UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II

GRAN SASSO SCIENCE INSTITUTE
SCHOOL OF ADVANCED STUDIES
Scuola Universitaria Superiore

PSD CONCEPT DESIGN

TEST BEAM & PAYLOAD PROTOTYPES

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MEETING ON THE HERD PROJECT, 20/05/2021

We are working on different solutions for the ***Payload*** and for the ***Test Beam***

BARS

BAR PROTOTYPE

TILES

GRID
TILE2LAYER-3FRAME (T2L-3F)

- Very preliminary design will be shown as **starting point for the discussion**
- The models will be detailed after the definition of several parameters (*front-end electronics, cabling, etc.)*

Concept design of the *Test Beam*

- 1 Prototype for Bars
- 1 Prototype for Tiles
- 1 single Horizontal Rail

OPEN QUESTIONS

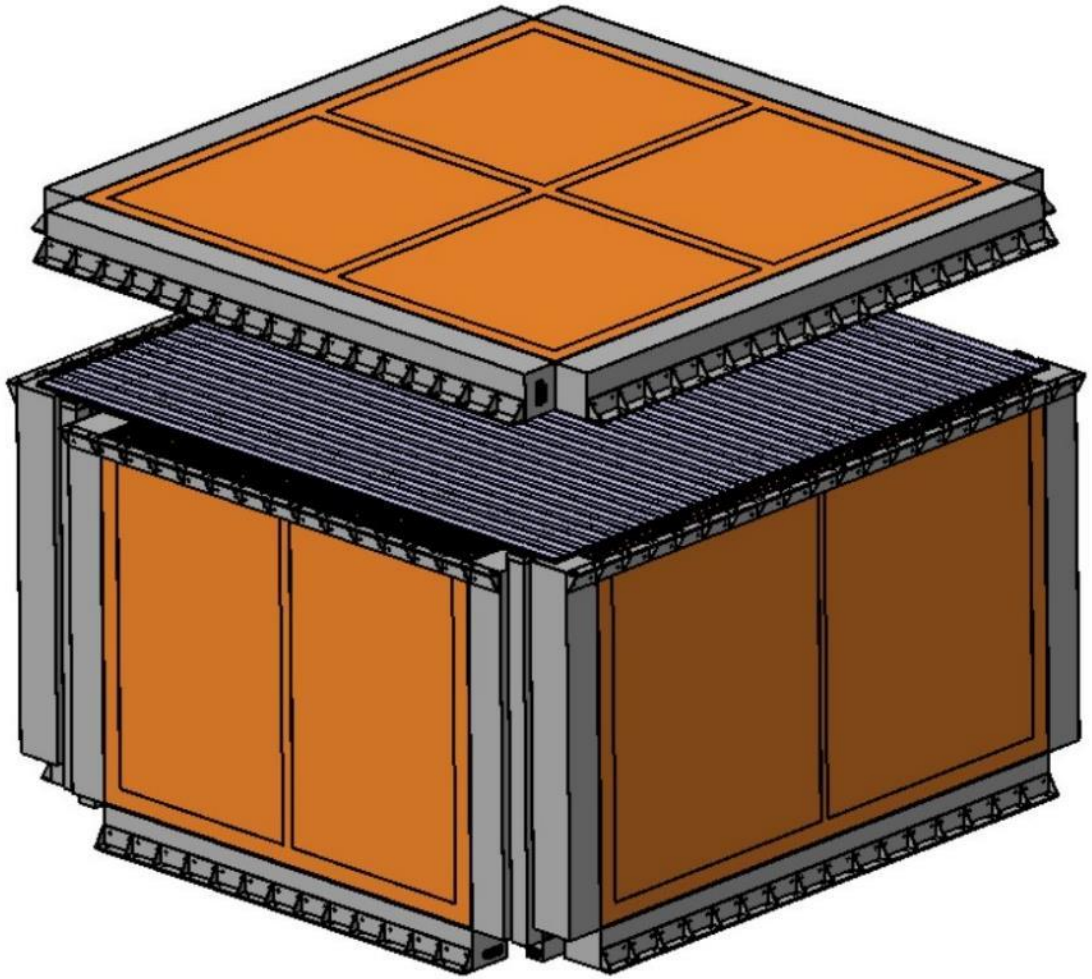
- **INTERFACES**
  Geometrical definition and loads at interface surfaces (particularly around the PSD)

- **ENVIRONMENTAL LOADS**
  To simulate the stresses, strains and the behavior of the system (to be compared with system natural frequencies: ***Response spectrum***, ***Vibration Environments***)

- **FOR THE TILES**
  The following numbers related to the conceived solutions have to be carefully considered

NUMBER OF TILES: 1336
NUMBER OF PCB CONNECTIONS: 2672
FRAME MASS: 41,5 kg
DETECTOR MASS: 73,8 kg

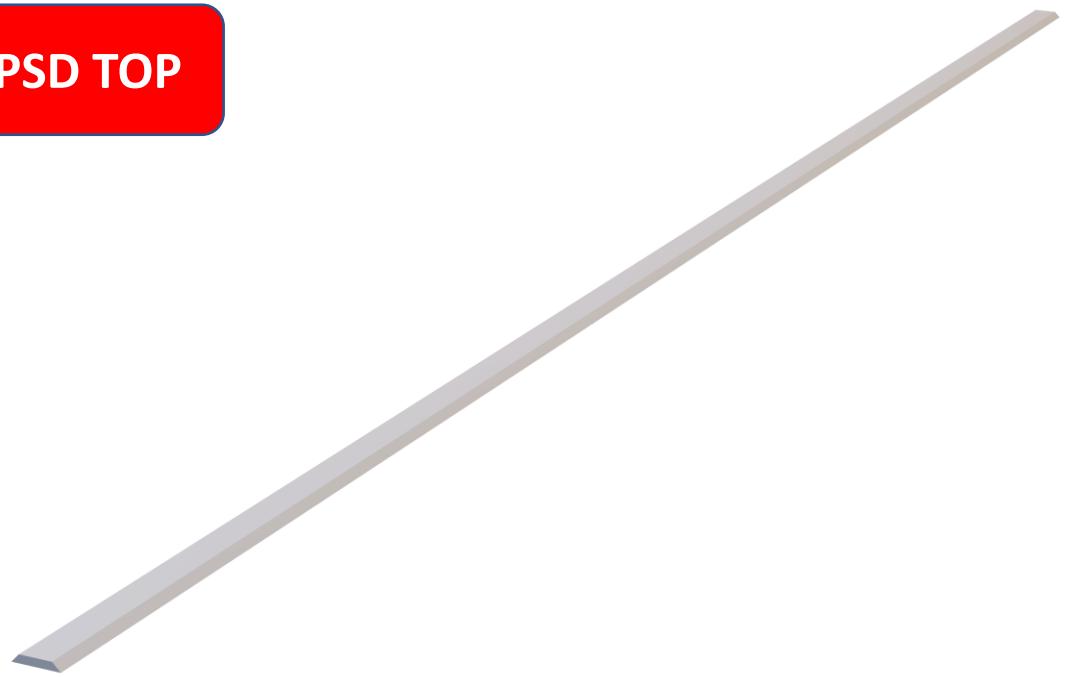
BAR PROTOTYPE

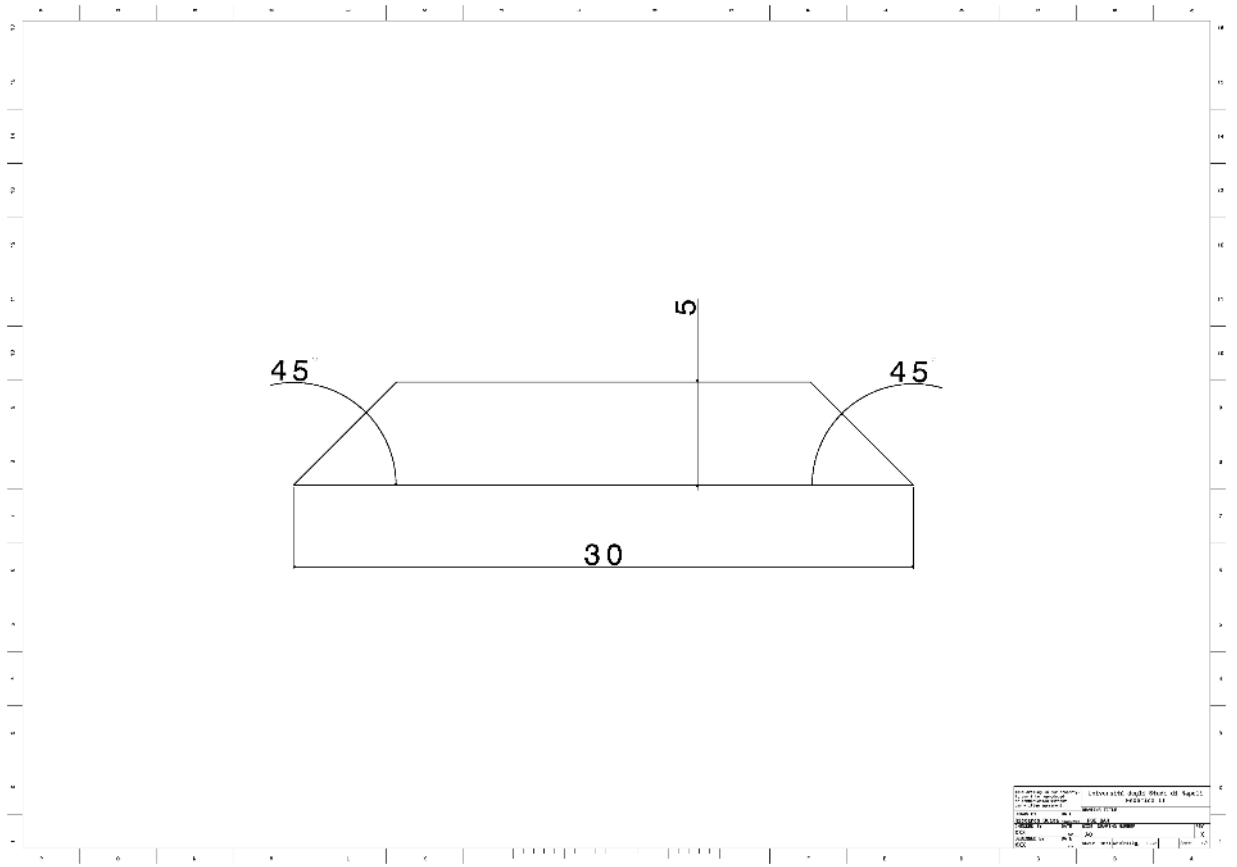


BAR PROTOTYPE

PSD Trapezoidal Bar

PSD TOP





Bar Section: (30x5) mm^2

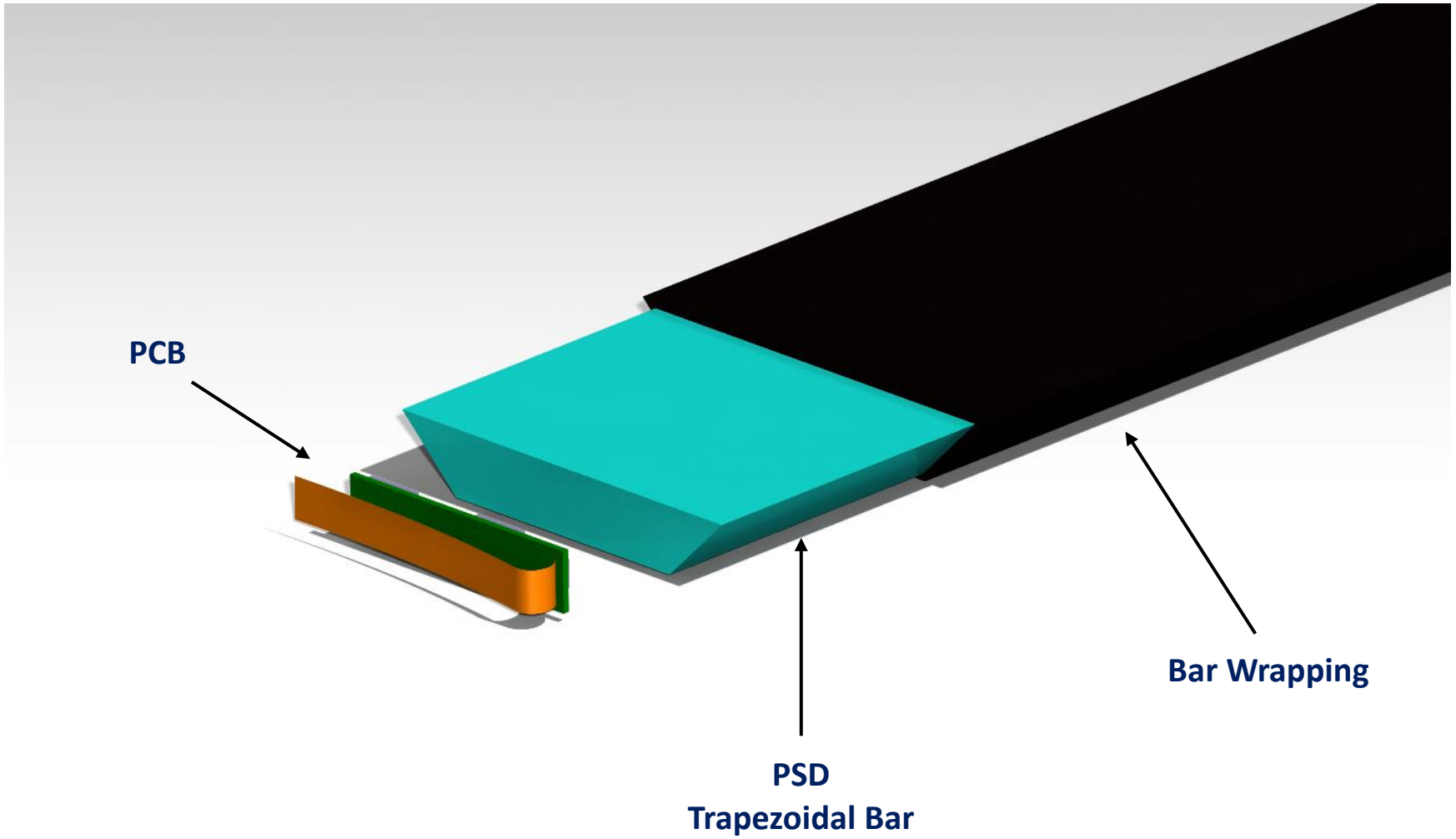
Bar Length: 1620 mm

BAR PROTOTYPE

PSD Trapezoidal Bar

PSD TOP

Wrapping: 0,5 mm



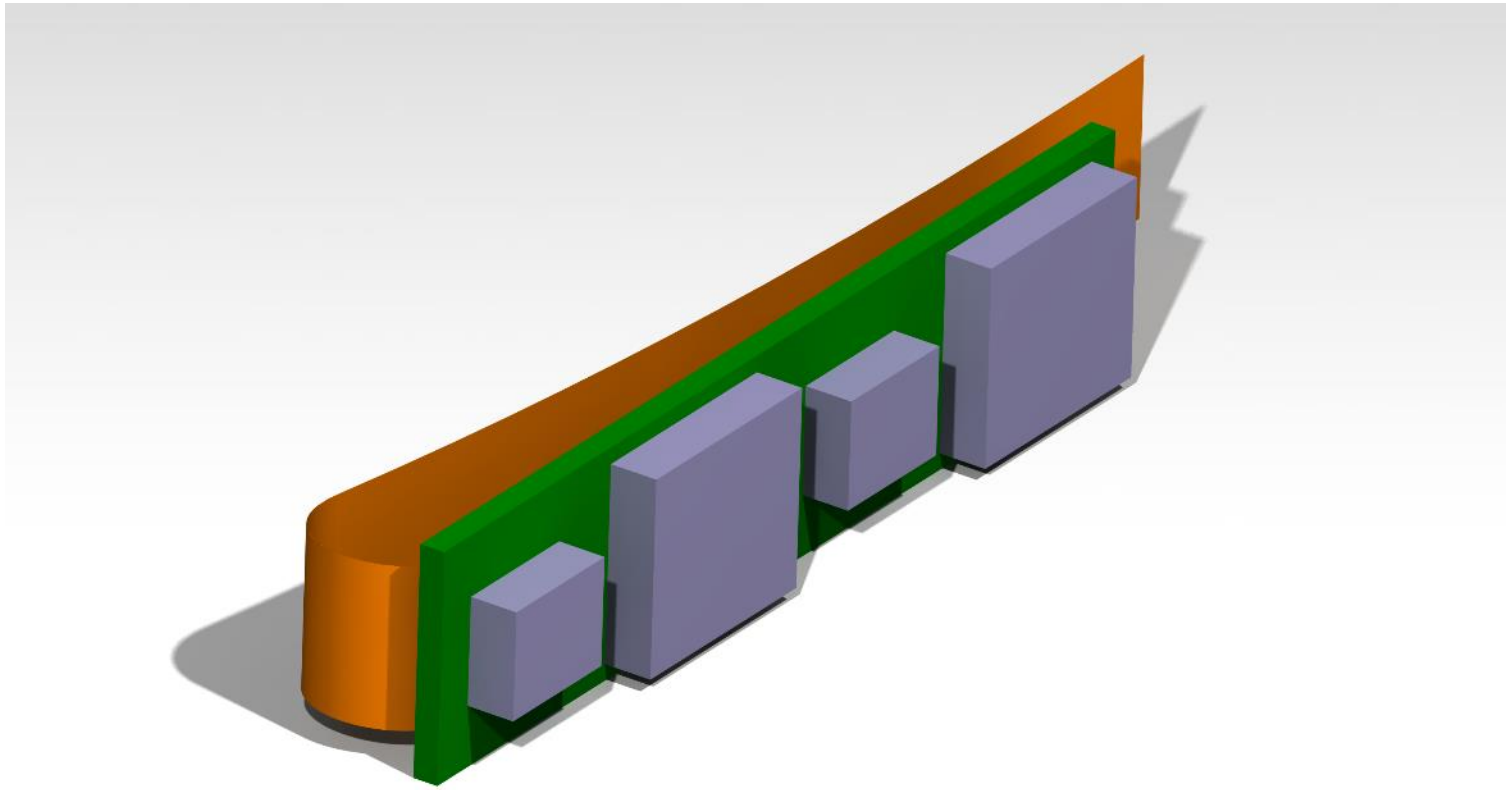
BAR PROTOTYPE

PCB mounting:

- **2 SiPM S13360-3050**
- **2 SiPM S14160-1310PS**

Kapton Flexible Cable providing power and signal read-out

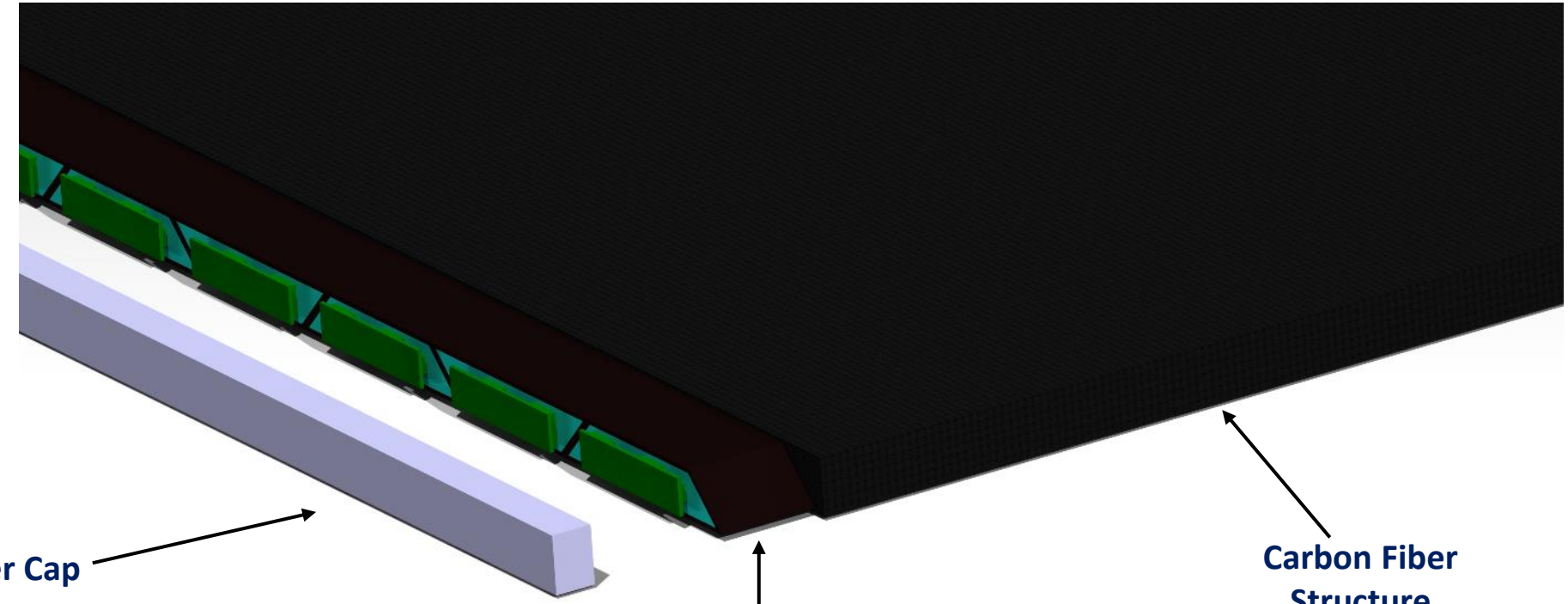
Single PCB interfaced with 4 different trapezoidal bars to be evaluated



BAR PROTOTYPE

PSD Bar Prototype

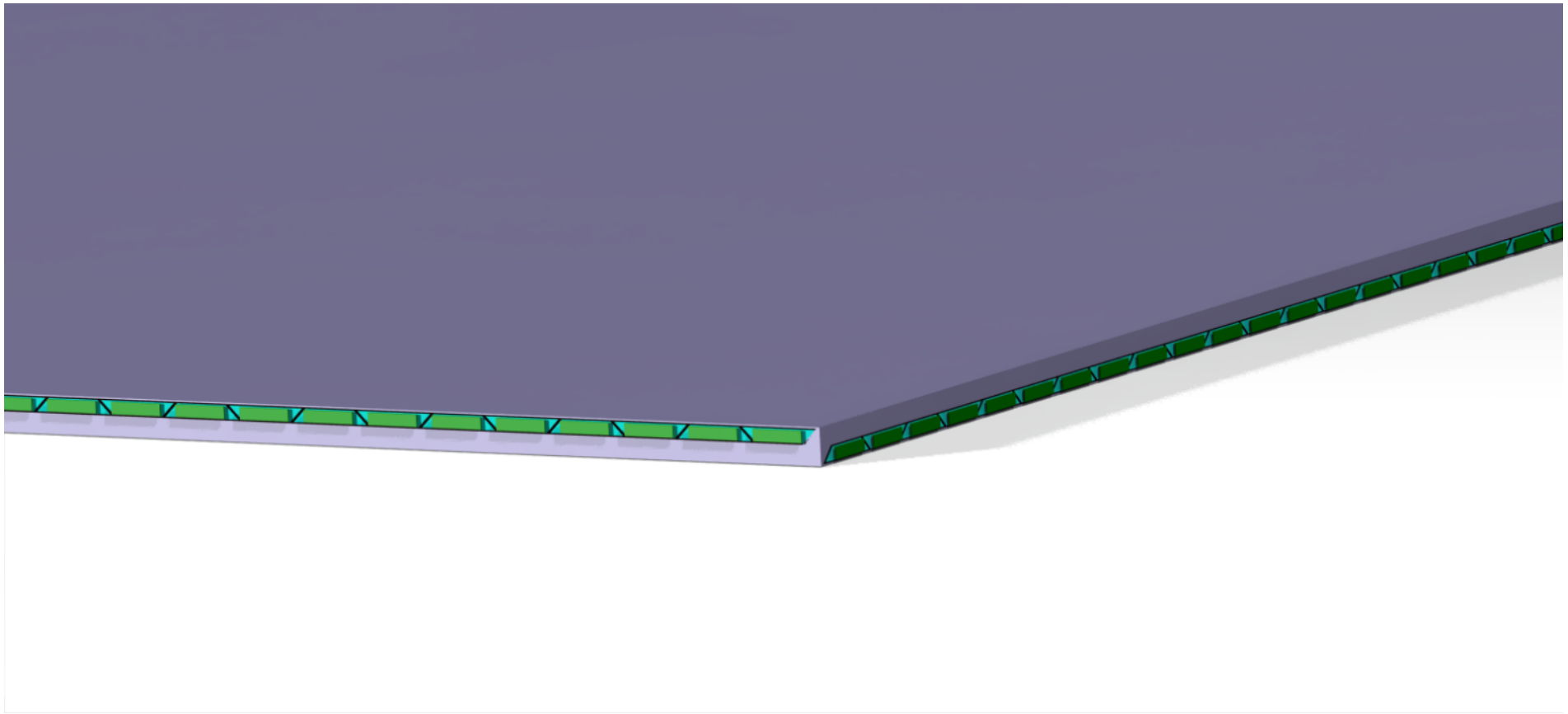
PSD TOP



BAR PROTOTYPE

PSD Bar Prototype

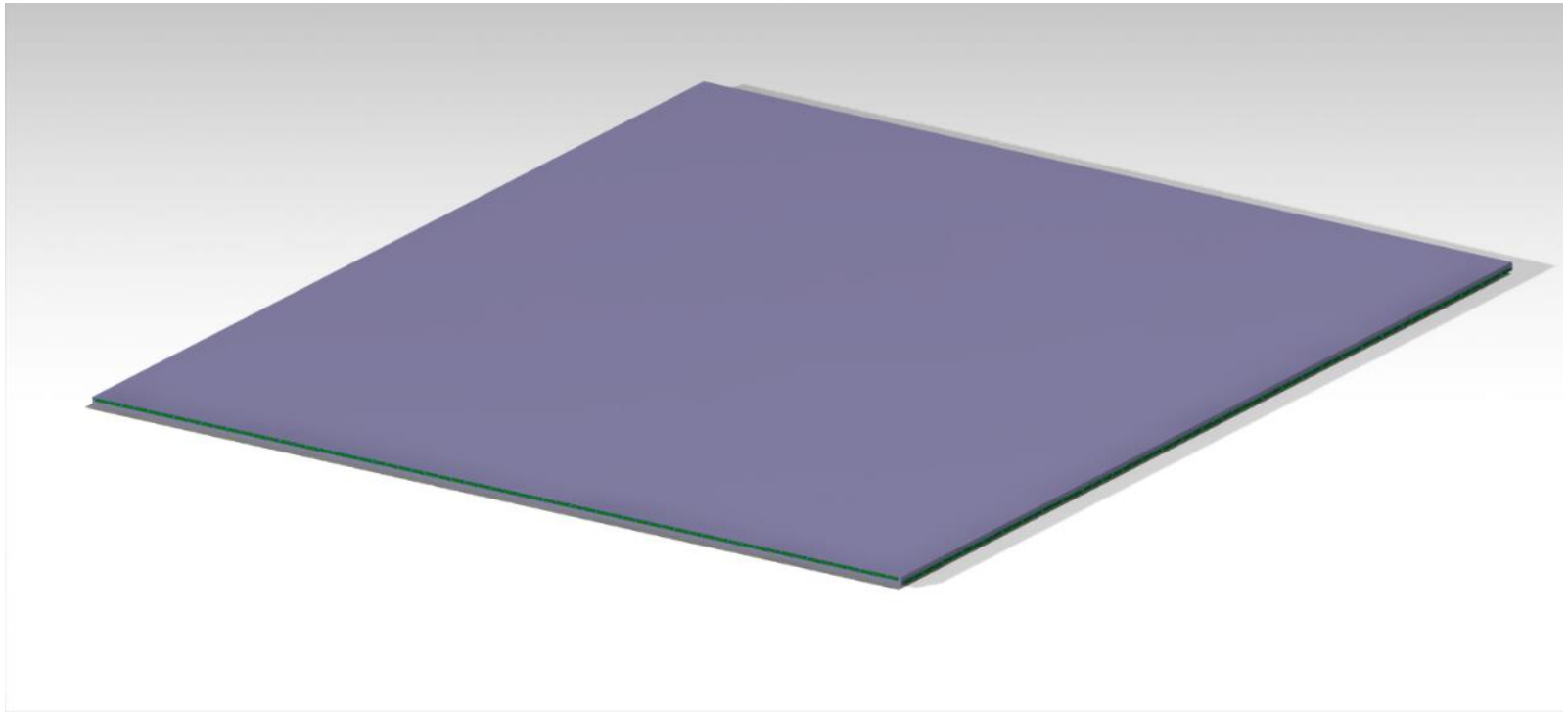
PSD TOP



BAR PROTOTYPE

PSD Bar Prototype

PSD TOP



Dimensions: 1620x1620x14 mm^3

Detection Area: 2,62 m^2

Distance between the two Bar Layers: 2 mm

Bars in External layer: 61

Bars in Internal layer: 61

Wrapped PSD Mass: 32,59 kg

Structure Mass: 9,50 kg

Total Mass: 42,085 kg

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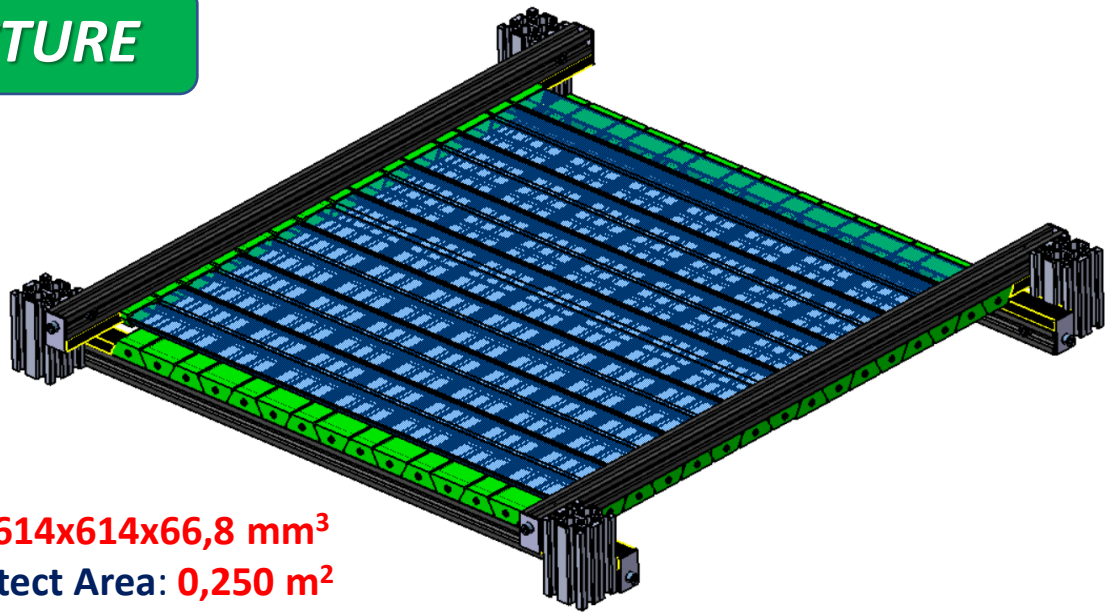
TEST BEAM PROTOTYPE

TEST BEAM PROTOTYPE

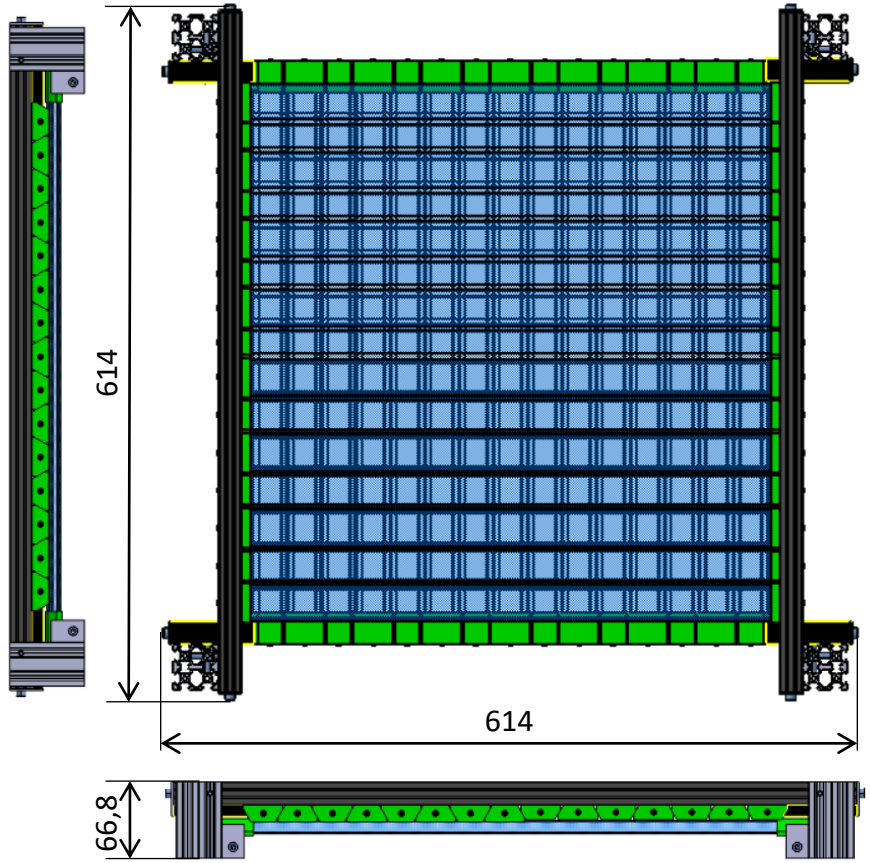
V-STRUCTURE



Dimension: 614x614x66,8 mm^3
Common Detect Area: 0,250 m^2
Distance between the two Bar Layers: 0 mm
except for 5 mm bars (about 3 mm)
Bars in a layer: 15
Total Mass: 7 kg

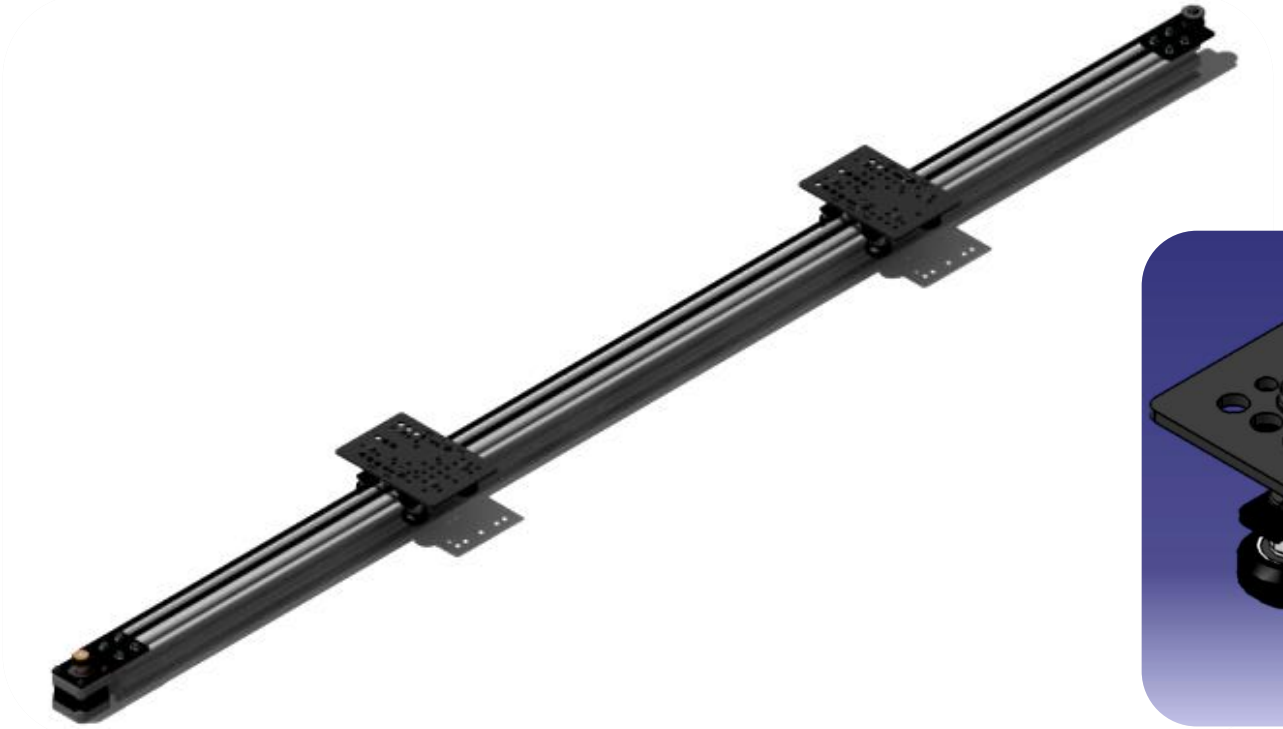
Middle Section

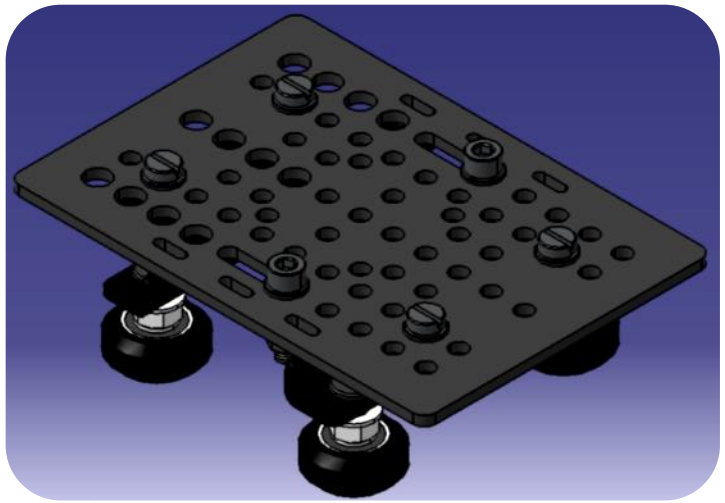
Orthogonal views



TEST BEAM PROTOTYPE

HANDLING MECHANISM FOR HORIZONTAL AXIS





- A mechanism has been conceived to move the structure of the PSD prototype
- A ***stepper motor*** moves a belt connected to two «universal» plates for the assembly operations of the PSD prototype by means of V-Slot cavity as binary line

TEST BEAM PROTOTYPE