



# **Ciemat Mechanical Structure Proposal for a SDHCAL m<sup>3</sup> Prototype of GRPCs and MICROMEAS.**

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The showed CAD files are on the following web:

[http://wwwae.ciemat.es/~calvo/ILC\\_CALICE/Drawings/HCAL\\_module/DHCAL\\_1m3\\_prototype/V1\\_GRPc-MICROME GAS/](http://wwwae.ciemat.es/~calvo/ILC_CALICE/Drawings/HCAL_module/DHCAL_1m3_prototype/V1_GRPc-MICROME GAS/)

And here this presentation:

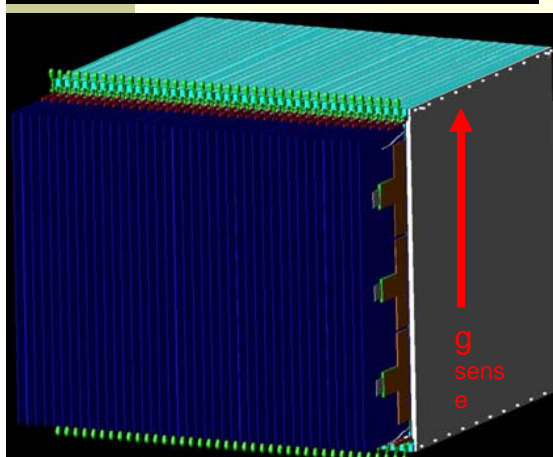
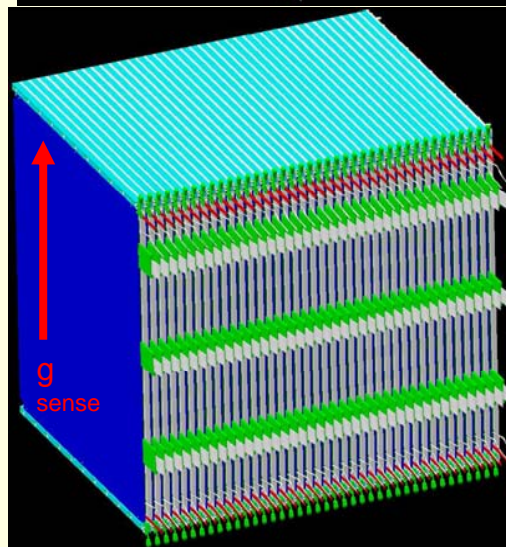
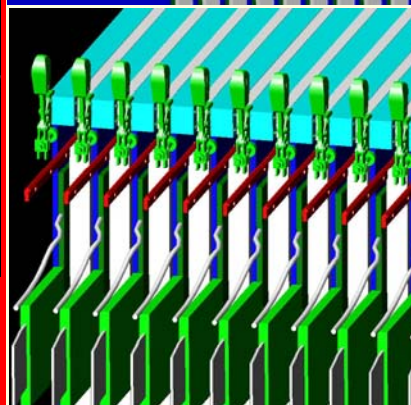
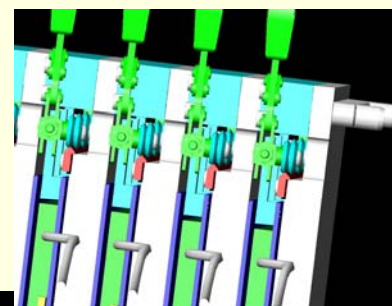
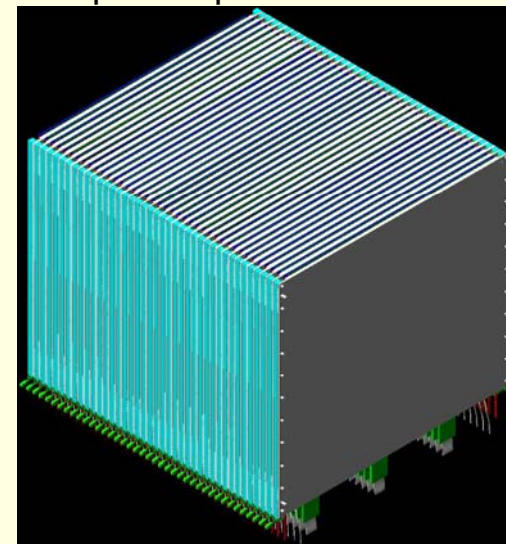
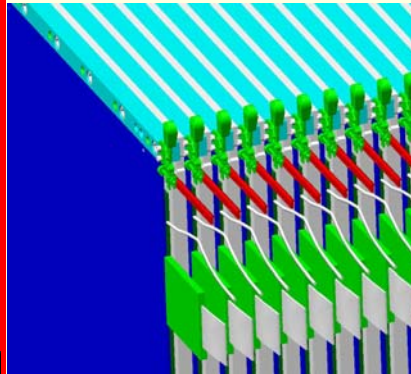
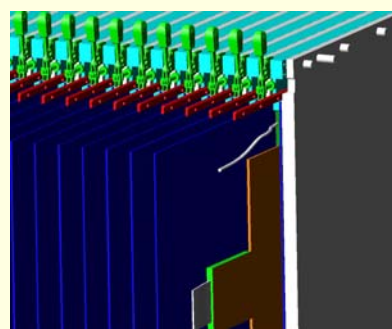
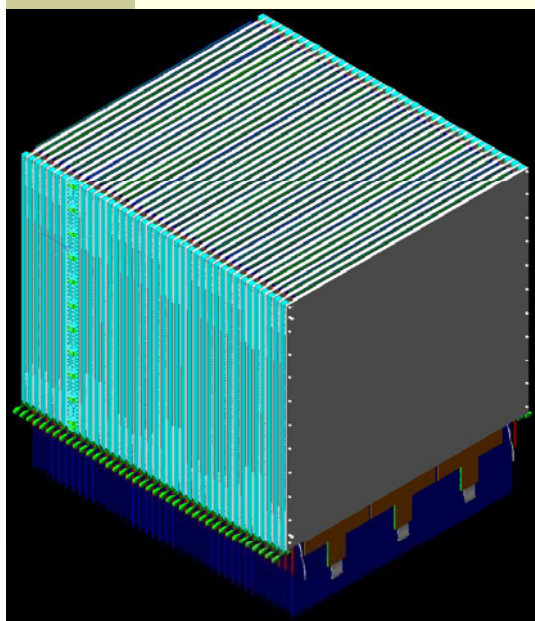
[http://wwwae.ciemat.es/~calvo/ILC\\_CALICE/Presentations/](http://wwwae.ciemat.es/~calvo/ILC_CALICE/Presentations/)

# 1.- 3D SDHCAL m<sup>3</sup> modular structure.

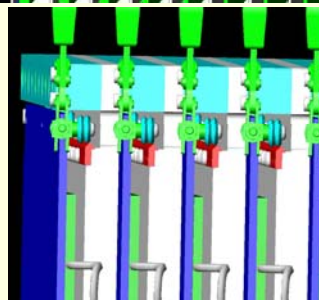
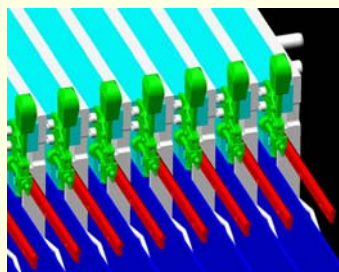
Here it is shown the 3D of 1 DHCAL m<sup>3</sup> modular structure:

- Composed by 40 layers of 31 mm thickness, 20 mm of them are absorber.
- Each detector layer has 3/6 DIF Board, 2 gas pipes and guide rails.
- The gravity direction is shown on the pictures.
- This modular 'cassette' structure can be used with MICROMEGAS (MMs in the next transparencies) (Left figs) and GRPC (Right figs) technologies.

-An external structure can be fixed to this module by the M10 screws sited on the spacers pieces.



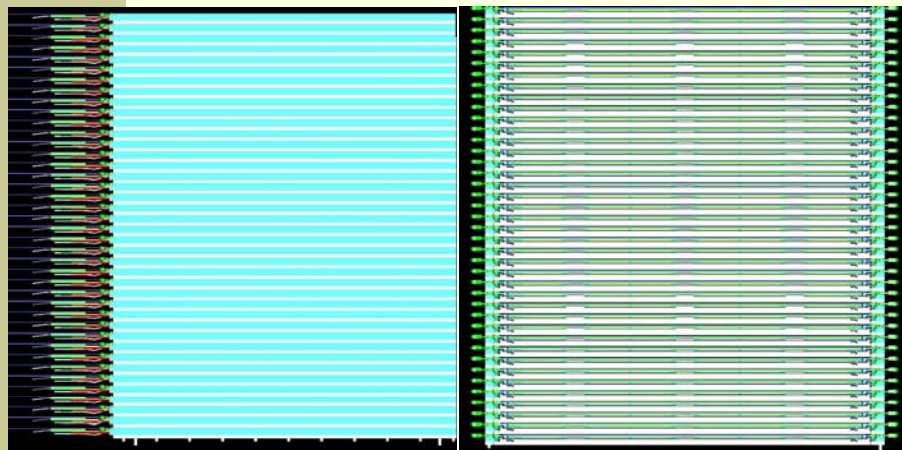
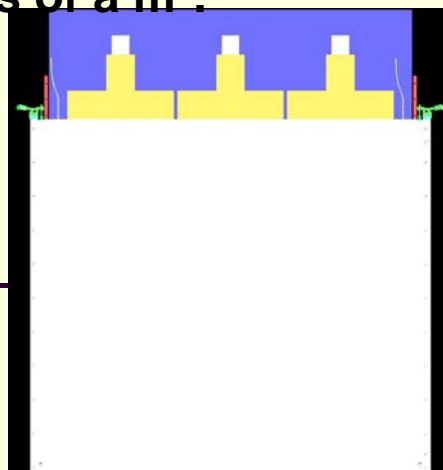
Details of the distribution.



## 2.- Orthogonal views of a m<sup>3</sup>.

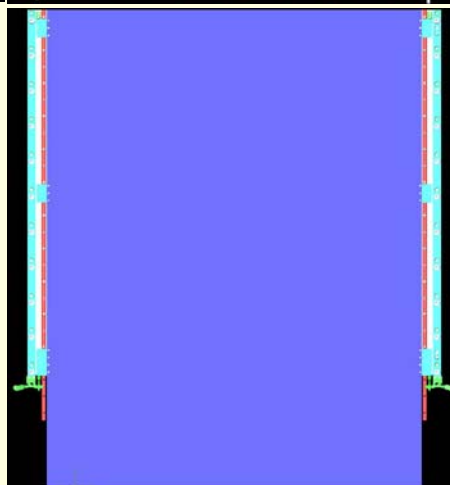
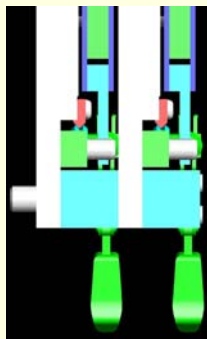
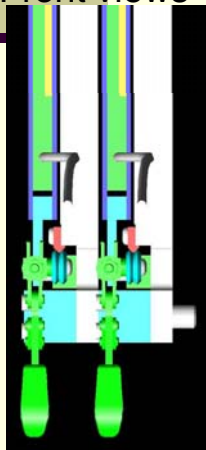
The calorimeter has 1240 mm on the beam direction, 800 mm of them are stainless steel.  
The base support absorber structure is the same for both technologies.

MMs

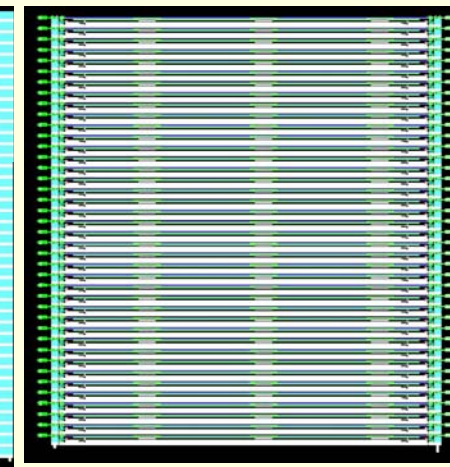
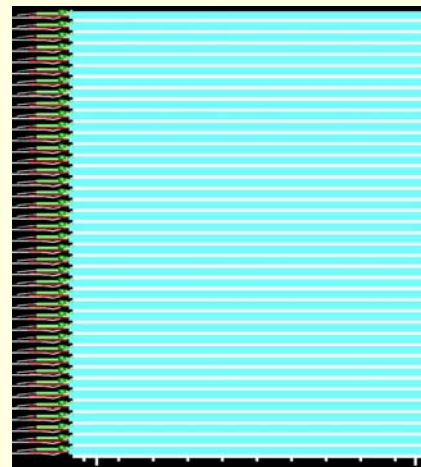


Front views

Rear view

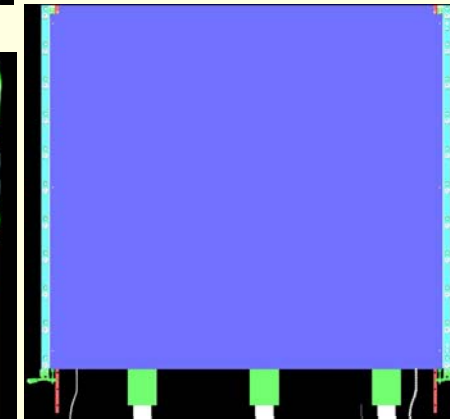
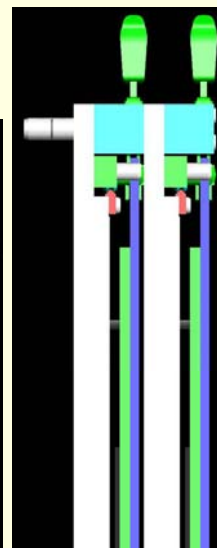
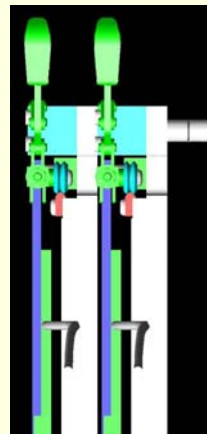


GRPCs



Rear view

Front views



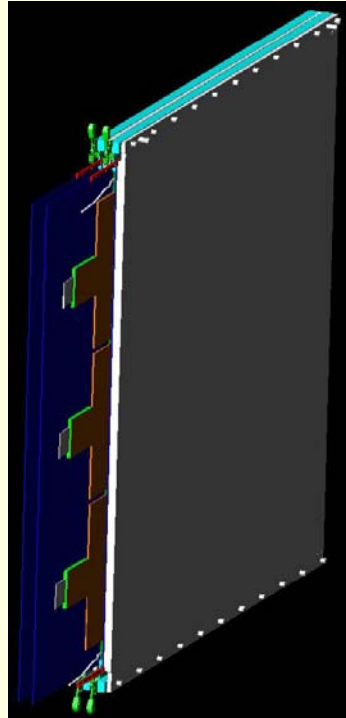
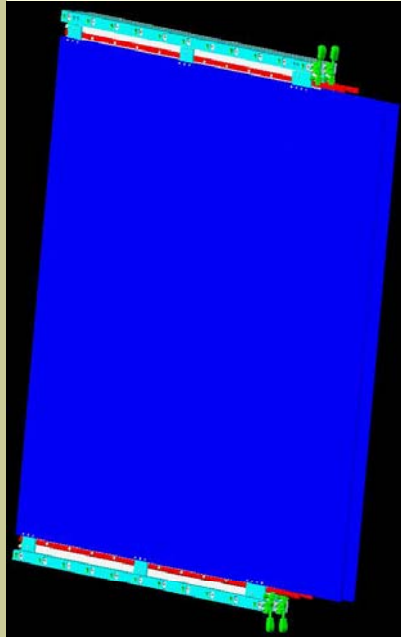
### 3.- Basic modular distribution.

The layout distribution is modular. And can be piled as many layers as we need to assembly 1 m<sup>3</sup> module.  
The basic repeat units is composed by two layers of 31 mm each (Showed on the figures)

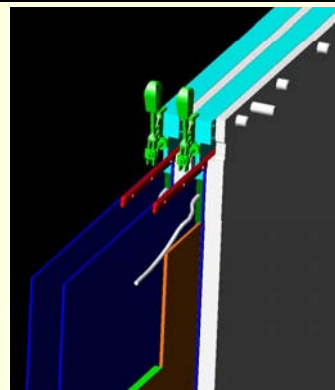
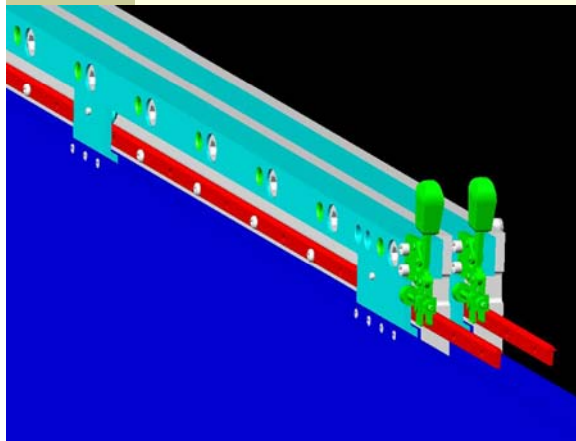
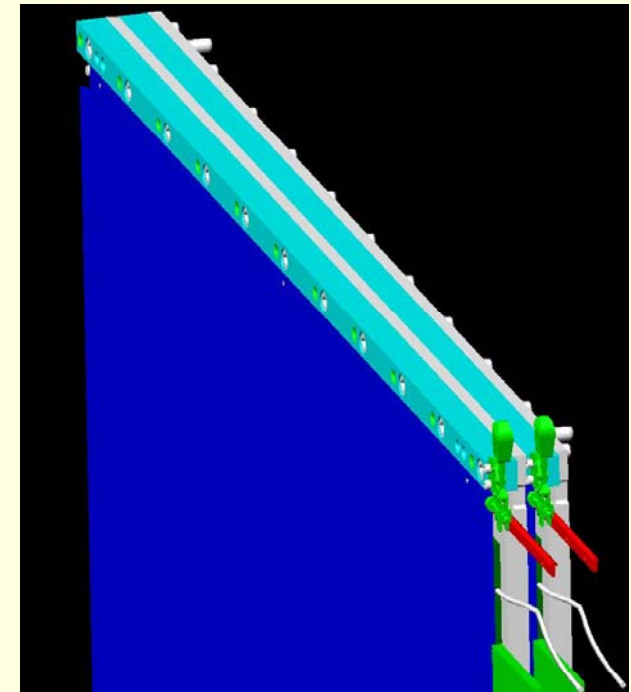
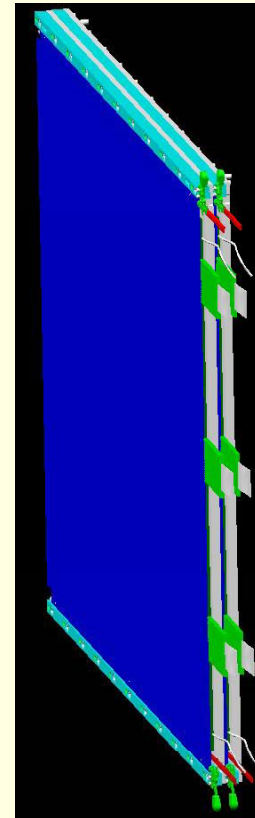
The absorber structure is composed by:

- Absorber layer (White color).
- Top and Bottom Spacers (Blue color), between absorber. With 2 Pins Holes on the extremes, to align layers.
- Support-absorber plates of the active modules (navy blue).

MMs



GRPCs



## 4.- Overall dimensions of each kind of module.

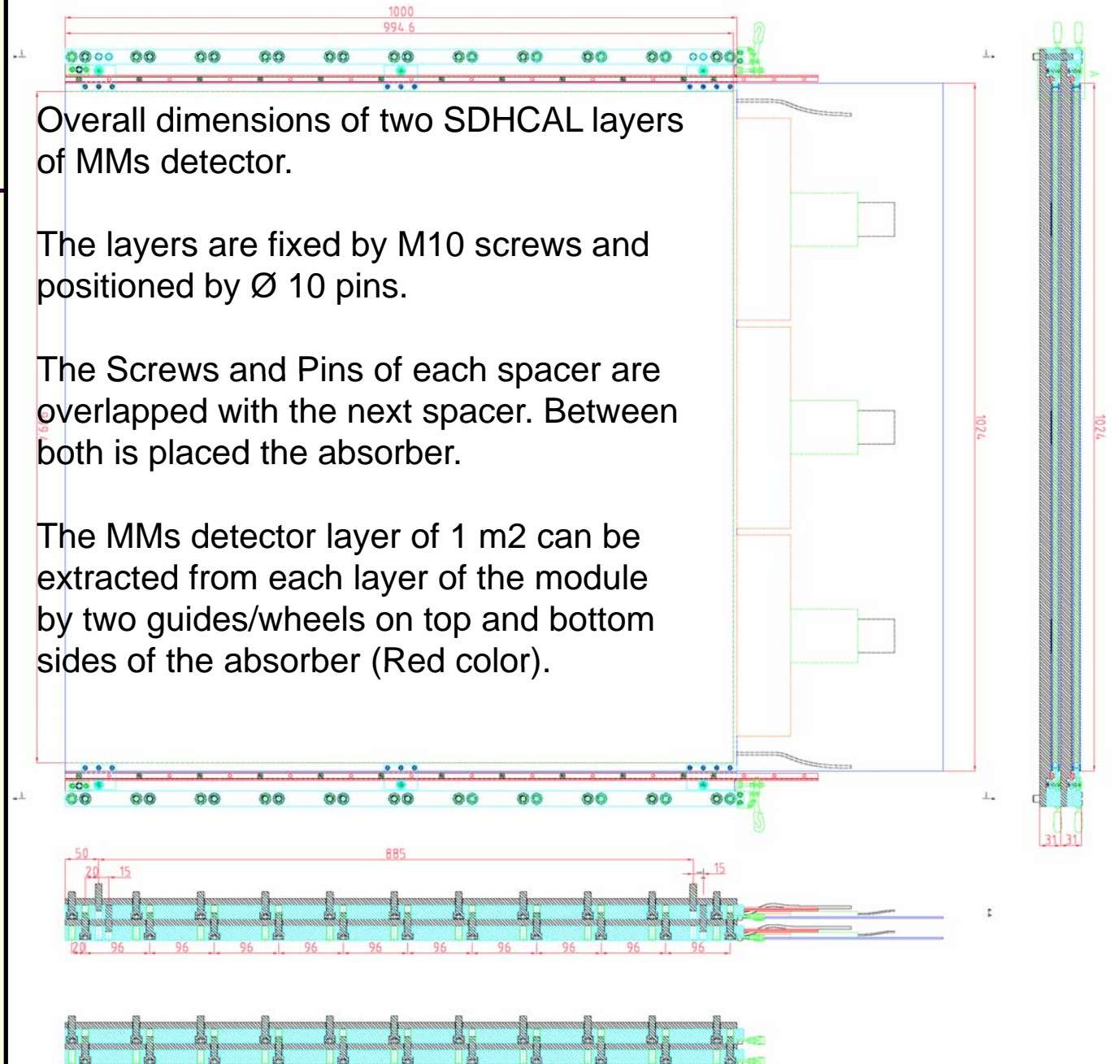
MMs

Overall dimensions of two SDHCAL layers of MMs detector.

The layers are fixed by M10 screws and positioned by  $\varnothing 10$  pins.

The Screws and Pins of each spacer are overlapped with the next spacer. Between both is placed the absorber.

The MMs detector layer of 1 m<sup>2</sup> can be extracted from each layer of the module by two guides/wheels on top and bottom sides of the absorber (Red color).



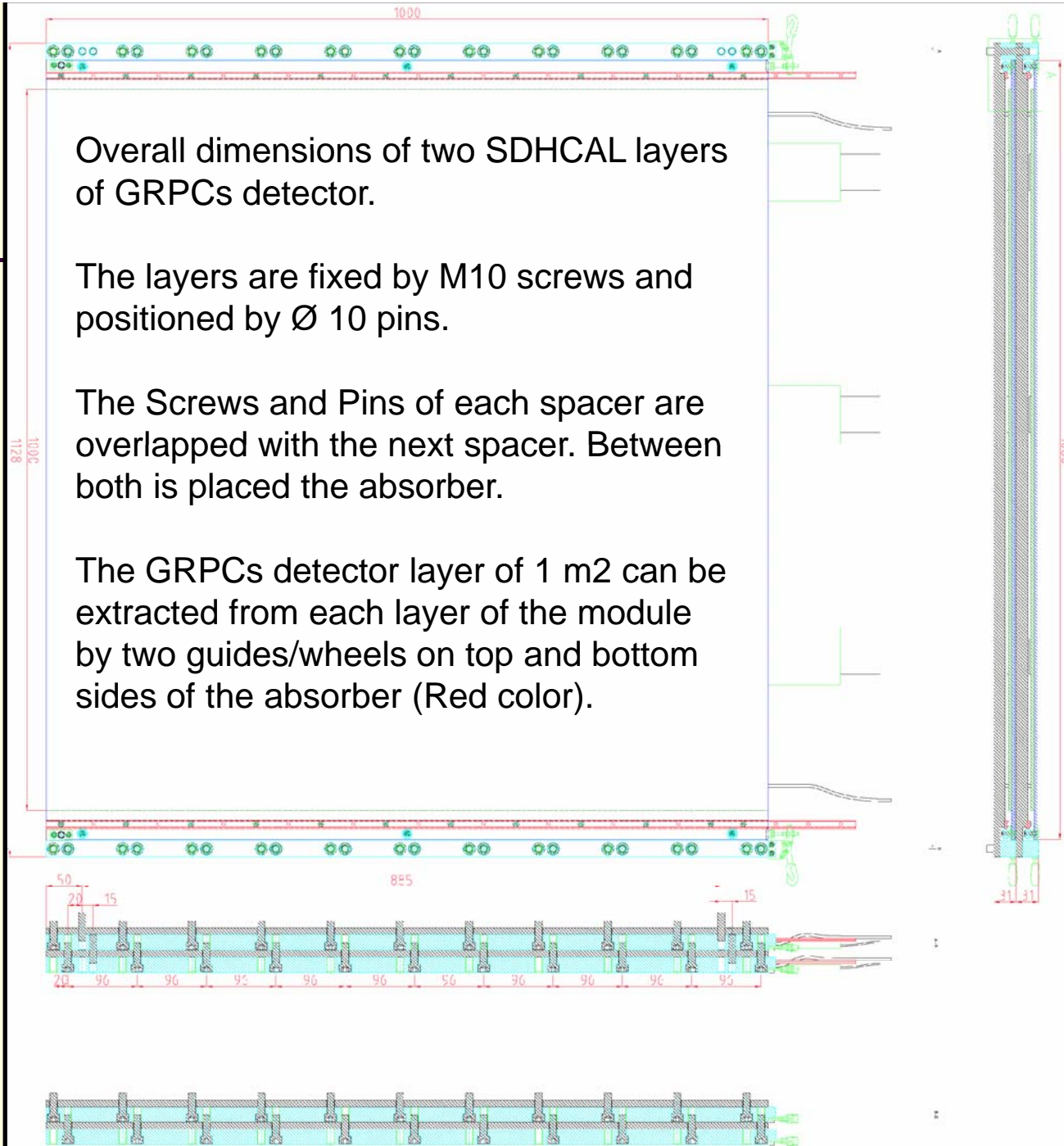
## GRPCs

Overall dimensions of two SDHCAL layers of GRPCs detector.

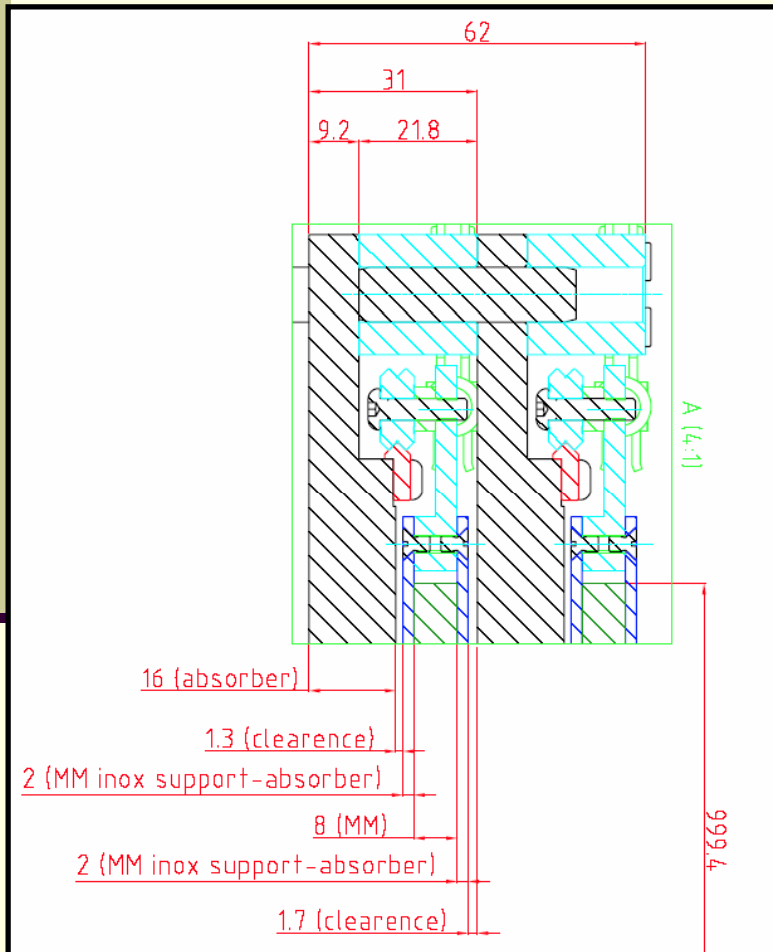
The layers are fixed by M10 screws and positioned by  $\varnothing 10$  pins.

The Screws and Pins of each spacer are overlapped with the next spacer. Between both is placed the absorber.

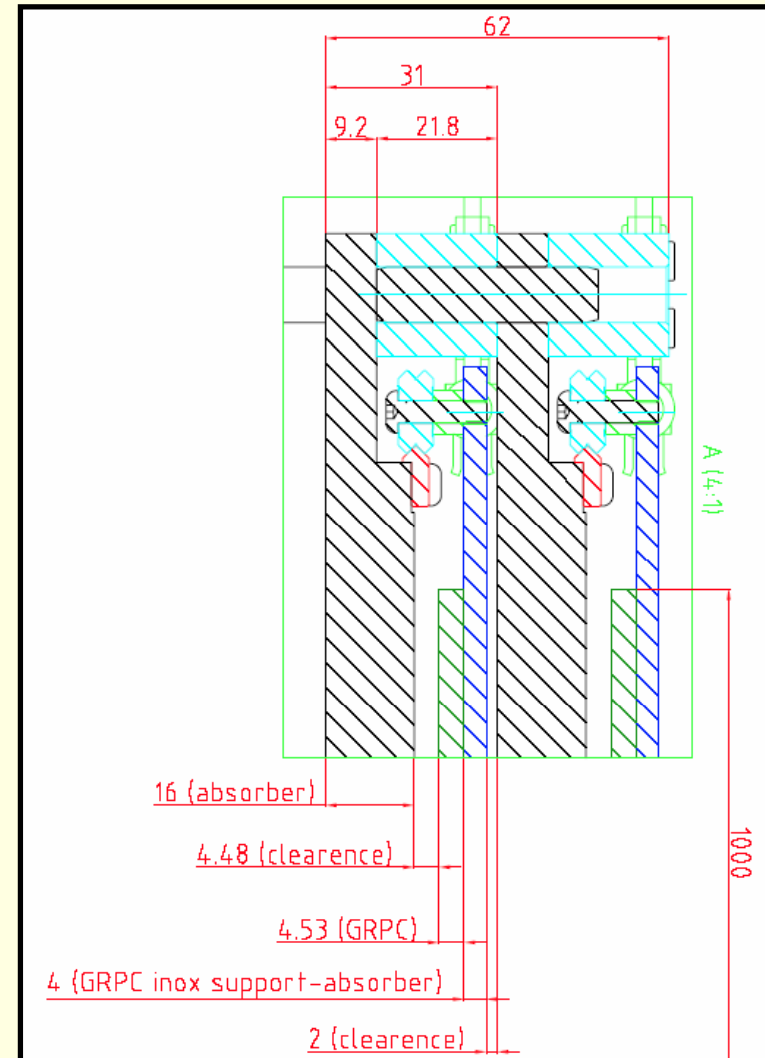
The GRPCs detector layer of 1 m<sup>2</sup> can be extracted from each layer of the module by two guides/wheels on top and bottom sides of the absorber (Red color).



- MMs** Layer distributions: (Theoretical dimensions)
- Absorber 16 mm.
  - Clearance 1.3 mm.
  - 1 M2 of MMs detector 12 mm.  
(Support-absorber of the detector 2x2 mm).
  - Clearance 1.7 mm.



- GRPCs** Layer distributions: (Theoretical dimensions)
- Absorber 16 mm.
  - Clearance 4.48 mm.
  - 1 M2 of the GRPC Detector 8.53 mm.  
(Support-absorber of the detector 4 mm)
  - Clearance 2 mm.





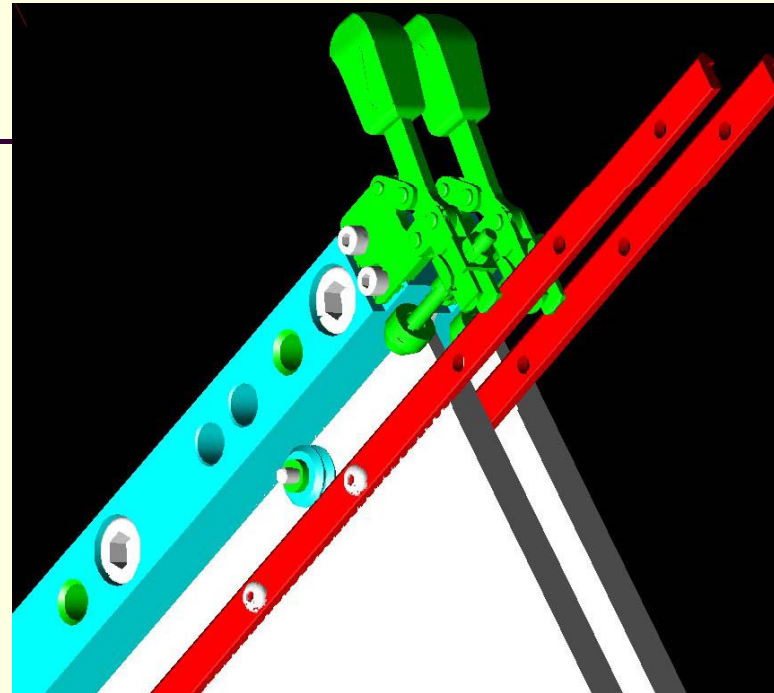
## 5.- Guiding and repositioning system.

Each detector module is supported on the 16 mm absorber by 6 wheels.

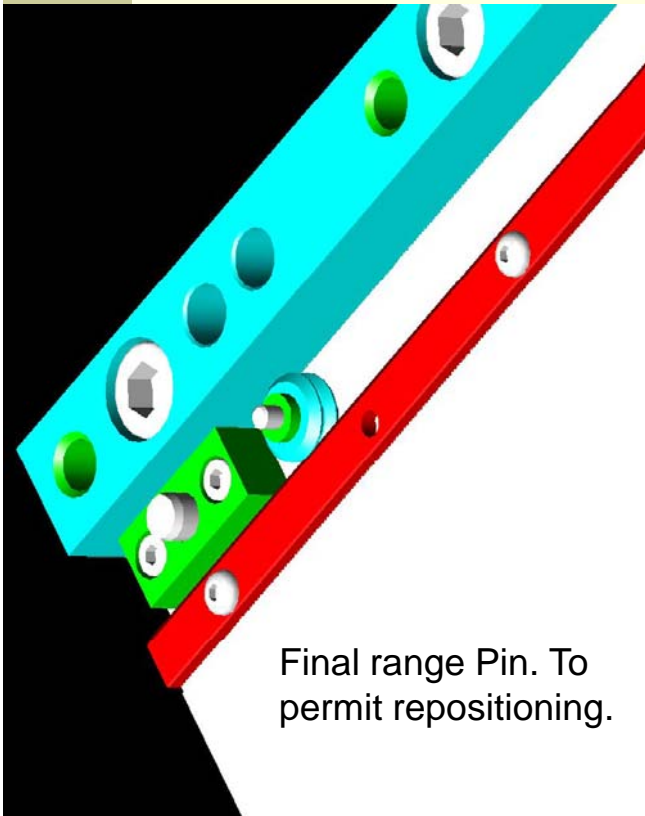
Attachment device. To minimize clearance. Are fixed on the top and bottom spacers.



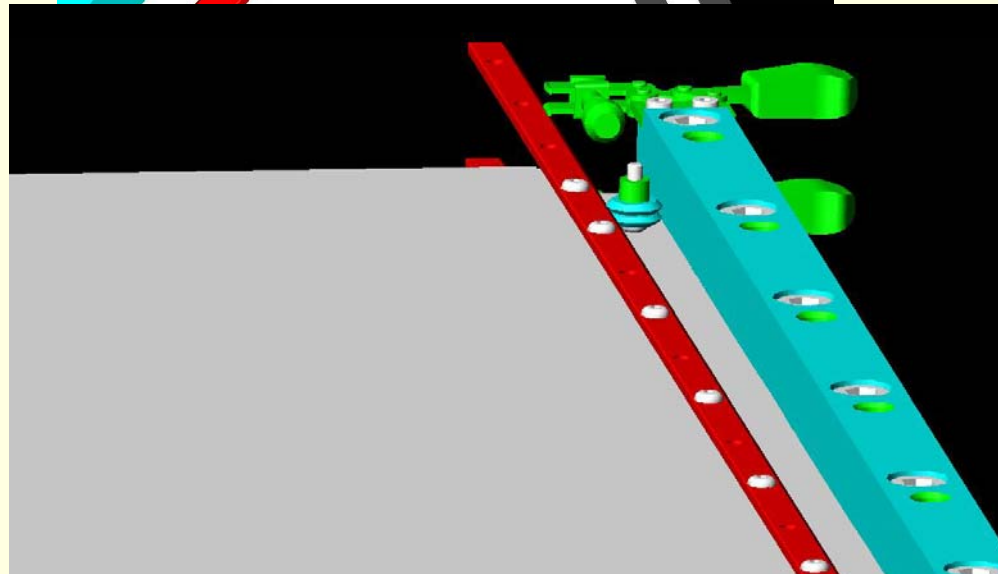
Details of the guiding system. The rails are fix on the 16 mm absorber.



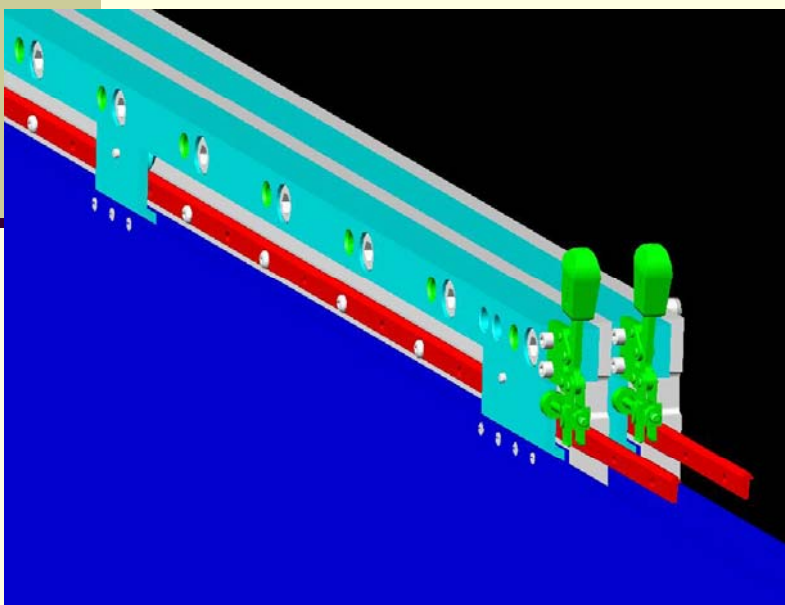
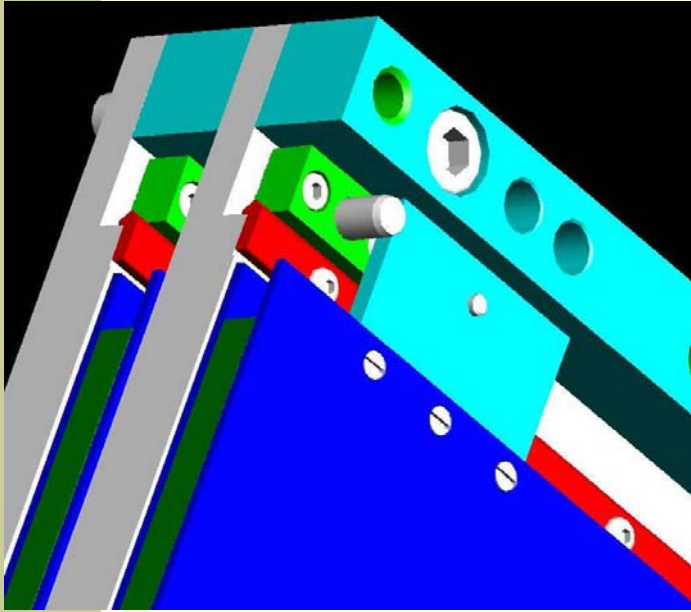
The 6 wheels are fixed on the support-absorber plates of the detector.



Final range Pin. To permit repositioning.

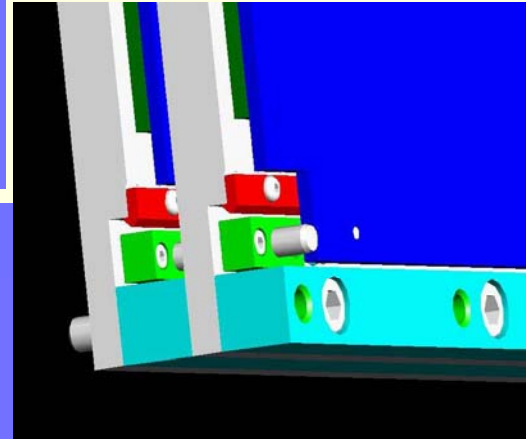
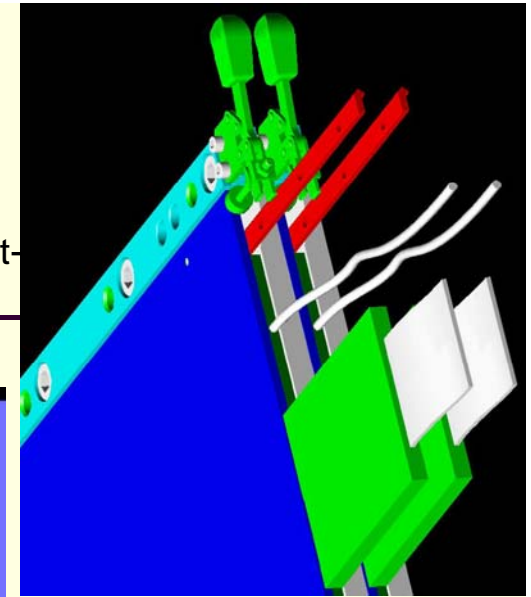
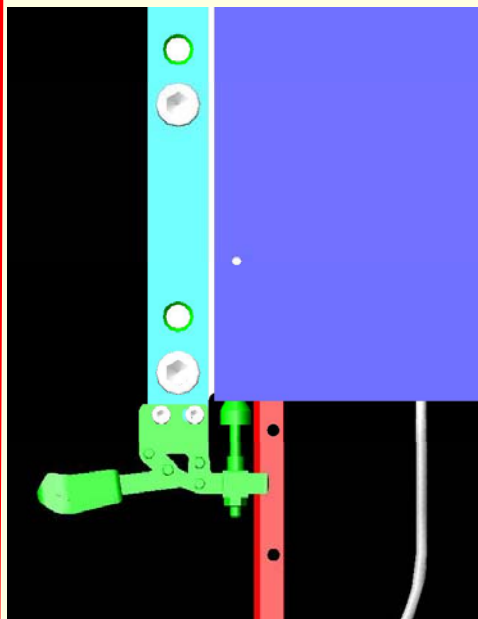
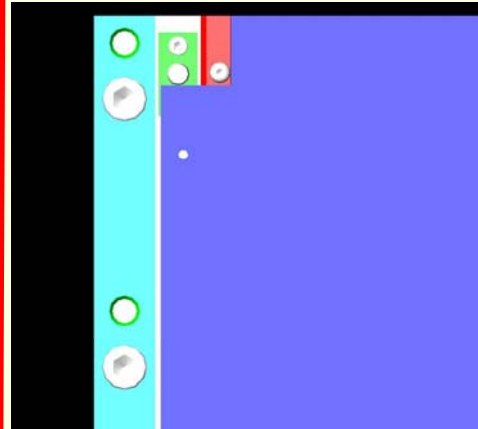


**MMs** Each MM detector is supported on the 16 mm absorber structure by 6 pieces (with 6 wheels), fixed between both 2 mm support-plates of the detector by M3 screws.

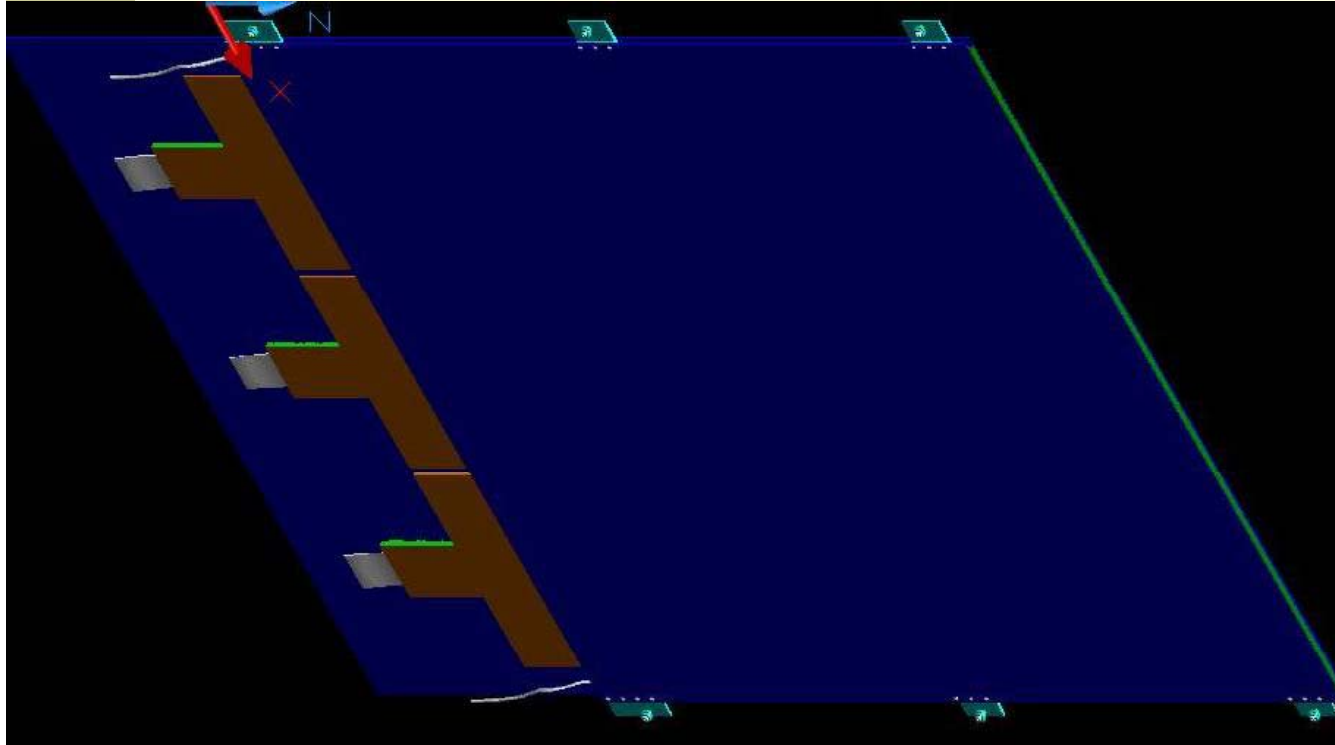


## GRPCs

Each GRPC detector is supported on the 16 mm absorber structure by 6 wheels, fixed on the support-plate of the detector.



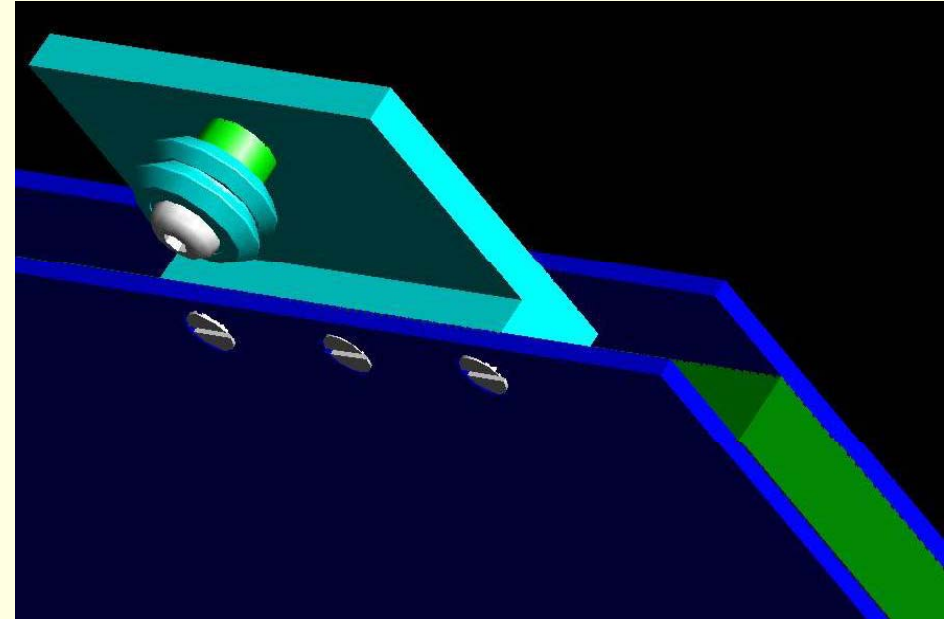
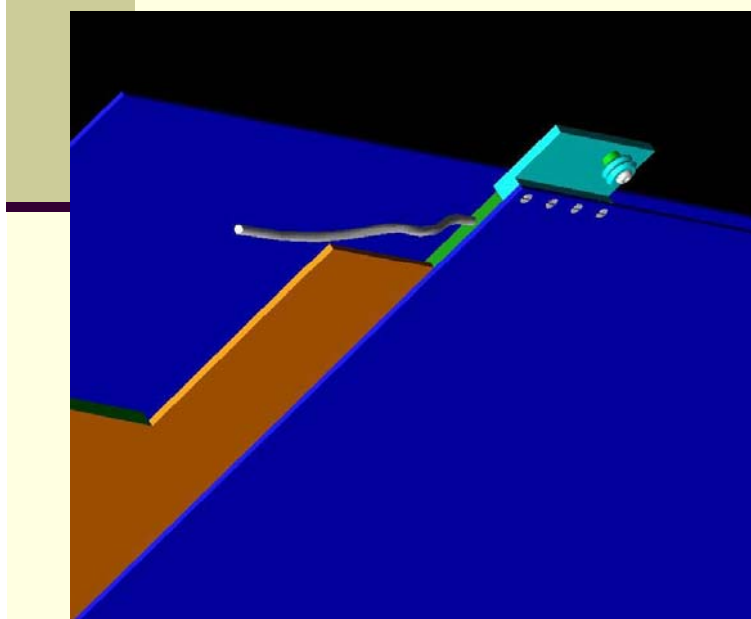
## 6.- MICROMEKAS and GRPCs detector layer. MMs



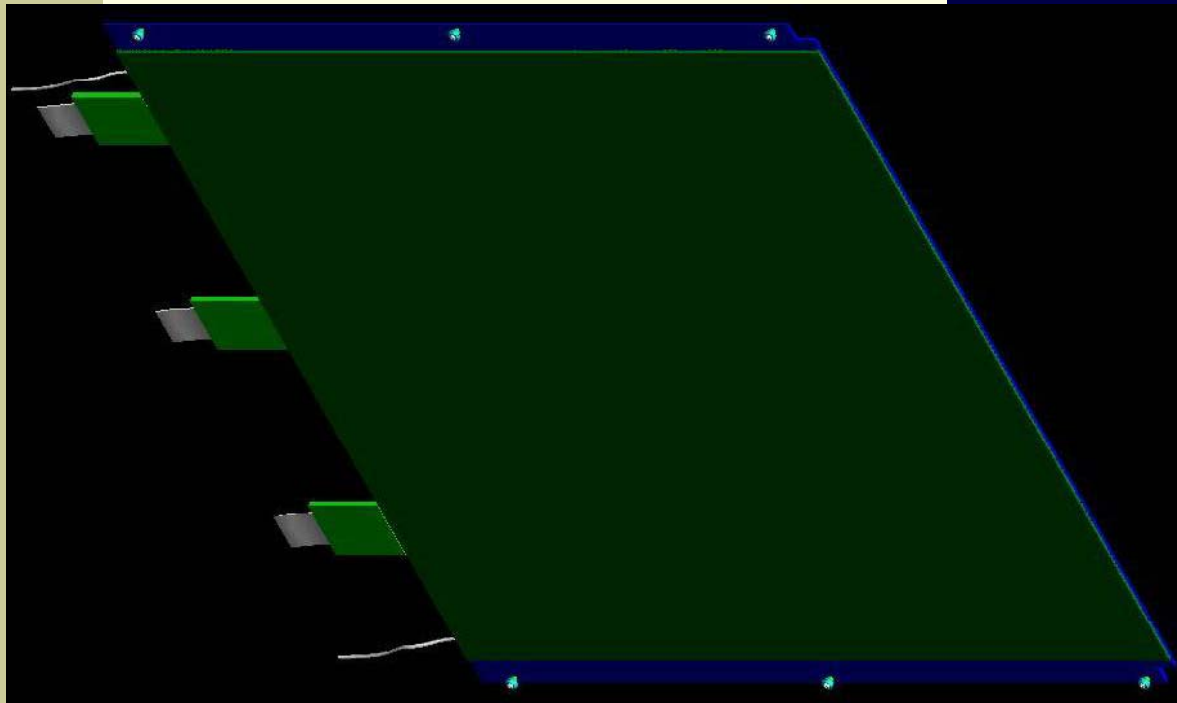
The plates-support of the detector has fixed 6 auxiliary pieces (blue color) with wheels to extract the layer from the absorber, like a cassette.

MM detector layer units.

Compose by the 1 m<sup>2</sup> detector (green color) and 2x2 mm support absorber plates.

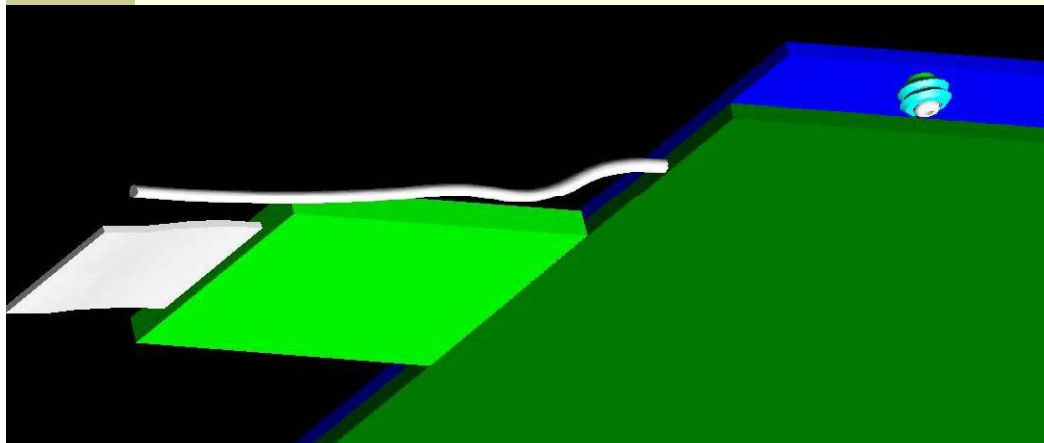


## GRPCs

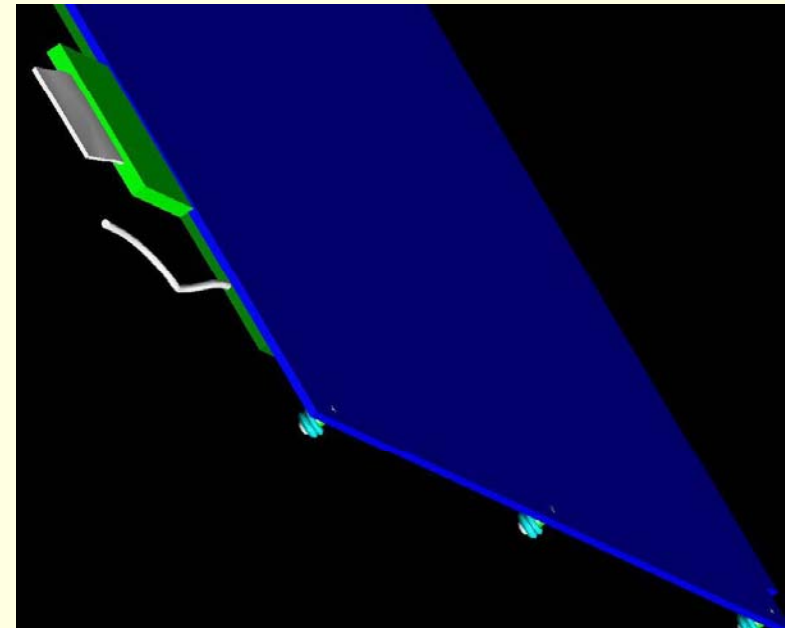


GRPC detector layer units.

Compose by the 1 m<sup>2</sup> detector (green color) and its 4 mm support absorber.



The support of the detector has fixed 6 wheels, to can extract the layer from the absorber, like a cassette.



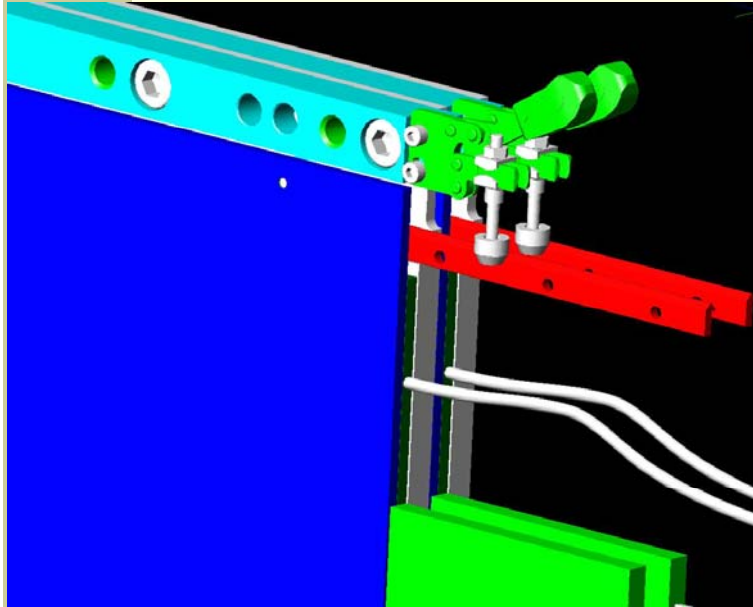
Here is shows a GRPC stainless steel prototype support plate (1000x1000x4mm<sup>3</sup>), made at Ciemat, with holes to host the chips.

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The construction problem to do this job, was fillets the M1 holes. But in the future the PCBs will be glued to this plate. A new prototype with 3 DIF is under fabrication.

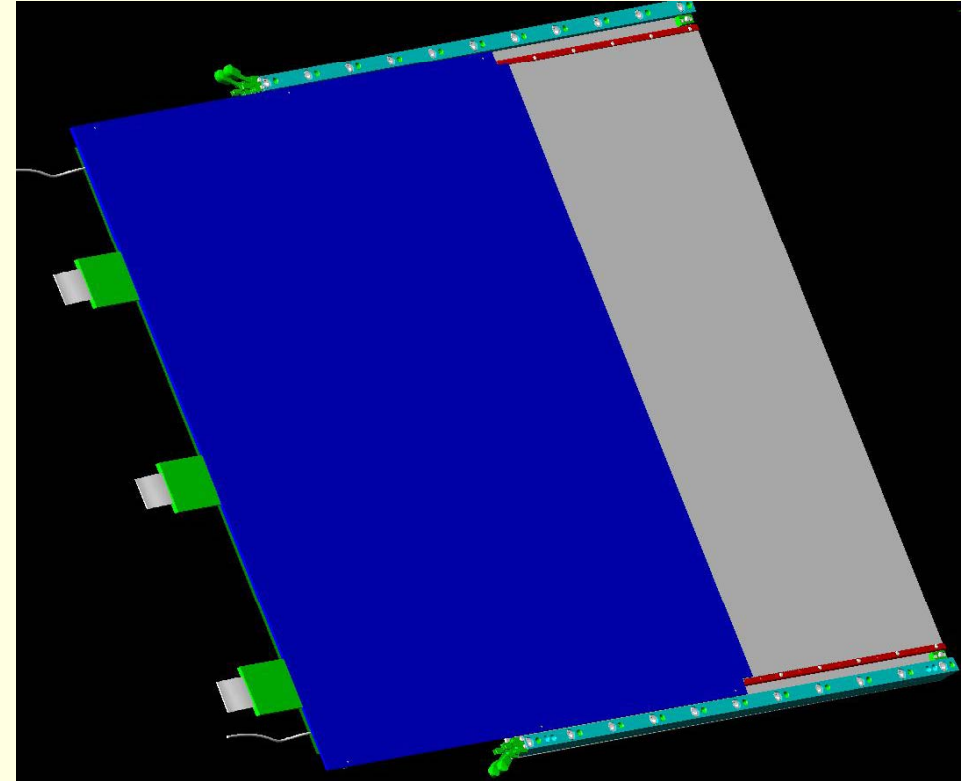
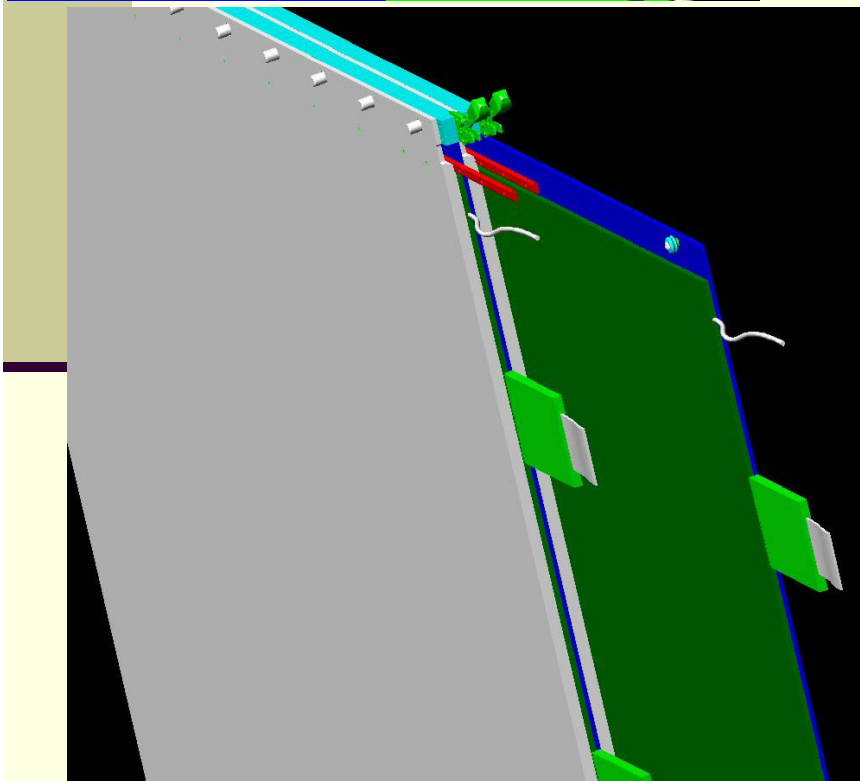
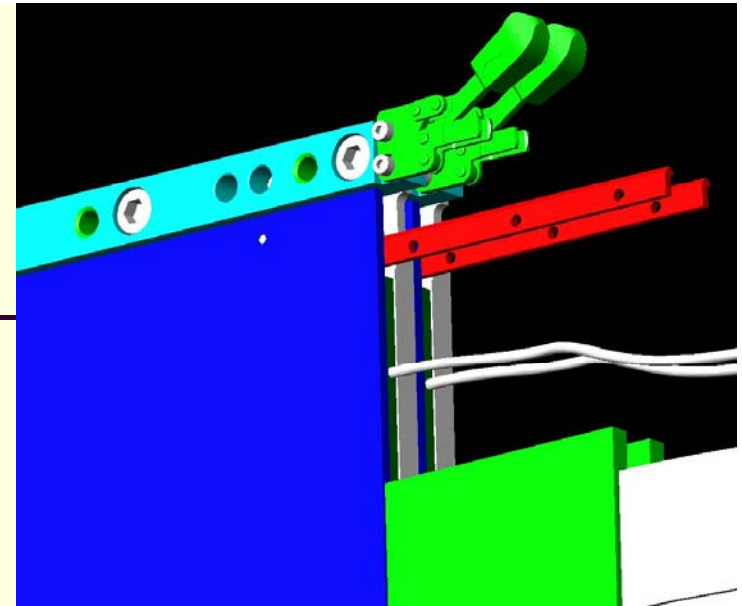


## 7.- Extraction of the detector's layers.



Detector layer under extraction. (GRPC example)

To can do that it is needed put the attachment device on the extraction position and extract the detector layer.



## 8.- Next steps.

### **Fabrication constrains at Ciemat:**

During this year, the workshop will be remodeled. This can take 6-9 months, starting during May.

During this operation the big CNC machines will be not operative.

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### **Next steps:**

- Fix the positioning tolerances of each detector layer in the calorimeter module prototype.
- Define the alignment procedure and references to include on the layers, to know the internal positioning between different detector layers.
- Define the interface support with the calibration setup.
- Fix the design of the calorimeter module prototype, with the different designers implied. To start the material survey and the fabrication as soon as possible.