

ARICH cooling system implementation into BASF2

ARICH temperature monitoring

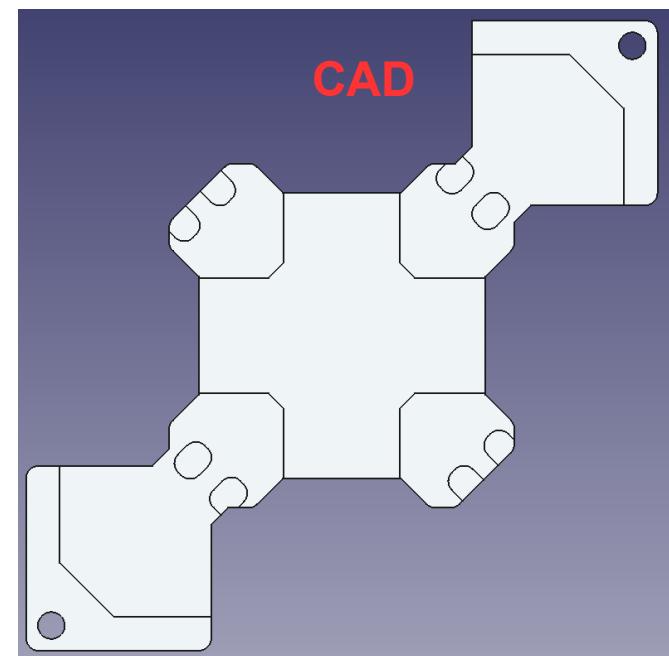
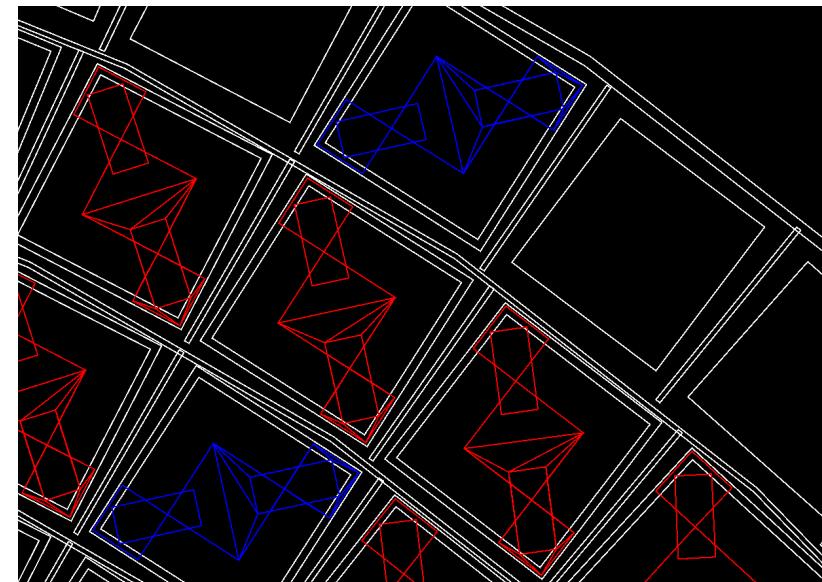
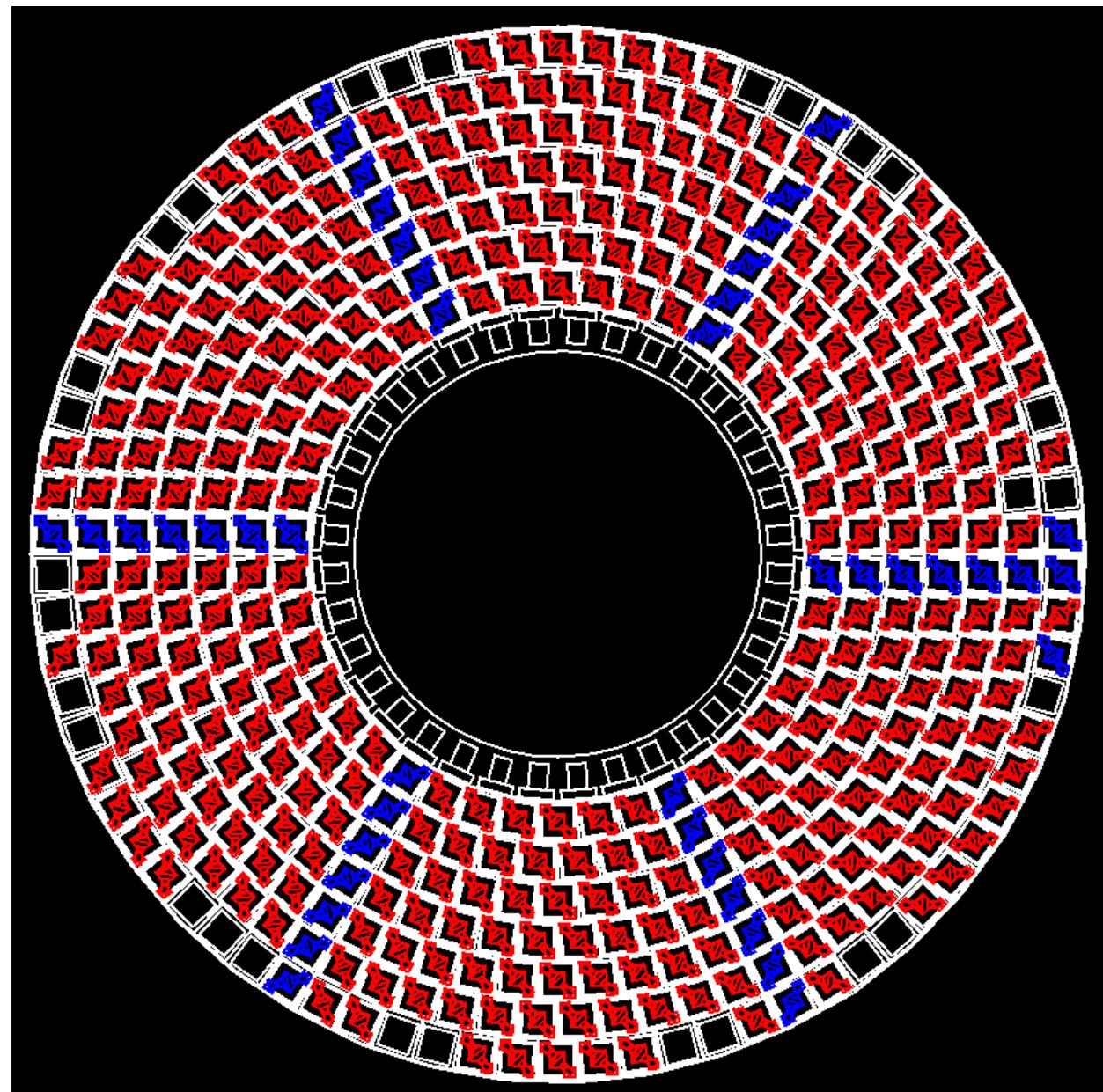
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¹ *LAL, Univ Paris-Sud, CNRS/IN2P3, Orsay, France*



FEB cooling bodies

Simulation include : its approximate geometry, orientation (default and rotated), some of the FEB's does not have cooling body installed due to interface problem.



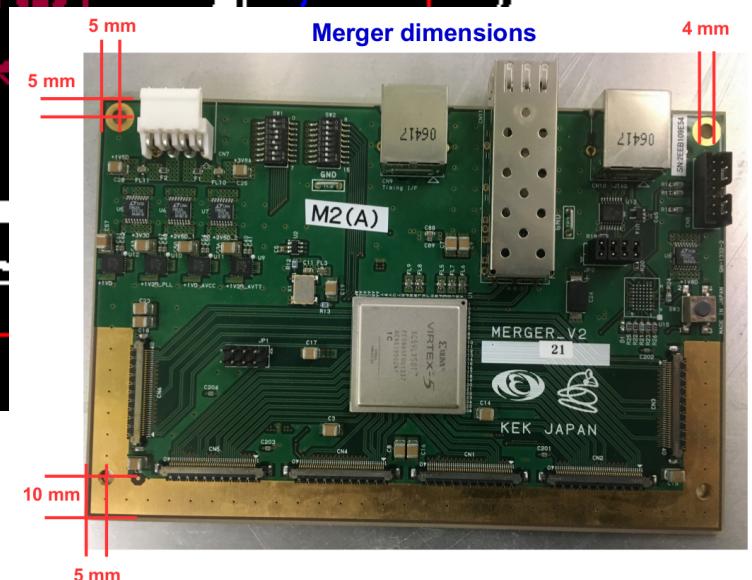
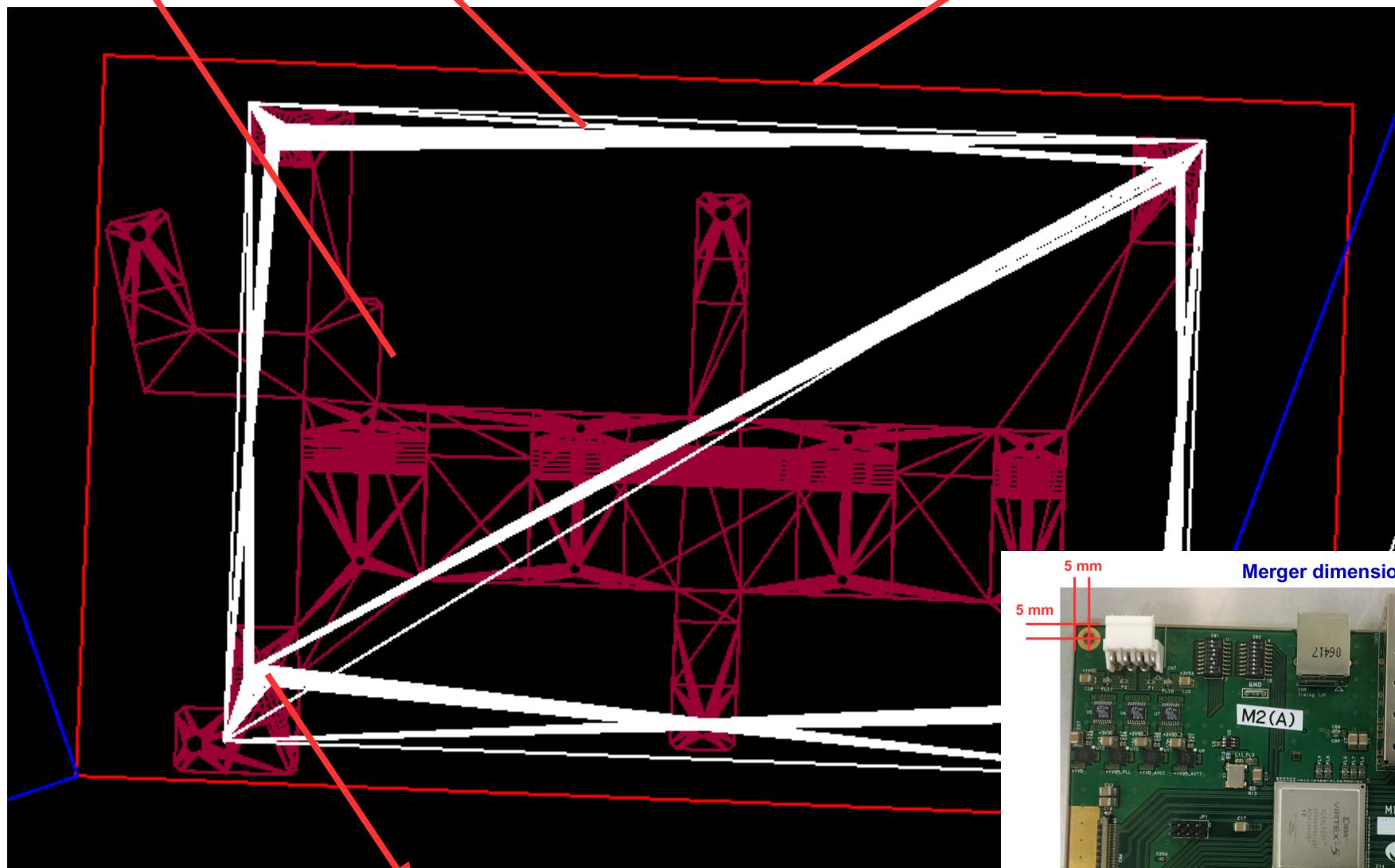
Cooling
body

Merger cooling bodies – positioning

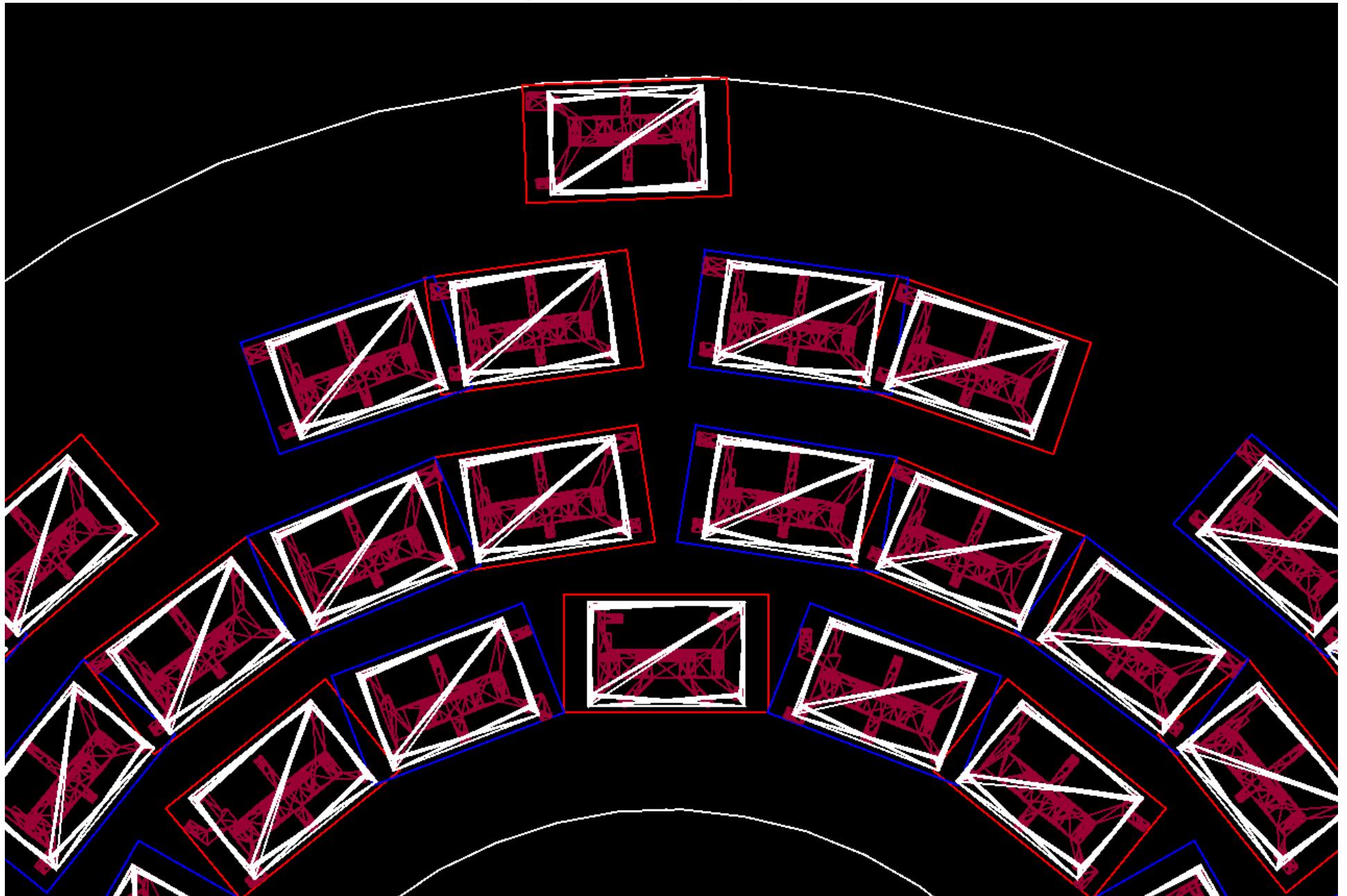
Merger

Merger and merger
cooling body envelope

Screw holes in merger and
cooling body are aligned.

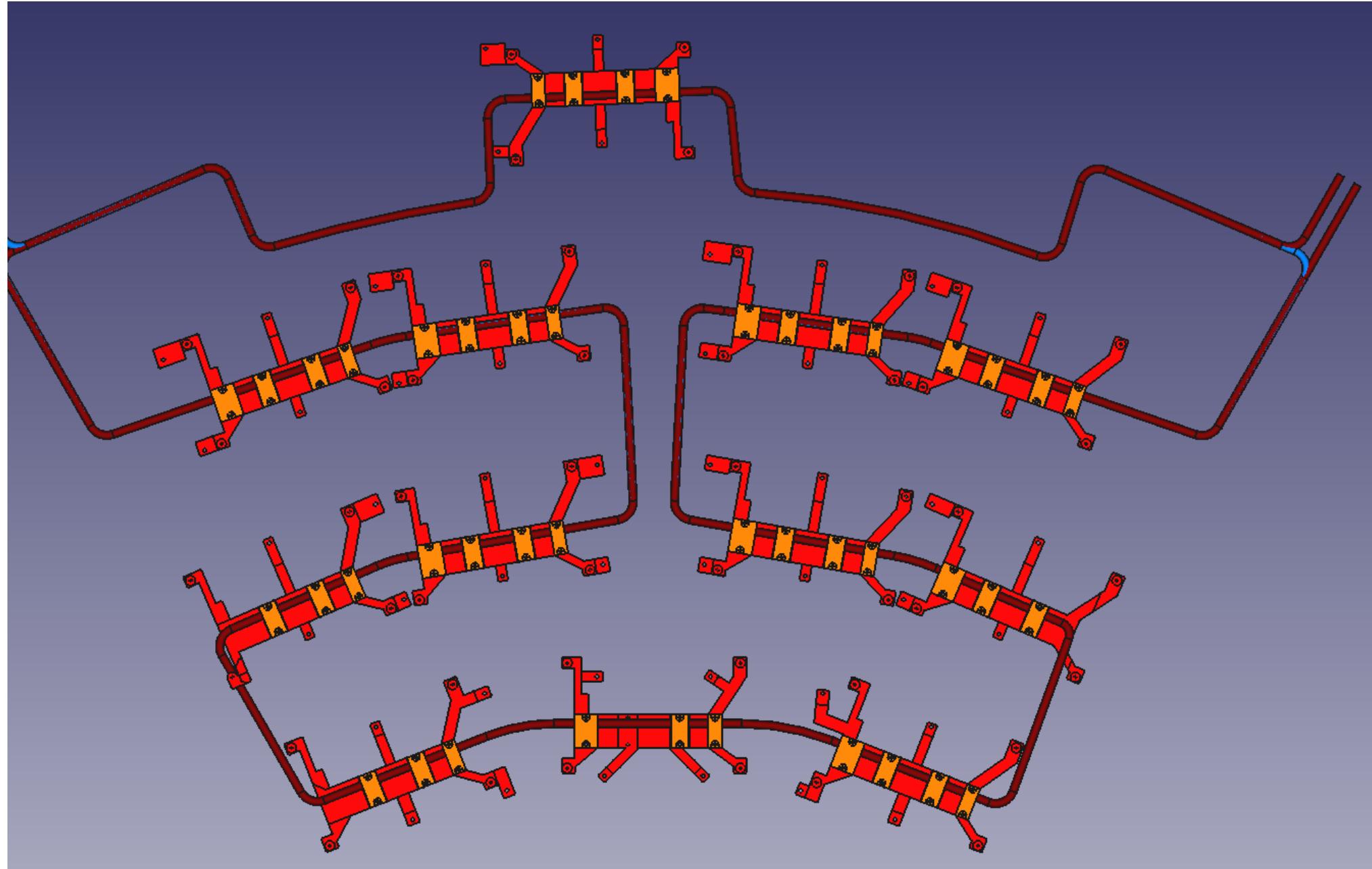


Merger cooling bodies

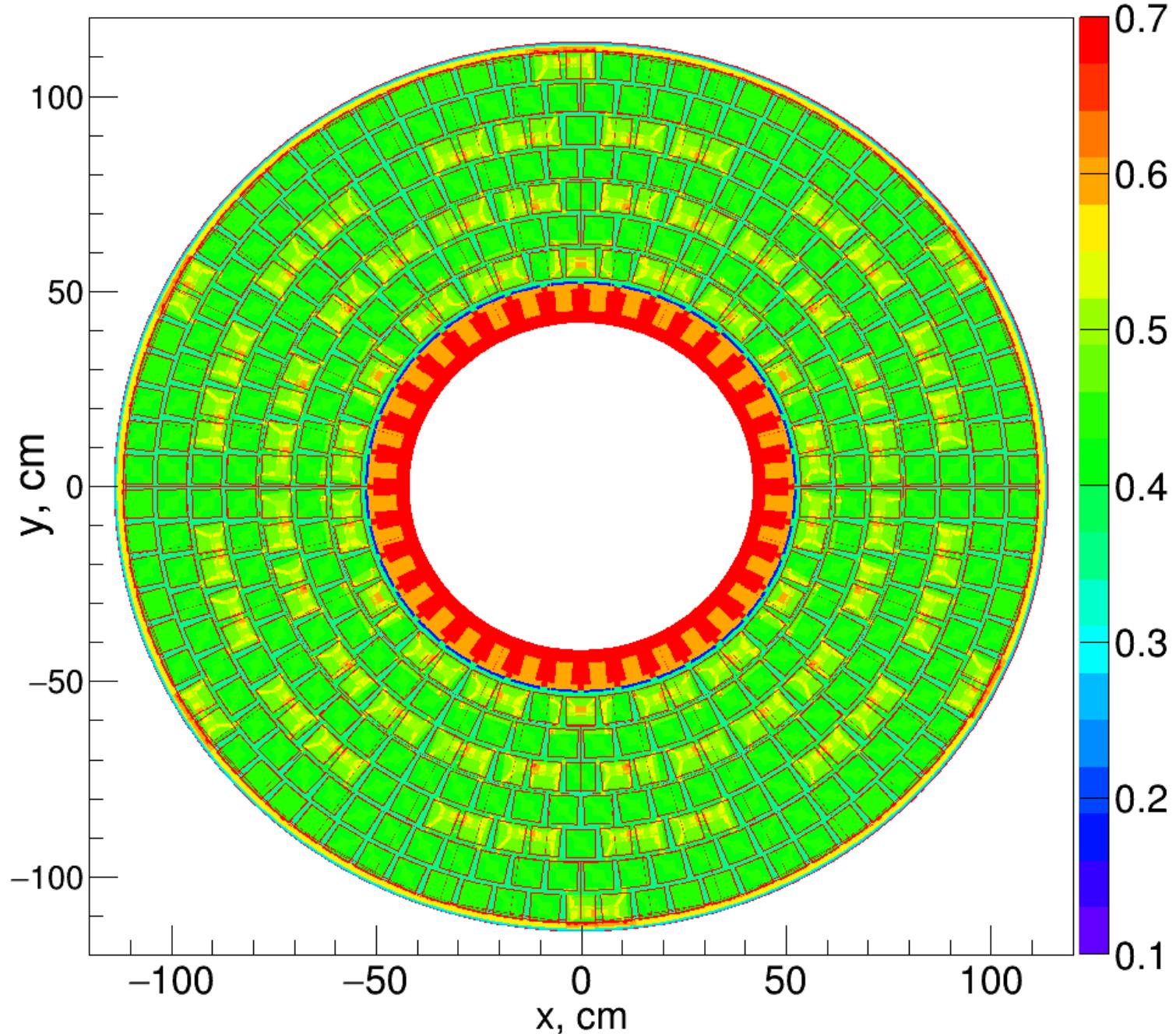


Simulation include : its precise position, different geometry, its orientation (N° 12 is rotated by 180 deg with respect to z – axis.).

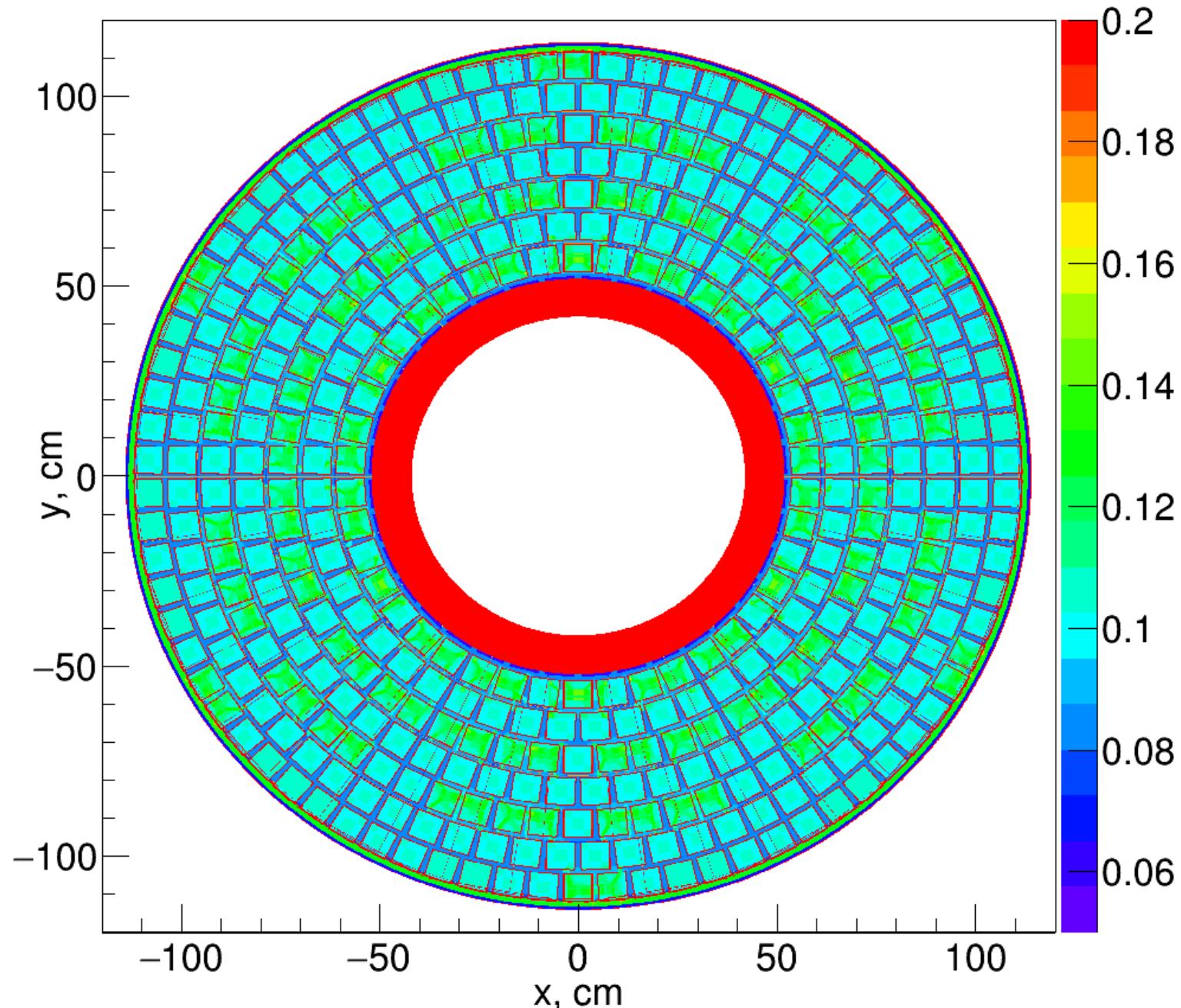
Merger cooling bodies - cad



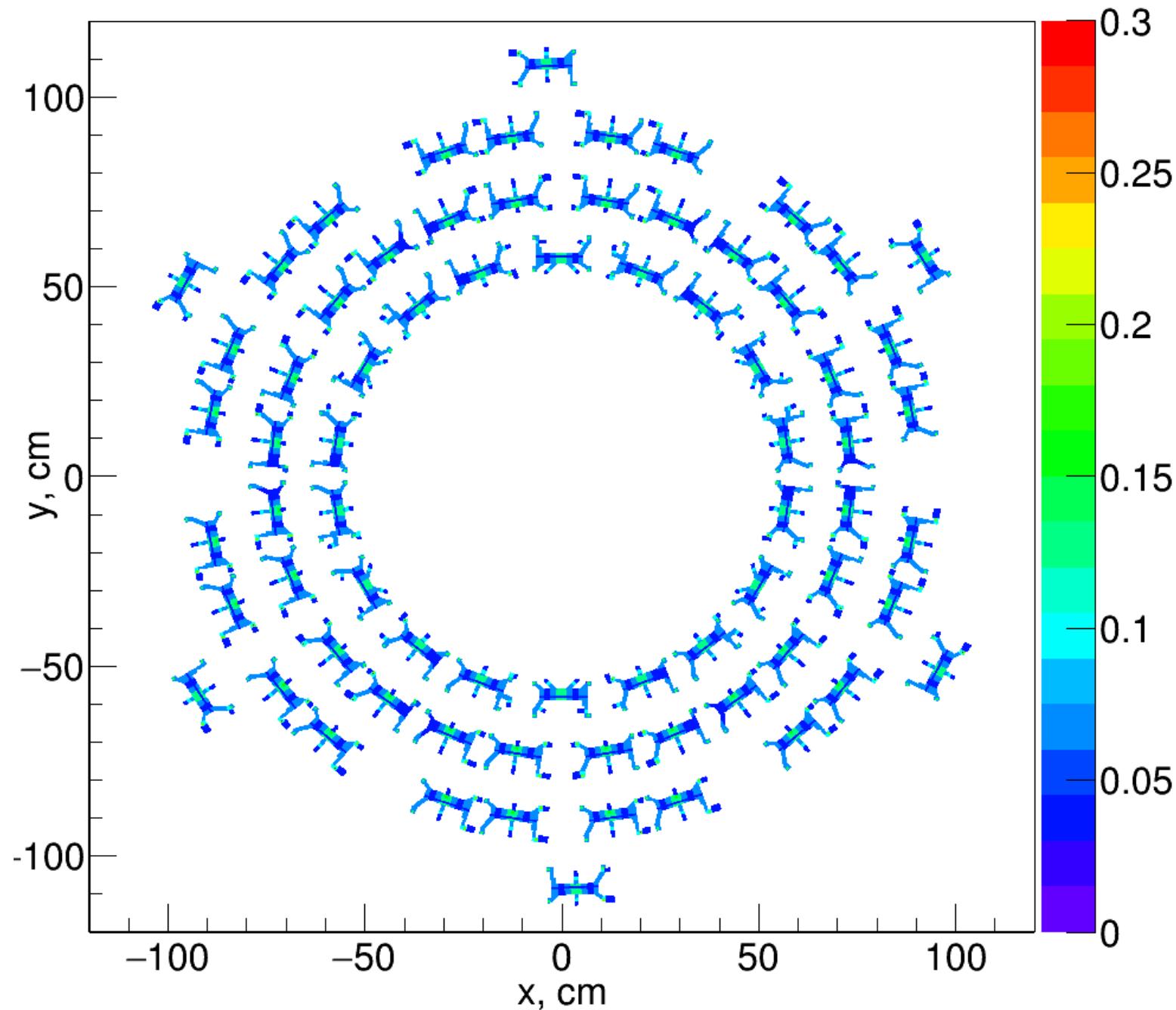
(Radiation length)/ x_0



(Nuclear interaction length)/ $\lambda_{\text{nuc.}}$

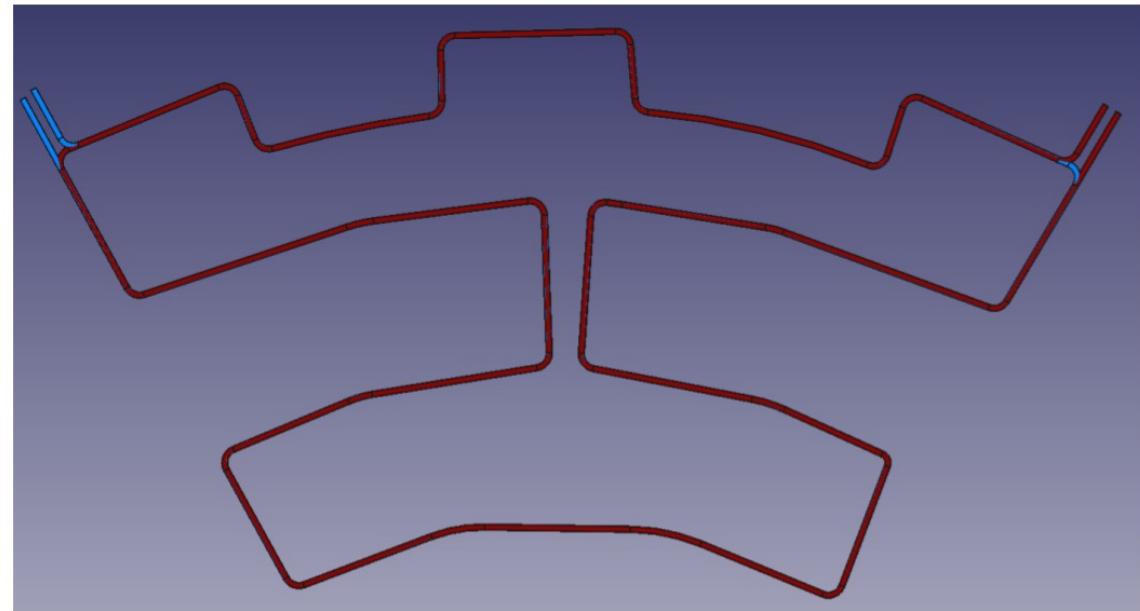
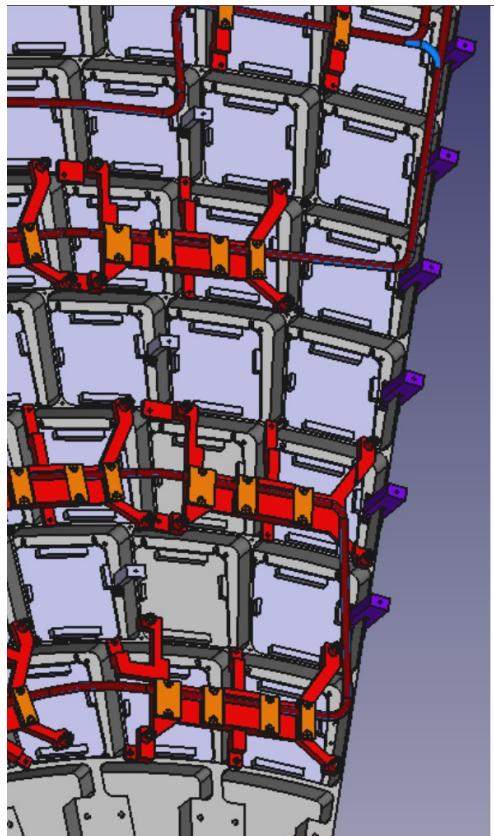


$(\text{Radiation length})/x_0$



Missing parts to add and tests to be done

- Cooling pipes
- Clamps between sectors
- Geometry backward compatibility (switching geometries with single geometryID number)
- Overlaps tests
- Memory and speed tests



HepRep visualization

HepRep and default visualizations were not working due to new ECL crystal description.

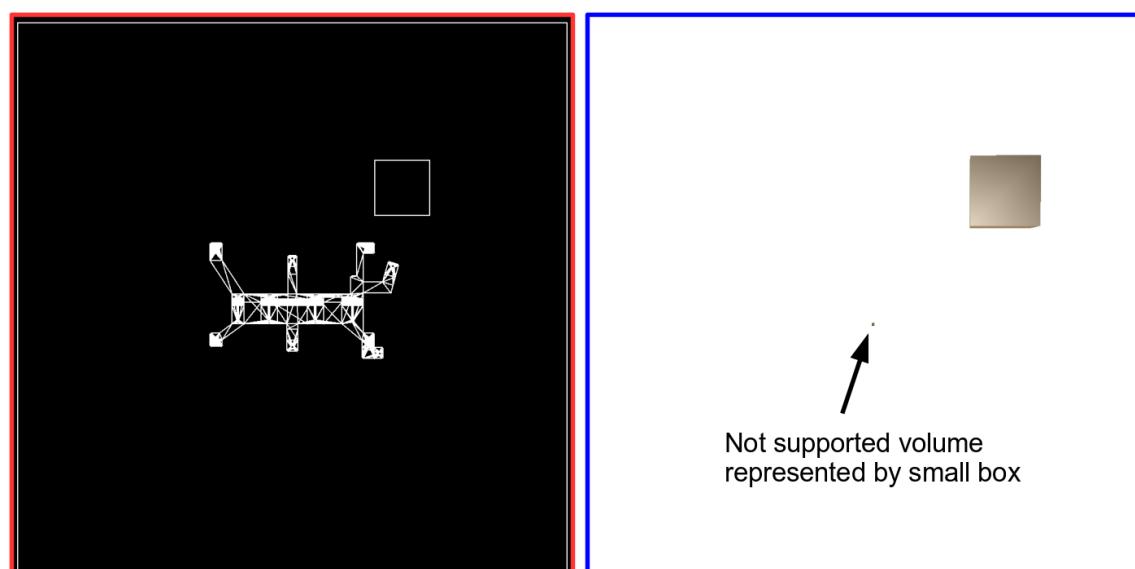
Visualization with HepRep can be used without excluding ECL. One needs only specify volume which needs to be visualized (ARICH.MasterVolume – for us.)

```
# Visualisation with HepRep
if (options.hepr):
    print('Visualisation with HepRep')
    simulation.param('EnableVisualization', True)
    simulation.param('UICommands', [
        '/vis/open HepRepFile',
        '/vis/scene/create',
        '/vis/scene/add/volume ARICH.MasterVolume',
        '/vis/sceneHandler/attach',
        '/vis/viewer/flush'
    ])
```

Baseline visualization

- BASF2 event display use ROOT geometry description TGeo objects. The conversion from Geant4 geometry to TGeo objects done with VGM package. But G4TessellatedSolid does not have equivalent in TGeo.
- Very first proposed solution **does not work** :
 - `setVisibility(*volume_logical, false);` - sets visualization option to false.
 - During conversion with VGM – check visualization flag. Does not work : because it convert all world volume which contains the all sub-detectors.
- The developer and librarian of the VGM - Ivana Hrivnacova. She help me to find needed solution.
=====
e-mail: Ivana.Hrivnacova@cern.ch
address: Institut de Physique Nucléaire, 91406 Orsay, France
phone: +33 169156594
=====
- **RootGM::Factory::SetIgnore(1);**

Stand alone test



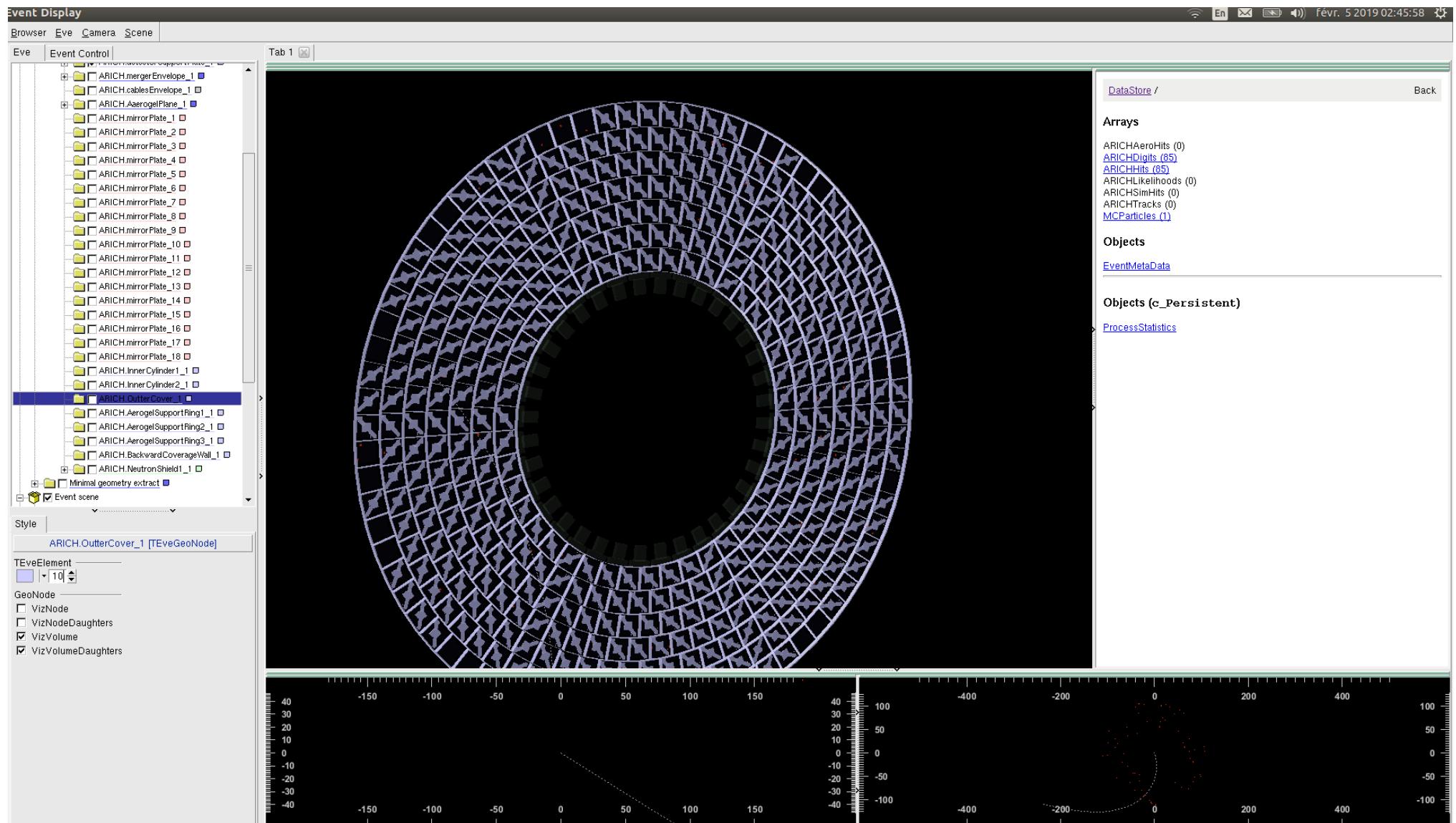
Baseline visualization

We need to exclude ECL from creation with Geant4.

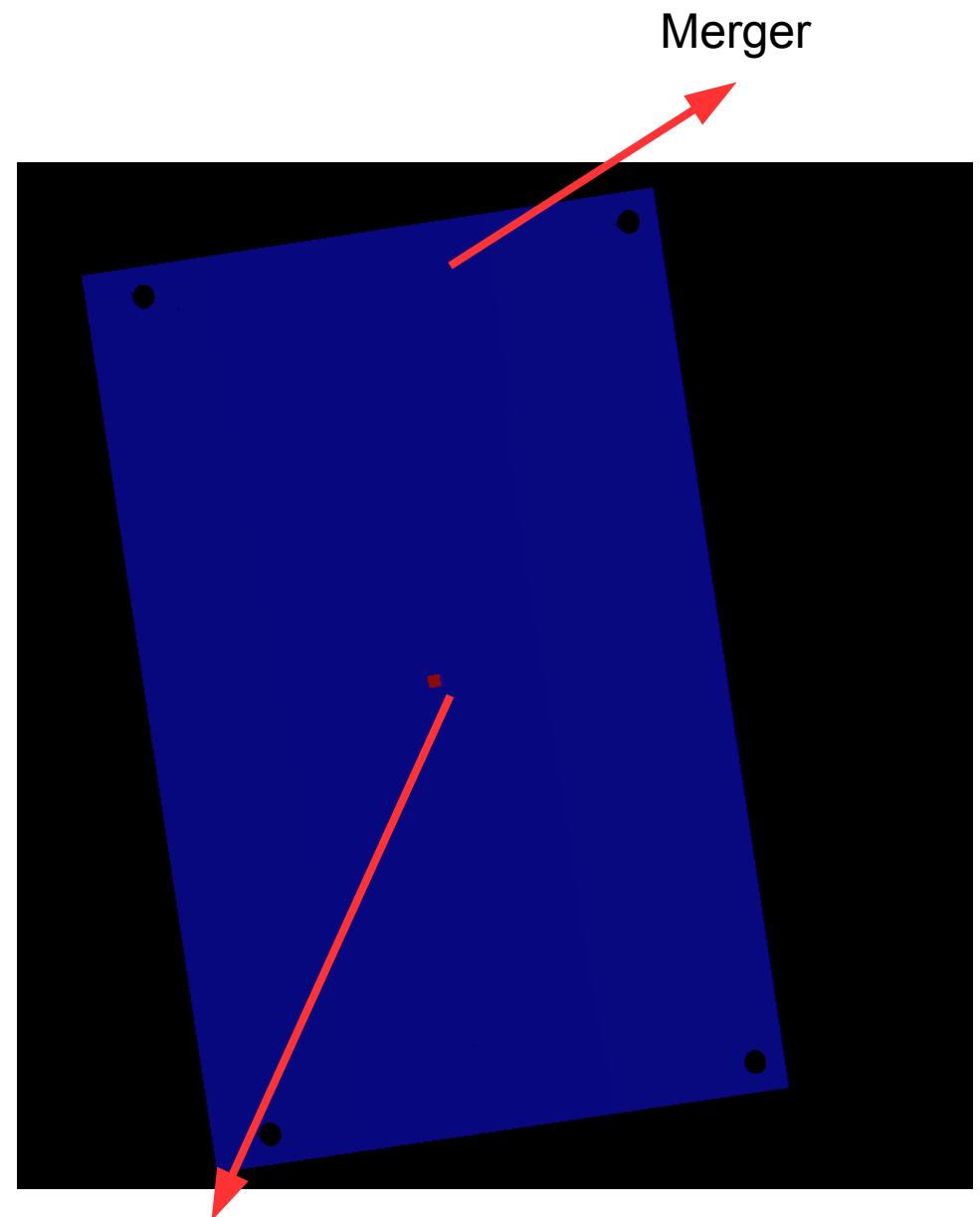
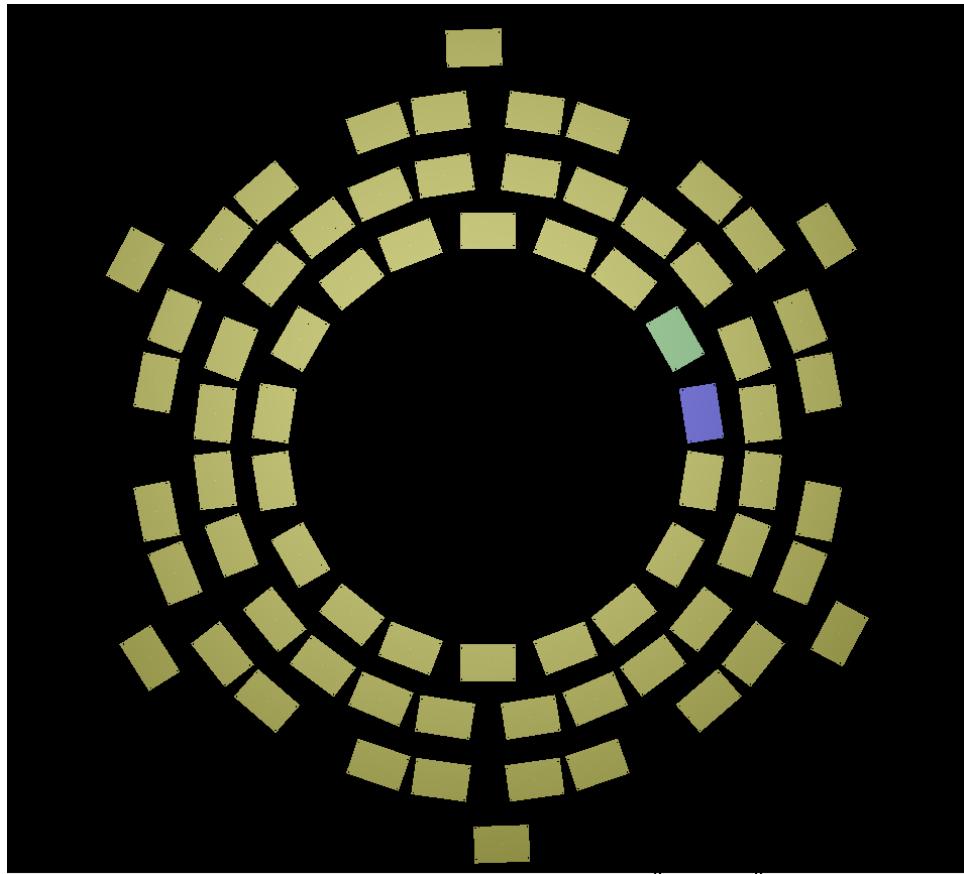
Open this file : ecl/geometry/src/GeoECLCreator.cc
and coment this string :
CreatorFactory<GeoECLCreator> GeoECLFactory("ECLCreator");

```
# Root event display
if (options.vis):
    display = register_module('Display')
    display.param('showARICHHits', True)
    # Remove this comment when visualisation
    # problem of complex volumes will be resolved.
    # Or in case you would like to meke ARICH visualisation
    # while it is not fixed. Please do the folowing actions :
    # open this file : ecl/geometry/src/GeoECLCreator.cc
    # and coment this string :
    # -CreatorFactory<GeoECLCreator> GeoECLFactory("ECLCreator");
    # +//CreatorFactory<GeoECLCreator> GeoECLFactory("ECLCreator");
    # recompile the code and you are ready to use this option :
    display.param('fullGeometry', True)
    main.add_module(display)
```

Baseline visualization (ARICH)



Baseline visualization (Merger)



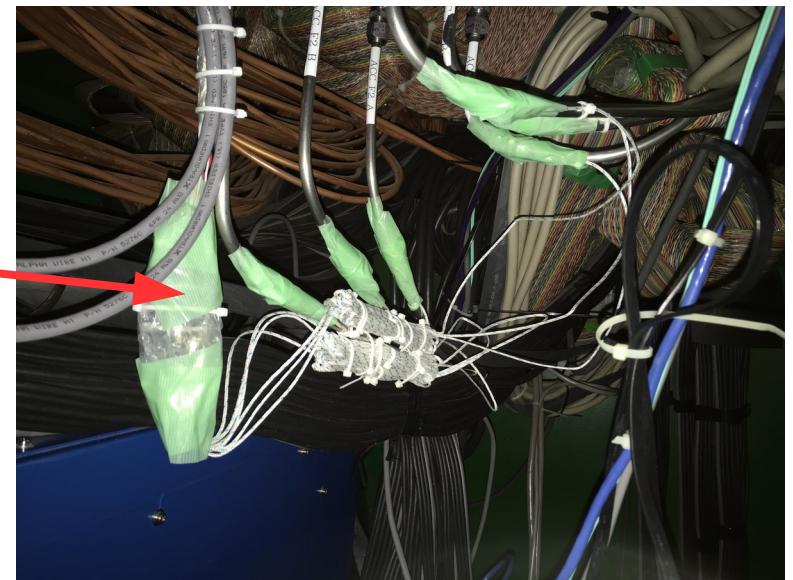
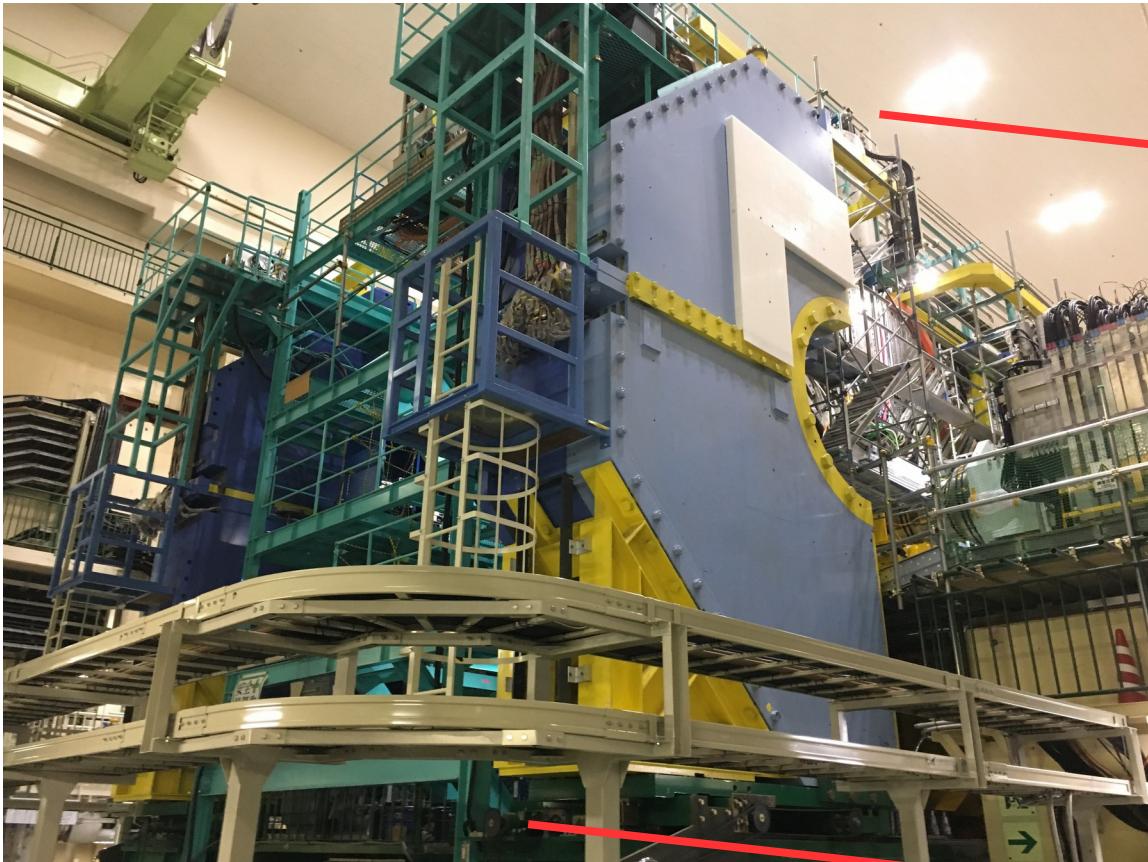
Representation of merger cooling body.

ARICH temperature monitoring and implementation same system for low voltages

- An old monitoring program produces FEB temperature map only for all the measurements during last 24 h.
- Upgrade :
 - Add merger temperatures map
 - Replace the temperature map (long pdf files example in the attachment) with more compact and informative plots.
 - For FEBs (t_1 , t_2) and mergers (FPGA and board) temperatures :
 - Maximum vs time per sector
 - Minimum vs time per sector
 - Average vs time per sector
 - Add the reading and login information from the logger about the extracted power for each sector.
 - Taking much disc space → make an optimization.

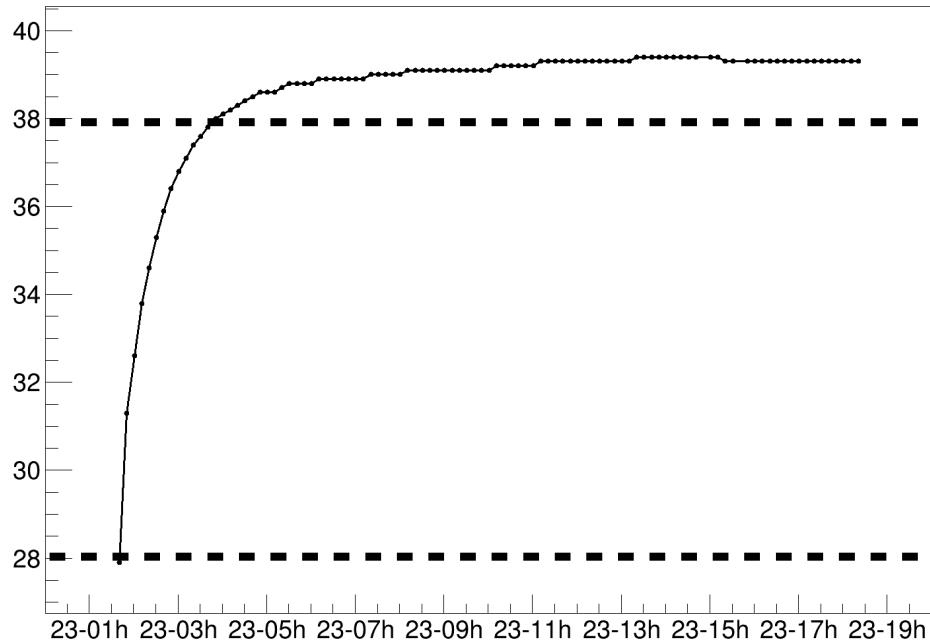
→ <http://research.kek.jp/group/arich/>

Adding sensors for the input/output water pipes for power extraction monitor.

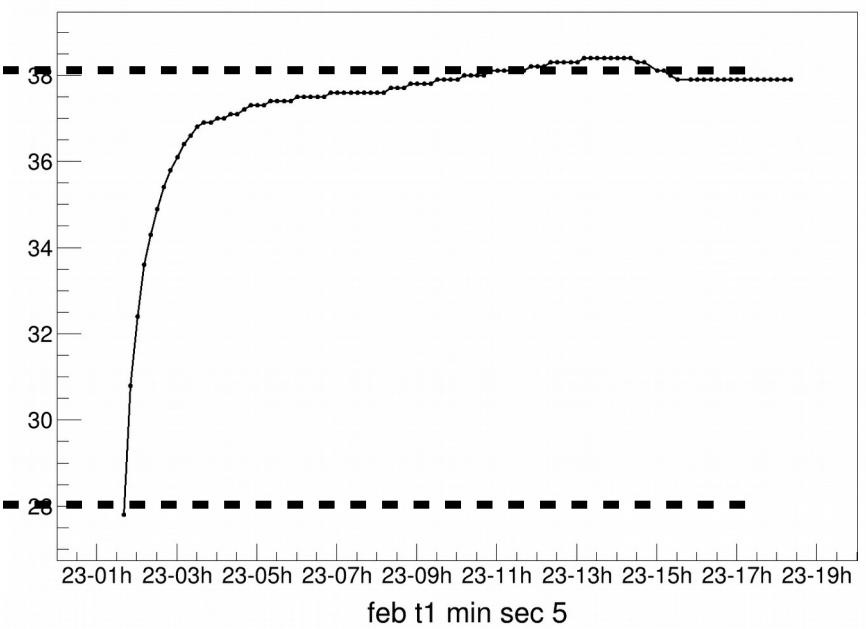


Example of temperature plots

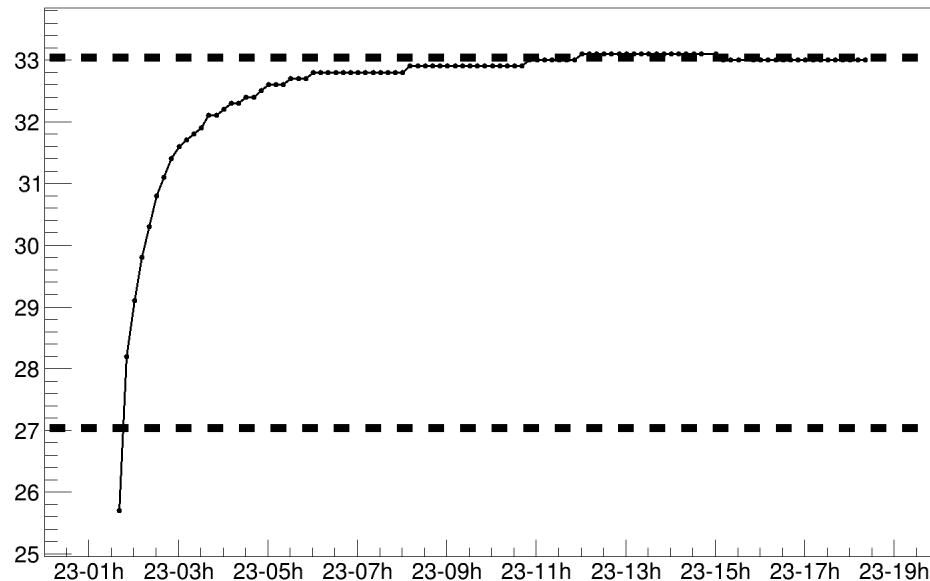
feb t1 max sec 2



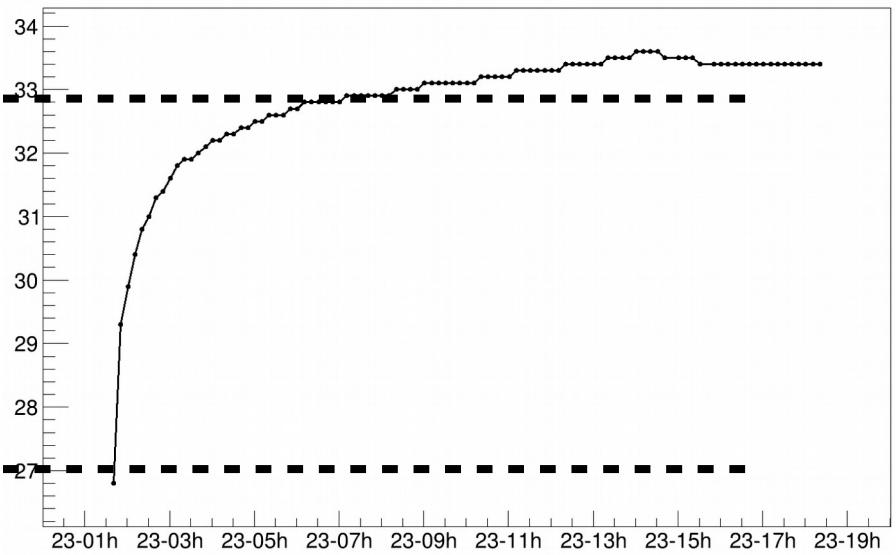
feb t1 max sec 5



feb t1 min sec 2



feb t1 min sec 5



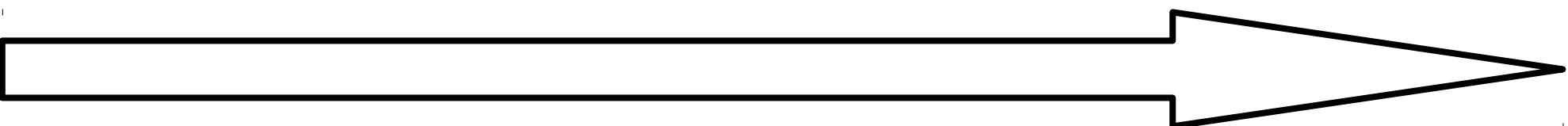
Temperature data organization

Time measurements each 10 min

Conversion of the data ones per day

Make the data cleaning and packing the rad data ones per day (14 days old data)

Cleaning and packing of the log files (every Sunday at 1 in the night.)



ariterm1 loopstats.20190212

