty file for detector TW and run -1  
  
Warning in <LocalRecoMC::ReadParFiles(): BB parametrization file does not exist for 12C at 200 MeV switch to true MC Z  
  
*** Break *** segmentation violation  
[/Users/lorenzoscavarda/root/build_root/lib/libCore.so] TUnixSystem::DispatchSignals(ESignals) /Users/lorenzoscavarda/root/build_root/lib/libCore.so:3631  
[...]
```




- Energy calibration?

```
//  
Bool_t TACAdigitizer::Process(Double_t edep, Double_t x0, Double_t y0, Double_t /*zin*/, Double_t /*zout*/, Double_t tim  
{  
    if (edep < fgThreshold) {  
        fCurrentHit = 0x0;  
        return true;  
    }  
  
    Float_t resEnergy = GetResEnergy(edep);  
    edep += gRandom->Gaus(0, resEnergy);  
    edep = fCalEPar1*edep + fCalEPar0; // rough calibration
```

fCalEPar0(-28.42),
fCalEPar1(1.252)