

ND-GAr: Pandora integration status.

ND Software integration meeting

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DESY
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Motivation.

Opening the Pandora Box

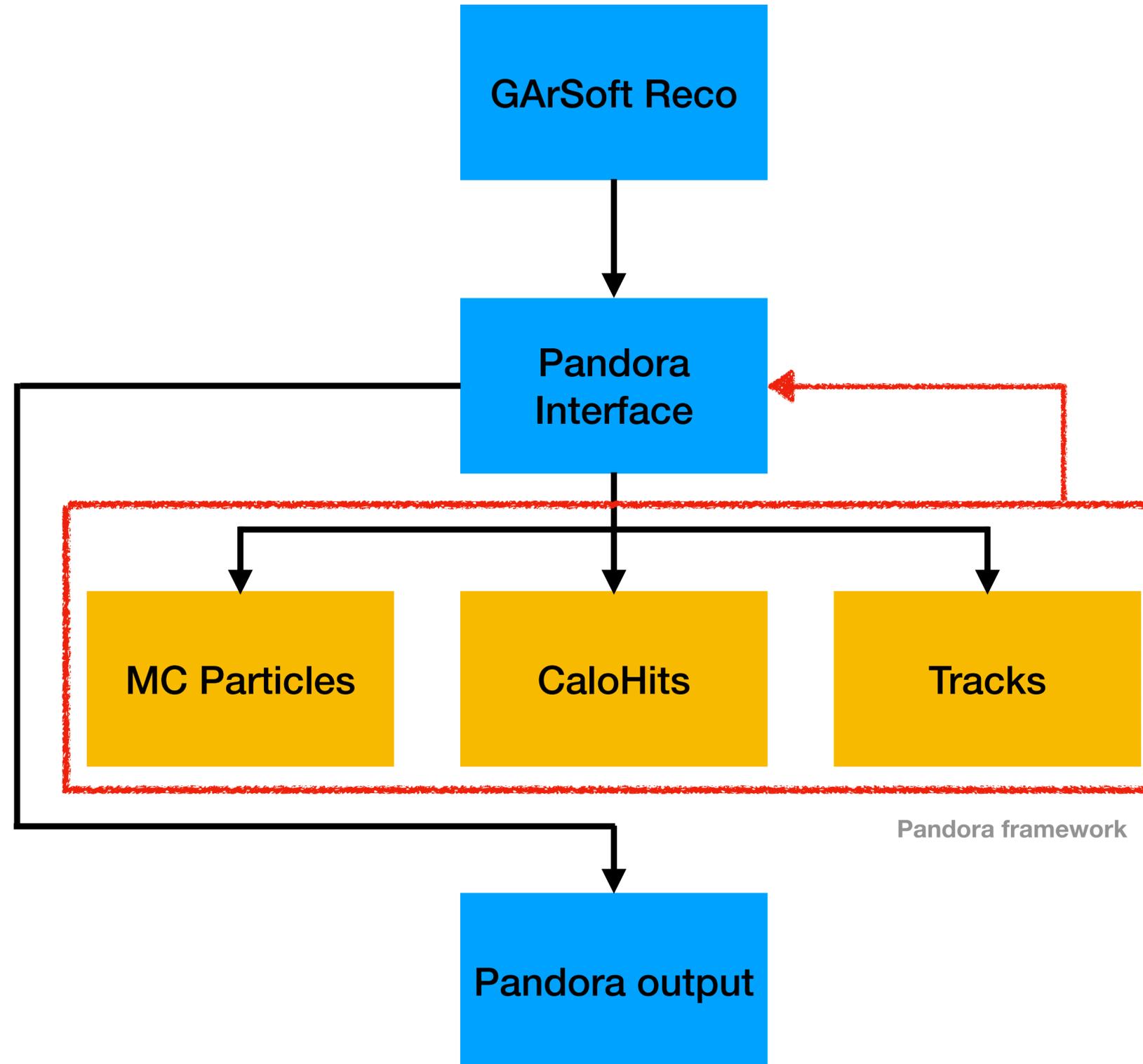
- The FD uses Pandora for reconstruction
 - To make complement things, the ND also should also provide a Pandora reconstruction option
- ND-LAr should be “*straight forward*” to implement Pandora based on LArPandora
- ND-BeamMonitor (SAND) will require some work if one wants to implement it.
- ND-GAr should also be “*straight forward*”
 - It has a very similar geometry as a LC detector: gas tracker/calorimeter/magnet/muon
 - Pandora is already used heavily for ILC reconstruction using the LCCContent package (<https://github.com/PandoraPFA/LCCContent>)
 - Can also be used for ND-GAr



How to implement?.

A mix between LC and LAr code

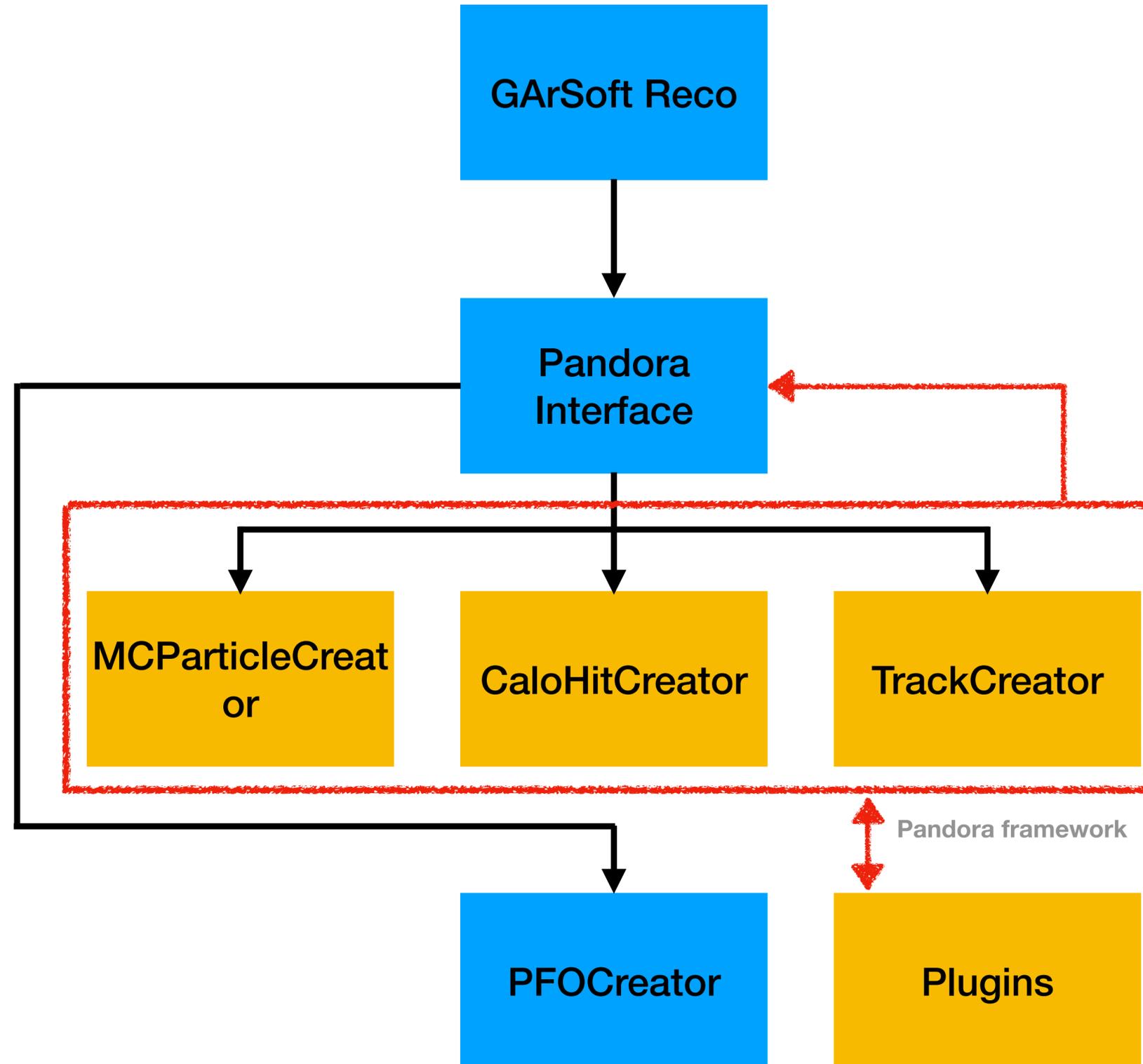
- Pandora works by using its own objects (MCParticles, CaloHits, Tracks...)
 - Avoiding framework dependencies
 - One only has to make an interface that translates art Objects to Pandora Objects
- LArSoft already implemented such interface in LArPandora (<https://github.com/LArSoft/larpandora>)
- ILC also has the same (<https://github.com/iLCSoft/DDMarlinPandora>)
- Pretty simple
 - Just adapt code (heavy adaptation) to work with GArSoft
- First problems
 - Geometry to pass to Pandora
 - Implicit convention z axis along BField...
 - art...



The actual implementation.

A mix between LC and LAr code

- Very similar to ILC implementation for the interface
 - Plugins
 - BField: Get GArSoft BField service and pass BField the value to Pandora
 - PseudoLayer: Similar to layer but avoid “hard” breaks between detector modules
 - Translators
 - MCParticleCreator: Translates art MCTruth and MCParticle into Pandora MC objects
 - CaloHitCreator: Translates art CaloHits (for now ECAL) into Pandora hits
 - TrackCreator: Translates art Tracks (from TPC) into Pandora tracks (very simple implementation for now)
 - PFOCreator: Translates Pandora Clusters/PFOs into art Clusters and PFParticles (output)

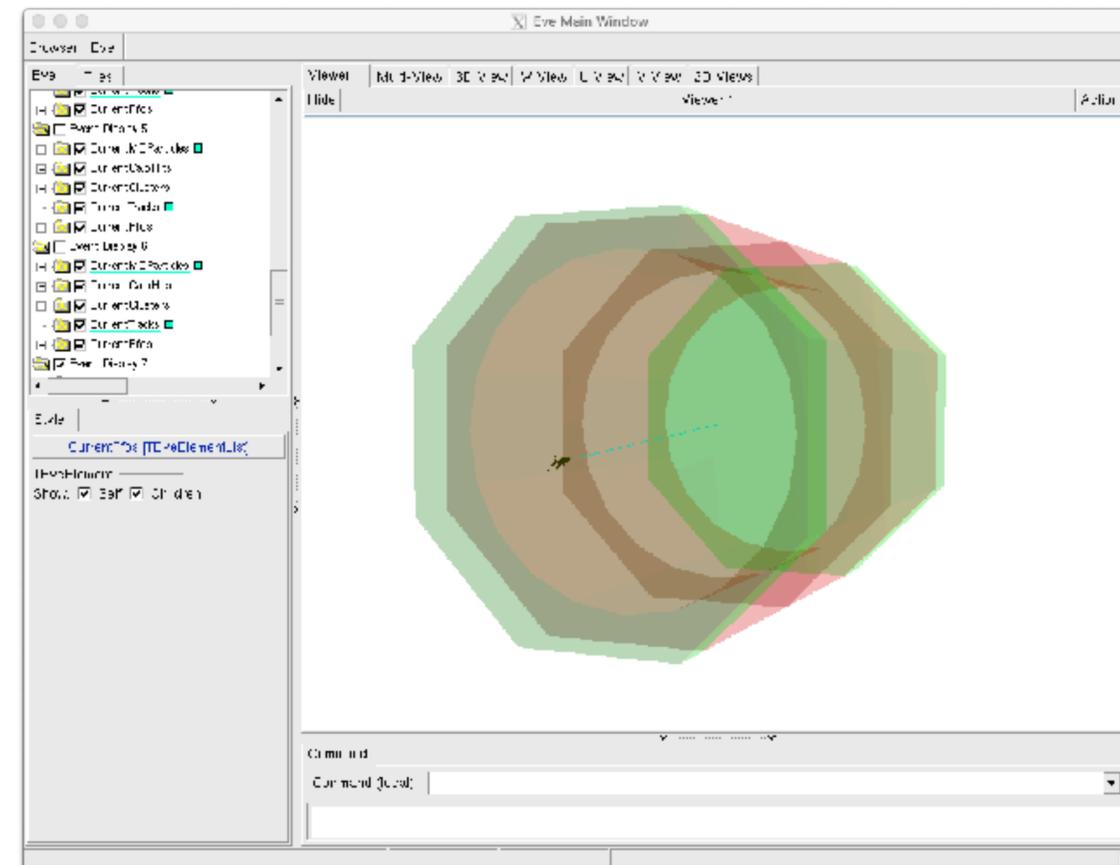
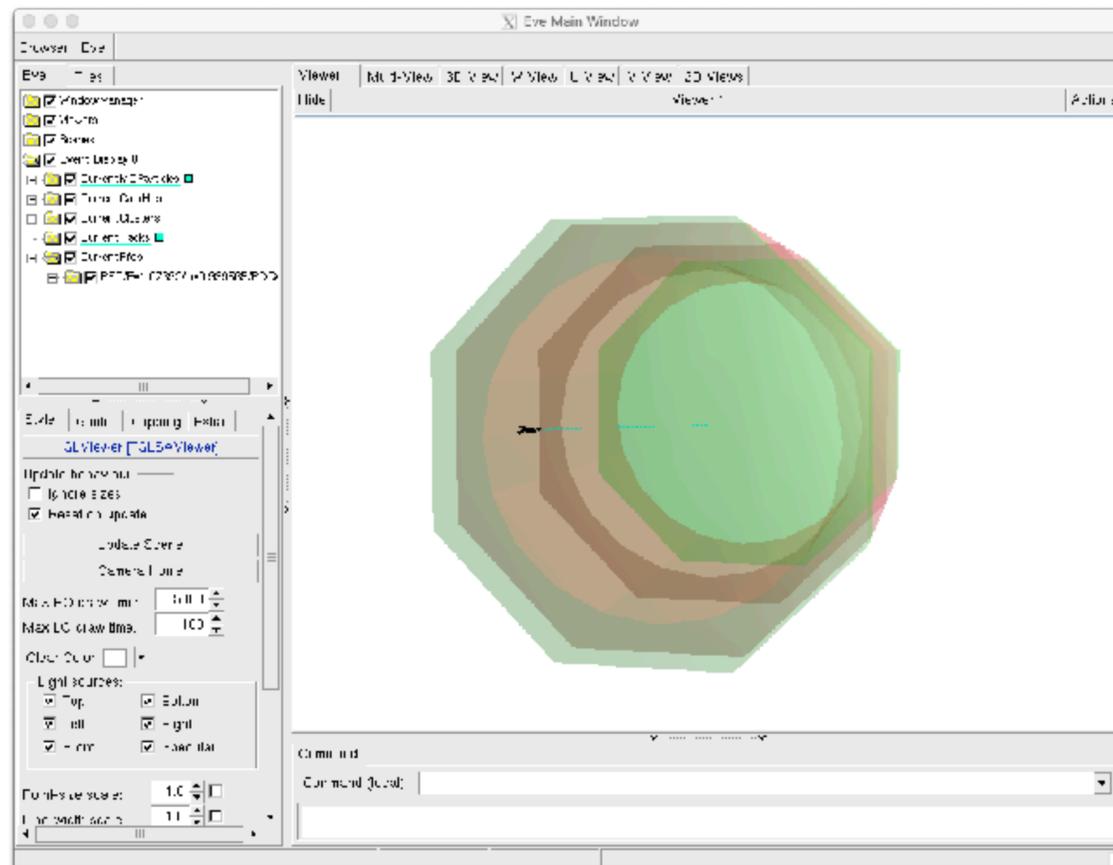


First event display.

Simple photon event

- Pandora now “works”, still few things to debug
- Use Pandora xml settings from the LC community (may need some tuning for ND-GAr at some point)
- Check event using the event display provided in Pandora
 - Geometry is passed correctly
 - Events (only 10 for now) seem to be reconstructed okay (~ 1GeV as generated)

```
MSG
Begin processing the 1st record. run: 1 subRun: 0 event: 1 at 09-Jul-2020 13:11:2
MSG-i PandoraInterface - produce: PandoraInterface:pandora@BeginModule 09-Jul-
MSG
Running Algorithm: Alg0001, CaloHitPreparation
Running Algorithm: Alg0002, EventPreparation
Running Algorithm: Alg0003, ClusteringParent
--> Running Algorithm: Alg0004, ConeClustering
--> Running Algorithm: Alg0005, TopologicalAssociationParent
-----> Running Algorithm: Alg0006, LoopingTracks
-----> Running Algorithm: Alg0007, BrokenTracks
-----> Running Algorithm: Alg0008, ShowerMipMerging
-----> Running Algorithm: Alg0009, ShowerMipMerging2
-----> Running Algorithm: Alg0010, BackscatteredTracks
-----> Running Algorithm: Alg0011, BackscatteredTracks2
-----> Running Algorithm: Alg0012, ShowerMipMerging3
-----> Running Algorithm: Alg0013, ShowerMipMerging4
-----> Running Algorithm: Alg0014, ProximityBasedMerging
-----> Running Algorithm: Alg0015, TrackClusterAssociation
-----> Running Algorithm: Alg0016, ConeBasedMerging
-----> Running Algorithm: Alg0017, TrackClusterAssociation
-----> Running Algorithm: Alg0018, MipPhotonSeparation
-----> Running Algorithm: Alg0019, TrackClusterAssociation
-----> Running Algorithm: Alg0020, SoftClusterMerging
```



Tasks to be done.

Not yet perfect...

- Not everything is perfect yet
- To do's:
 - Fix MC Particle to calohit relation (cannot use perfect PFA as relations are not correct)
 - Investigate some calo hits that are wrongly reconstructed (reco outside the calo volume...), may be a bug in the strip splitting algorithm
 - PID from Pandora seems not correct at the moment, might be specific to the implementation based on LC detector
 - Tune some parameters
 - Try with more events and also tracks!
 - Try with neutrino events!



Conclusions and Outlook.

The box has been opened!

- A first implementation of the interface with PandoraPFA is done for the ND-GAr
- Pandora seems to run through events without too much troubles for now
- Still some work to be done
- We should start soon a discussion with Cambridge on how to proceed for the ND
 - Implementation, packages...



Backup Slides.

