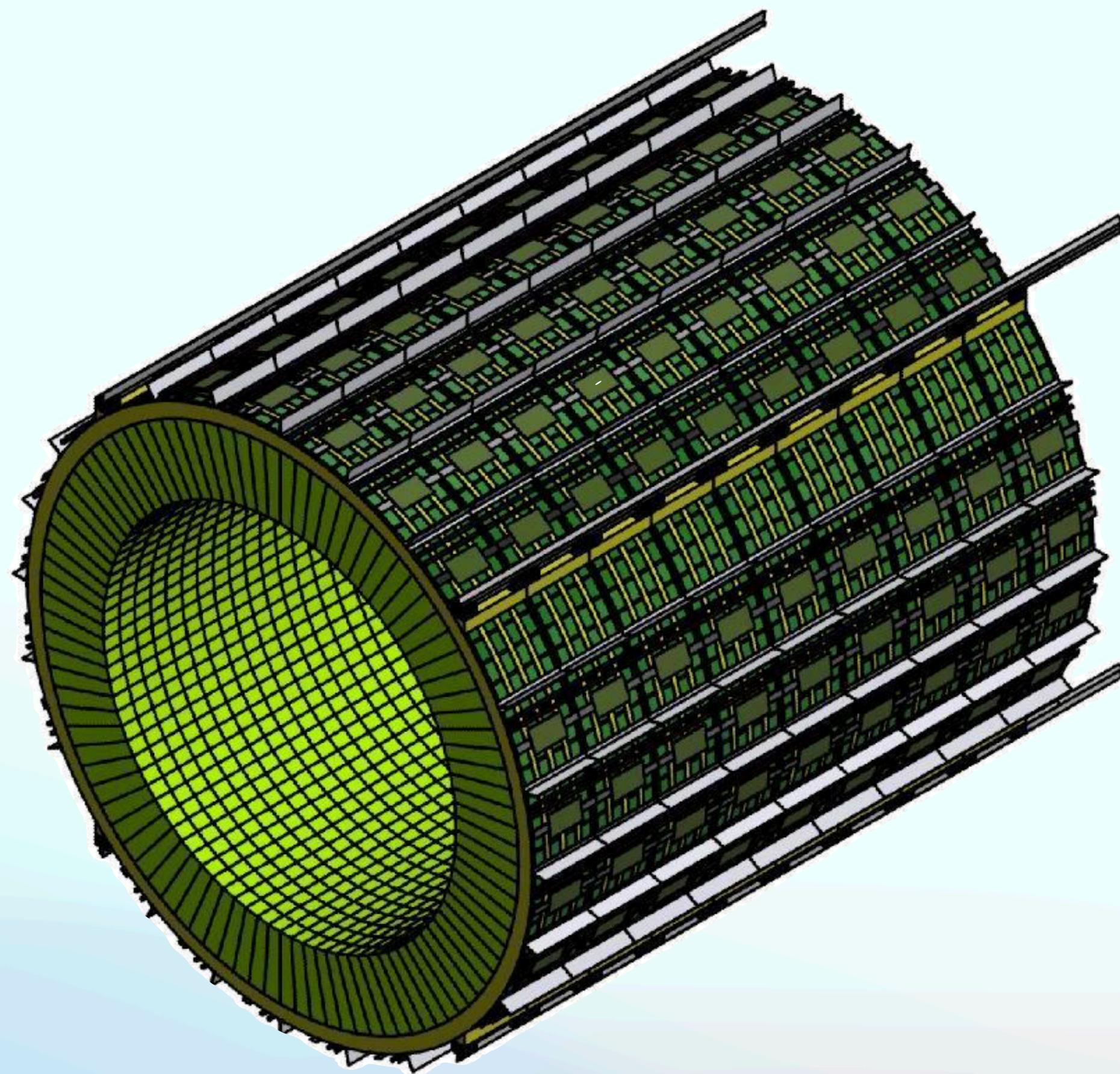


# Status of Detector Description

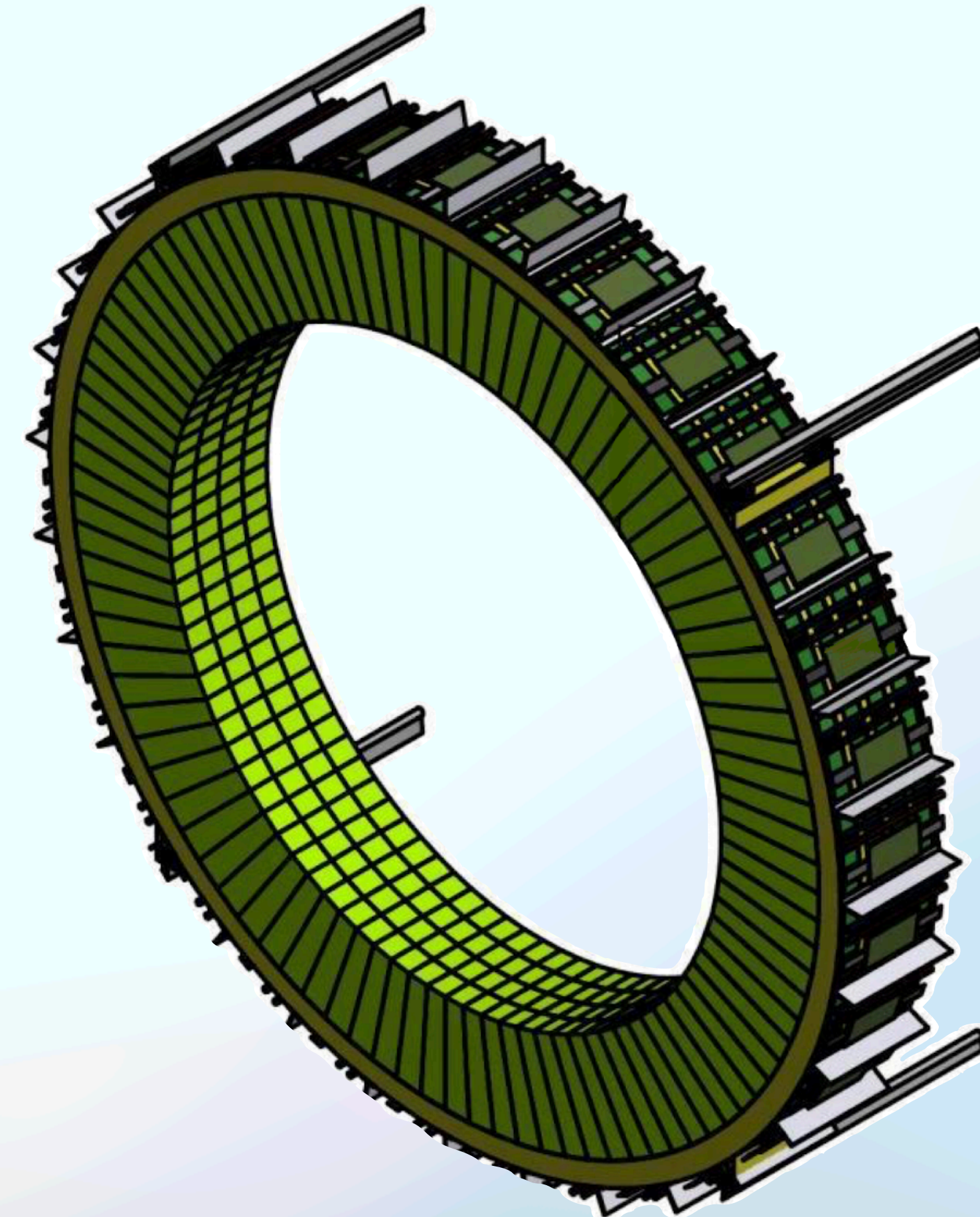
SPD Software&Computing meeting

# Electromagnetic calorimeter inner structure description

# Electromagnetic calorimeter barrel part



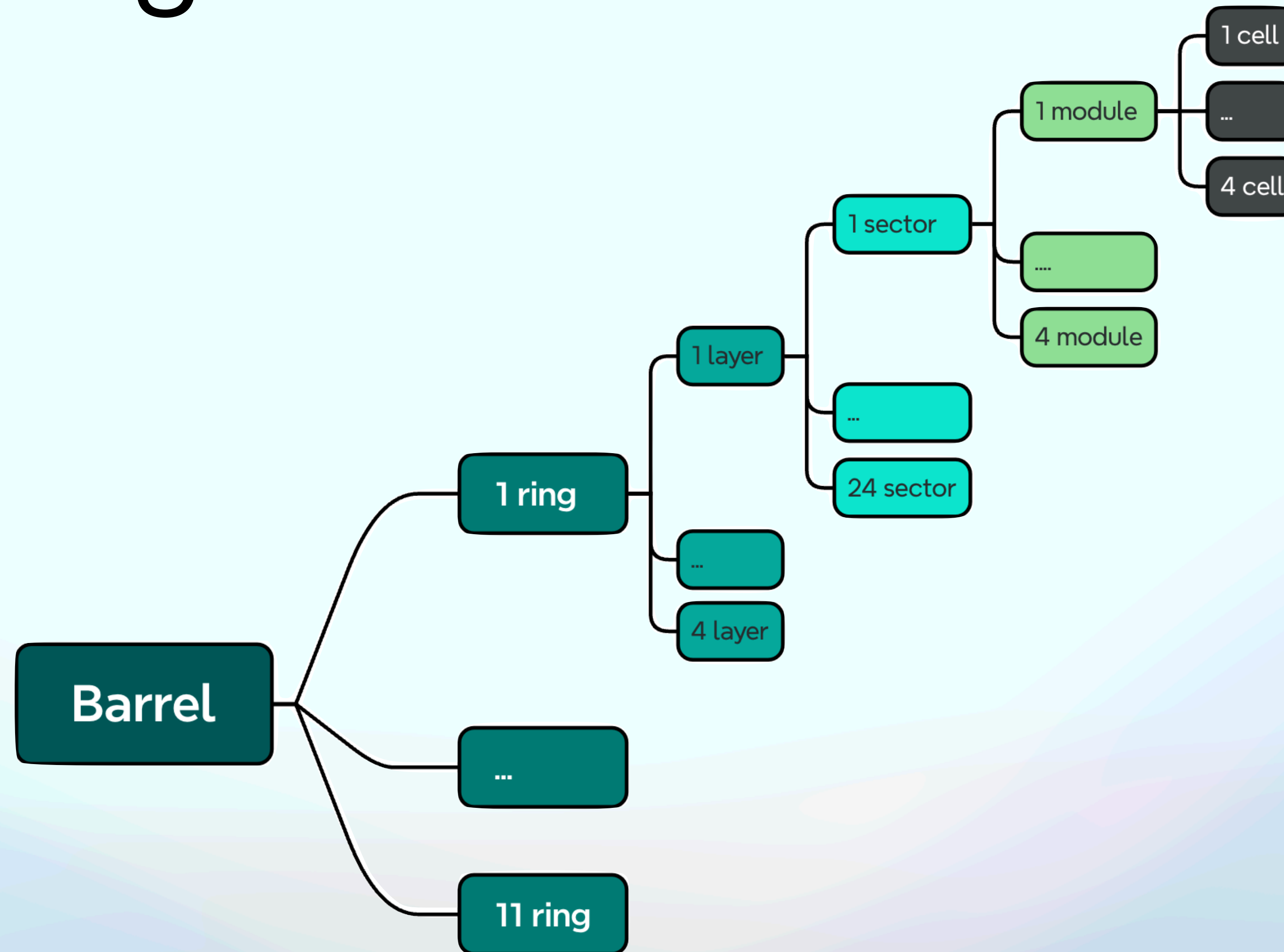
a)



b)

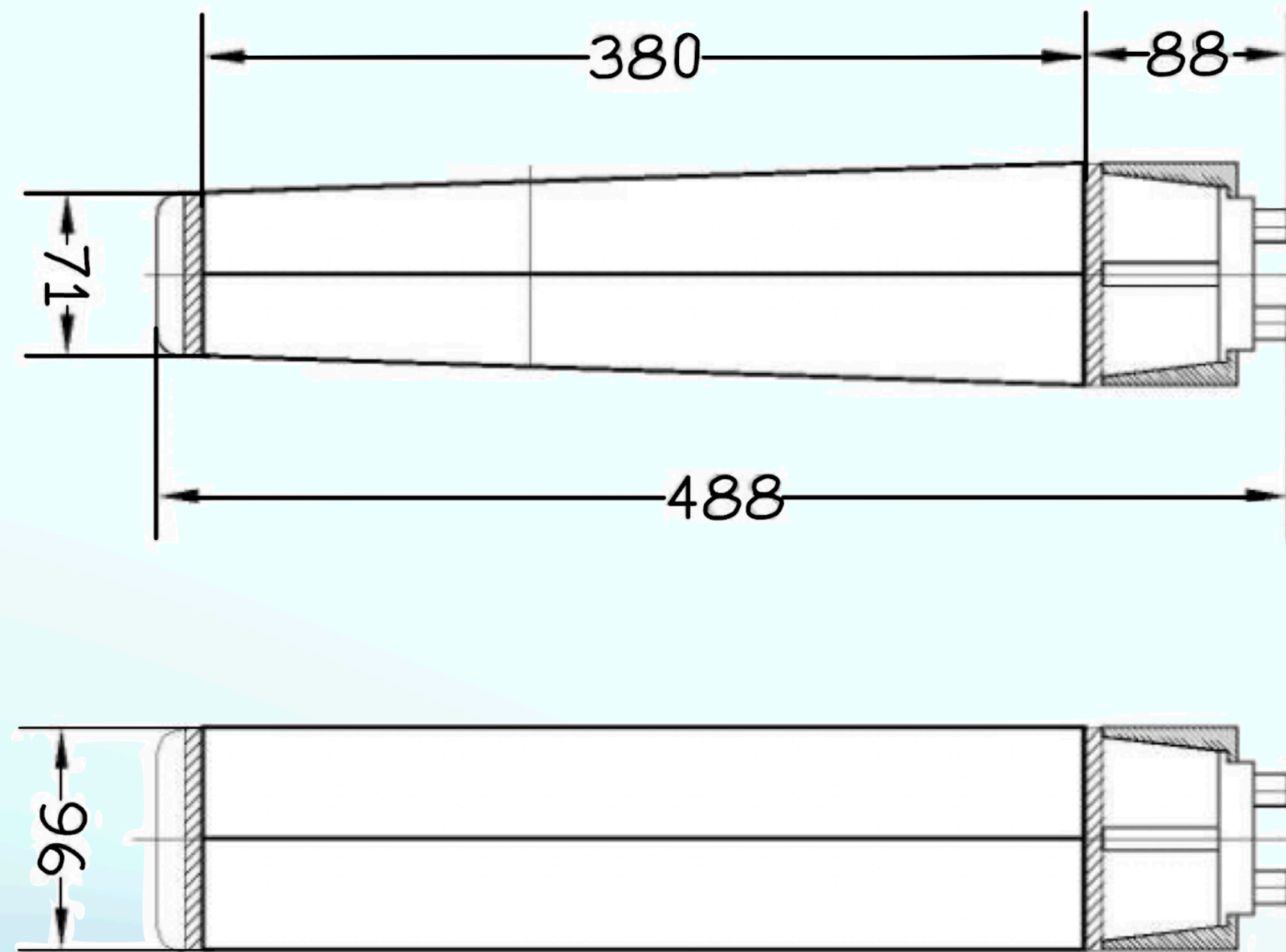
a) The barrel part of the calorimeter. b) A separate ring in more detail.

# Electromagnetic calorimeter barrel part

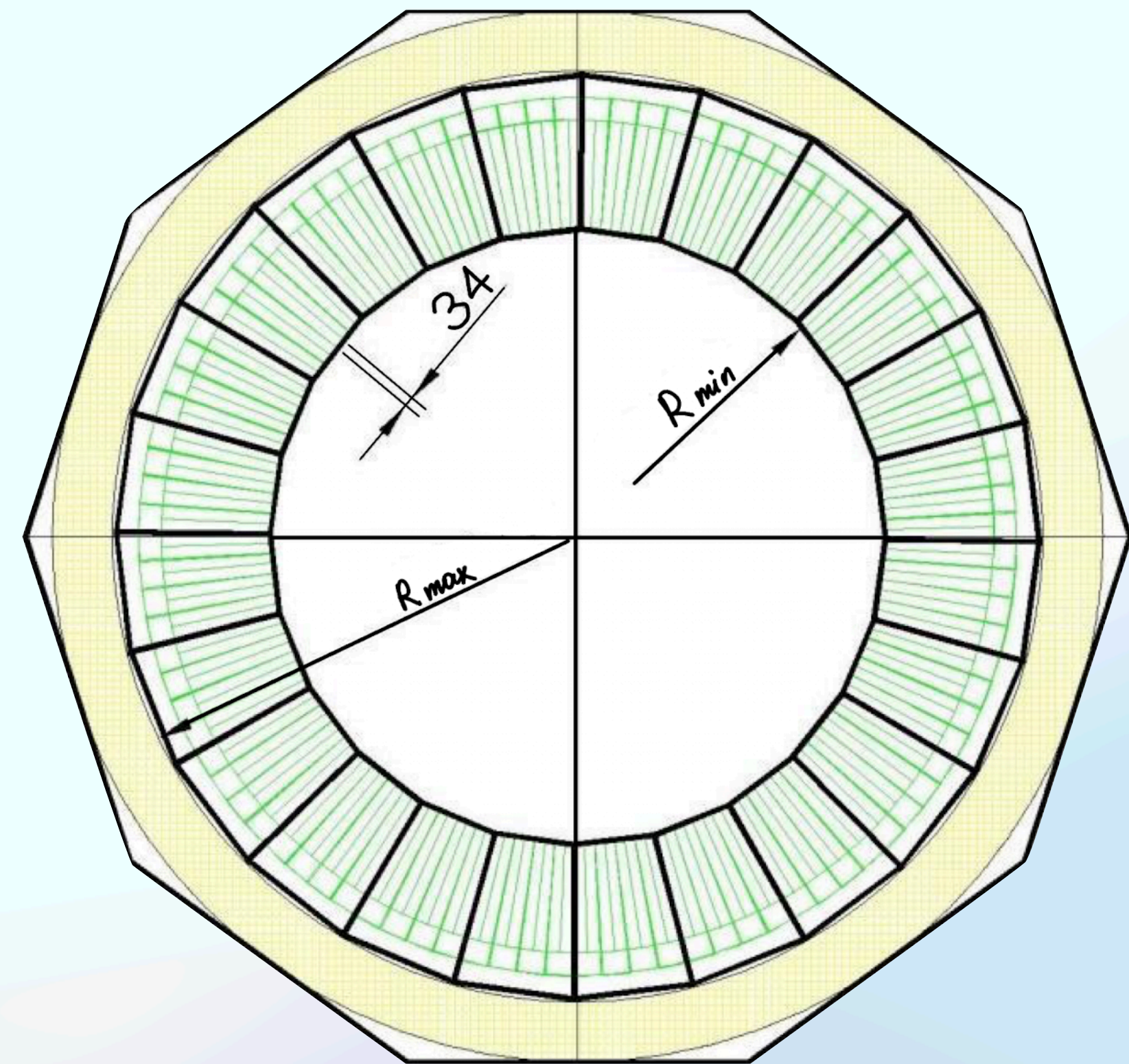


Scheme of the ECal barrel part volumes hierarchy.

# Parameterizations for ECal barrel part



a)



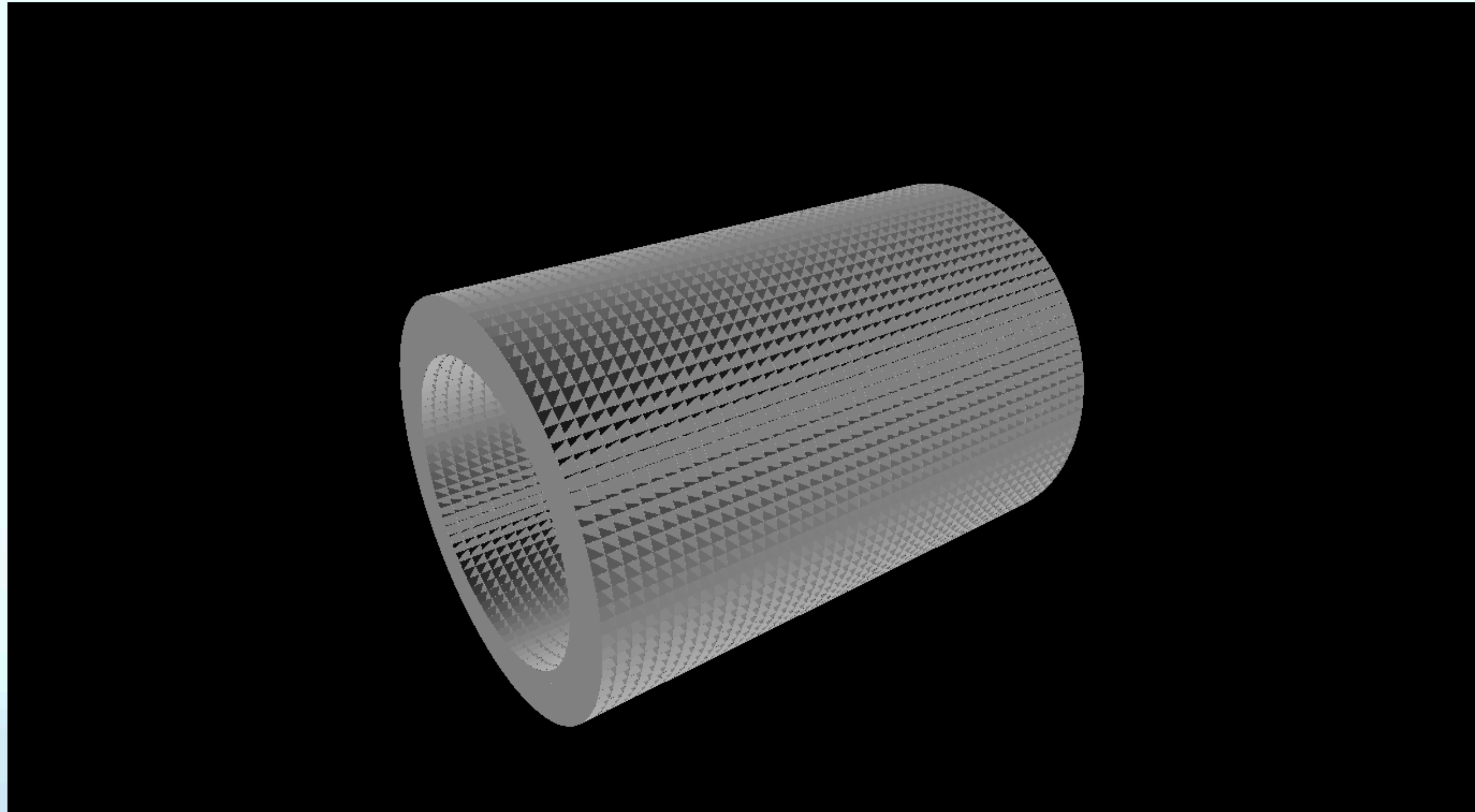
b)

a) ECal module. b) Schematic drawing of a cross-section of the barrel part of the calorimeter.

# Parameterizations for ECal barrel part

- $\text{translation} = R_{\text{min\_ecalbar}} + 0.5 \text{ zmodule\_height};$
- $\text{GeoTrf::TranslateX3D} = \text{translation} * \cos(3.75 * i * \text{deg});$
- $\text{GeoTrf::TranslateY3D} = \text{translation} * \sin(3.75 * i * \text{deg});$
- $\text{GeoTrf::RotateY3D}((270.0 + 3.75 * i) * \text{deg});$
- $\text{GeoTrf::TranslateZ3D} = 0.5 * \text{Length\_ecalbar} - \text{ymodule\_length} * j;$

# Electromagnetic calorimeter barrel part

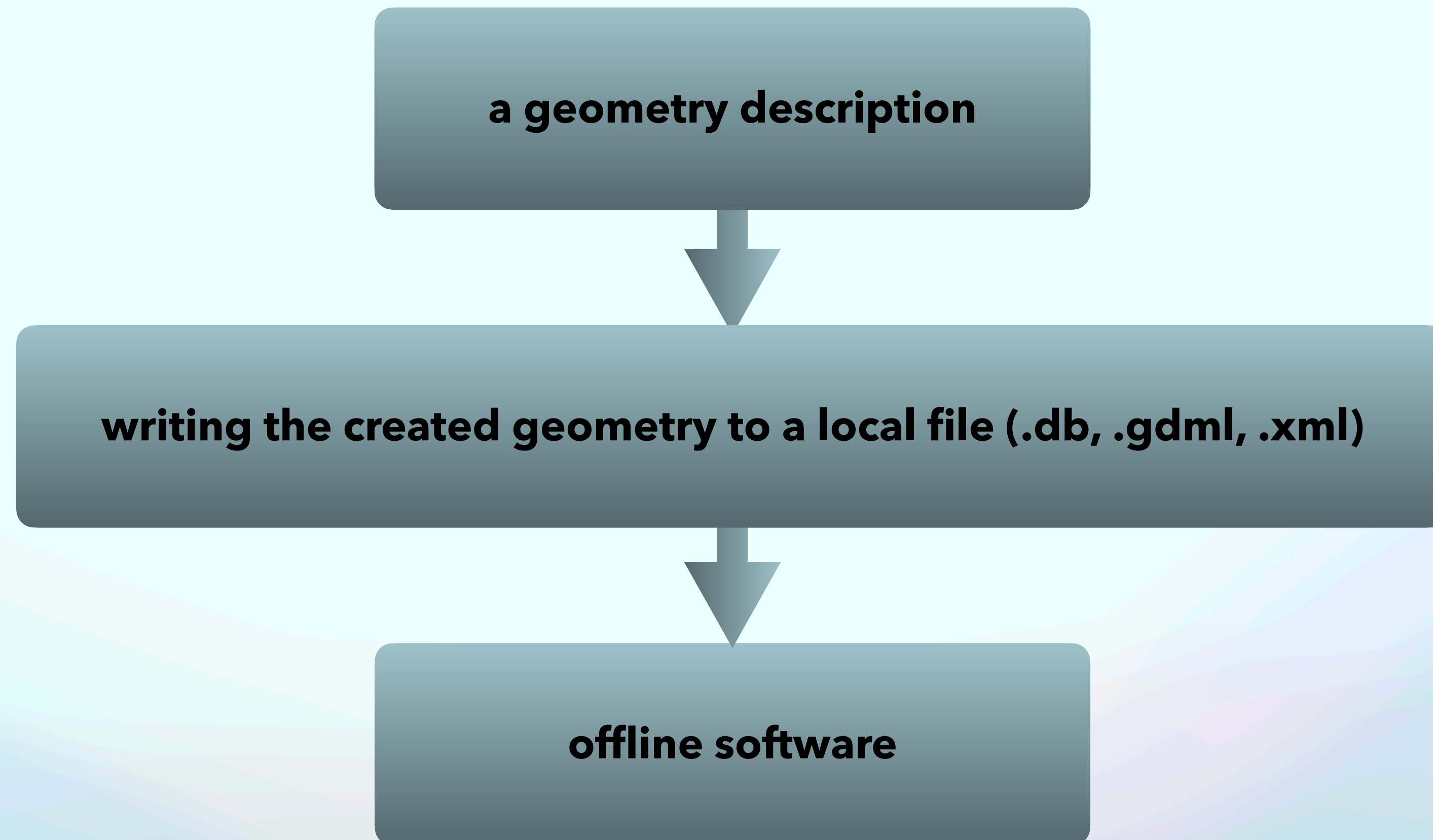


The barrel part of the ECal.

# Sensitive volumes in Geant4 and GeoModel



# The mechanism of interaction with GeoModel



# Coverting GeoModel data to a Geant4 geometry

```
static const std::string path = "/path to db file/spd.db";
```

```
GMDBManager* db = new GMDBManager(path);
```

```
GeoModelIO::ReadGeoModel readInGeo = GeoModelIO::ReadGeoModel(db);
```

```
GeoVPhysVol* world = readInGeo.buildGeoModel();
```

```
ExtParameterisedVolumeBuilder* builder = new ExtParameterisedVolumeBuilder("SPD");
```

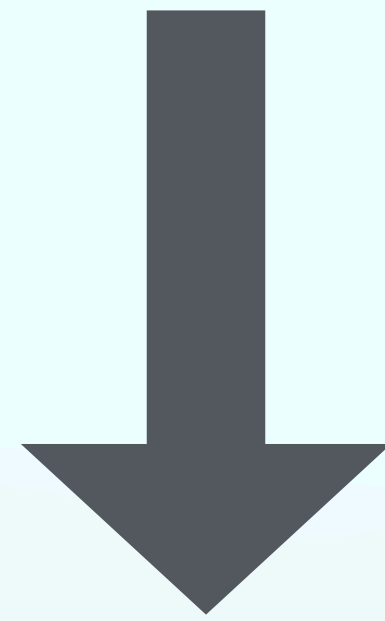
```
G4LogicalVolume* g4World = builder->Build(world);
```

```
G4VPhysicalVolume* physWorld = new G4PVPlacement(0, G4ThreeVector(), g4World, "World", 0, false,  
0, true);
```

# Sensitive volume in Geant4

- The detector contains a large number of elements. Some of which are necessary to support the facility.
- Sensitive detector is used to distinguish detecting elements from others. It is a way to declare a geometric element sensitive to the passage of particles.

The GeoModel doesn't know  
what sensitive volumes are



Need to be developed

# Sensitive detector in Geant4

adding a flag «\_sens» + «\_type of sensitive volume» to GeoModel logical volume name

creating of Geant4 geometry from GeoModel geometry

getting logical volume store, filtering volumes

adding selected volumes into sensitive detectors

# Sensitive detector in Geant4

Input database (originated in GeoModel):



Box



Box\_sens\_type1



Box\_sens\_type2

# Sensitive detector in Geant4

```
std::cout << "***** List of registered logical volumes *****" << std::endl;
std::vector <G4String> SensLVnames;

std::vector<G4LogicalVolume*>* lvStore = G4LogicalVolumeStore::GetInstance();
std::size_t nlv=lvStore->size();
std::cout<<"G4LogicalVolumeStore size:\t " <<nlv<<std::endl; //info for debugging

for (std::size_t i=0; i<nlv; i++)
{
    G4LogicalVolume* lv = (*lvStore)[i];
    G4String name = lv->GetName();
    std::cout << name << std::endl; //info for debugging

    if (name.contains(«_sens"))
    {
        SensLVnames.push_back(name);
        std::cout<< "Volume with \t"<< name << " is sensetive" << std::endl; //info for debugging
    }
}
```

# Sensitive detector in Geant4

```
for(int i=0; i<SensLVnames.size(); i++)
{
    G4String names = SensLVnames[i];

    if(names.contains("_type1 "))
    {
        box_type1 = G4LogicalVolumeStore::GetInstance()->GetVolume(names);
        std::cout << «Sensitive volume\t» << names << «is created» << std::endl; //info for debugging
    }
    if(names.contains(«_type2"))
    {
        box_type2 = G4LogicalVolumeStore::GetInstance()->GetVolume(names);
        std::cout << «Sensitive volume\t» << names << «is created» << std::endl; //info for debugging
    }
}
```



# Sensitive detector in Geant4

```
***** List of registered logical volumes *****
```

```
G4LogicalVolumeStore size:      4
worldLog
Box_sens_type1
Volume with      Box_sens_type1 is sensitive
Box
Box_sens_type2
Volume with      Box_sens_type2 is sensitive
```

```
***** Creation of new logical volumes *****
```

```
Sensitive volume Box_sens_type1 is created
Sensitive volume Box_sens_type2 is created
```

```
Step#   X(mm)   Y(mm)   Z(mm) KinE(MeV)  dE(MeV) StepLeng TrackLeng  NextVolume ProcName
   0 -0.000112 0.000438  0.306  0.00164      0      0      0 Box_sens_type1 initStep
   1  0.00593 -0.0259  0.317  0  0.00164  0.0345  0.0345 Box_sens_type1 eIoni
```

```
Volume ID: 22
```

```
1 event has been kept for refreshing and/or reviewing
```

# Next steps

- Finish electromagnetic calorimeter inner structure description;
- Update geometry description in accordance with last version of TDR;
- Range system inner structure description;
- Development of methods that produce the necessary geometric parameters (for reconstruction).

**Thank you for your attention!**