AHCAL software: CALICE and ILD
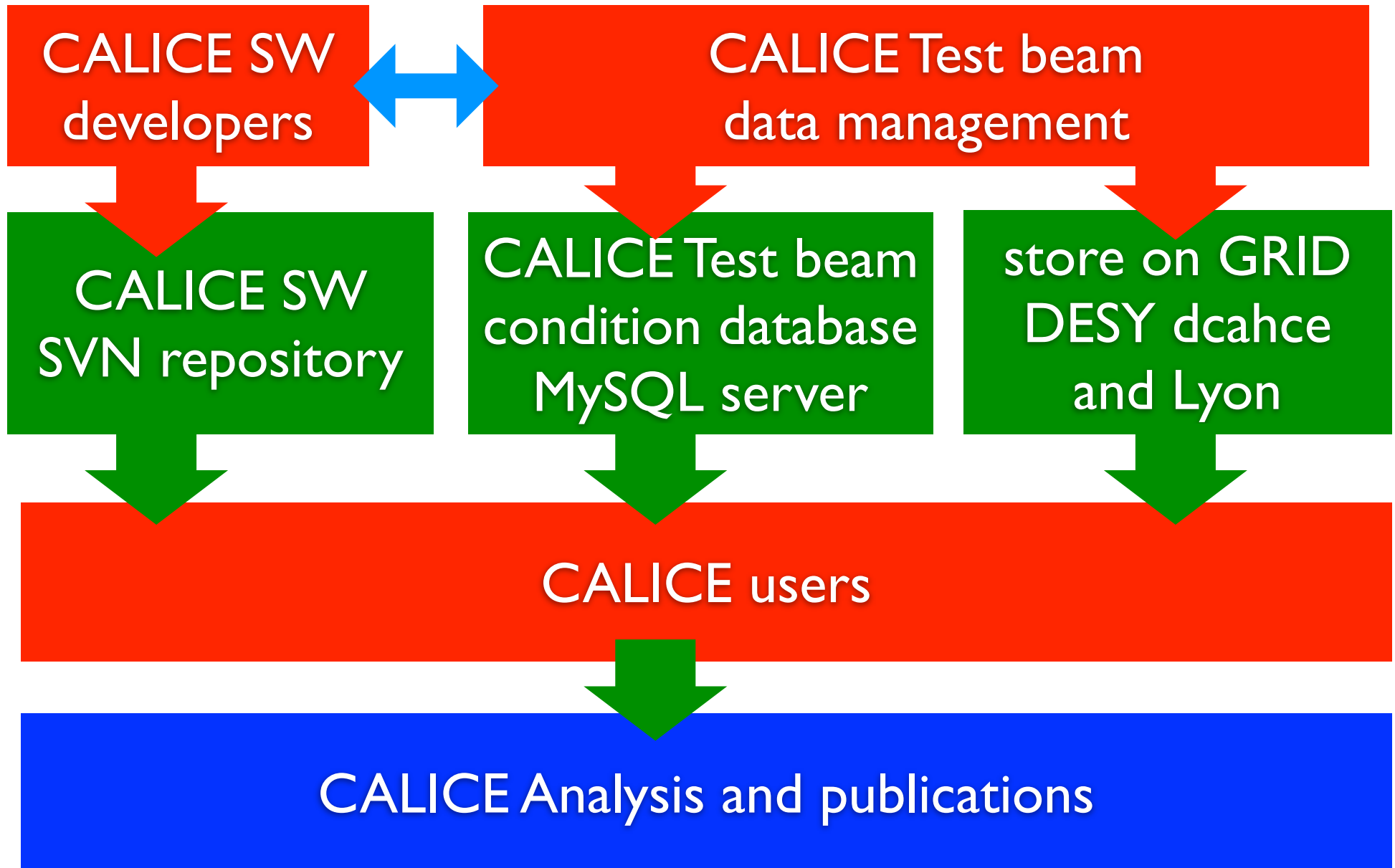
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Outline

- CALICE offline software:

  - Centre supported CALICE normal users packages: calice_userlib, calice_reco, calice_sim and script generator package calice_run

  - Centre supported CALICE experts packages: calice_cddata, calice_db_tools, calice_calib

  - To be supported CALICE users analysis package: calice_analysis

Outline

- Mokka drivers: ILD-AHCAL

  - New videau geometry for ILD-AHCAL Barrel

  - New mechanical endcap geometry design of ILD-AHCAL

  - Sensitive detector digitization

AHCAL : CALICE SW

Organization and sharing

CALICE SW developers ⟷ CALICE Test beam data management

CALICE SW SVN repository

CALICE Test beam condition database MySQL server

store on GRID DESY dcahce and Lyon

CALICE users

CALICE Analysis and publications

AHCAL reconstruction

- Centre supported CALICE normal users packages: calice_userlib, calice_reco, calice_sim and script generator package calice_run

  - Software existed for test beam data reconstruction
  - During the intensive usage by CALICE users, the common requests implementation and the physical logical for treating the data have been improved day after day.
  - The bugs, wrong physical logical have been (/will be) corrected in the processors, when they has been explored during usage.

AHCAL experts software

- Centre supported CALICE experts packages: calice_cddata, calice_db_tools, calice_calib

  - The support will be also provided for the experts packages, and fully maintained on AFS and NAF system at DESY

  - They also have been used by CALICE normal users today

CALICE higher level software

- To be supported CALICE users analysis package: calice_analysis

  - A new repository has been created, and to be used for sharing the CALICE analysis processors

  - There are examples inside this package,

    - new users could generate physics means plots

    - CALICE analysis notes could be reproduced by new comer, or colleagues for continuing and preparing final publications

General rules for CALICE SW

- DO NOT set exception for event in your common proposal Marlin processor. test beam event should be only selected with event selector processor.
- The CALICE test beam event includes several collections for other detectors, the event may not fully fit your proposal in your processor, but next processors have to work out on other collections for other detectors.
- That is the reason that we need the centre maintain software to explore the c++ bug and the personal physical logical mistakes.
- This strategy will provide you better software today than yesterday.

AHCAL : ILD drivers

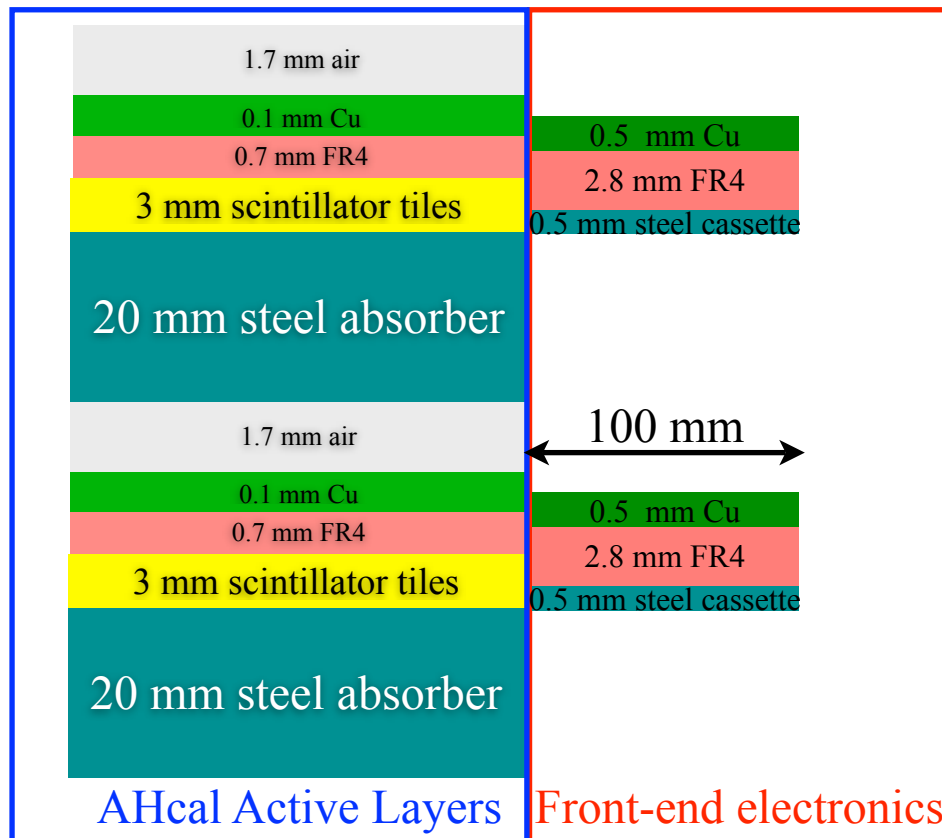# 2nd Generation Prototype: Layer
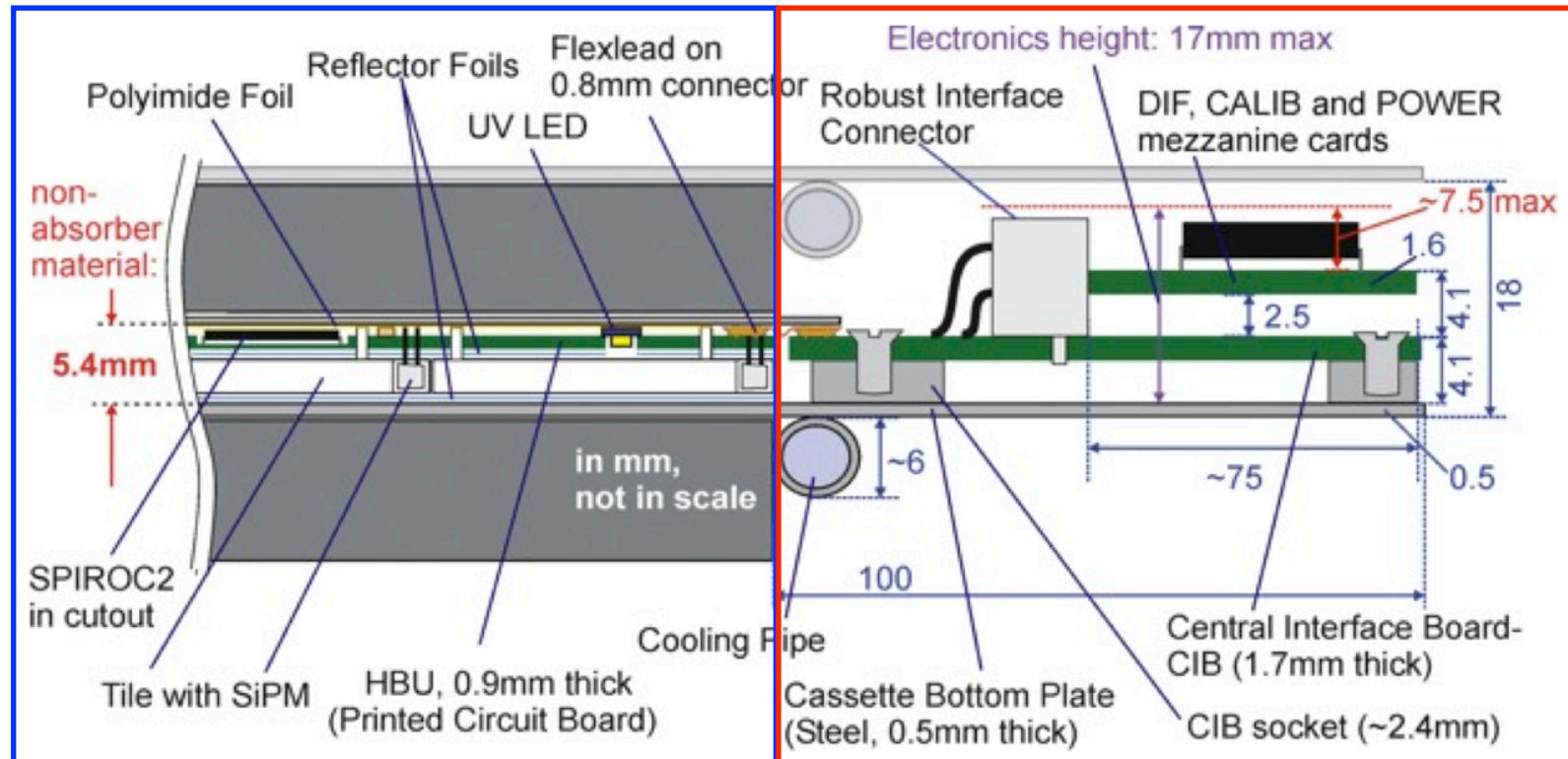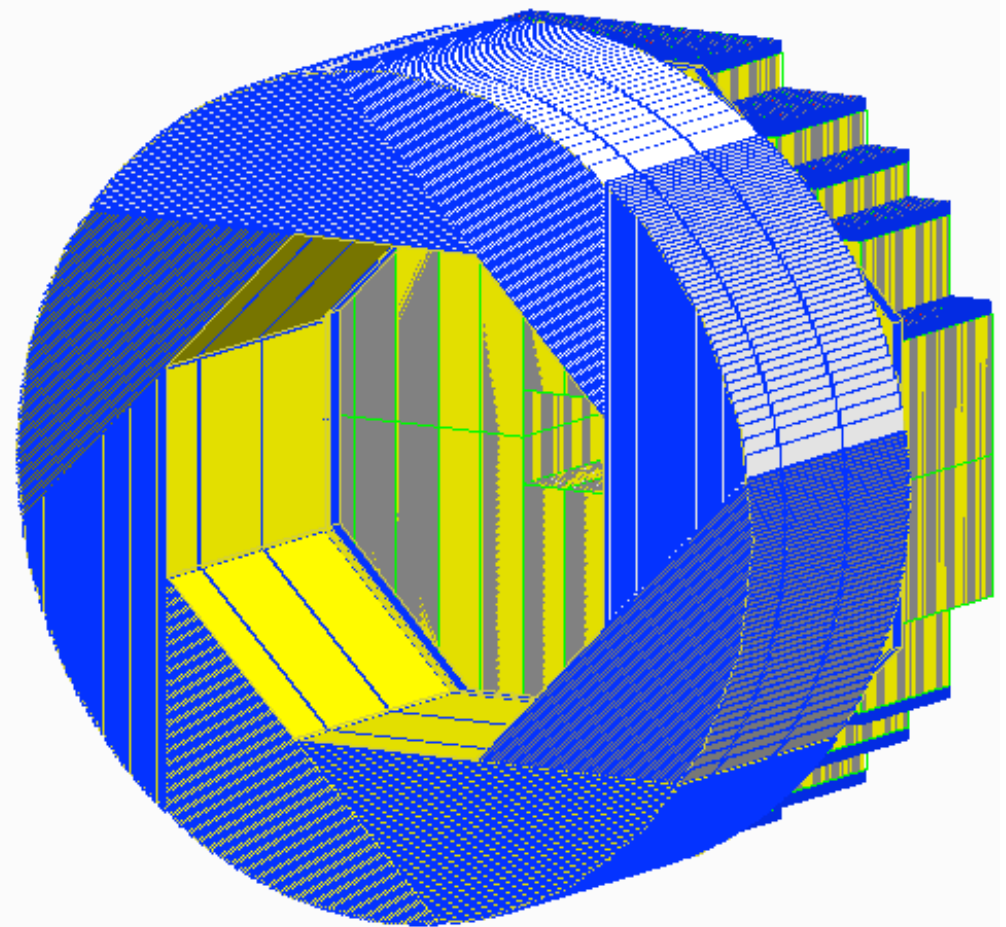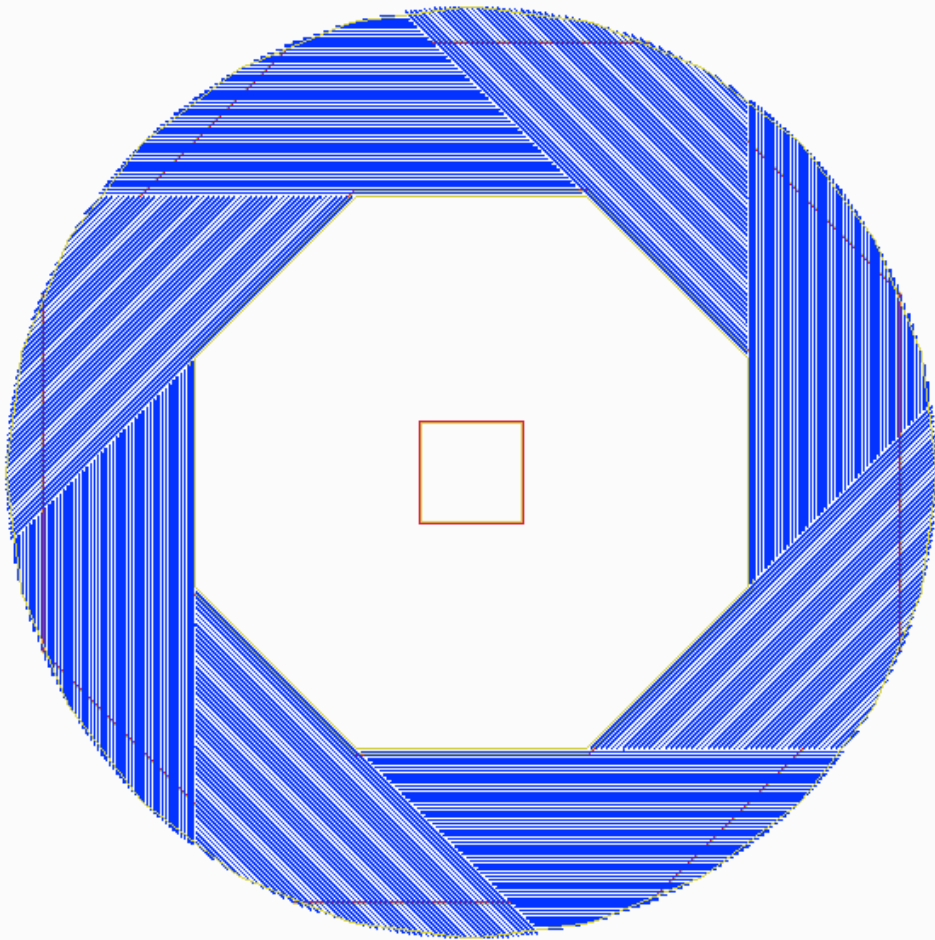

AHcal Active Layers

Front-end electronics
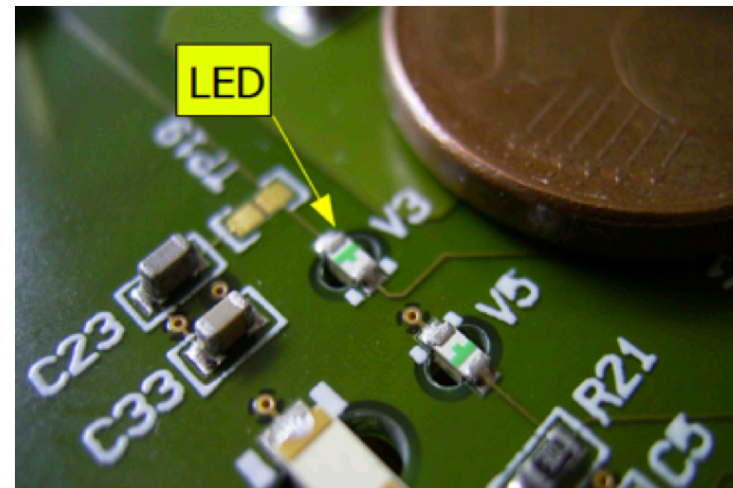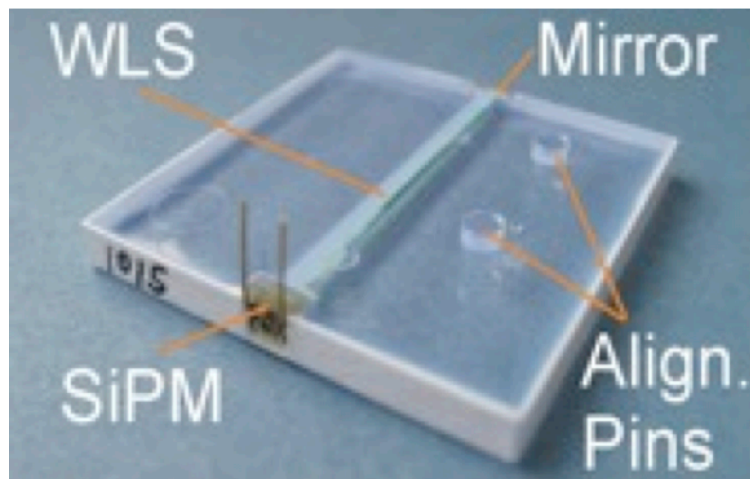
Current Implementation of Simulation Geometry

- The current mechanical active layers design
  - Implemented for Barrel and Endcap of ILD Hcal calorimeter.
  - The up-to-date AHcal endcap Mokka driver include front-end electronic too. (more realistic)

- Current implementation of detector layers:
  - 20 mm thick steel absorber: include 19 mm absorber and 2*0.5 steel cassettes
  - 3 mm thick scintillator tiles
  - readout board with integrated ASICS simulated by 0.7 mm FR4 and 0.1 mm Cu
  - 1.7 mm air gap for connectors, solder pins ...
- Front-end electronics at module ends were implemented
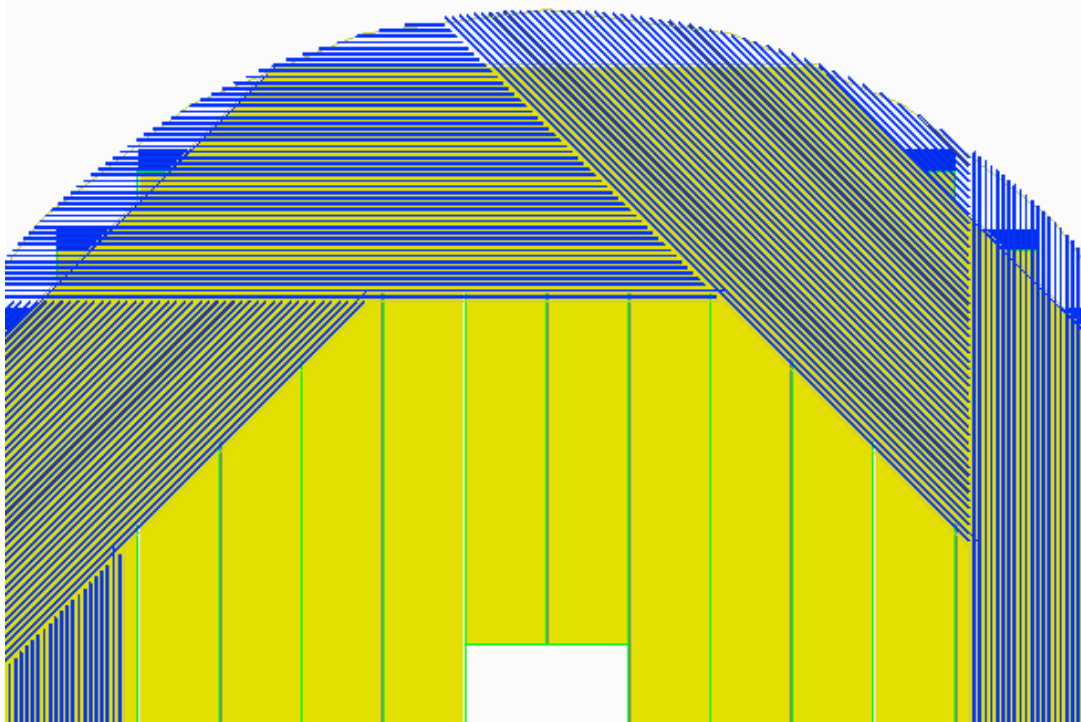 - 0.5 mm steel, 2.8 mm FR4 and 0.4 mm Cu

Mokka drivers: ILD-AHCAL

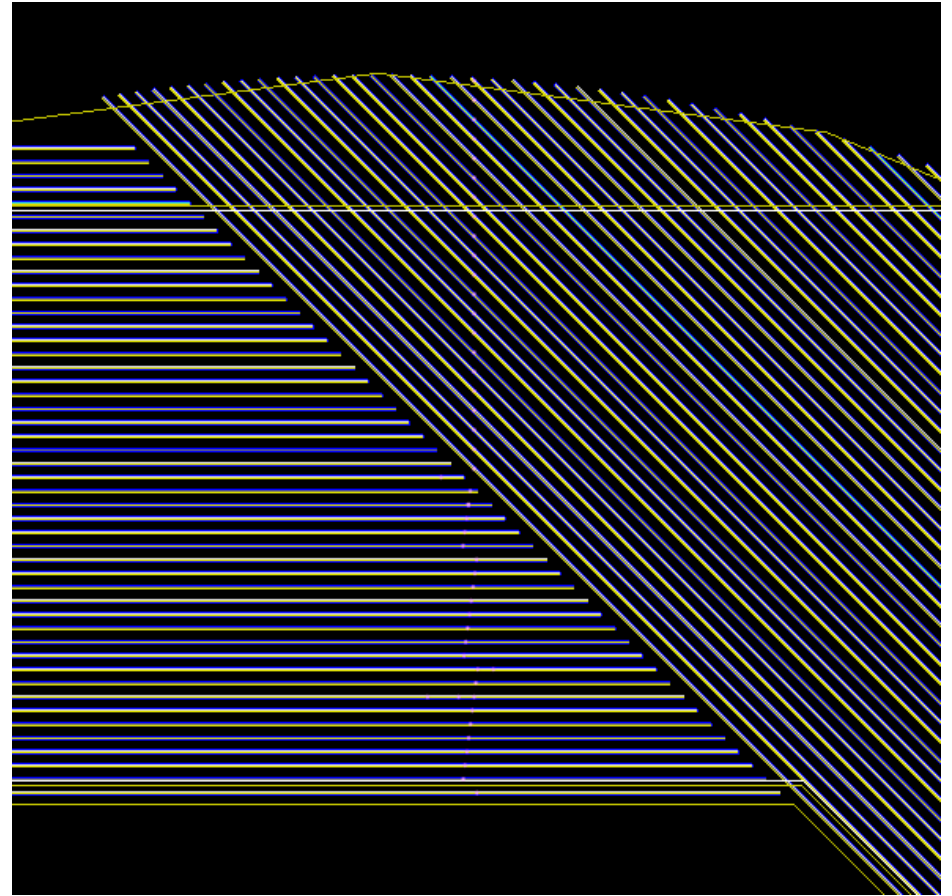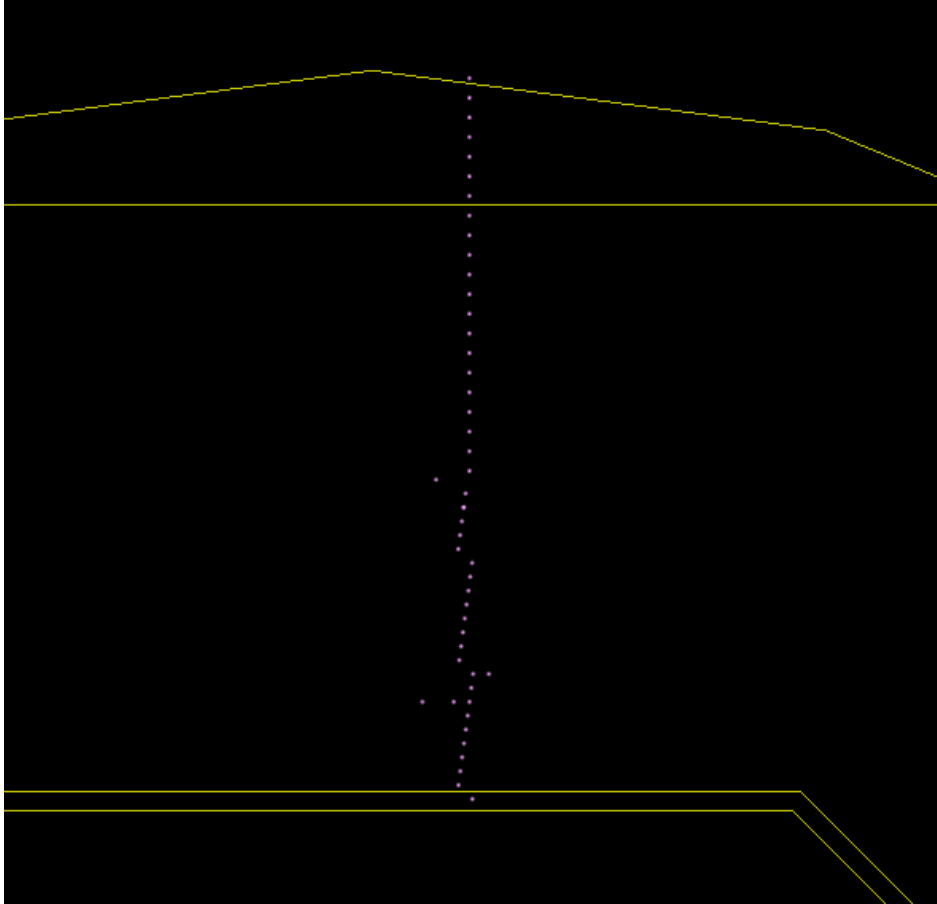- New videau geometry for ILD-AHCAL Barrel

Active layers

- The active layers are identical to the current AHCAL mechanical design

 - Barrel and Endcap (also identical active layers)

Muon event display

- here shows one muon event, with/without active layers shown on the same picture
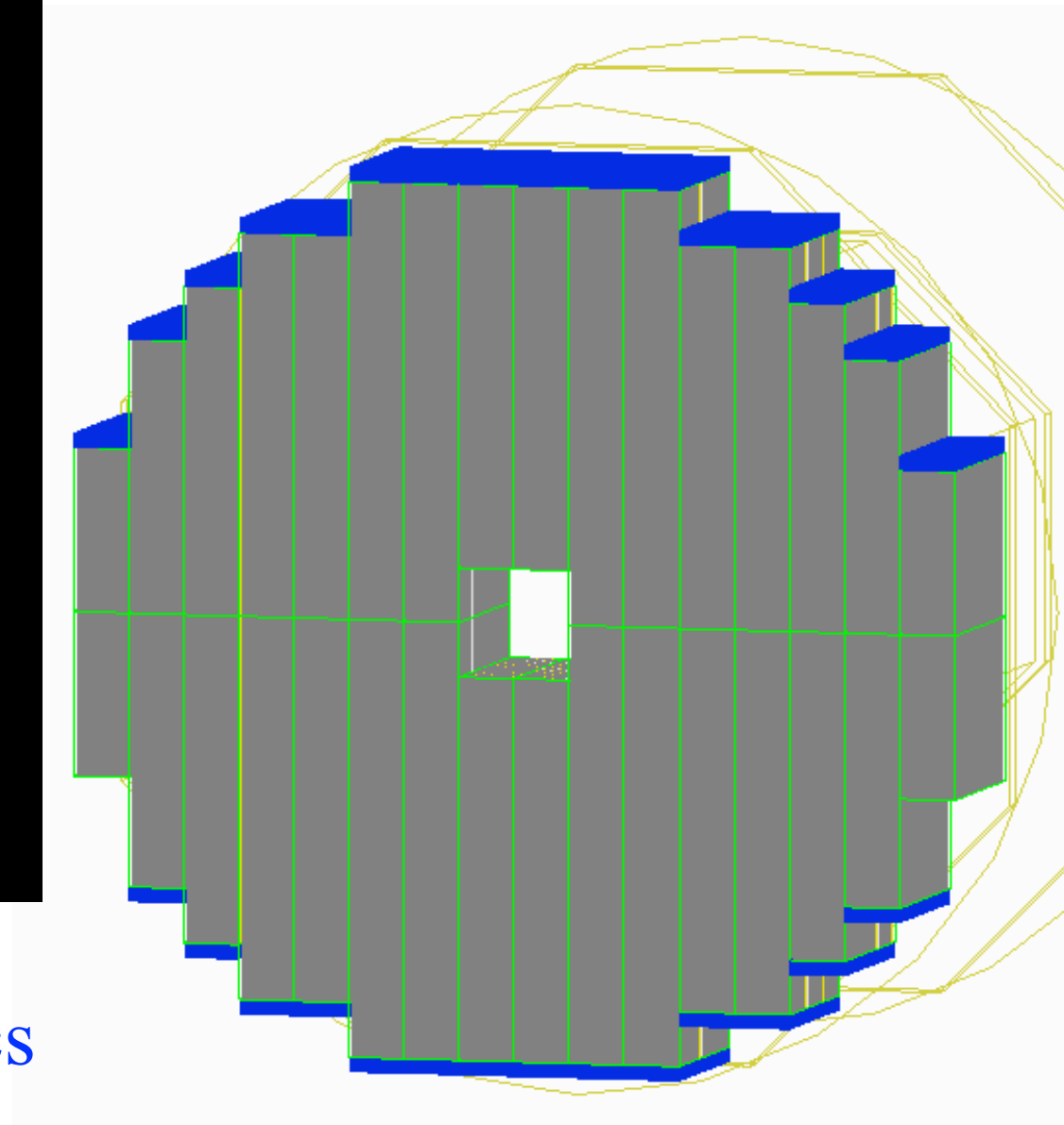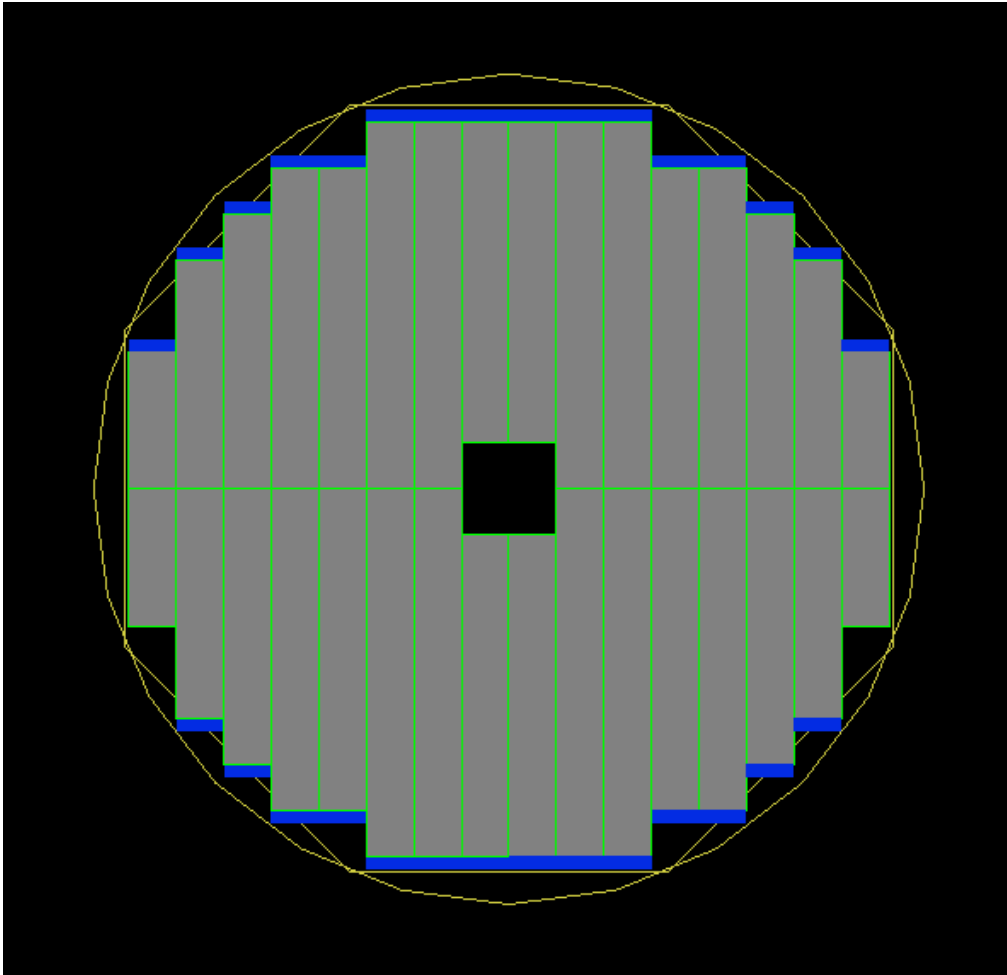- The steps came from the videau geometry and the sensitive detector digitization.

Sensitive detector digitization

- The steps came from the digitization

- absorber + chamber: 26.5 mm

- AHCAL tile: 30x30 mm

- It existed in any HCAL with videau geometry .

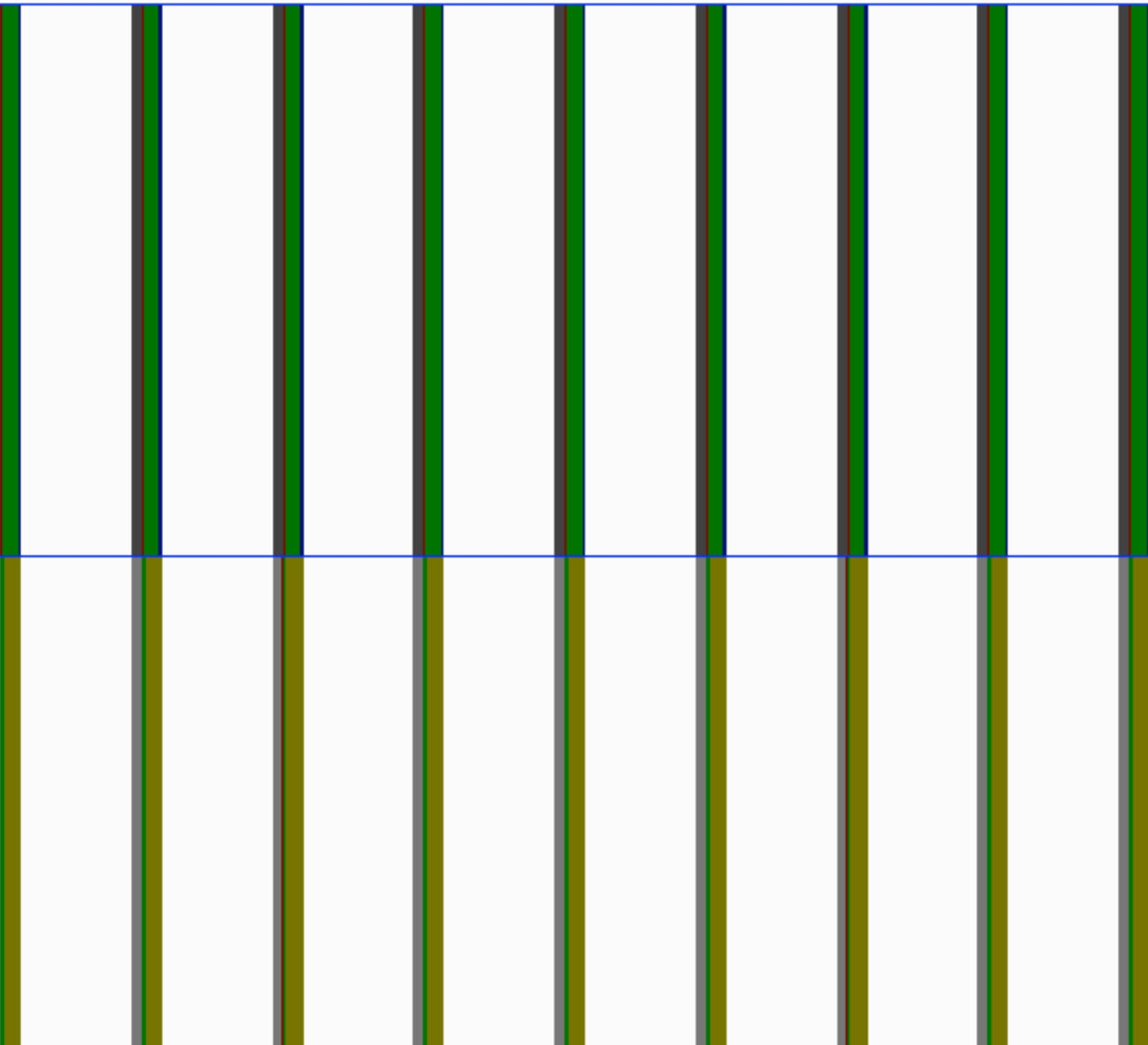- That could not be compromised in both stave modules in the same time.
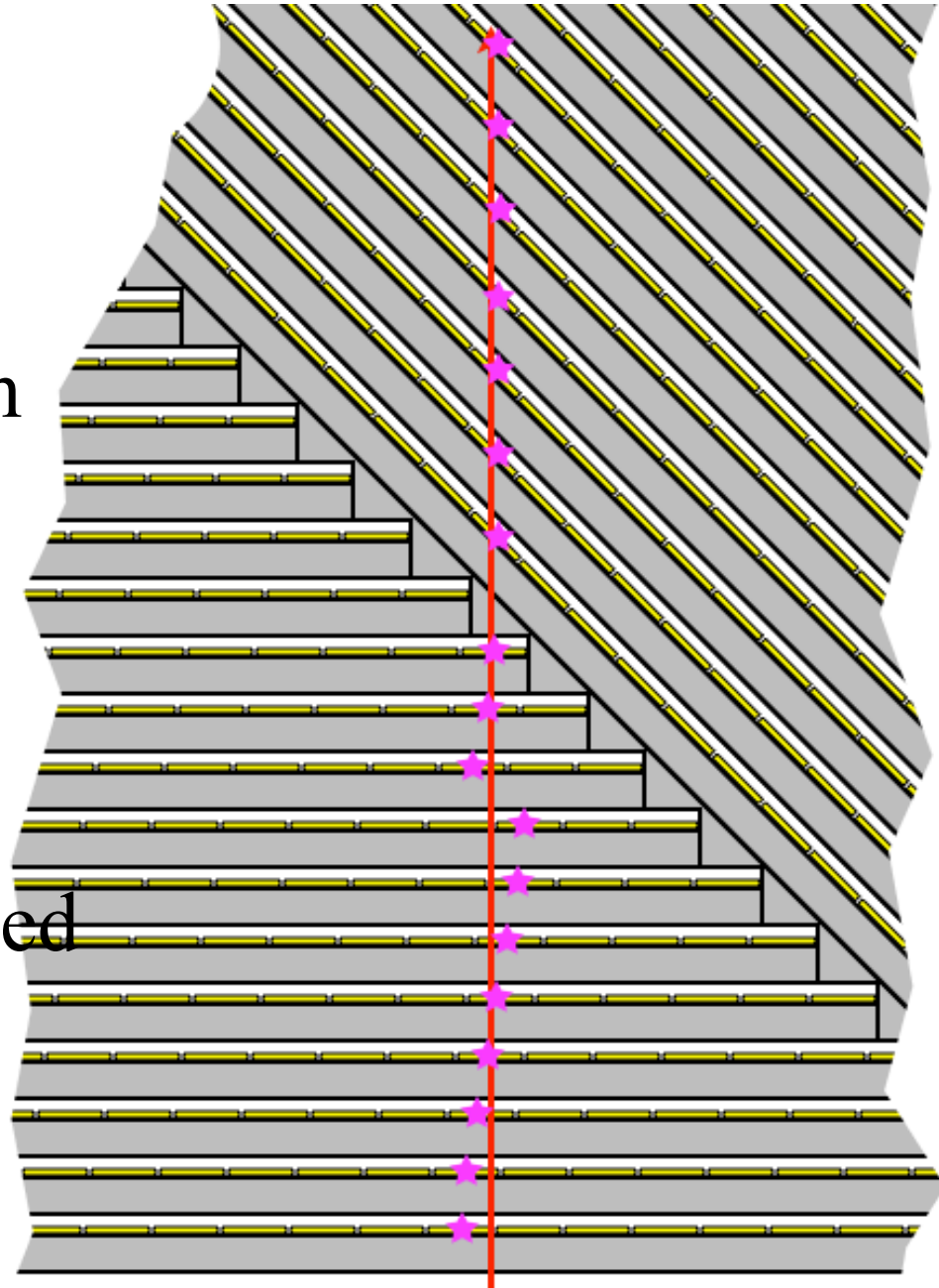
New mechanical endcap design

- **blue: front end electronics**
- **grey: endcap modules**

The chamber in the endcap design

- Geant4 visualization

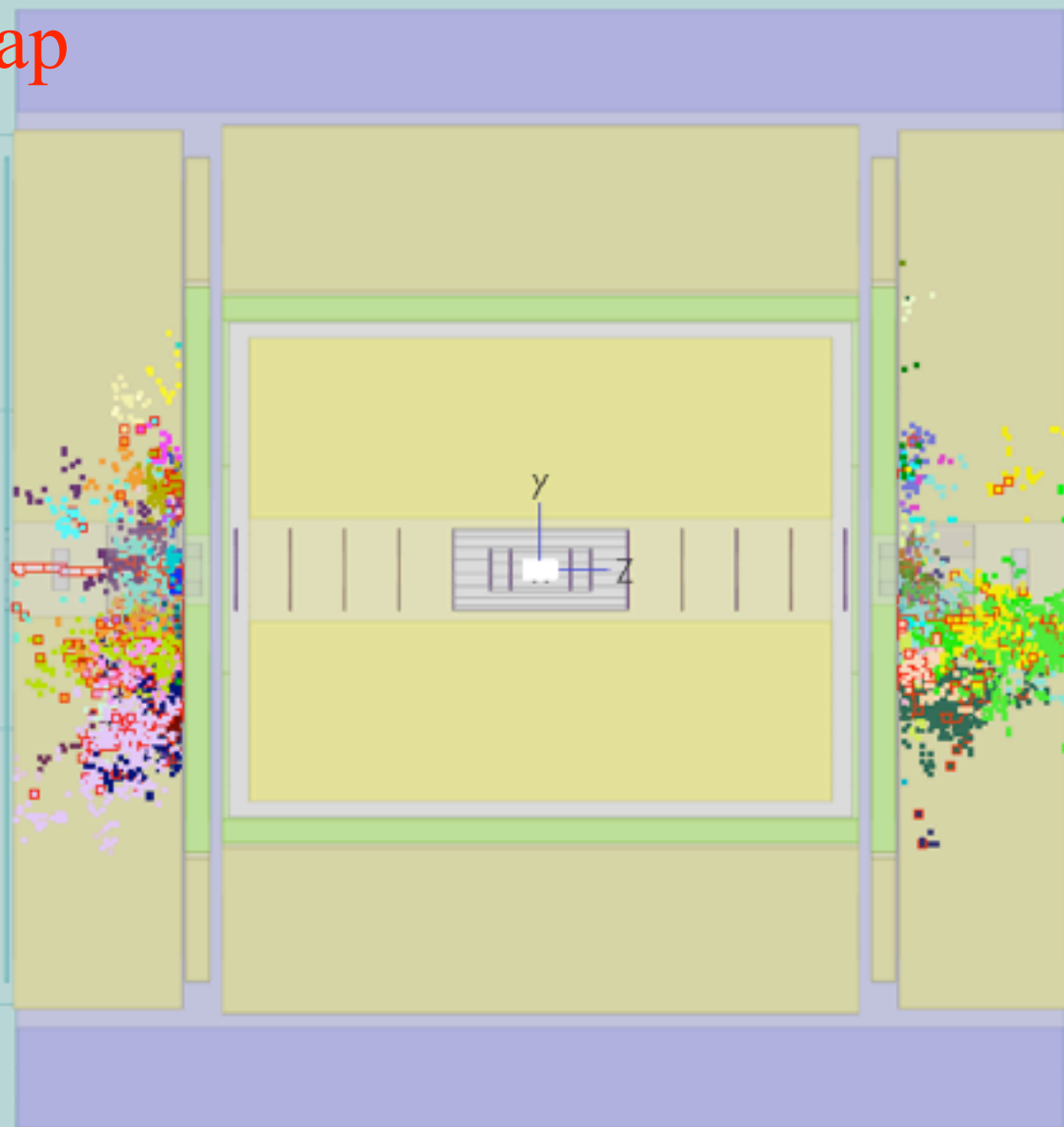- The detail implementation of the active layer and front end electronic in the endcap modules
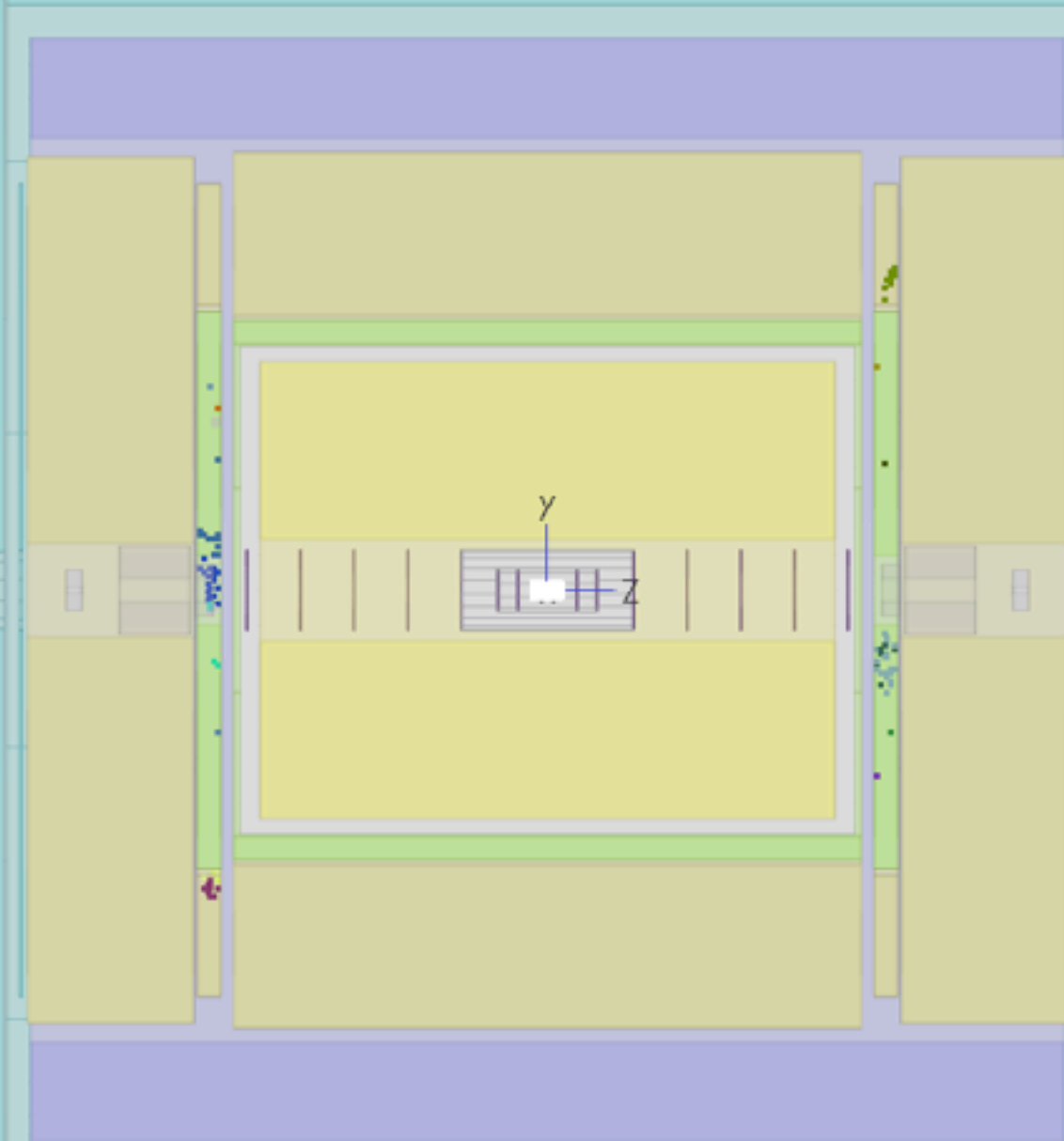
New mechanical endcap design

- Module steel wall: 5 mm

- The layer air gap: 2 mm

- The active layer identical to the current mechanical design
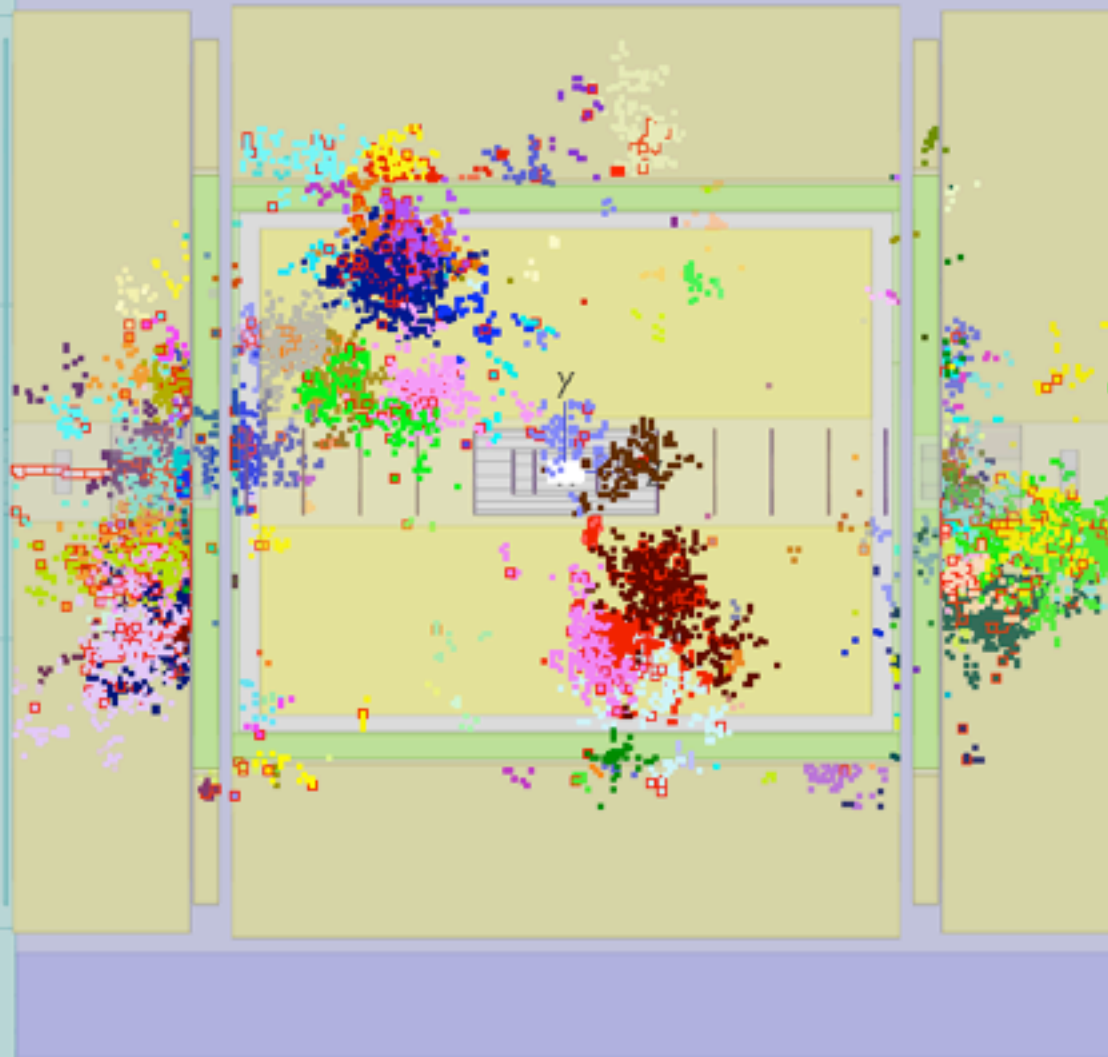
ILD_01_dev:
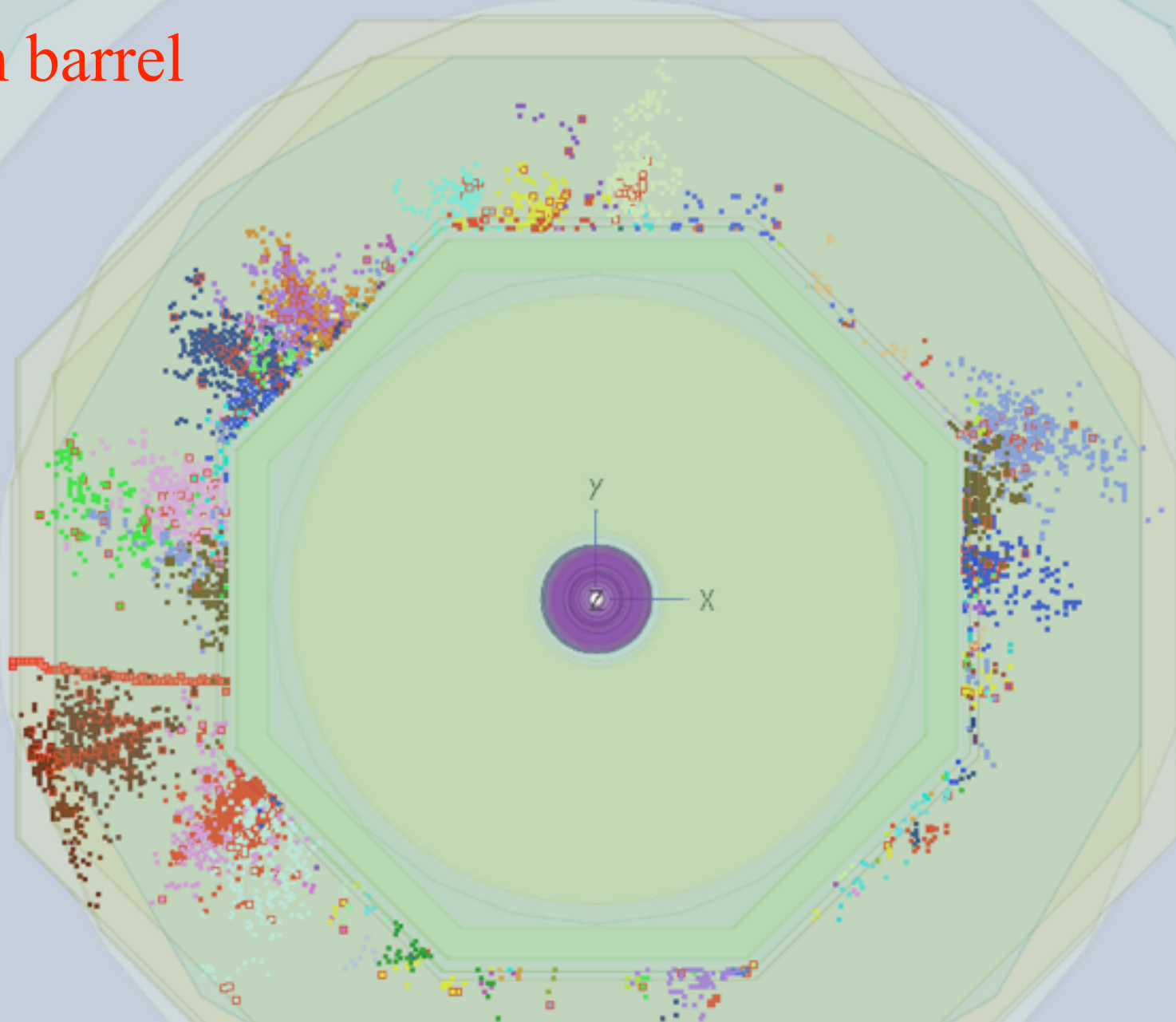## event reconstruction and CED display

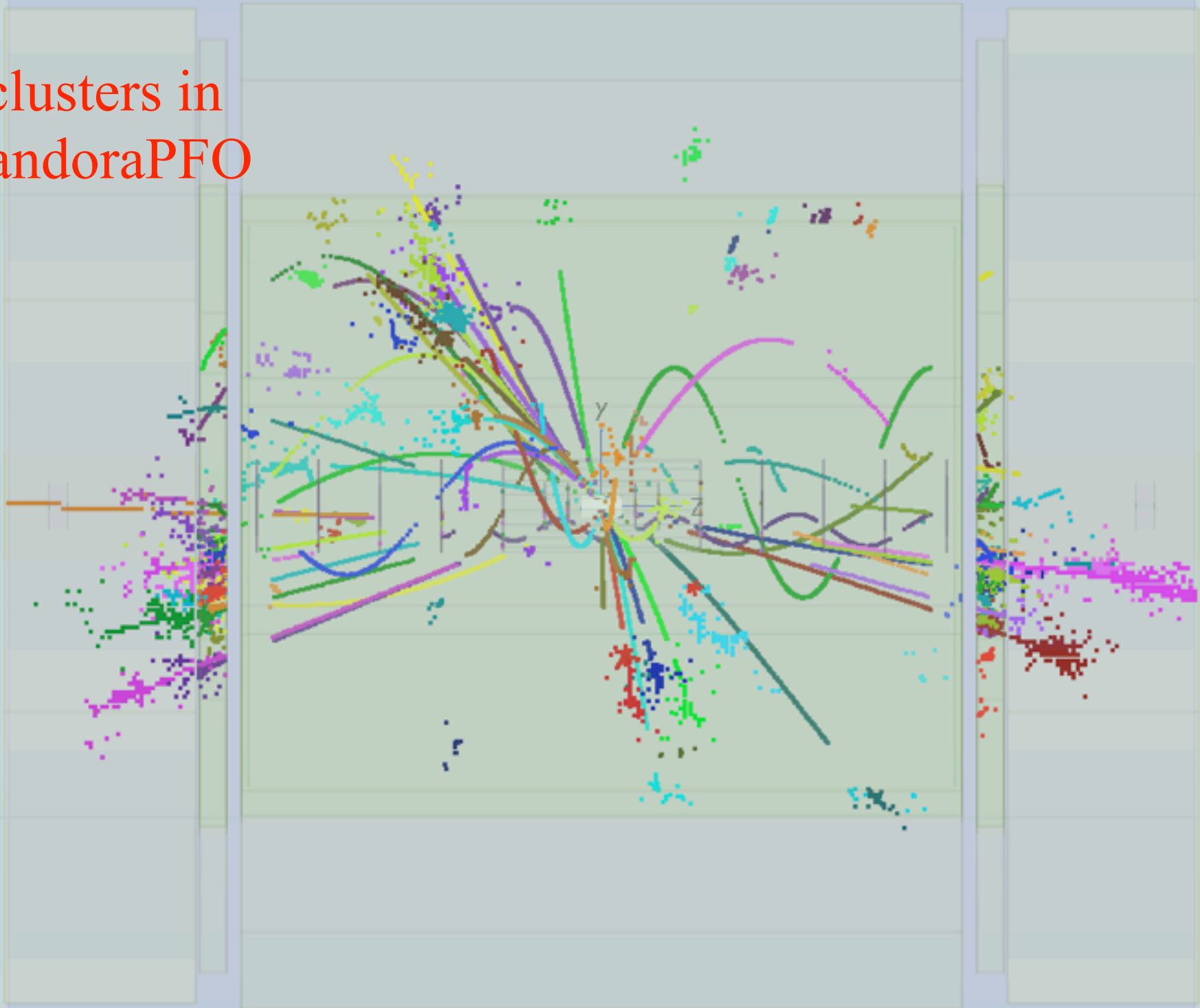hits in endcap

hits in endcapRing

All hits in ILD-AHCAL

hits in barrel

clusters in
PandoraPFO

clusters in
PandoraPFO
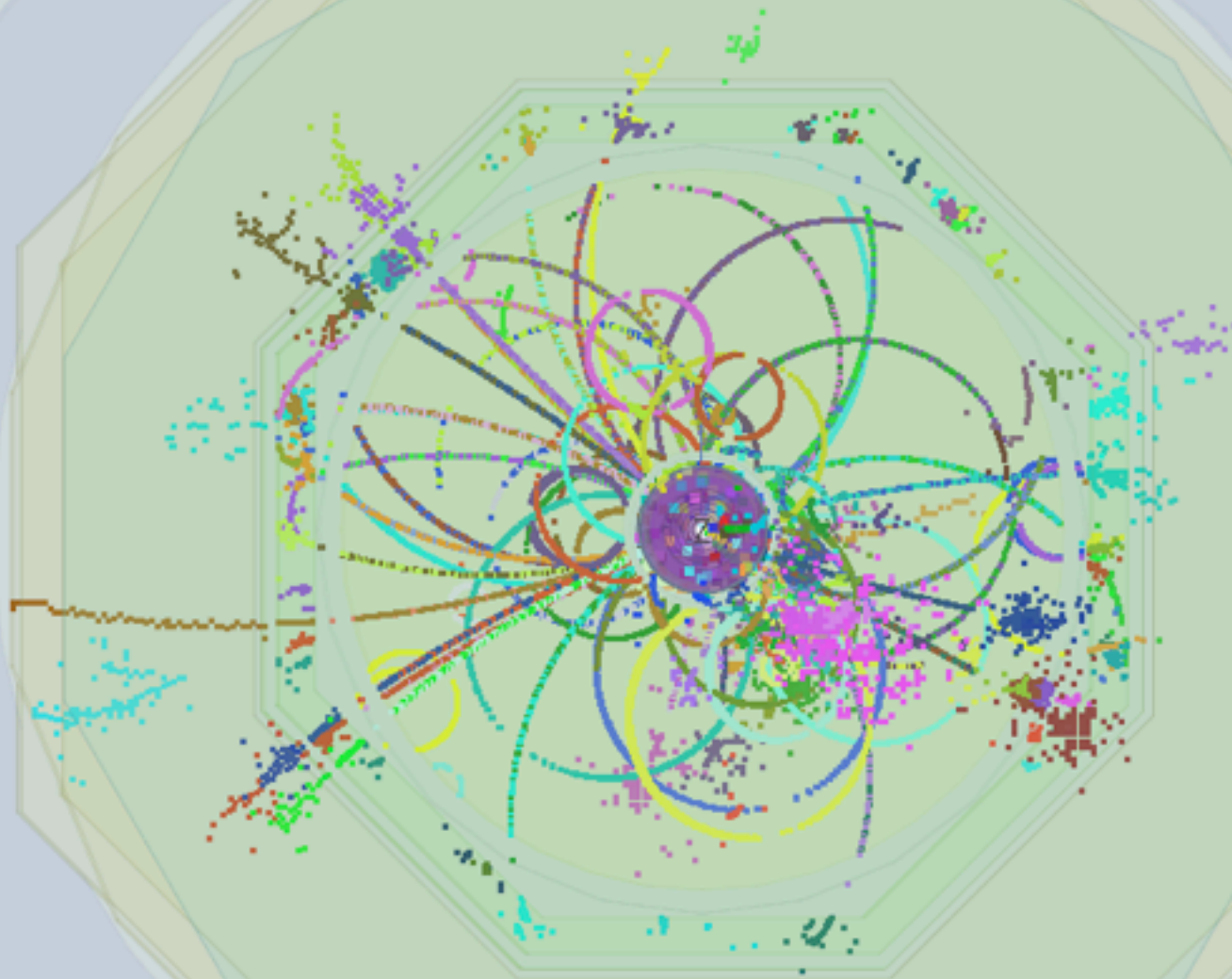
ILD-AHCAL

- The updated mechanical design have been implemented into the Mokka drivers.

- The Event display from last few slides show the full reconstruction chain, include the PandoraPFO reconstruction.

- CEDviewer: Just draw the volume from each detectors.

  - Detail and true geometry could be seen on the Geant4 visualization.

- More test will be performed in cooperation with ILC software group to support the DBD.

CALICE database

- Connection: maximum 8 hours, the reconstruction jobs will finished within this time.

- All CALICE jobs will keep connection to the database, and sleep there until next time when the job need to get the updated condition data from CALICE database. (it is about each 30 min).

- One user try to submit 200 jobs, which normally belong to the same test beam period, that means they need the same database folders, with the same tags.

- Grid CREAM responsible faster than before, and we got more GRID CEs. With the old grid job manager, your jobs were in the queue, but Today your jobs will be executed immediately. You could image that the database has been heavy loaded within one hour, and most time there is nothing happen.

- Looking for a new solution: preprocessing, try to prepare the condition data from database once for one user with all the jobs which need the same database, and all the jobs need only to read the condition from CALICE database for this group and free the CALICE database for next group of jobs from other users.

- This is very important for CALICE with increasing usage of CALICE test beam data, and detectors, and CALICE users.
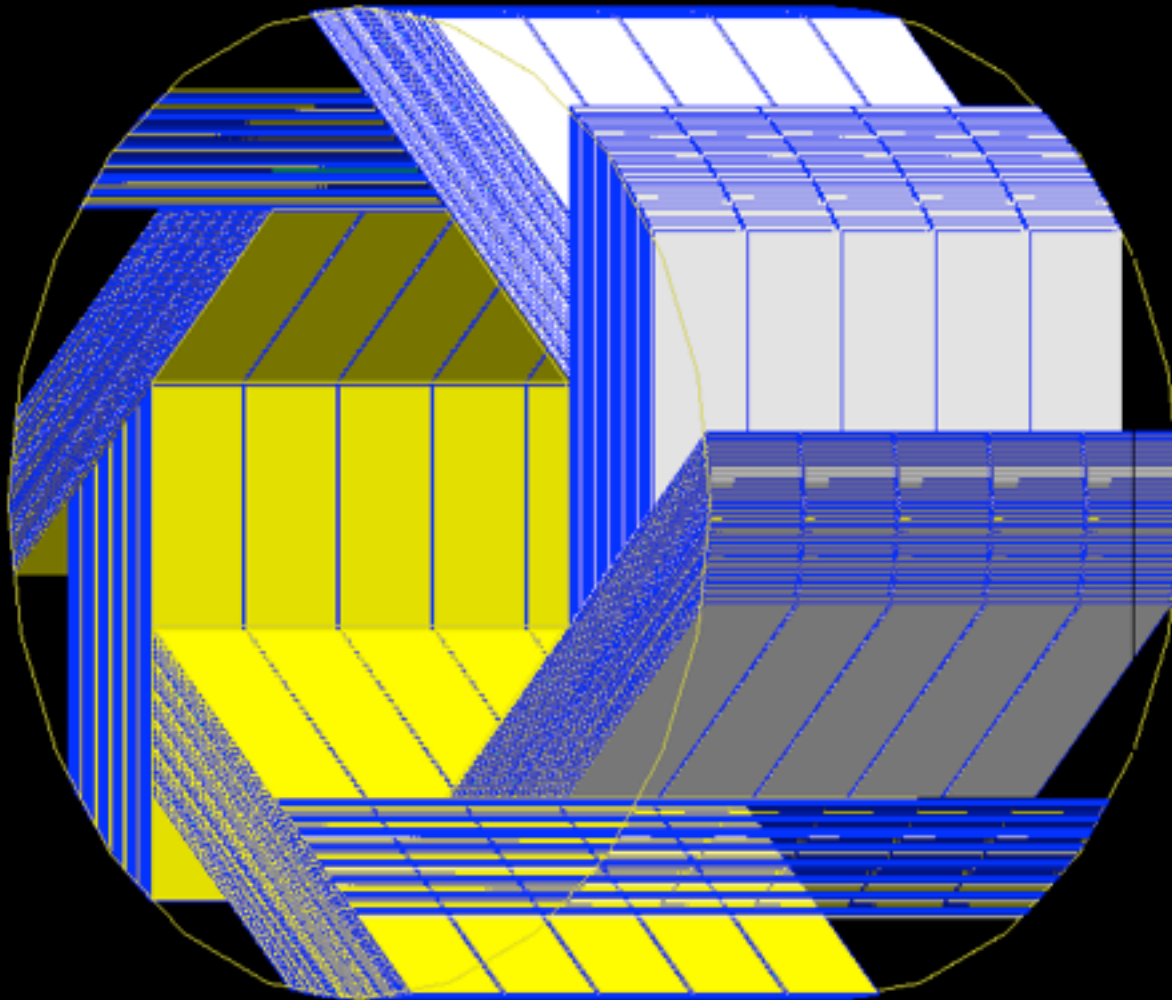
Summary

- AHCAL CALICE software:
  - Fully implemented for the reconstruction and calibration.
  - Debugged during the explore of the intensive usage by CALICE users.
  - More higher level applications to be supported.
  - Go through the calibrations and hardware connection setup for the last test beam with hardware exports.
  - And plan to prepare a new release version.
- AHCAL ILD Mokka driver for ILC DBD:
  - The Mokka drivers for the barrel and endcap have been updated and implemented.
  - The intensive test will be followed up.
- CALICE database (lower priority):
  - Updated hardware.
  - Looking for a new mechanisms to handle the grid jobs and CALICE database.
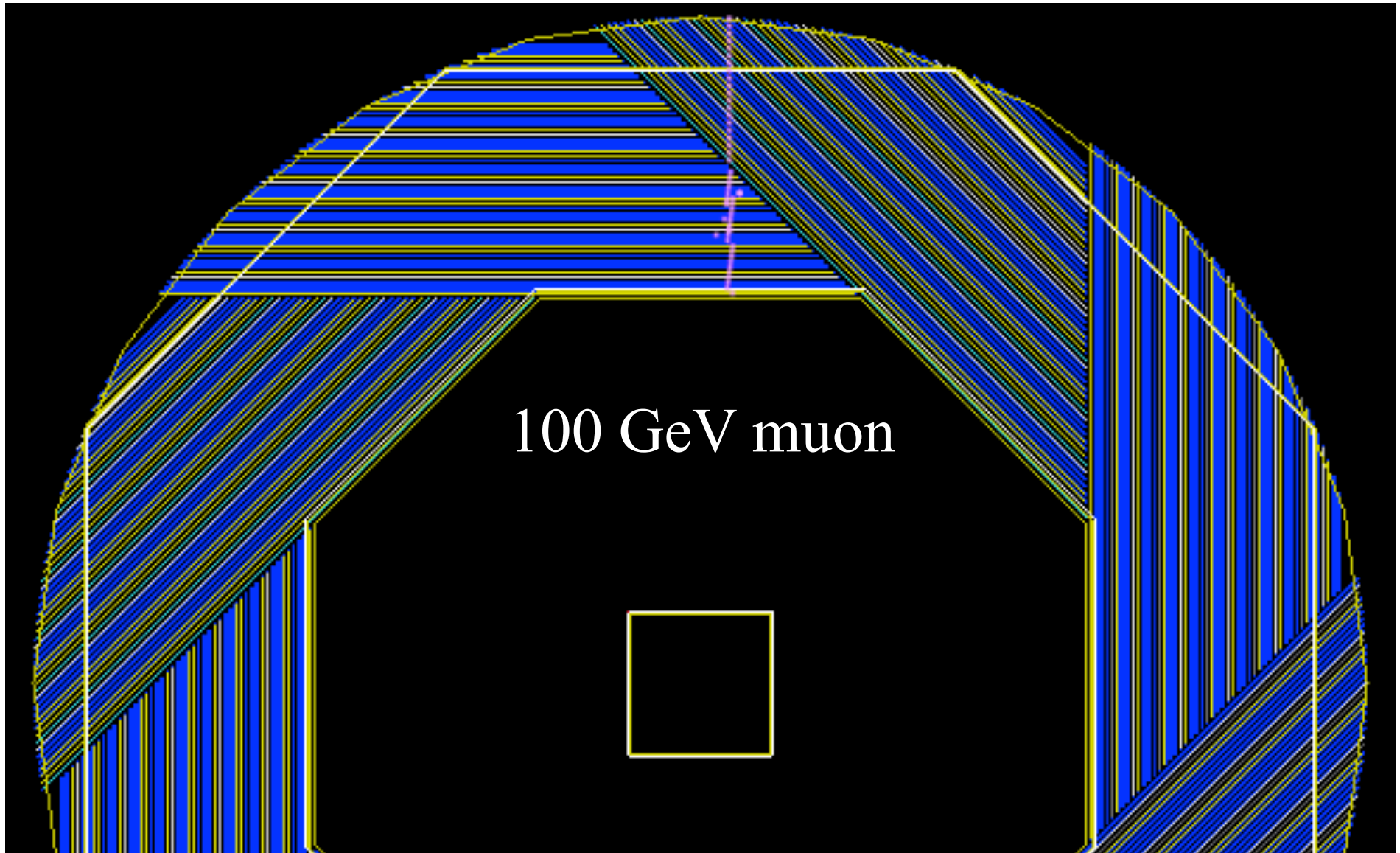
backup

Videau Geometry

100 GeV pion

Videau Geometry

Videau Geometry

100 GeV muon

Barrel Geometry