SIT AND FTD DESIGN FOR ILD

Rod and Petals modules modeling

SIT DESIGN GUIDELINES

- 1 Rod contains 4 sensors in the case of the inner layer and 7 in the case of the outer layer
- Module design is compatible with 6” wafers
- The following numbers are for 2.5 cm strips length
- The Sit has 6 rods at inner layer and 12 rods at the outer layer

SIT module design

- Design for 2.5 cm strip length
- Sensor glued on 2 TPG strips
- TPG strips on both side of sensors
- Hybrid with chip’s glued on sensor, strip side, above the TPG strip
- DC-DC converter glued on the TPG strip of the sensor.
- One DC-DC converter powers 2 hybrids
- r/o chip: 128 channels , 50 um pitch
- Two options
  - Same pitch for the sensor an the r/o chip
  - Alternatively, integrate the pitch adapter in the sensor (double metal layer)

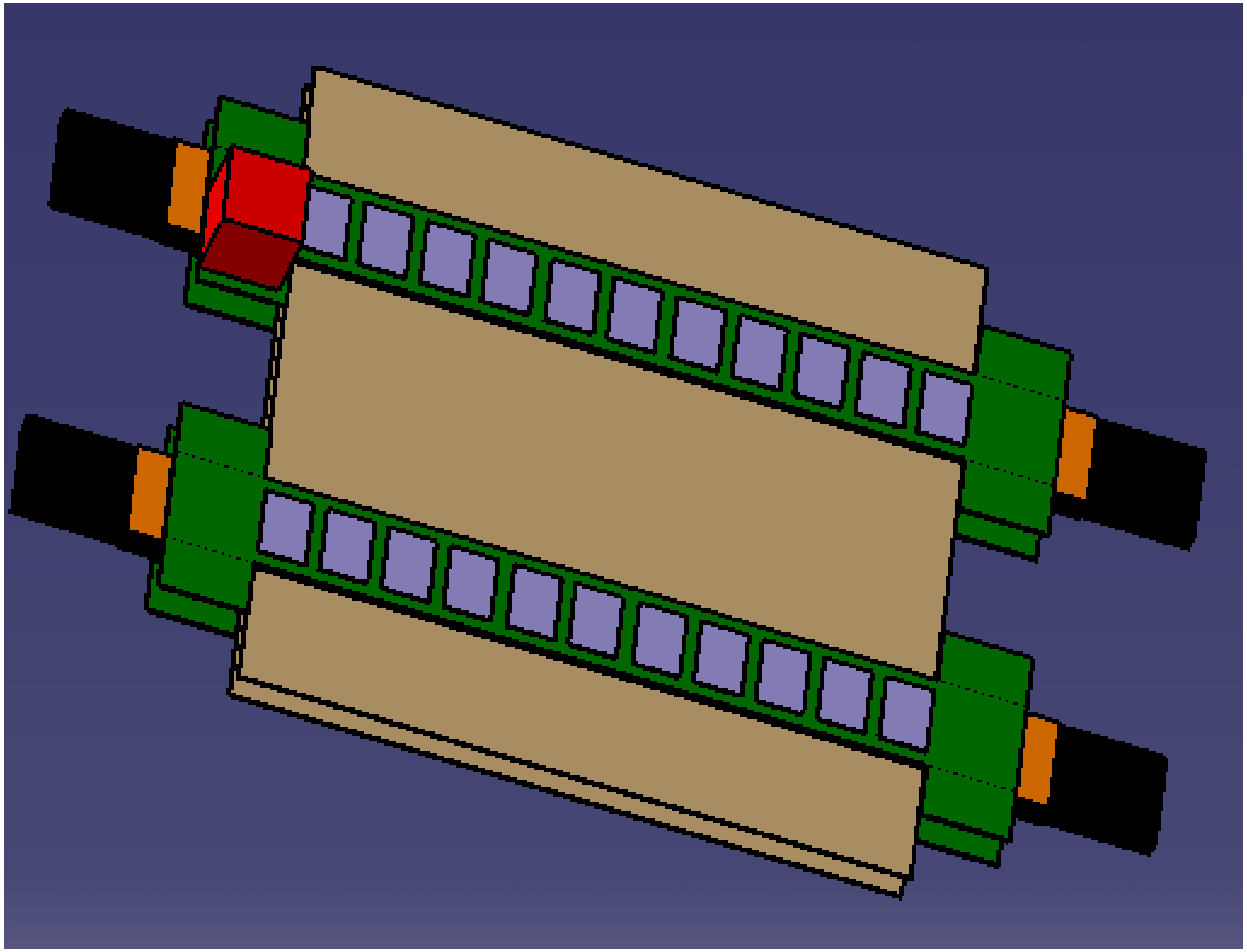
Dimensions

- Rod envelope 143 x 20 x 645 / 371 mm
- Sensor 200 micron, 84.5 x 100.3 mm (50 um strip)
- TPG strip 0.3 mm thick, 14 x 116 mm
- Hybrid envelope 30 x 107 x 0.3 mm
- Connector 9 x 5 x 4 mm
- DC-DC converter 35 x 20 mm
- Coil on DC-DC converter 12 x 12 x 9 mm
- Optohybrid 84,5 x 70 mm
- Optoconverter 50 x 14 x 9 mm

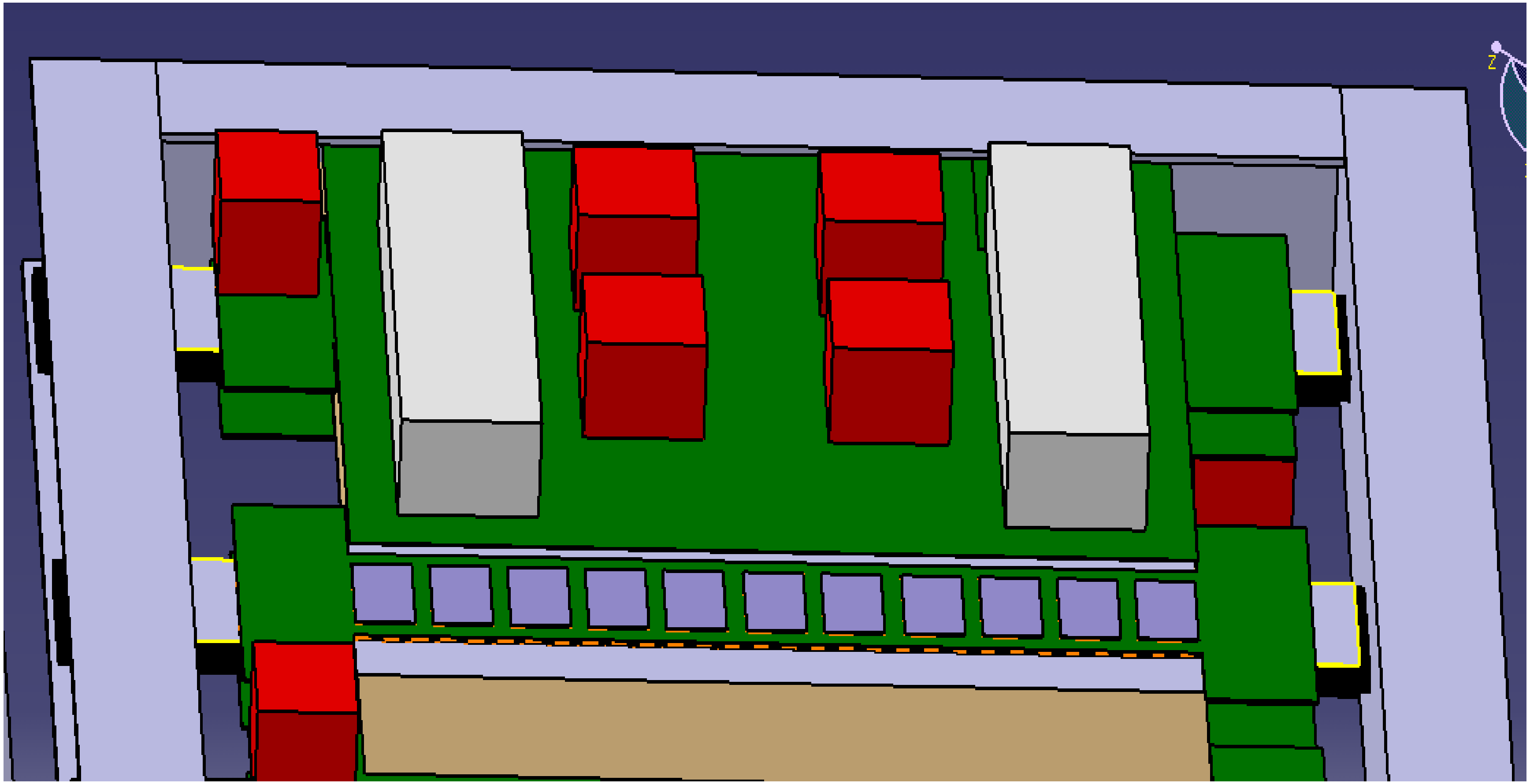
Cabling

- 1 HV cable per sensor
- 2 twisted pairs for readout per 2 Chips' = 52 tp per module = 208 tp per inner rod /364 tp per outer rod
- 1 supply cable per DC-DC converter (12 V)
- 1 output (1-2 V) connector per DC-DC converter containing 2 cables for 2 hybrids

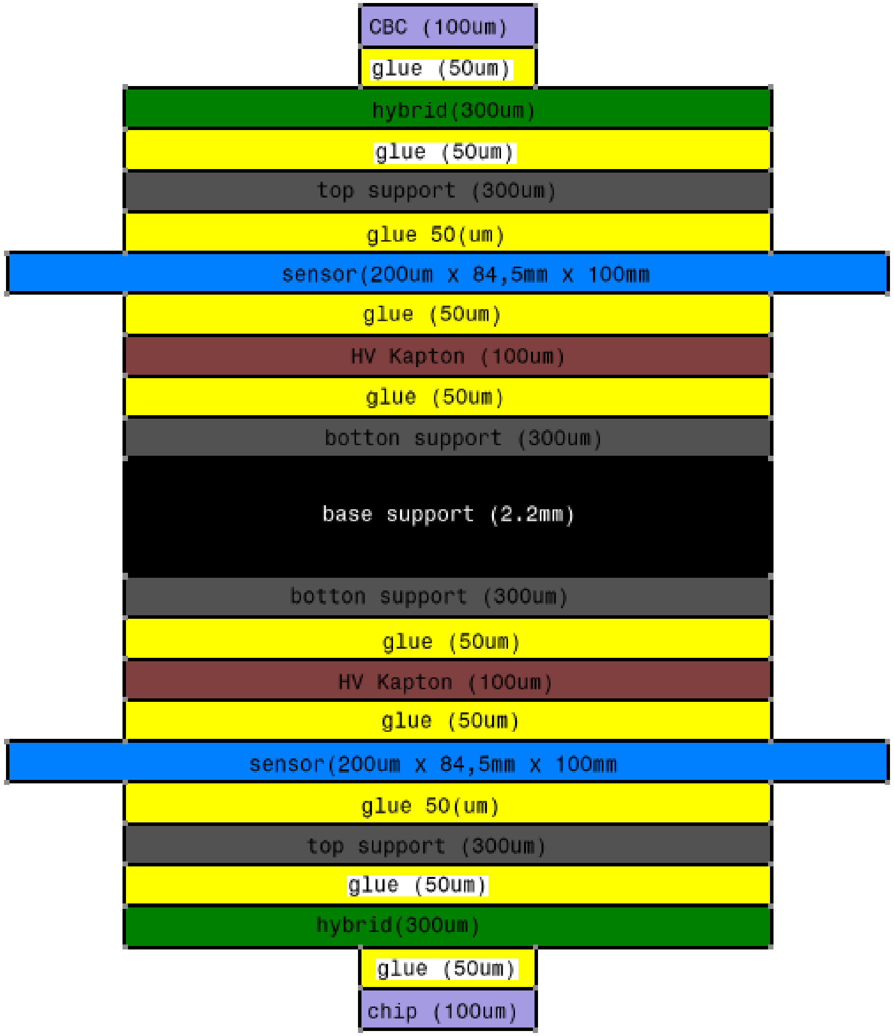
SIT FRONT END ELECTRONIC



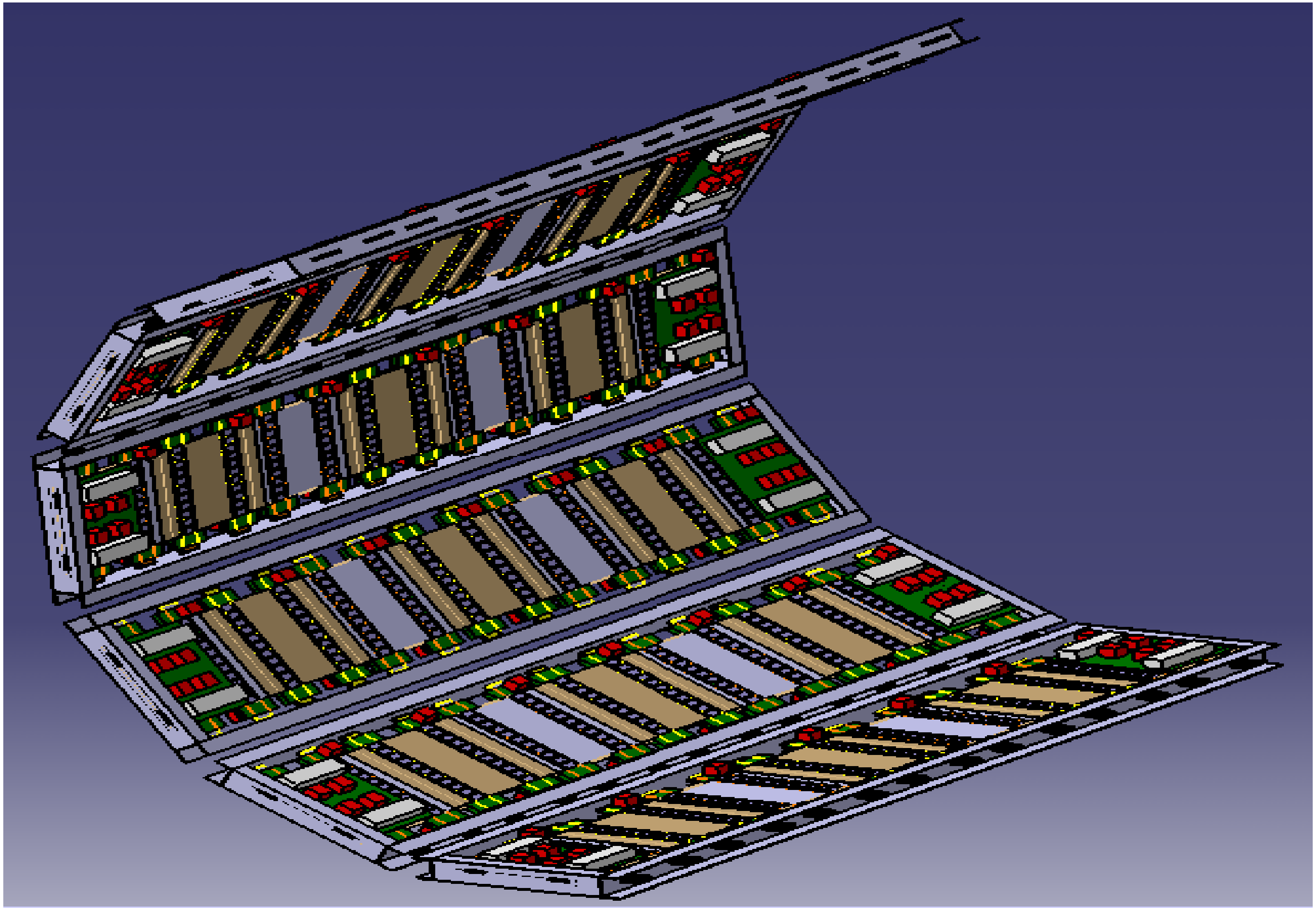
SIT OPTOHYBRID



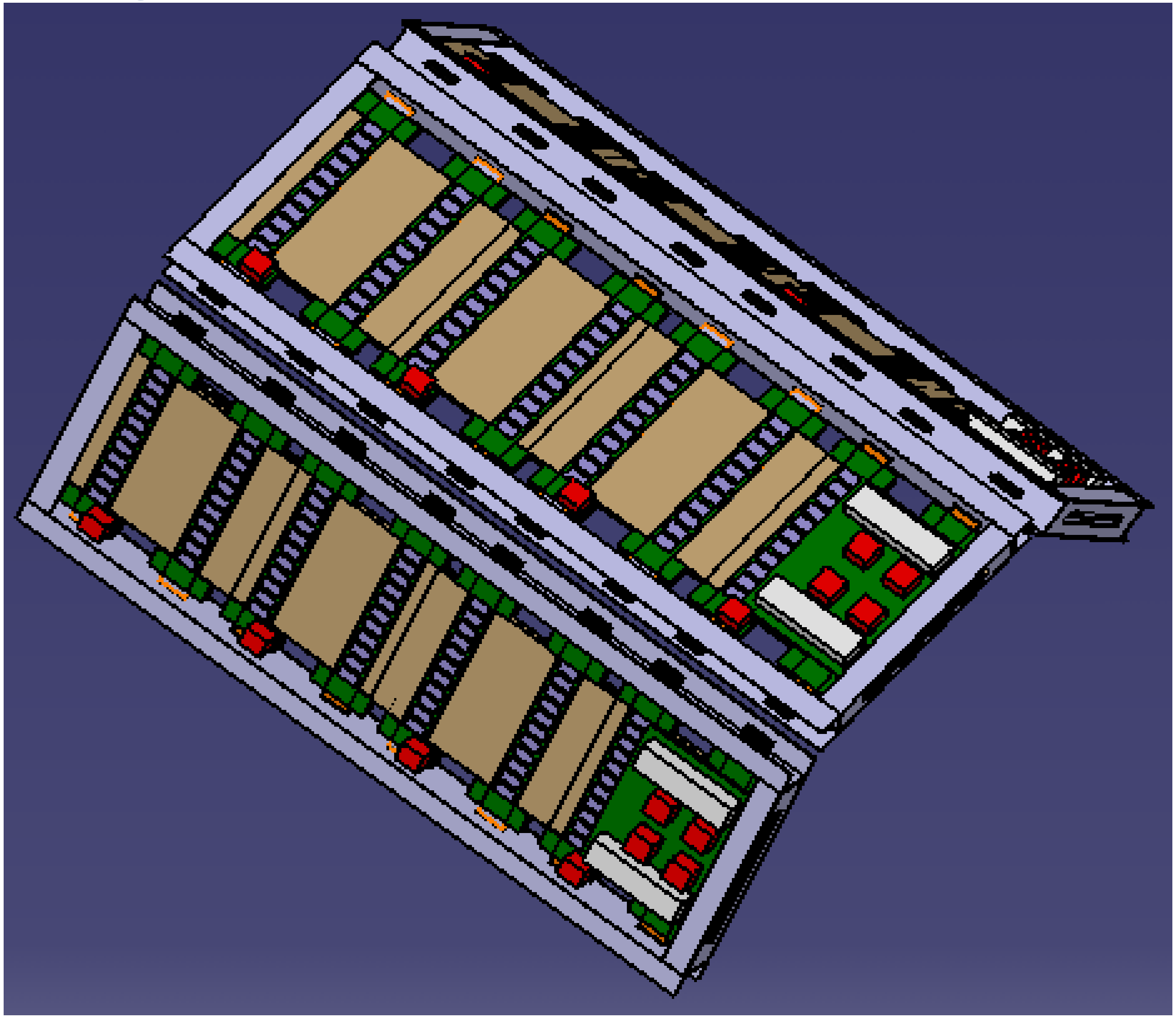
MODULE LAYOUT



SIT EXTERNAL LAYER



SIT INTERNAL LAYER



FTD MECHANICAL STRUCTURE

- First Step:
  - Define the Front End electronic of the module
  - This will allow us to make a more realistic mechanical design of the module:
- Once the Front end is defined:
  - Will start defining the cable rooting, cooling and Simulations

FTD Module Design

- 4 sensors per petal. 2 sensors per side in Stereo (6º / -6º)
- Sensors in a 6” wafer
- Front end electronic design same as SIT but without bottom support

FTD MODULE DESIGN

- Sensor glued on petal directly
- Hybrid with chip’s glued on sensor, strip side, above the TPG strip
- DC-DC converter glued on the TPG strip of the sensor.
- One DC-DC converter powers 2 hybrids

Dimensions

- Sensor size different depending of the FTD disk and the position in the petal.
- TPG strip 0,3mm
- Hybrid envelope 30 x 0.3 mm (131,365mm maximum length)
- Connector 9 x 5 x 4 mm
- DC-DC converter 35 x 20 mm
- Coil on DC-DC converter 12 x 12 x 9 mm
- Optohybrid geometry to be defined
- Optoconverter 50 x 14 x 9 mm

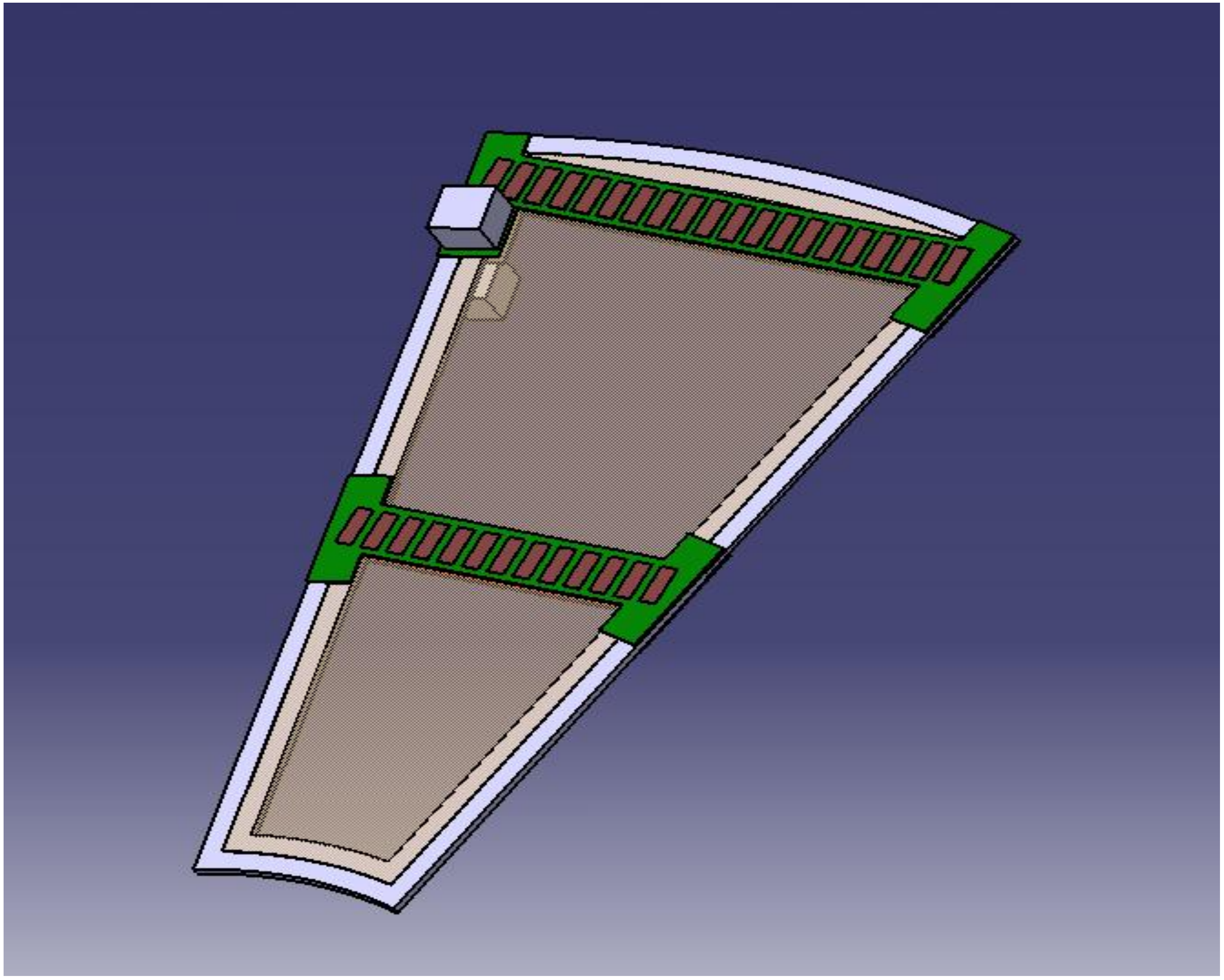
FTD Cabling

- 1 HV cable per sensor
- 2 twisted pairs for readout per 2 Chips'
- 1 supply cable per DC-DC converter (12 V)
- 1 output (1-2 V) connector per DC-DC converter containing 2 cables for 2 hybrids

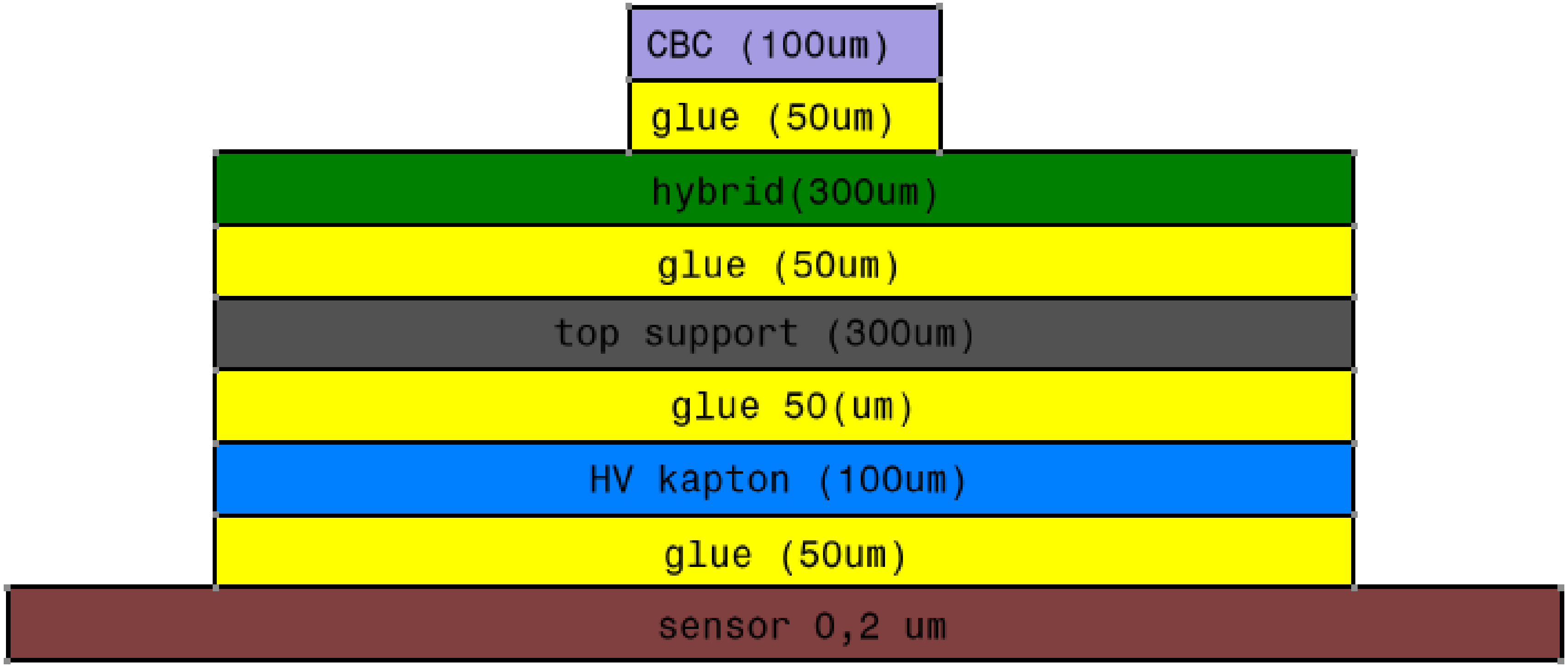
FTD ROUTING

- Will be defined by the chosen front end electronic of the module.
- Routing:
  - The SIT, Vertex and FTD cables will go between the Beam Pipe and the FTD Disks after the 2nd FTD. Before it would be better the cables to go between the disk an the support structure.
  - It must be know the total quantity of cable of all the subdetectors to make a good routing and a good mechanicals design of the routing.

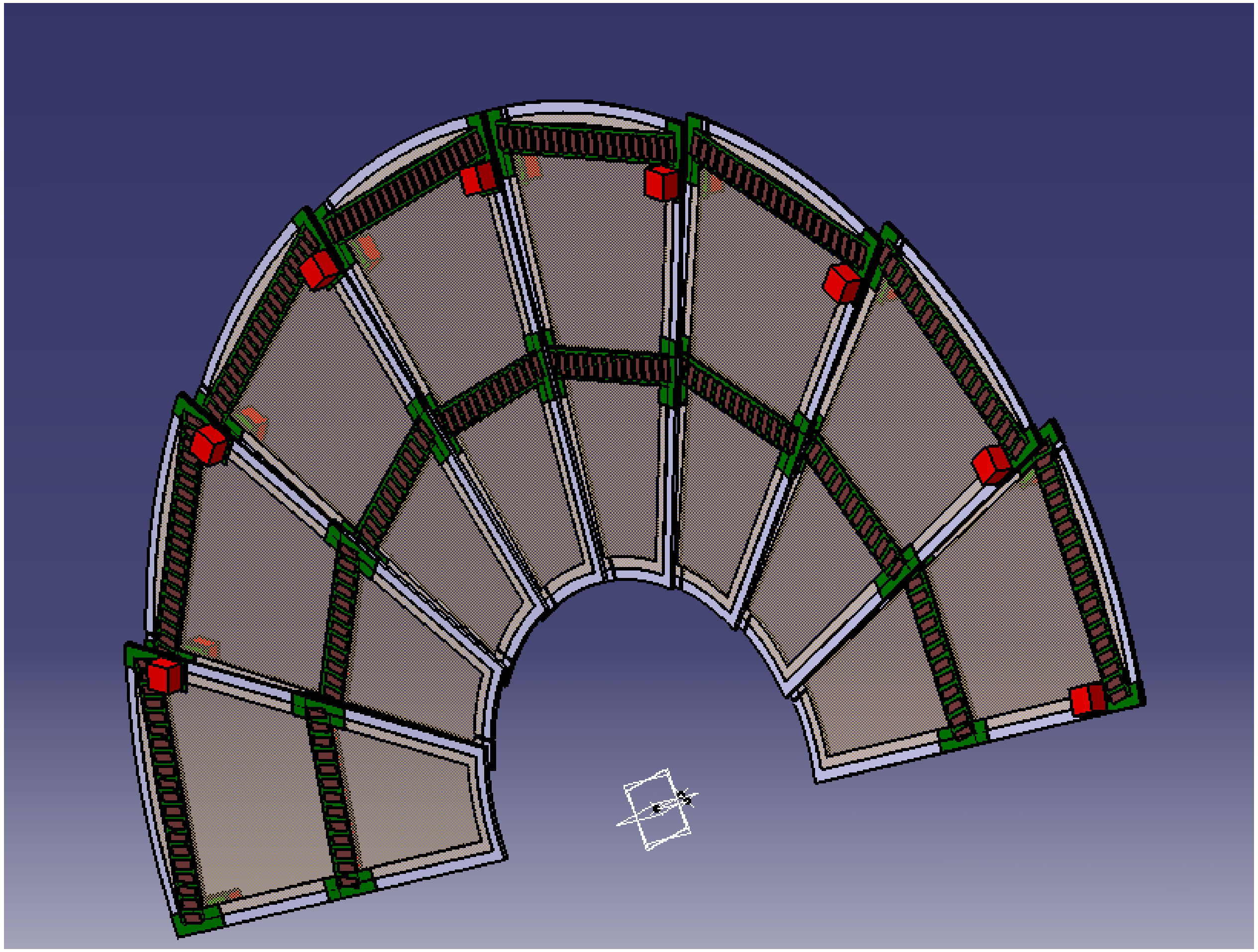
FTD PETAL DESIGN



FTD MODULE LAYOUT



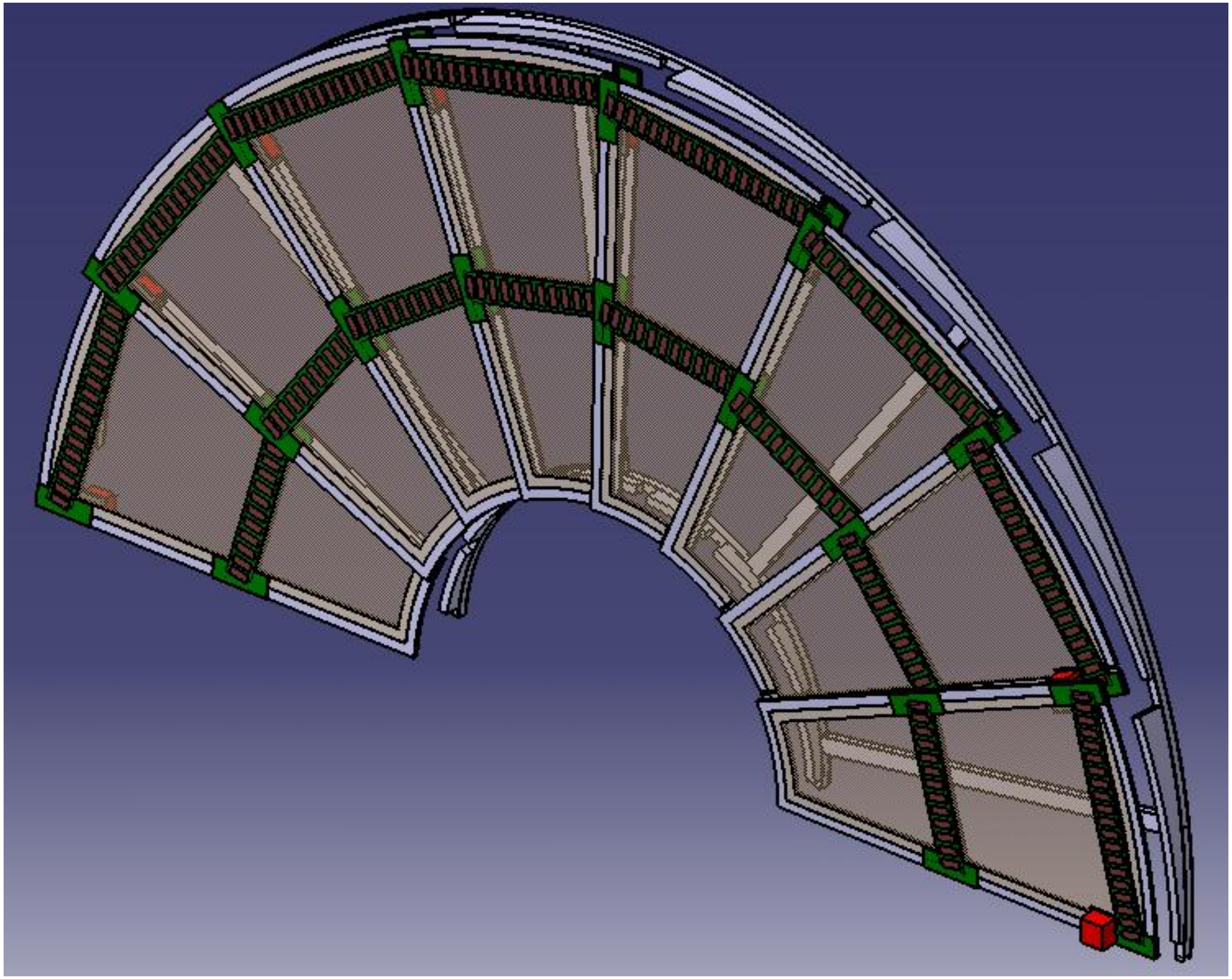
4th FTD DISK



SUPPORT STRUCTURE

- Petals will be assembled to a ring shape support structure
- In the actual design the petals would be glued in a toothed ring.
  - It would be better an assembly by aluminium inserts.

SUPPORT STRUCTURE



Mechanical Design Checking

- It must be done a mechanical simulation of all the structure:
  - In order to obtain stress, strain an displacements of the structure and the natural frequency's.
  - For this wee need information about typical materials used in the Particles physics
  - Compare with the high module MTM45/IM7 (it will be tested in radiation environment to obtain the change in the mechanical parameters
  - Perhaps a change of the design will be needed.

FTD Cooling

- We would need to do some thermal simulations
  - We would need for a realistic simulation
    - Thermal properties of the material
    - Convection coefficients
    - Chip produced heat

Bt SUPPORTED BY FTD

- Mechanical simulation needed:
  - The last design of the Beam Tube and materials
- We think that it could be possible but before we must see the strain induced by the beam Tube in the FTD

CONCLUSIONS

- SIT AND FTD FRON END ELECTRONIC DESIGN
- SIT LADDERS AND FTD DESIGN
- MECHANICAL AND THERMAL SIMULATIONS MUST BE DONE FOT BOTH
- INITIAL DESIGN: OPENED TO DISCUTION AND CHANGES.