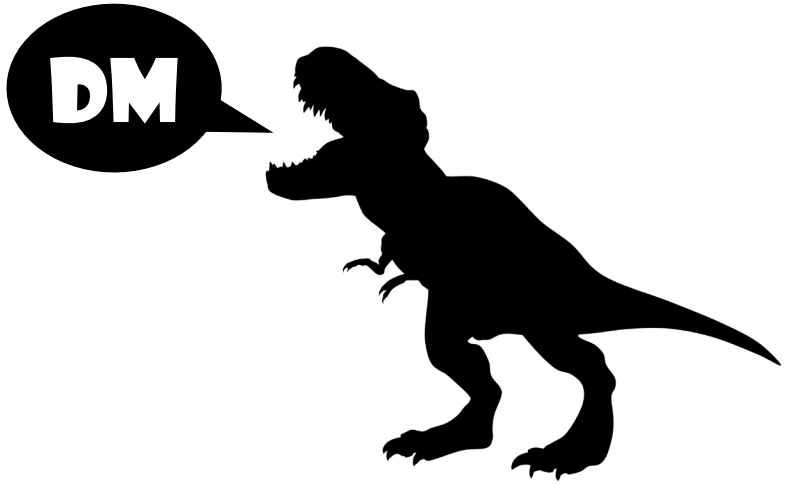
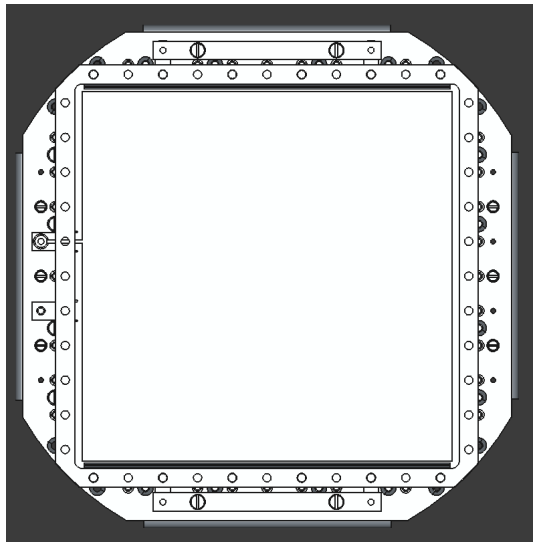
Micromegas assembly

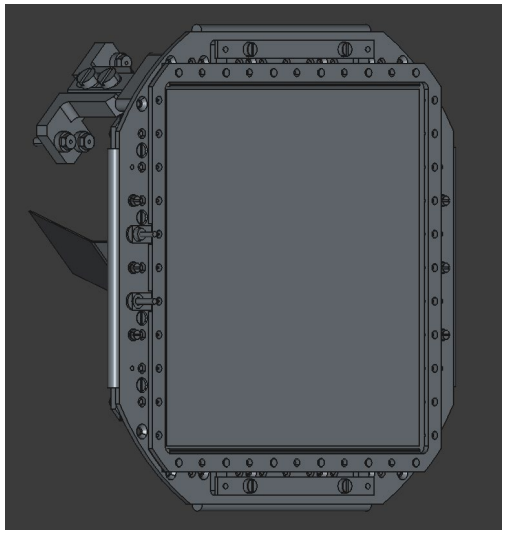
Álvaro Ezquerro

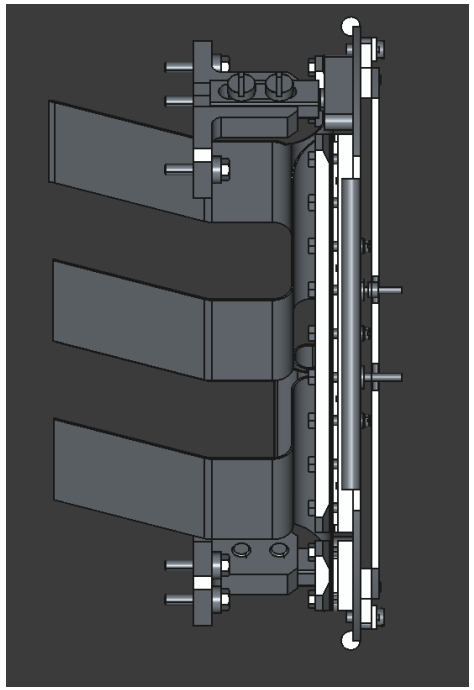
July 2025

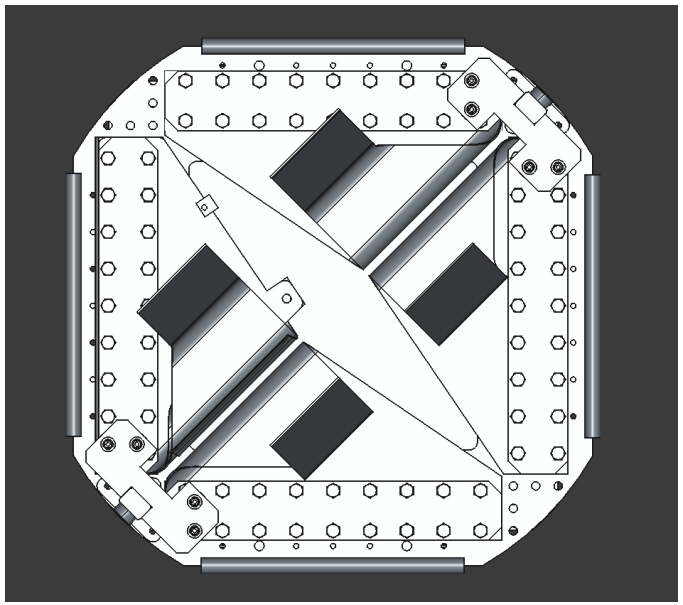


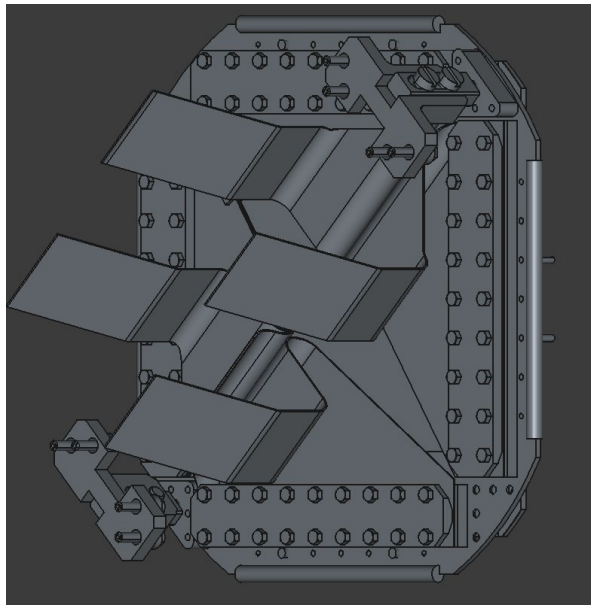
CAD design which is based on











And photos of the real setup:
[June 2022 intervention]

Micromegas generator module

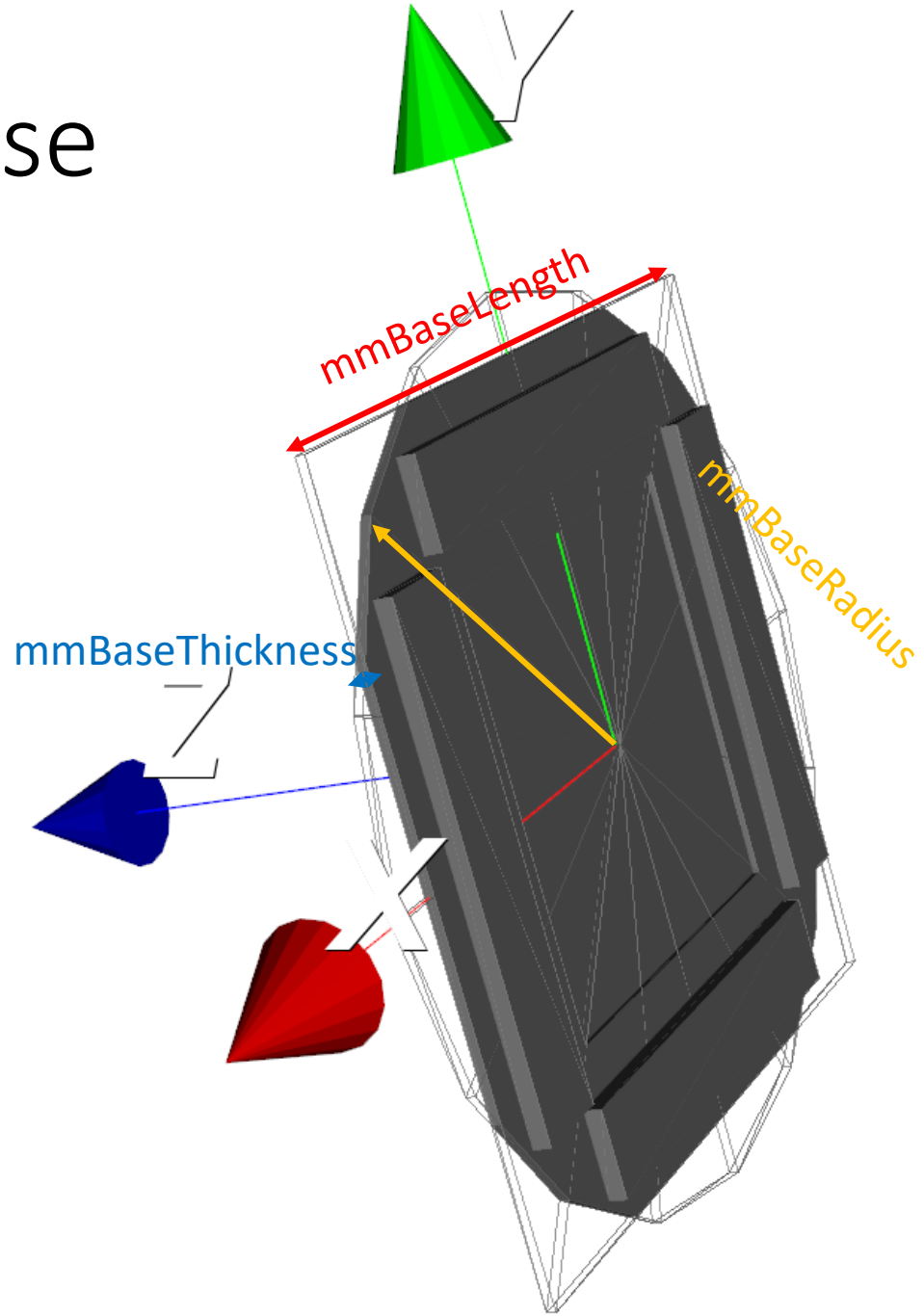
- The assembly is generated by the function:

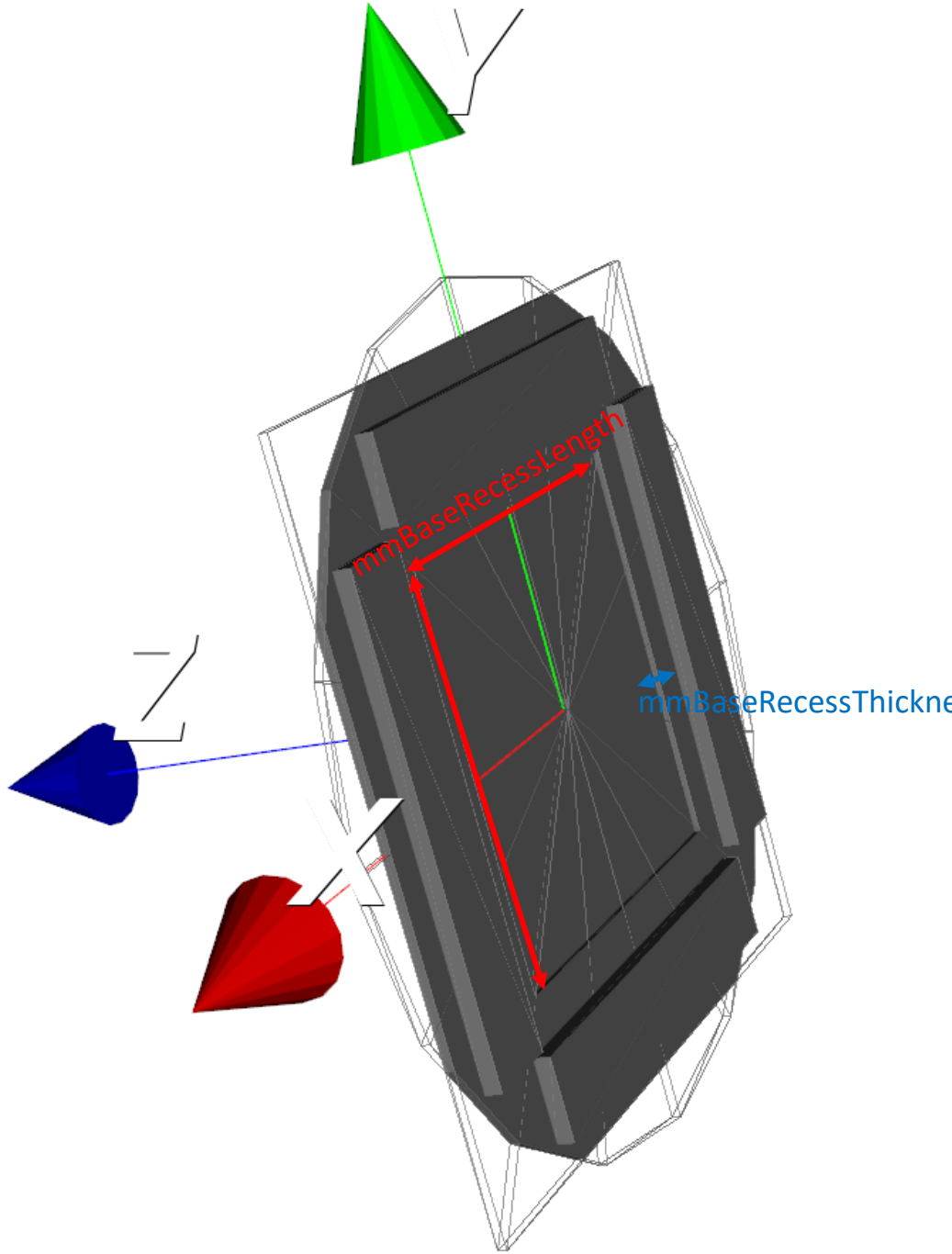
```
generate_micromegas_assembly(name="micromegas_assembly", registry=None, is_right_side=True):
```

- It can generate the assembly for the right or left side. These are mirror assemblies of each other, which cannot be done by rotation of one of the assemblies.

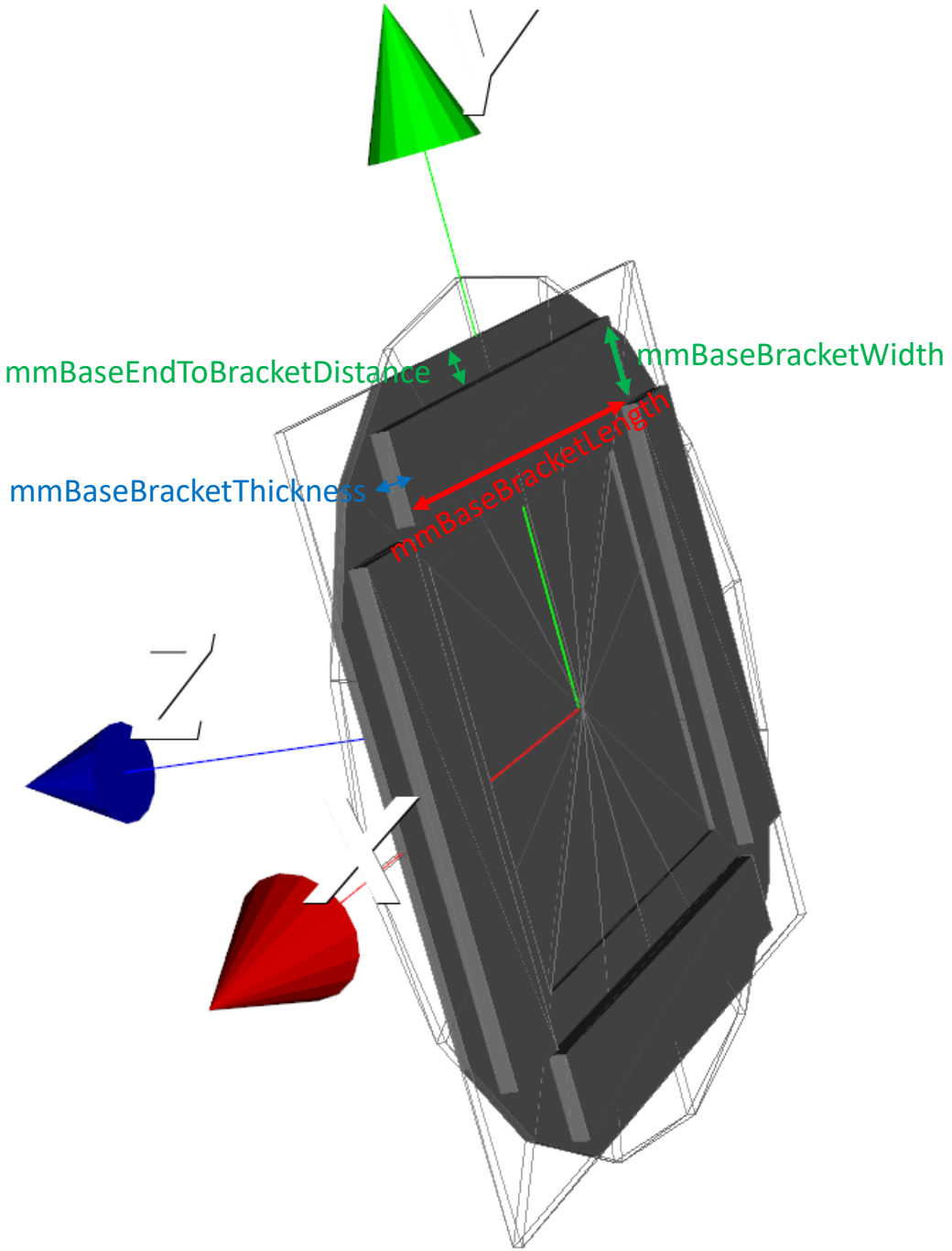
- In this document, the right side assembly is shown.

mMBase

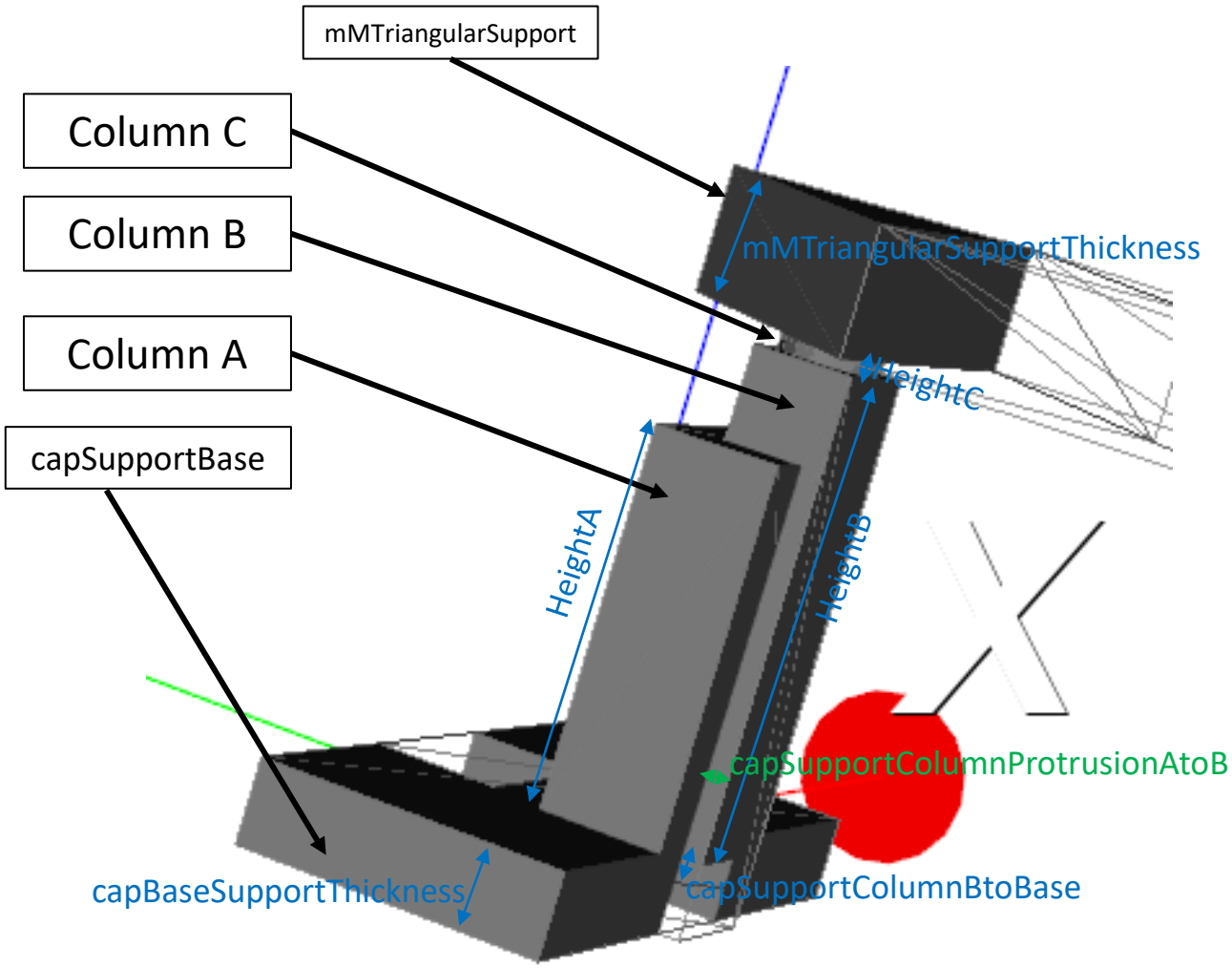

mmBaseLength
mmBaseRadius
mmBaseThickness

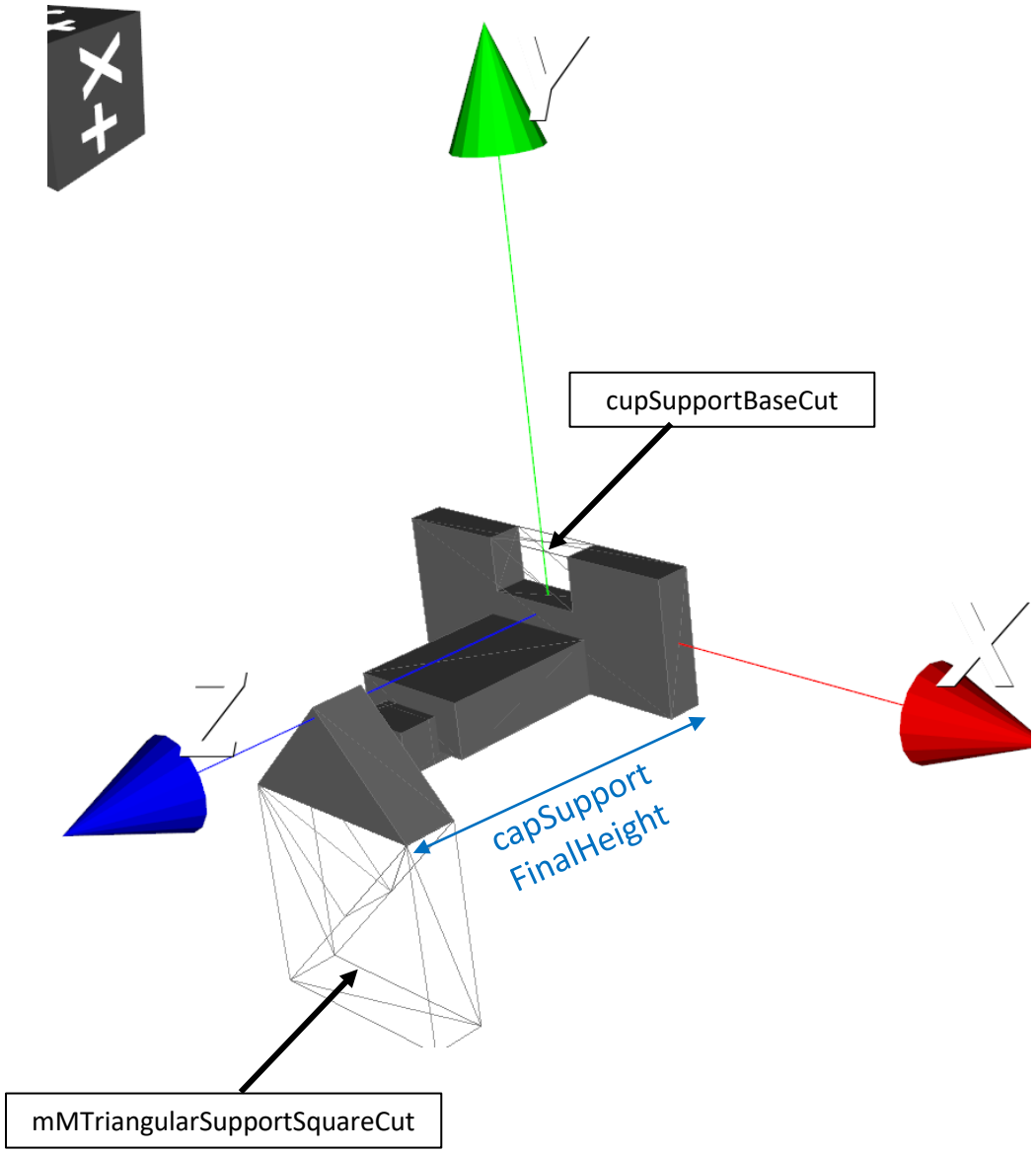

mmBaseRecessLength
mmBaseRecessThickne

mMBaseBracket

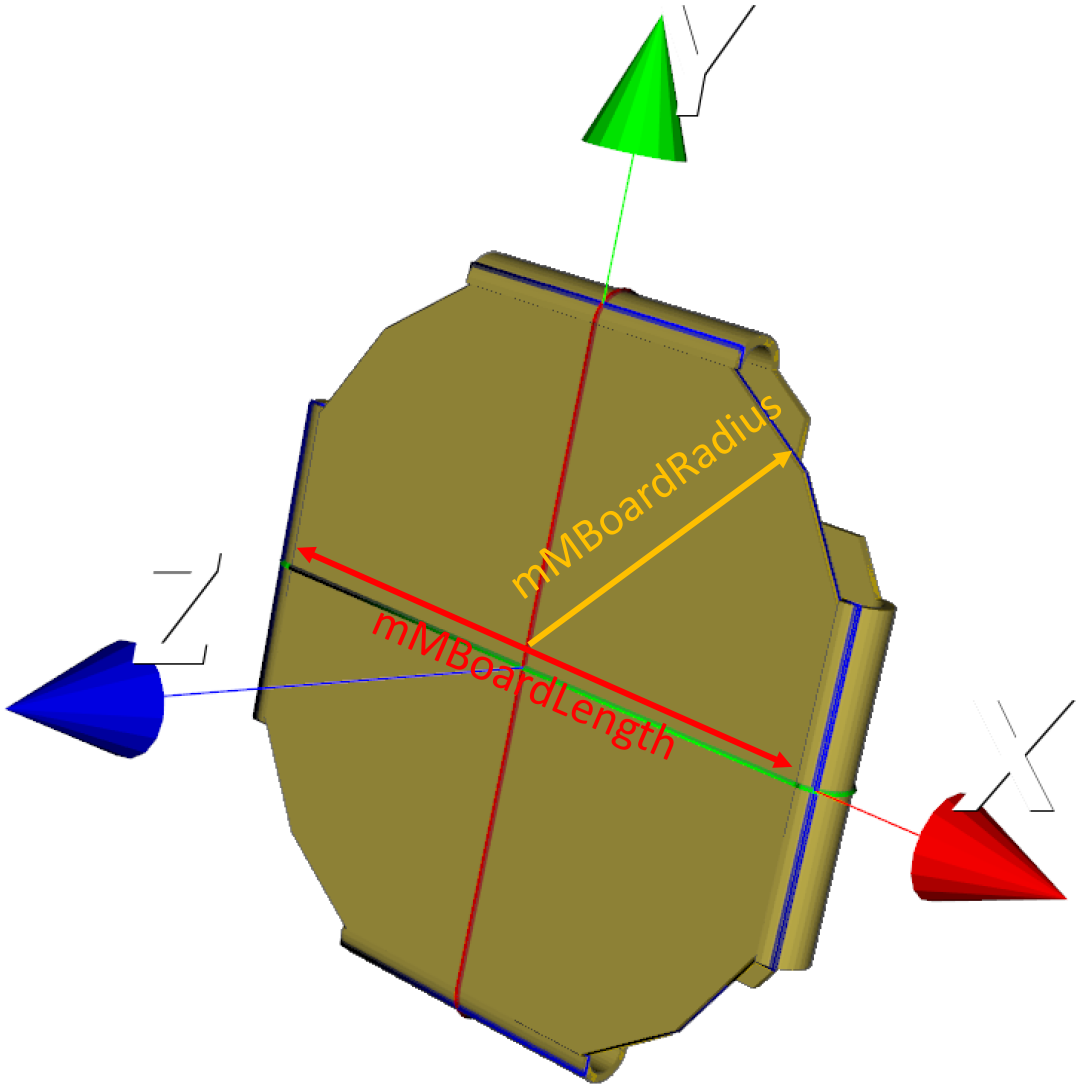


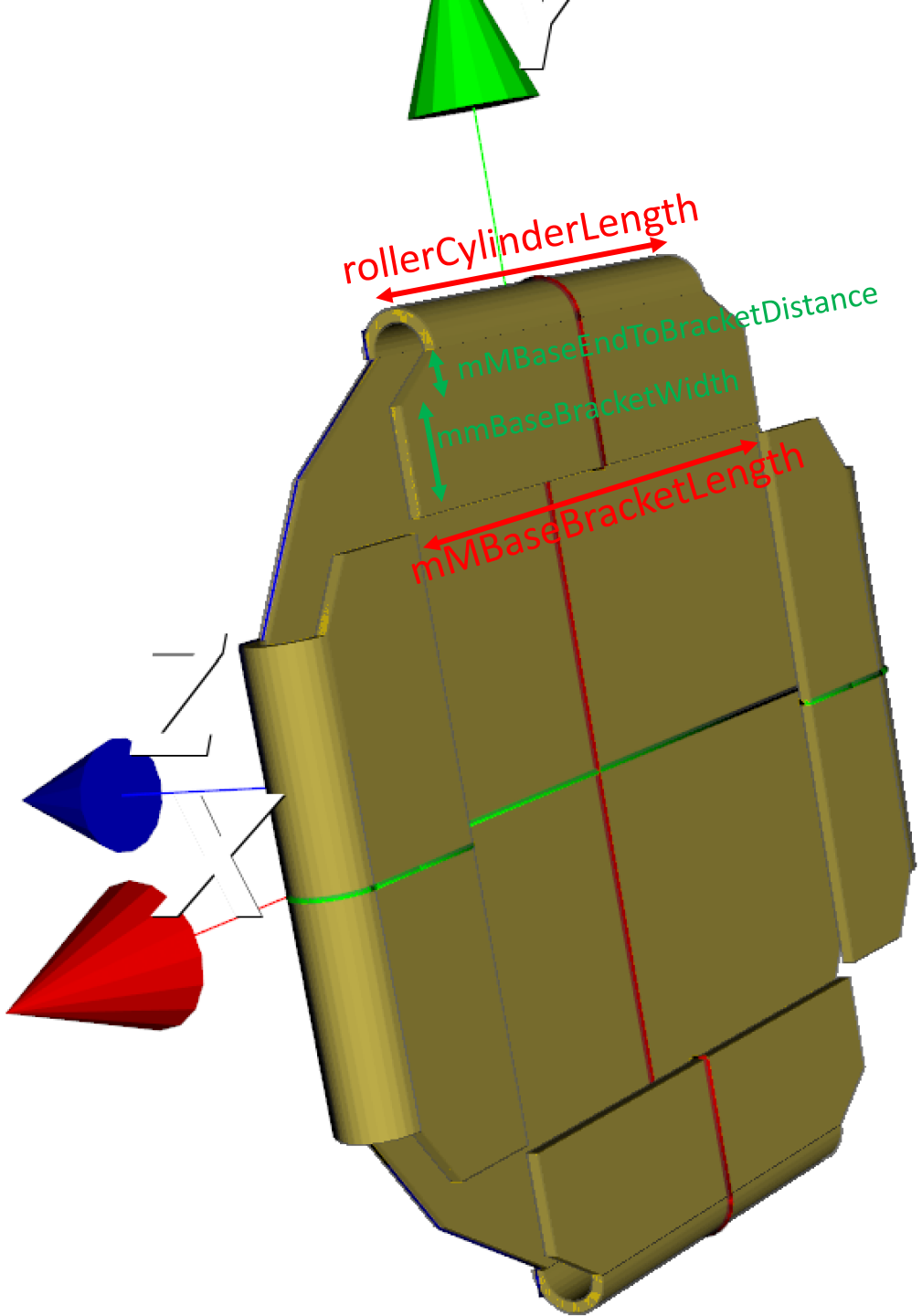
mMSupport


mMTriangularSupport
Column C
Column B
Column A
capSupportBase
mMTriangularSupportThickness
HeightC
HeightA
HeightB
capSupportColumnProtrusionAtoB
capBaseSupportThickness
capSupportColumnBtoBase


cupSupportBaseCut
capSupport
FinalHeight
mMTriangularSupportSquareCut

mMBoard


mMBoardRadius
mMBoardLength


rollerCylinderLength
mMBaseEndToBracketDistance
mmBaseBracketWidth
mMBaseBracketLength

mMBoard – thickness

```
def generate_micromegas_board(name="mMBoard", suffix="", thickness_in_mm=1, thickness_below_in_mm=0, registry=None):
    """ Generates the micromegas board geometry. It is done in this function because the board has several layers with the same shape but different materials.
    The function is meant to generate the solid of each layer which each has different thickness. Also, the inner layer is inside the other, so the inner radius
    of the fold has to be increased by the thickness_below_in_mm parameter.

    param name: Name of the final solid. This will NOT include the suffix.
    param suffix: Suffix to append to the solids needed to generate the final solid. If you call this function multiple times with the same registry,
    you must use a different suffix for each call to avoid solid name conflicts.
    param thickness_in_mm: Thickness of the layer of the board in mm.
    param thickness_below_in_mm: Thickness below the board in mm, used for the inner radius of the fold.
    param registry: Registry to use for the Geant4 objects. If None, a new registry is created.
    Returns the registry with the board geometry.
    """
```

The micromegas has 4 copper layers (mesh, X strips, Y strips, grounding) of 17um thickness separated by 2 kapton layers of 50um (amplification gap) and another one of 150um thickness. *See Hector Mirallas thesis.*

For simplicity, we model the mM board as a sandwich of copper-kapton-copper, omiting the internal 2 layers of copper. But, for the micromegas active area (25cmx25cm), we do include this 2 layers of copper (mMCopperFoilLayer2,3_PV).

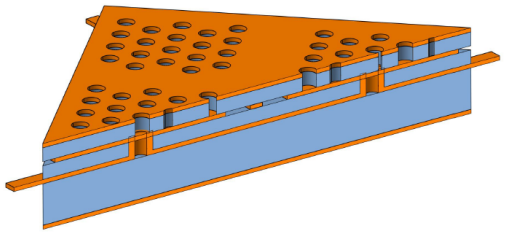
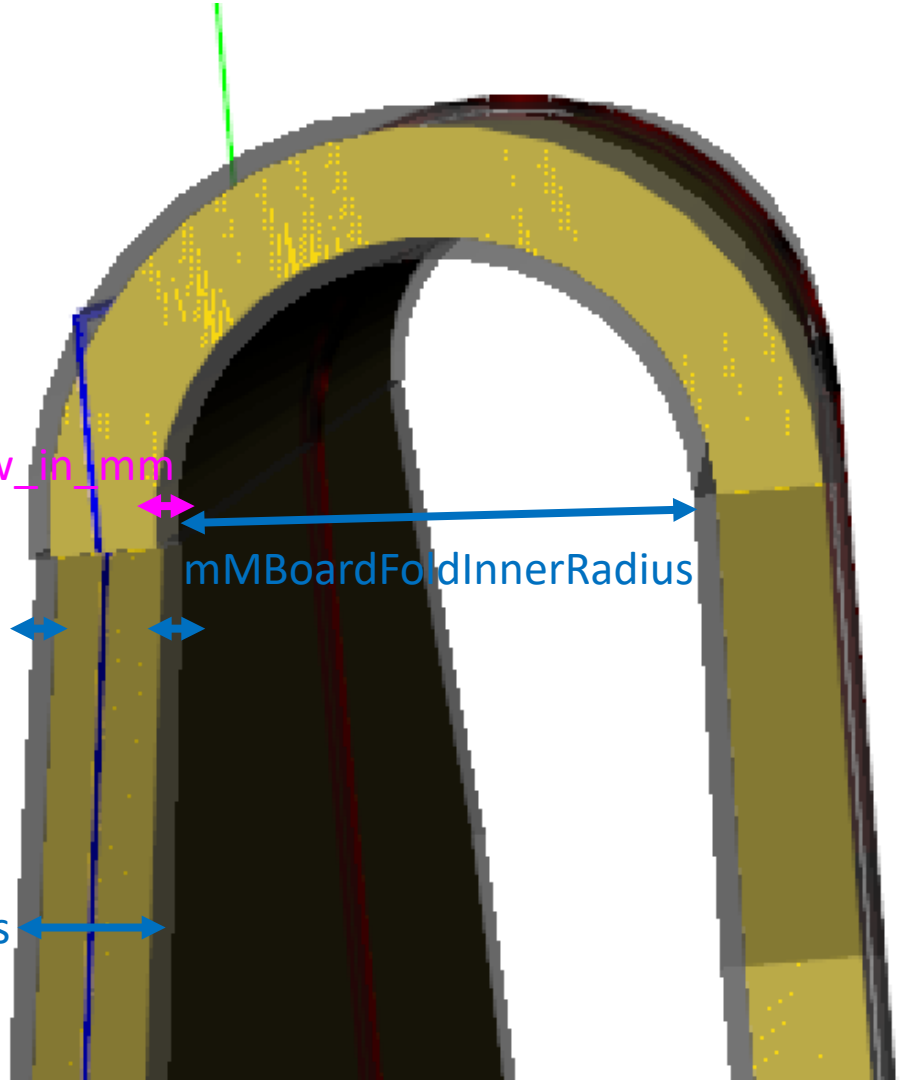


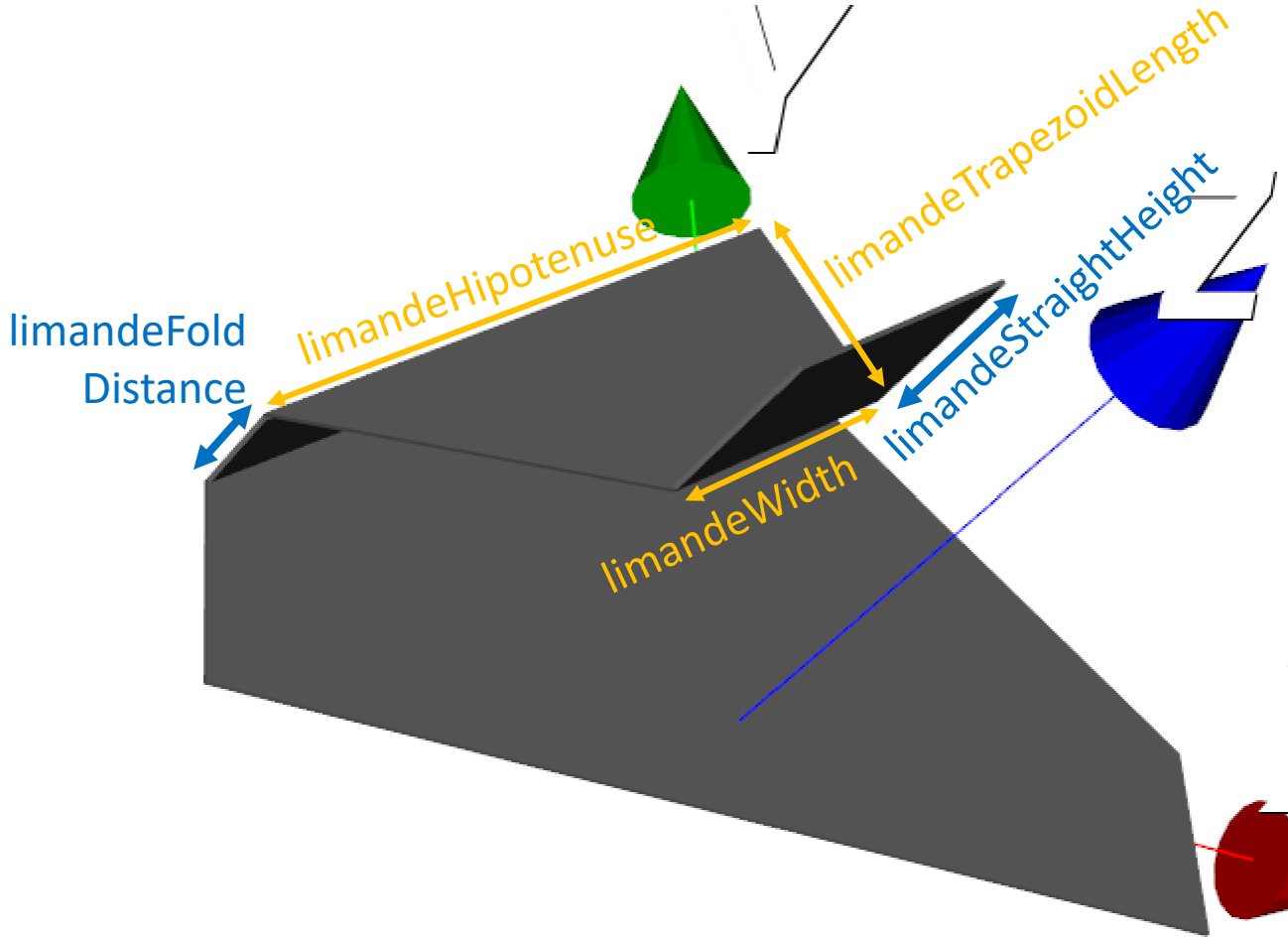
Figura 8.3: Sección del área activa de la Micromegas con el plano de tierra añadido en la parte inferior, con una separación de 150 μm respecto a la capa 3 del circuito Micromegas.

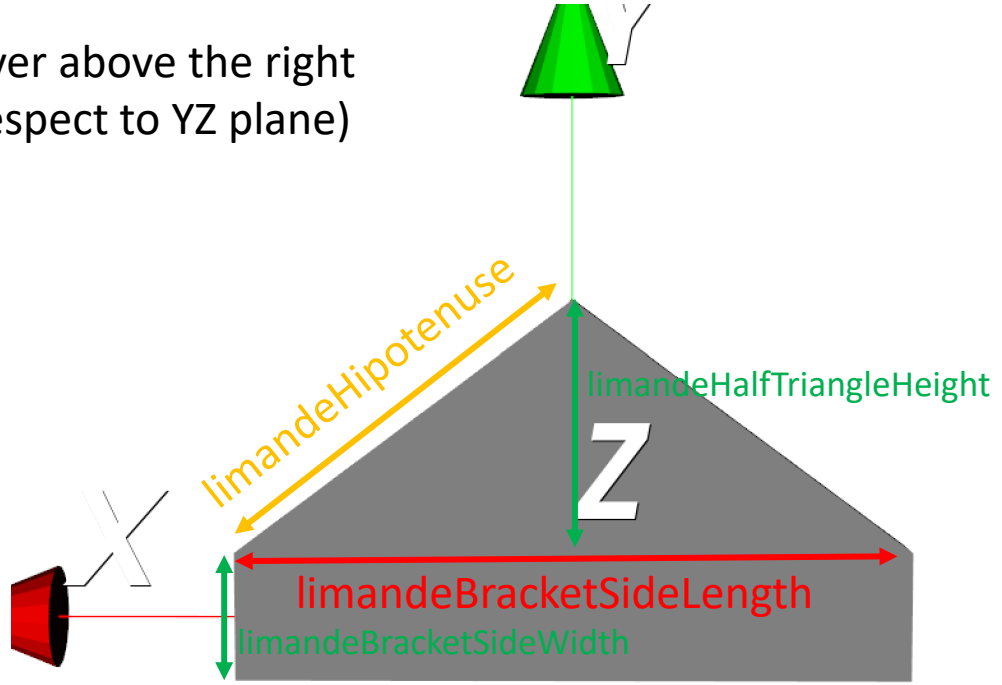


**thickness is increased for visualization purposes*

Limande A

* Limande B is the same but with the top layer above the right hipotenuse instead of the left one (mirror respect to YZ plane)

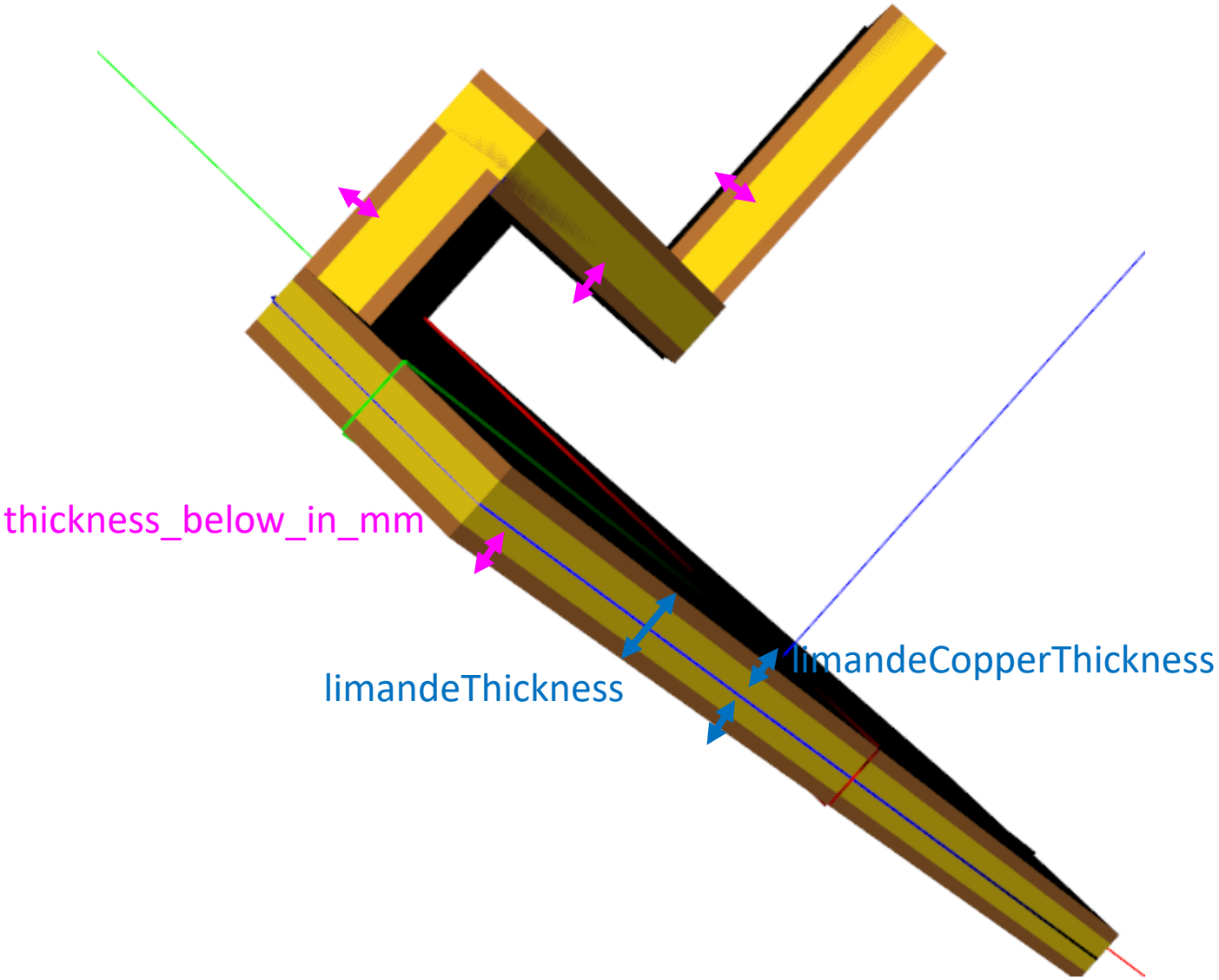




Limande – thickness

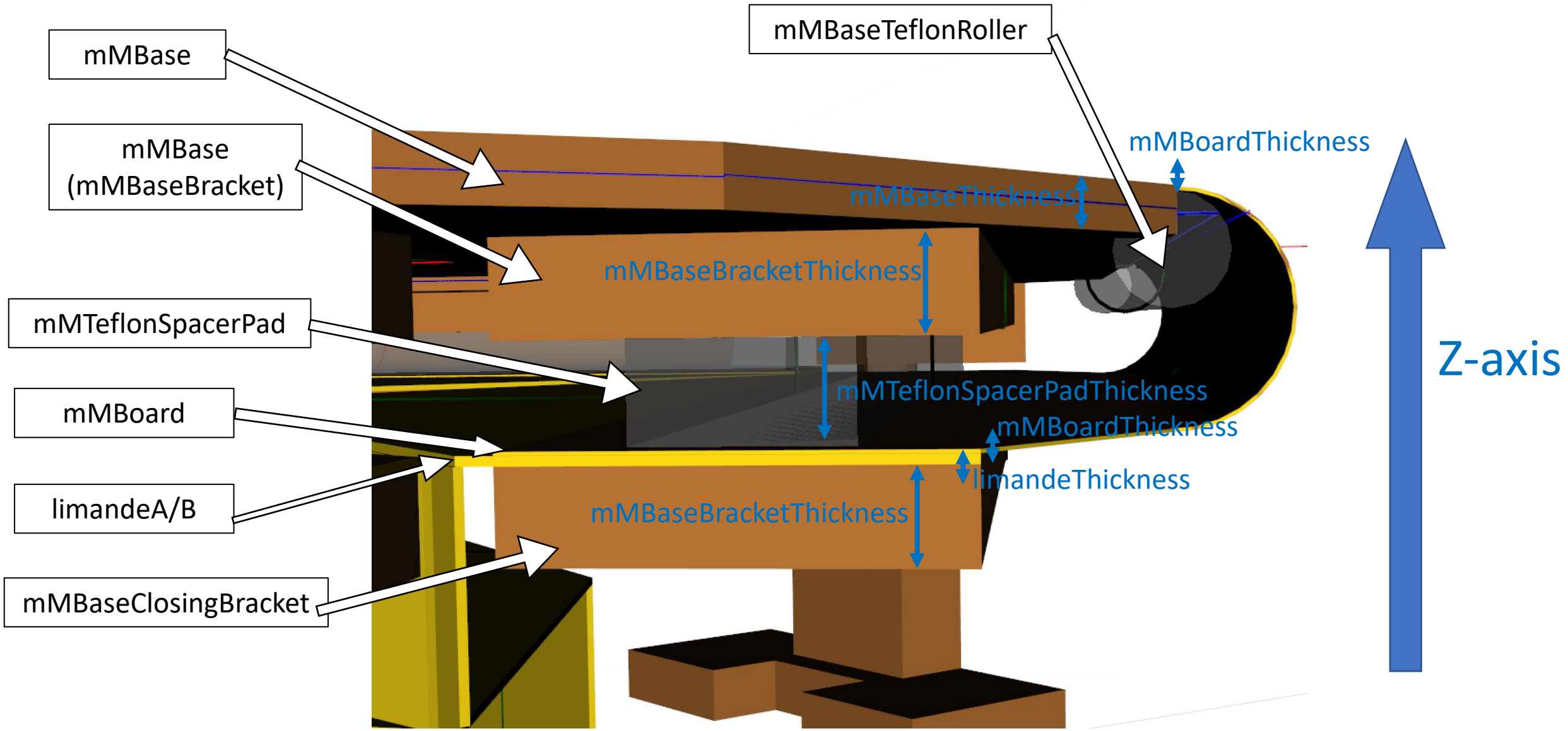
The flat cables (limandes) have 4 copper layers (mesh, X strips, Y strips, grounding) of ¿17um thickness?(I asume its the same as the mM layers) separated by 2 kapton layers of 50um (amplification gap) and another one of 350um thickness. *See Hector Mirallas thesis.*

For simplicity, we model the limandes as a sandwich of copper-kapton-copper, omiting the internal 2 layers of copper.



**thickness is increased for visualization purposes*

Closing Bracket-limande-mMBoard-mMBase



Position (Z) of the micromegas assembly wrt vessel

The center of the Micromegas assembly is at the center of the mMBase. So the Micromegas assembly must be placed a distance:

capSupportFinalHeight + mMBaseThickness/2

from the vessel end cap.