



## GCRCalib package status

- Code overall structure
- Flow chart
- Next developments



# Overall structure

- **2 new packages:**

- **GCRCalib:** selection of Xtals useful for calibration
- **gcrSelectRootData:** storage of selected Xtals into new ROOT file

- **GCRCalib: 2 Algs, 1 tool each**

- **GcrReconAlg - GcrReconTool**
- **GcrSelectAlg - GcrSelectTool**

- **Algs inserted and controlled easily using Job Options files:**

```
ApplicationMgr.DLLs +={  
"CalRecon", "CalUtil",  
"GCRCalib",...}
```

```
Call.Members = {"CalXtalRecAlg",  
"CalClustersAlg/first",  
"GcrReconAlg", "GcrSelectAlg",...}
```

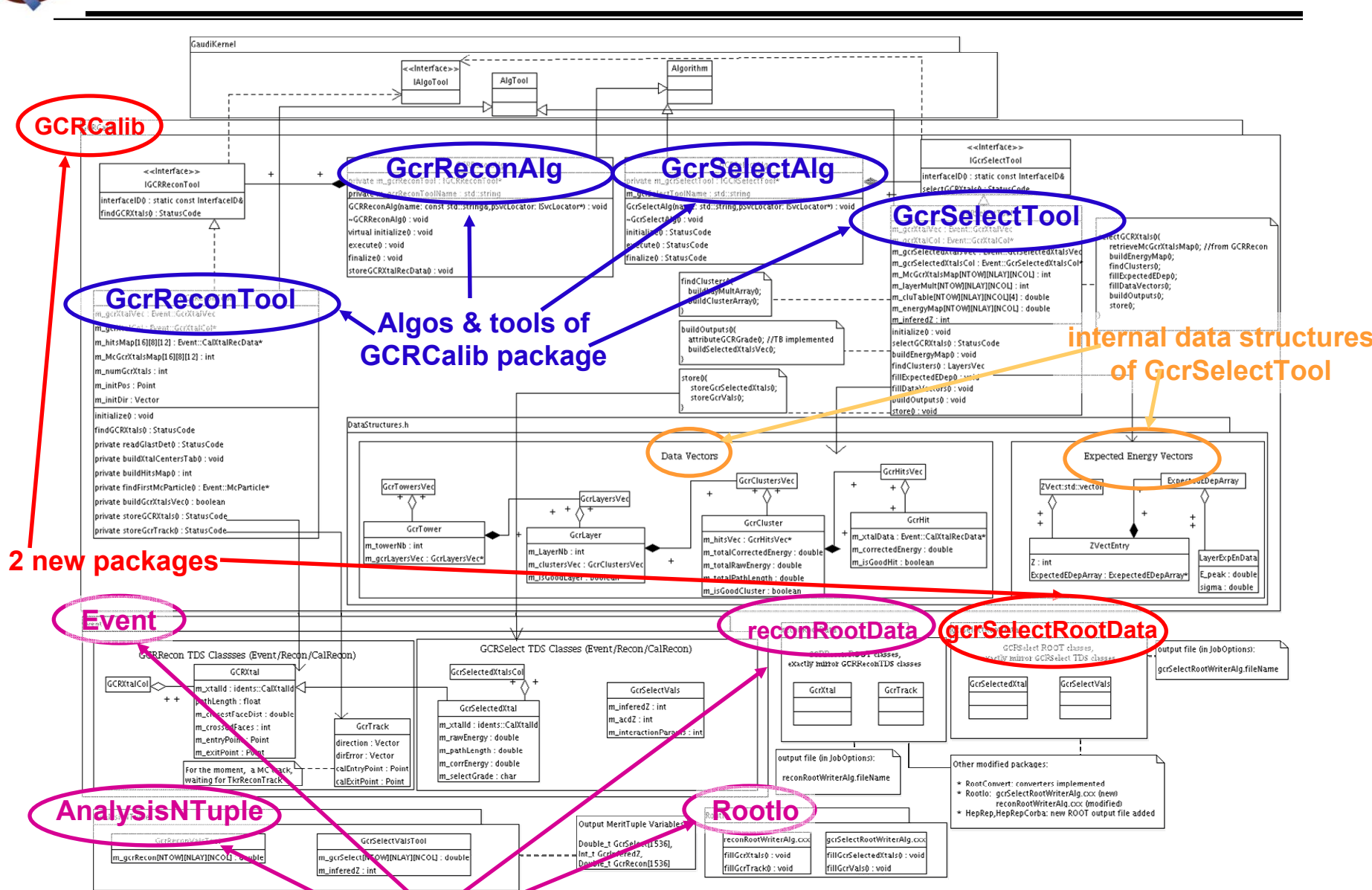
- **modified packages:**

- **Event: (Event/Recon/CalRecon)**
- **reconRootData**
- **RootConvert**
- **RootIO**
- **HepRep**
- **HepRepCorba**
- **AnalysisNTuple**

- **ROOT files:**

- **recon.root: modified**
- **gcrSelect.root: new**

# Total UML diagram



**GCRCalib**

**GcrReconTool**

**GcrReconAlg**

**GcrSelectAlg**

**GcrSelectTool**

Algos & tools of GCRCalib package

internal data structures of GcrSelectTool

2 new packages

**Event**

**reconRootData**

**gcrSelectRootData**

**AnalysisNTuple**

**Rootlo**

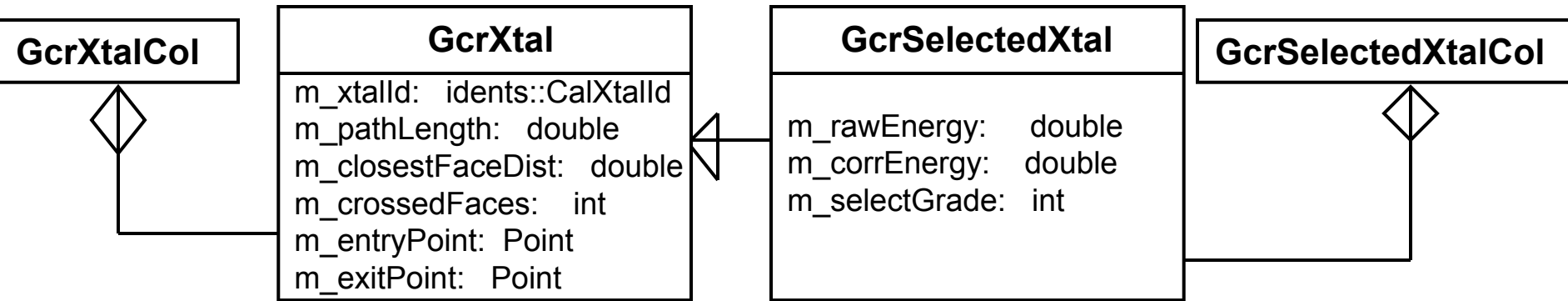
modified packages (some of them)



# TDS & ROOT objects

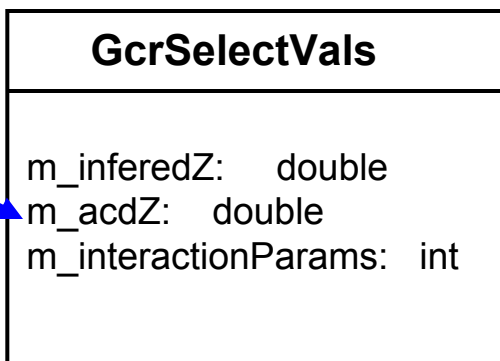
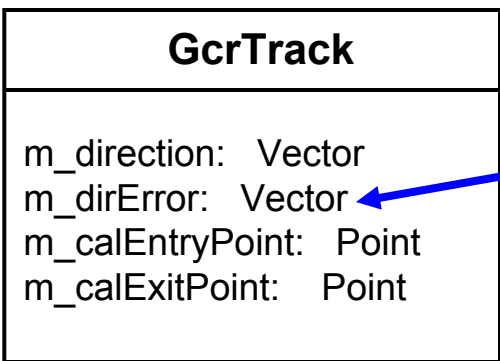
## GCRRecon

## GCRSelect



**GcrXtal:** a log being crossed by the primary particle track

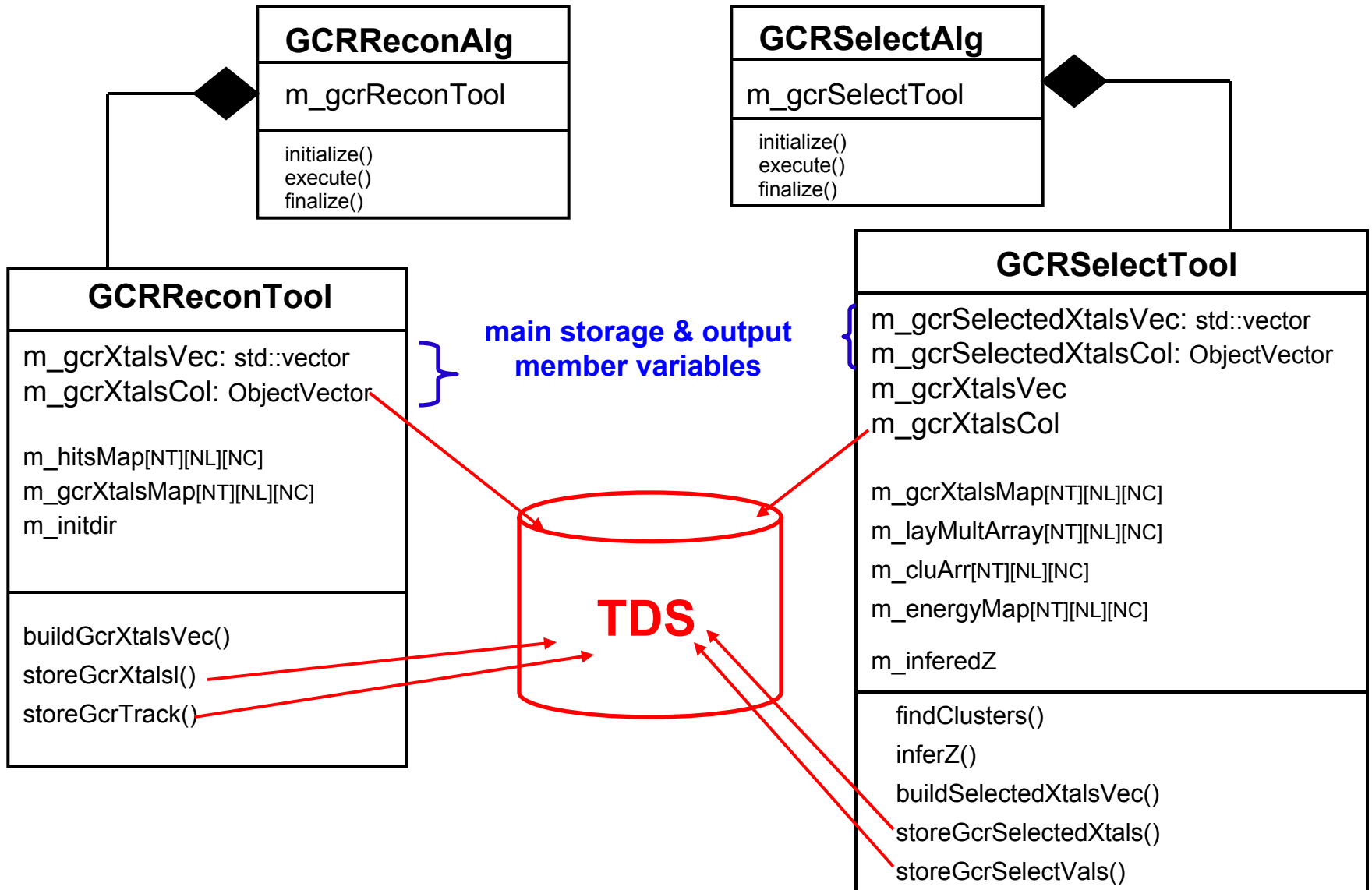
**GcrSelectedXtal:** a GcrXtal having an energy deposit >  $E_{th}$  (120 MeV), selected after rejection of nuclear interaction)



dirError & acdZ:  
not available yet

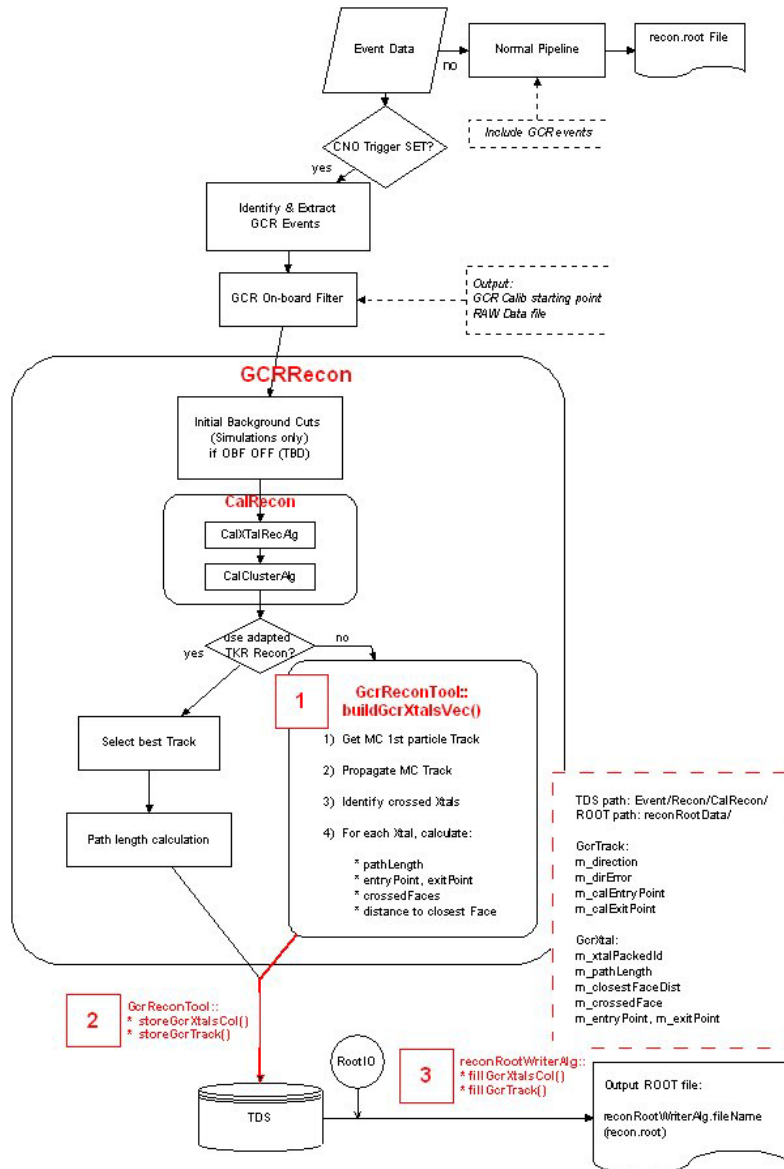


# GCRCalib package





# Flow chart: GCRRecon



- Flowchart initiated by Mark
- Now updated according to last code version

**1** GcrReconTool::buildGcrXtalsVec

- 1) Get MC 1st particle Track
- 2) Propagate MC Track
- 3) Identify crossed Xtals
- 4) For each Xtal, calculate:
  - \* pathLength
  - \* entryPoint, exitPoint
  - \* crossedFaces
  - \* distance to closest Face

**2** GcrReconTool::store (TDS)

- 1) storeGcrXtalsCol
- 2) storeGcrTrack

**3** reconRootWriterAlg (ROOT)

- 1) fillGcrXtalsCol
- 2) fillGcrTrack

TDS path: Event/Recon/CalRecon/  
ROOT path: reconRootData/  
  
GcrTrack:  
m\_direction  
m\_dirError  
m\_calEntryPoint  
m\_calExitPoint  
  
GcrXtal:  
m\_xtalPackedId  
m\_pathLength  
m\_closestFaceDist  
m\_crossedFace  
m\_entryPoint, m\_exitPoint

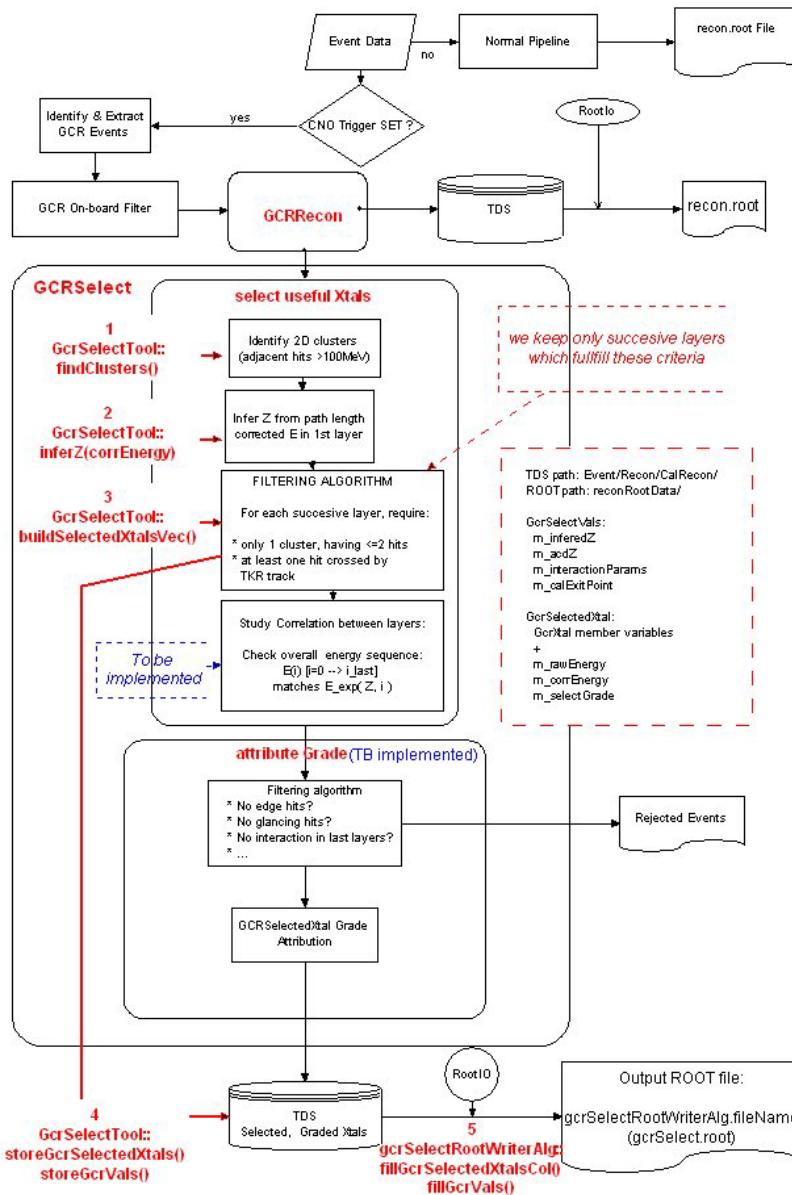
**2** GcrReconTool::  
\* storeGcrXtalsCol()  
\* storeGcrTrack()

**3** reconRootWriterAlg::  
\* fillGcrXtalsCol()  
\* fillGcrTrack()

Output ROOT file:  
reconRootWriterAlg.fileName  
(recon.root)



# Flow chart: GCRSelect



- 1** **GcrSelectTool::findClusters():**  
Identify 2D clusters  
(adjacent hits>100MeV)
- 2** **GcrSelectTool::inferZ(corrEnergy):**  
Estimate Z from pathLength corrected energy in 1st layer
- 3** **GcrSelectTool::buildSelectedXtalsVec():**  
build vector & apply simple filtering algorithm:  
  - \* for each layer, requires 1 and only 1 cluster with at most 2 hits (multiplicity criterium)
  - \* only keeps the first successive layer (starting from the top of the CAL) which fulfill the above criterium
- 3** **GcrSelectTool::store** (TDS output):  
  - \* storeGcrSelectedXtalsCol()
  - \* storeGcrVals()
- 3** **gcrSelectrootWriterAlg** (ROOT output)  
  - \* fillGcrSelectedXtalsCol()
  - \* fillGcrSelectVals()





# Code status

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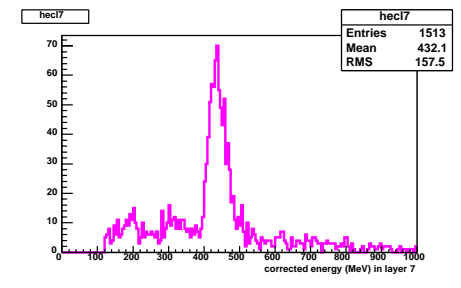
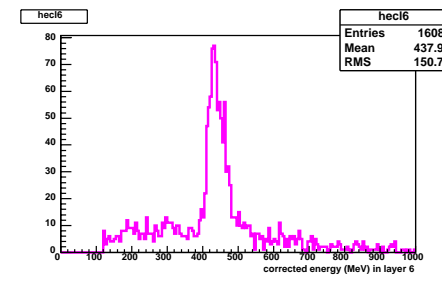
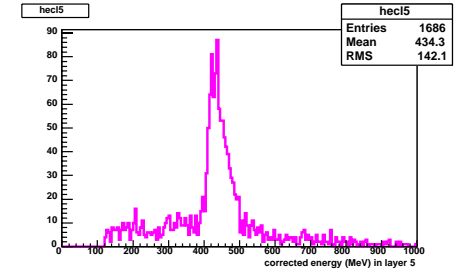
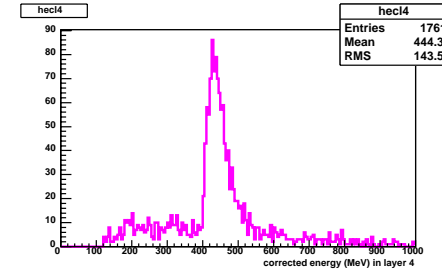
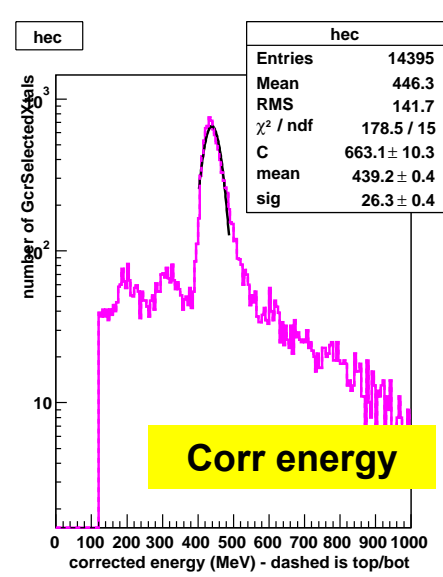
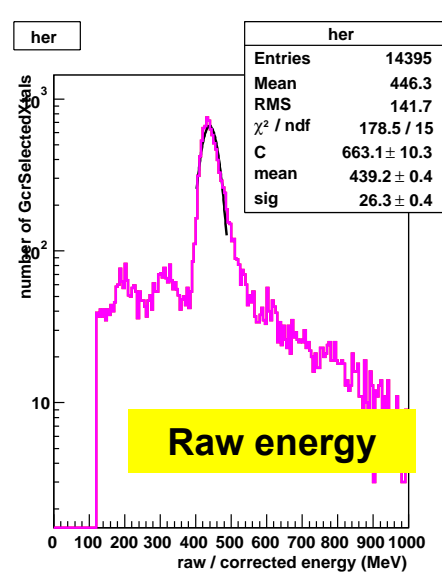
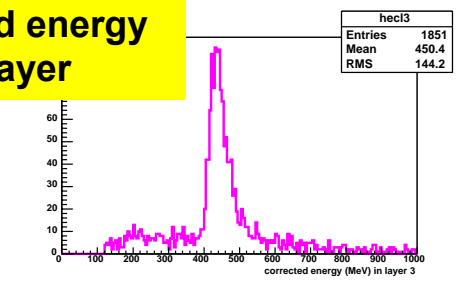
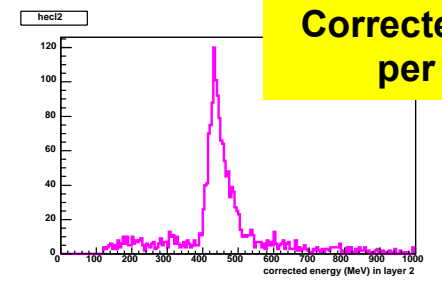
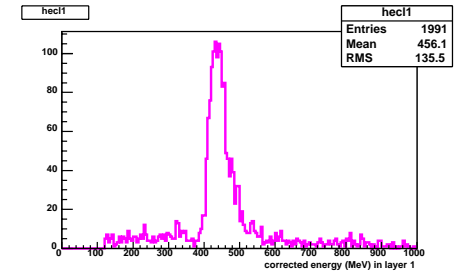
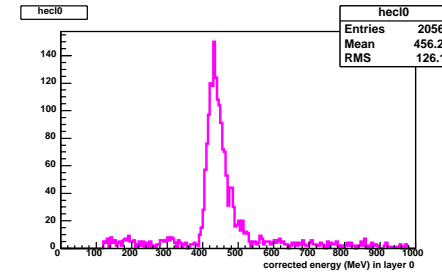
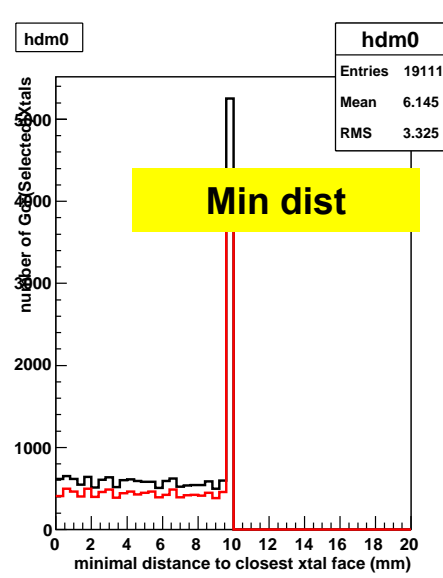
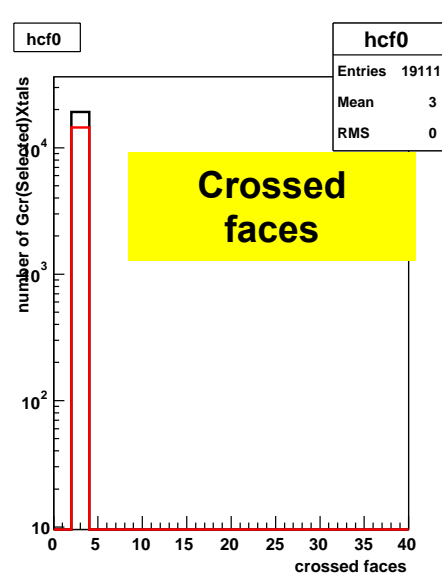
- **Code implemented & running with GR-v9r3**
  - cleaning & documentation
  - TB compiled with latest GR version
  - G4Propagator (G4PropagationTool.cxx) mods not needed (?)
- **RootTreeAnalysis code updated to include new gcrSelect.root file (compiled & running)**
- **Simulations storage & documentation procedure implemented (IN2P3-CC Lyon)**
  - a simple **Postgres relational « metadata » database**
  - « metadata » DB linked to structured storage file system (AFS - HPSS)
  - metadata DB automatic feeding scripts now being implemented

**CVS**



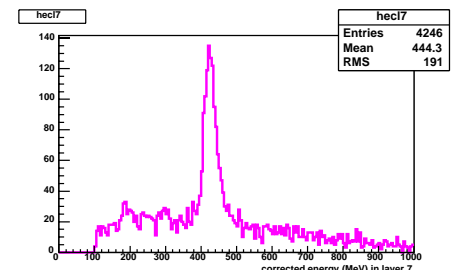
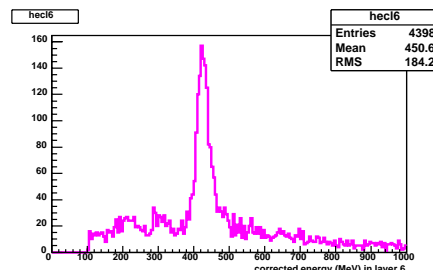
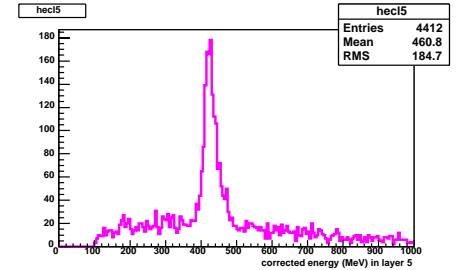
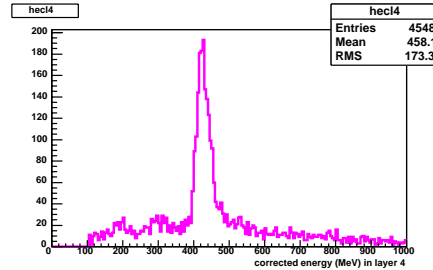
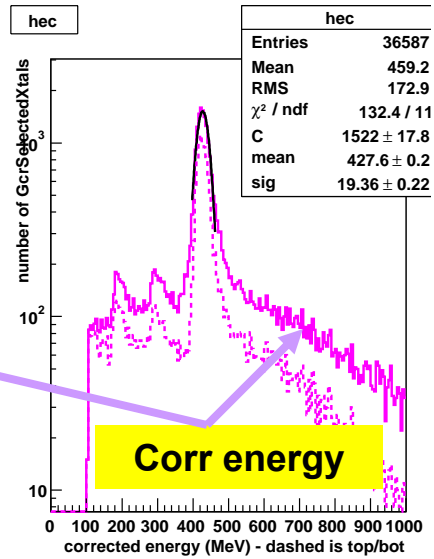
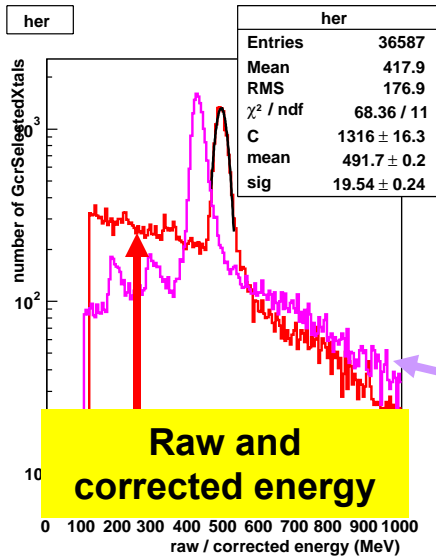
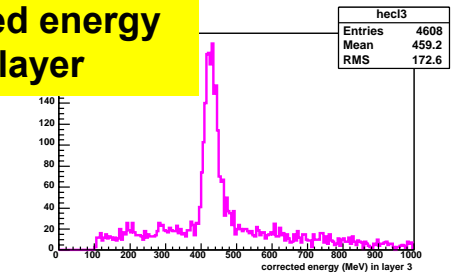
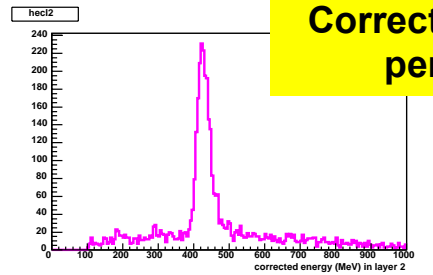
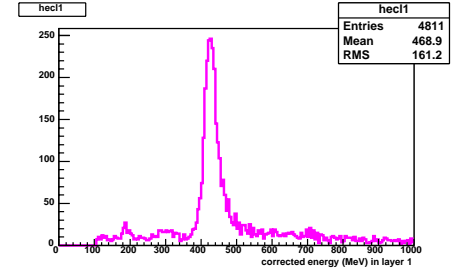
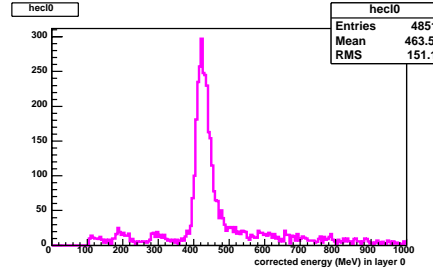
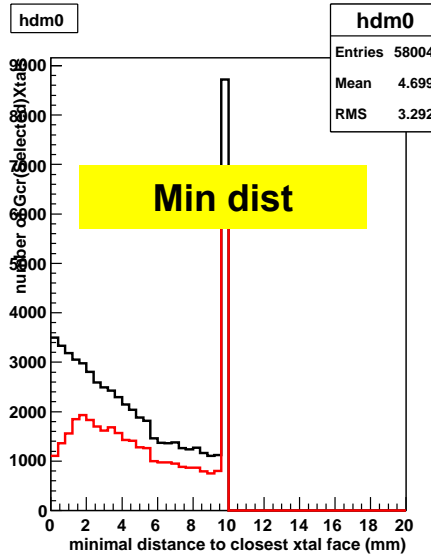
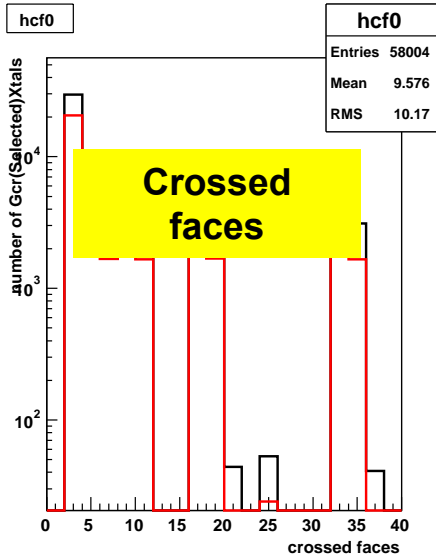


# Some simulations results: vertical C





# Some simulations results: C at 30 deg





# Some simulation results

- Performed simulations using Reconstruction sequence as:

```
Reconstruction.Members={  
    "Sequencer/Call"  
};
```

—————→ (No Tkr,Cal2,TkrIter,Acd)

**AND**

```
Call.Members = {  
    "CalXtalRecAlg",  
    "CalClustersAlg/first",  
    //"CalMipFinderAlg",  
    "GcrReconAlg",  
    "GcrSelectAlg",  
    //"CalEventEnergyAlg/RawEnergy"  
};
```

—————→ (No CalMipFinder,  
CalEventEnergyAlg)

**CPU time for 10k events:**

**Z=14 → ~5 Hours**

**Z=26 → ~10 Hours**



# Some simulation results

- Performed simulations using complete Cal1 sequence:

```
Call.Members = {  
    "CalXtalRecAlg",  
    "CalClustersAlg/first",  
    //"CalMipFinderAlg",  
    "GcrReconAlg",  
    "GcrSelectAlg",  
    //"CalEventEnergyAlg/RawEnergy«  
};
```

CalXtalRecAlg:execute	INFO	Time	User	:	Tot=	1.46	[s]	Ave=	1.25(+/- 3.43
first:execute	INFO	Time	User	:	Tot=	0.55	[s]	Ave=	470(+/-2.12e+03
GcrReconAlg:execute	INFO	Time	User	:	Tot=	0.91	[s]	Ave=	0.778(+/- 2.68)
GcrSelectAlg:execute	INFO	Time	User	:	Tot=	430	[ms]	Ave=	368(+/-1.93e+03)
RawEnergy:execute	INFO	Time	User	:	Tot=	90	[ms]	Ave=	77(+/- 874)
Call:execute	INFO	Time	User	:	Tot=	3.45	[s]	Ave=	2.95(+/- 4.99)

**We are studying optimization of GcrReconTool & GcrSelectTool codes**



# Next steps

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- **A few runs of some 1000 events are needed to:**
  - accurately evaluate algorithm performances
  - complete filtering algorithms
- **Other tasks (before or after SC1 ?):**
  - **TKR:** need for an adapted recon for ions
  - **CAL:**
    - study of heaviest ions slowing down and peak high-energy tail
      - need for an estimate of Z using **ACD** PM high-energy range
      - study of energy sequence and correlation between layers kept for calibration
    - implementation of **quenching** effects (after SC1...)
      - need for CalDigi mods and model for quenching