

Detector Geometry: MFT Support code in O2

Rafael P. Pezzi
Porto Alegre - Brazil



Part 1

- MFT PCB Supports Geometry in O2
 - Rewritten for O2
 - Simplified parametrization approach
 - Simpler to maintain and update once the blueprints are available
 - Same code can be used for PCBs and other flat objects

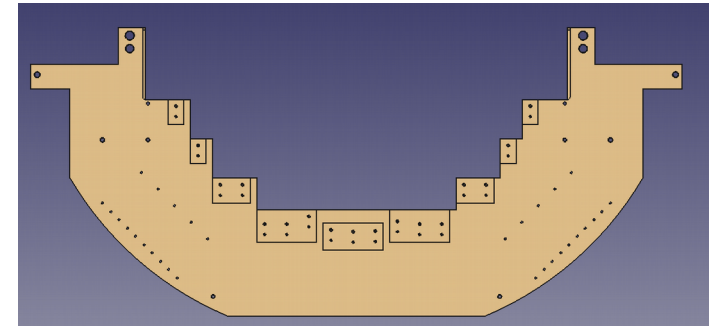
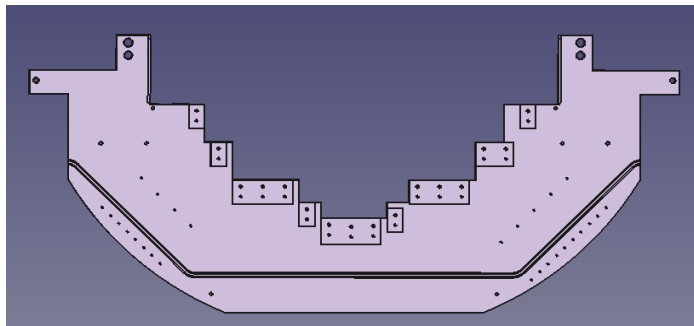
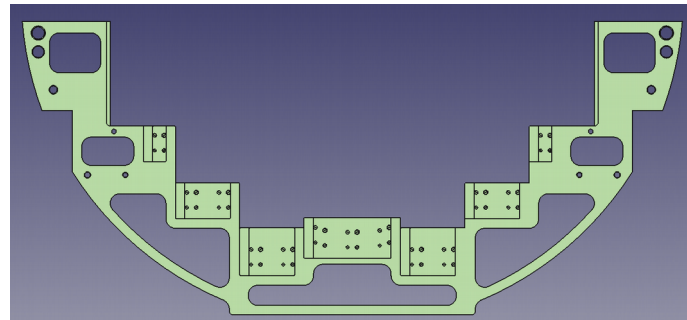
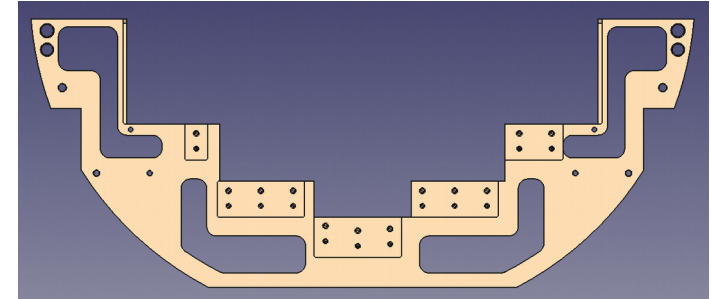
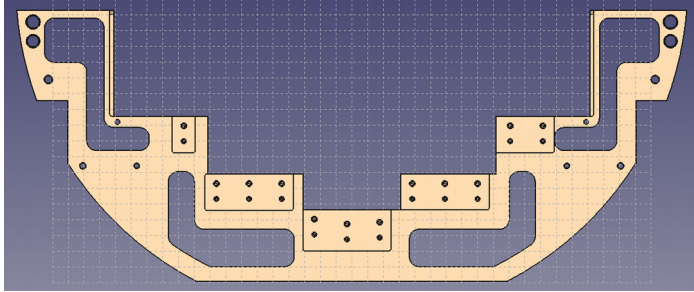
Part 2

- Case study: GDML files for detector geometry description



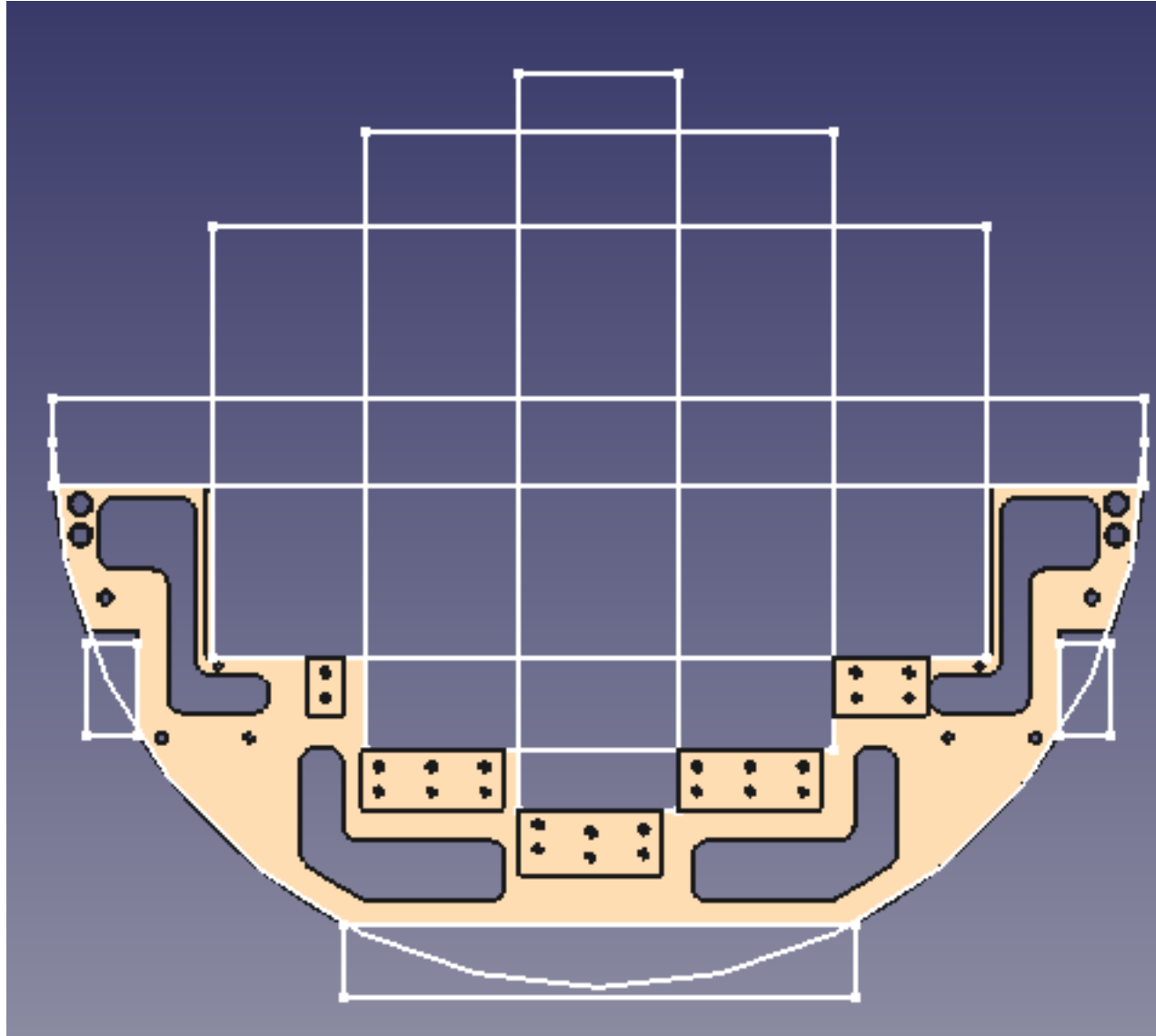
ALICE

Part 1: MFT PCB Supports



Explore similarities on the supports

Example: Cutting boxes



Example: Cutting boxes

Position and dimensions of each box

Number of boxes to cut on disk 0

```
// =====  
// ## Cut boxes (squares)  
// ### halfDisks 00  
mNumberOfBoxCuts[0]=7;  
// Cut boxes {Width, Height, x_center, y_center}  
mBoxCuts[00] = new Double_t[mNumberOfBoxCuts[0]][4]{  
    {mSupRad[0]+mT_delta, mDiskGap, 0, 0},  
    {sqrt(pow(mSupRad[0],2.)-pow(mOuterCut[0],2.)),  
     (mSupRad[0]-mOuterCut[0])/2.,  
     0.,  
     (mSupRad[0]+mOuterCut[0])/2.}, //External cut width: 2*sqrt(R^2-x^2)  
    {12.4, 6.91, 0, 0},  
    {7.95, 9.4, 0, 0},  
    {2.9, 11.885, 0, 0},  
    {1.3875, 1.45, 16.1875, 7.9},  
    {1.3875, 1.45, -16.1875, 7.9}  
};  
  
// ### halfDisks 01  
mNumberOfBoxCuts[1]=mNumberOfBoxCuts[0];  
mBoxCuts[01]=mBoxCuts[00];
```

Same for disk 1

Example: Cutting boxes

Loops for removing or adding things

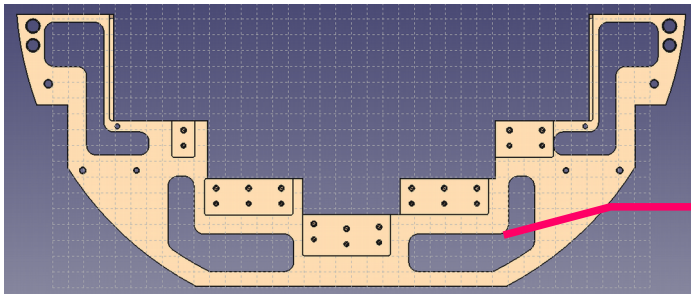
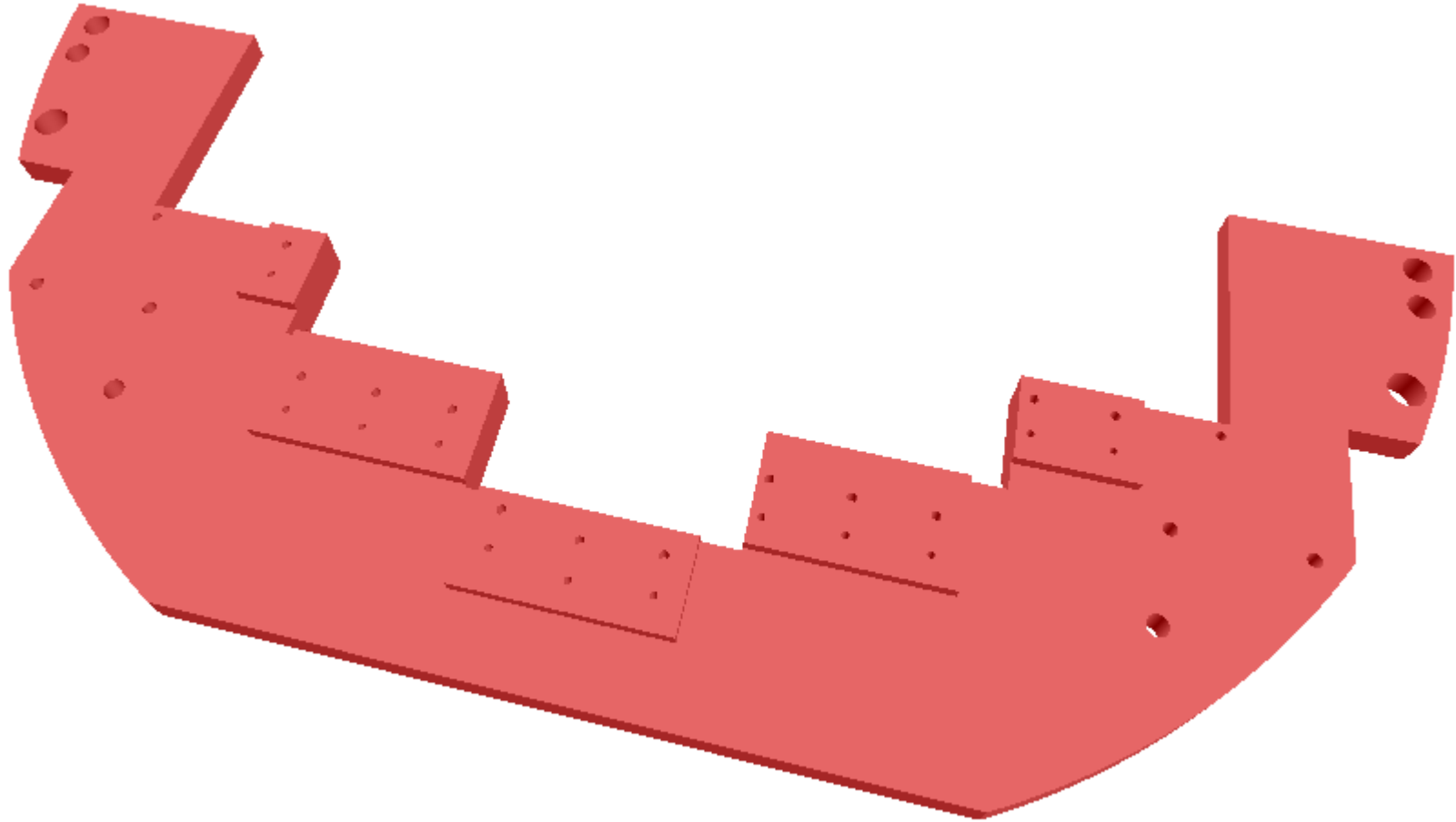
```
// Cutting boxes
Info("Create",Form("Cutting Boxes Support_H%D_D%D", half,disk),0,0);
for(Int_t cut = 0 ; cut<mNumberOfBoxCuts[disk]; cut++){
  auto *boxName = Form("BoxCut_%d_H%D_D%D",cut, half, disk);
  auto *boxCSName = Form("BoxCS_%d_H%D_D%D",cut, half, disk);
  mSomeBox = new TGeoBBox(boxName,mBoxCuts[disk][cut][0],mBoxCuts[disk][cut][1], mSupThickness/2.+mT_delta);
  mSomeTranslation = new TGeoTranslation(mBoxCuts[disk][cut][2],mBoxCuts[disk][cut][3], 0.);
  //The first subtraction needs a shape, the base tube
  if (cut ==0) mSomeSubtraction = new TGeoSubtraction(base, mSomeBox, NULL,mSomeTranslation);
  else mSomeSubtraction = new TGeoSubtraction(mSomeCS, mSomeBox, NULL,mSomeTranslation);
  mSomeCS = new TGeoCompositeShape(boxCSName, mSomeSubtraction);
}
```

Memory leaks!?!



ALICE

Support 00



Voids to be included once blueprints are available

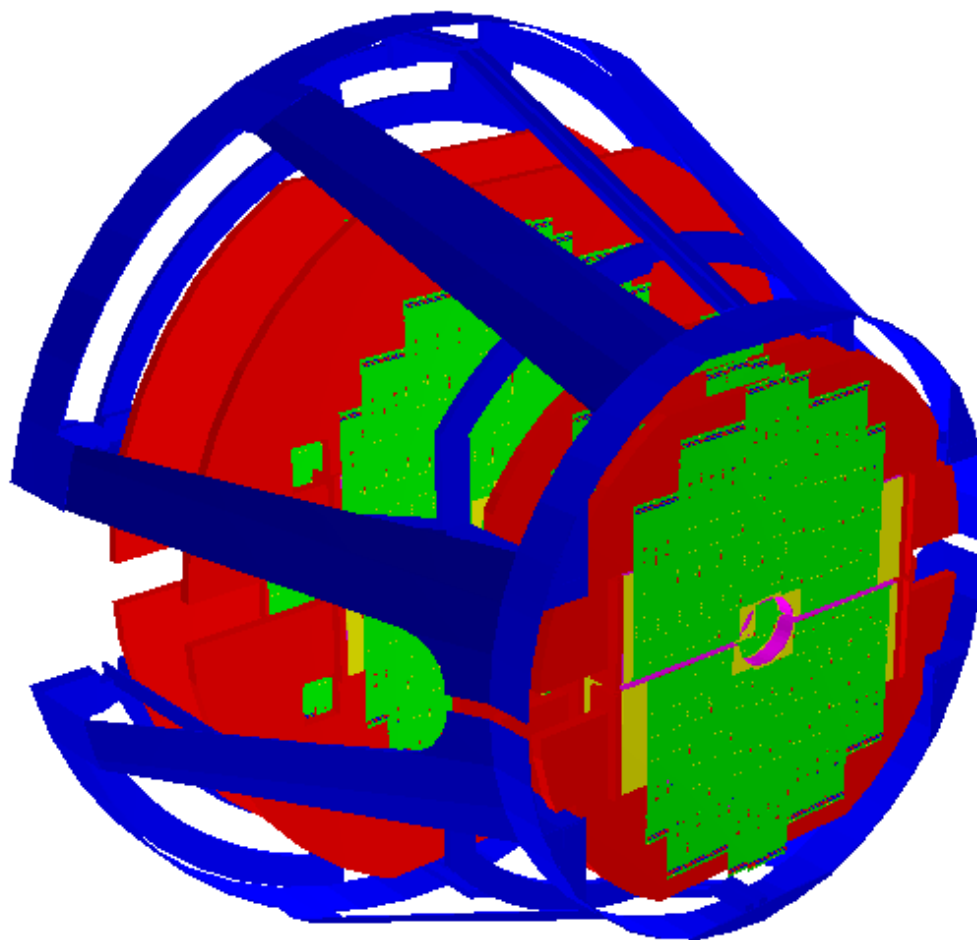


ALICE

Current MFT on O2

(mft-support branch on my github fork)

<https://github.com/rpezzi/AliceO2/commit/13e6f1be75cd9dbf6a0824eba5abd76510bdc7d1>



Part 2: Case study

CAD → root/O2

- Is it possible to import CAD files into O2 to describe the detector geometry?

- The Geometry Description Markup Language (GDML) is an application-independent geometry description format based on XML.
- Some tools available to convert CAD files to GDML
 - [CATIA-GDML](#) (see [conference proceeding](#))
 - [CADMesh tool](#)
 - [CAD-GDML](#)

Using GDML in root: Scenario 1

- Current: root GDML Import method deletes TGeoManager
 - it is not possible to import GDML files into root without deleting every other ALICE detector component. See [documentation](#).
 - Solution: whole ALICE described in a single GDML file
 - Drawback: difficult to fine tune detector alignment

Using GDML in root: Scenario 2

- Adapt TGeoManager import function to import GDML files within existing TGeoManager
 - Simpler for parts that are fixed in relation to the laboratory frame or reference
 - Some development needed for parts that can move and need careful alignment.

Thanks!

Rafael P. Pezzi

Porto Alegre – Brazil

rafael.pezzi@cern.ch

