

- SARA -
Scintillator Assemblies to
Reveal Annihilations

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AEGIS
THE WEIGHT OF ANTIMATTER



POLITECNICO
MILANO 1863

What will be shown

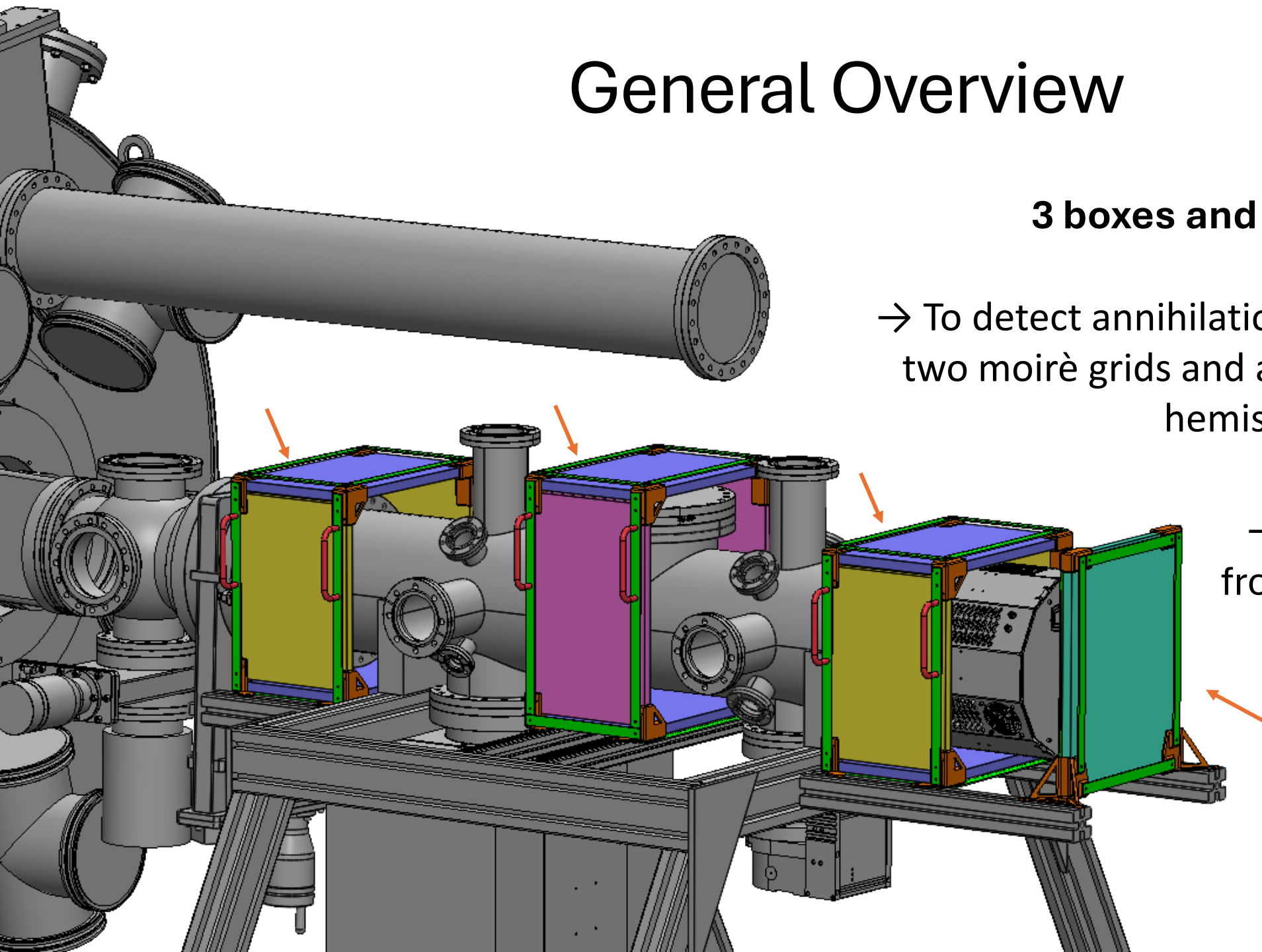
1. General Overview
2. Detailed description of the design
3. Progress assessment
4. Summary

General Overview

3 boxes and 1 final panel

→ To detect annihilation products around the two moiré grids and at the OPHANIM back hemisphere

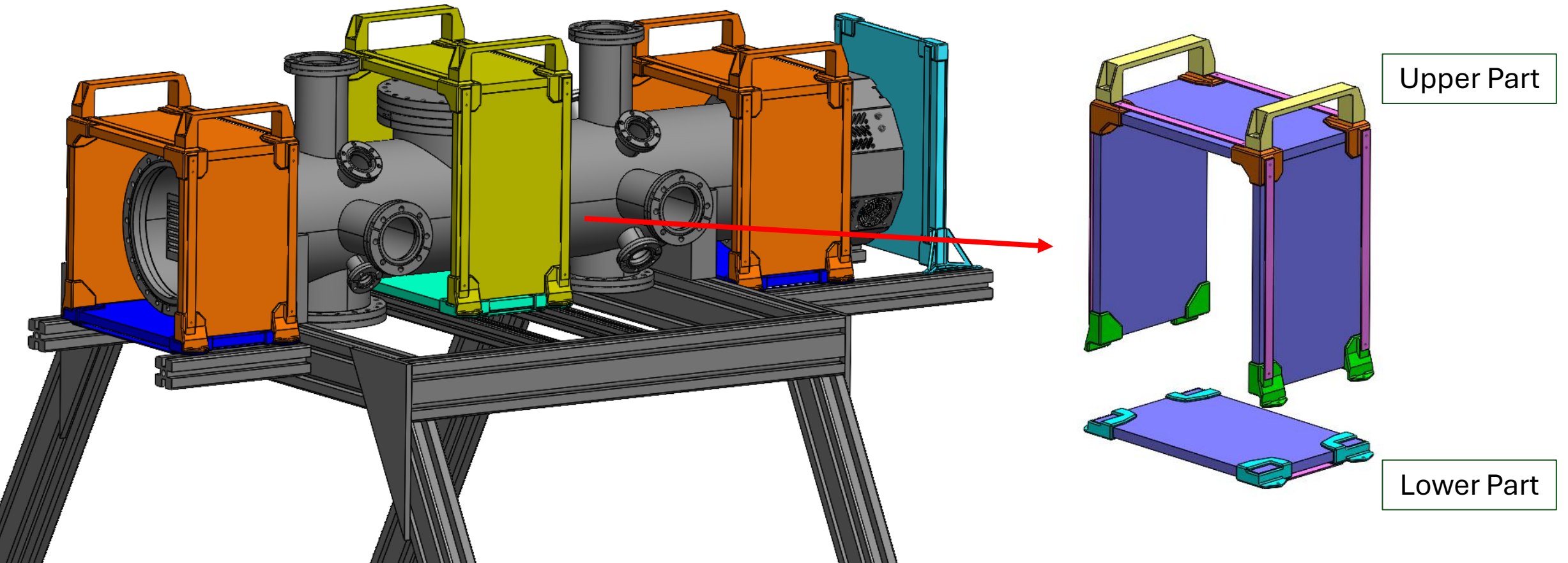
→ Scintillators come from ATRAP Experiment



General Overview

Previous Design Iteration

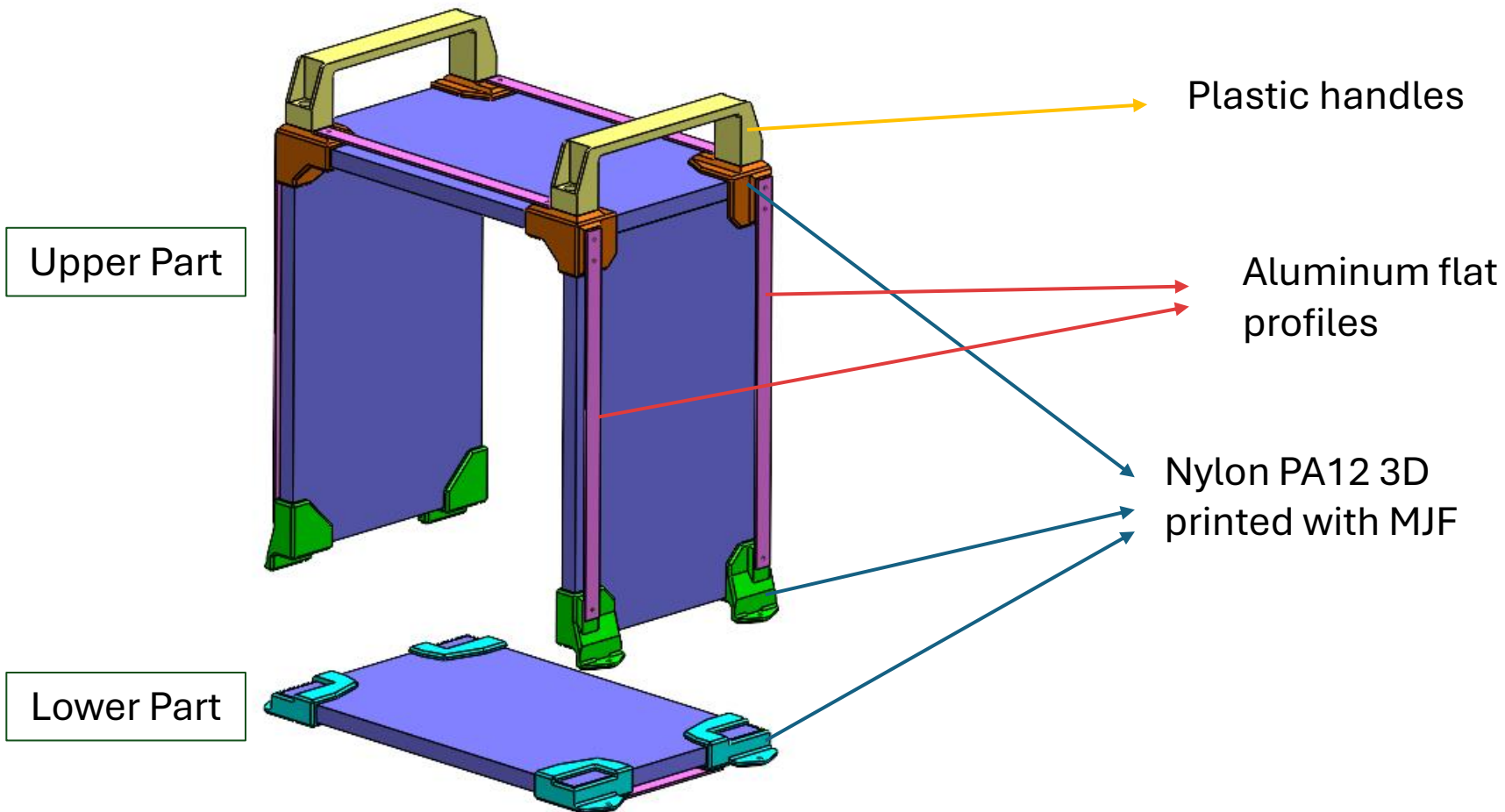
→ Concept modified due to an improved knowledge of SARA surrounding



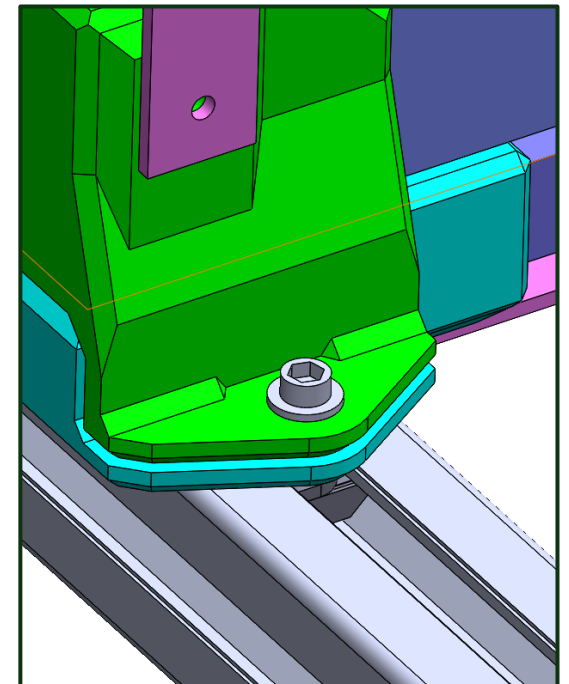
General Overview

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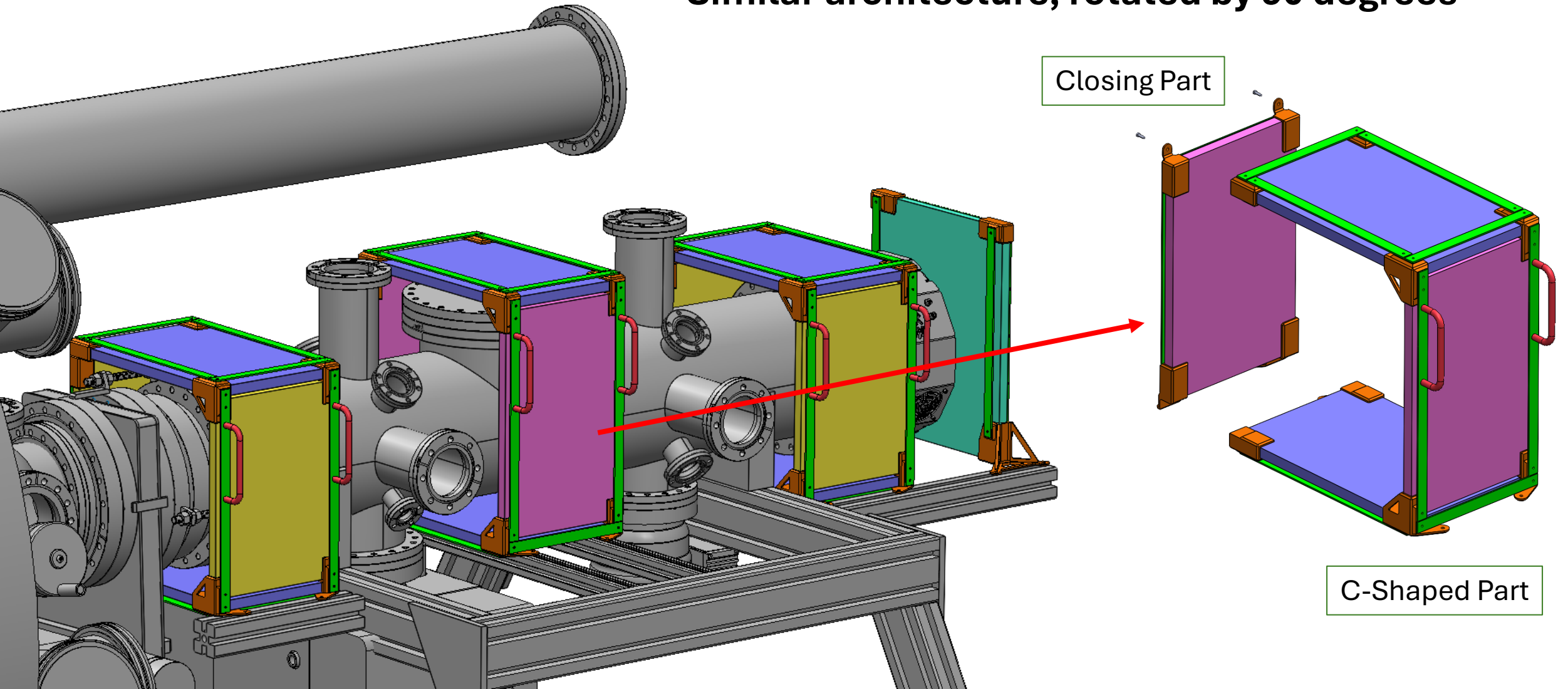


Fastening strategy

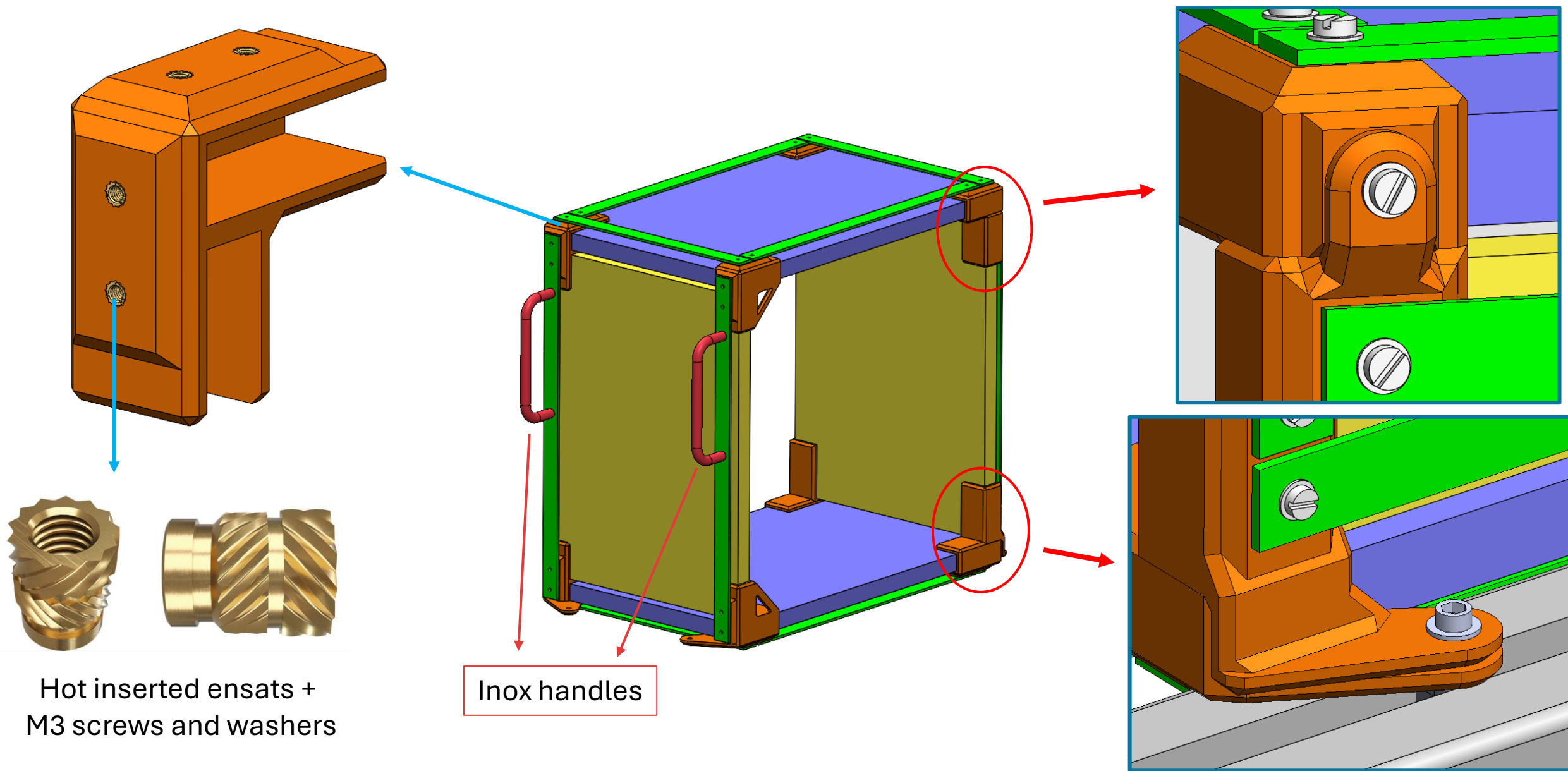


Detailed description of the design

Similar architecture, rotated by 90 degrees



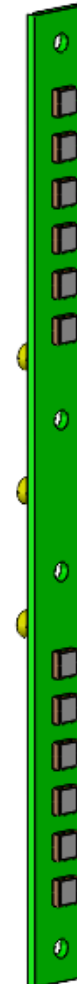
Detailed description of the design



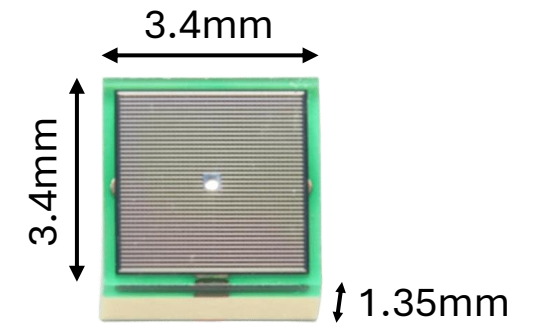
Detailed description of the design

Scintillation measured with SiPM. Why?

Technology	PROS	CONS
Silicon PM	<ul style="list-style-type: none">- Very compact- Barely affected by magnetic fields	<ul style="list-style-type: none">- Not cheap- $\sim 10^6$ amp. factor
Photomultiplier Tube	<ul style="list-style-type: none">- Economic- $\sim 10^7$ amp. Factor	<ul style="list-style-type: none">- Require a bulky light guide- Affected by magnetic field

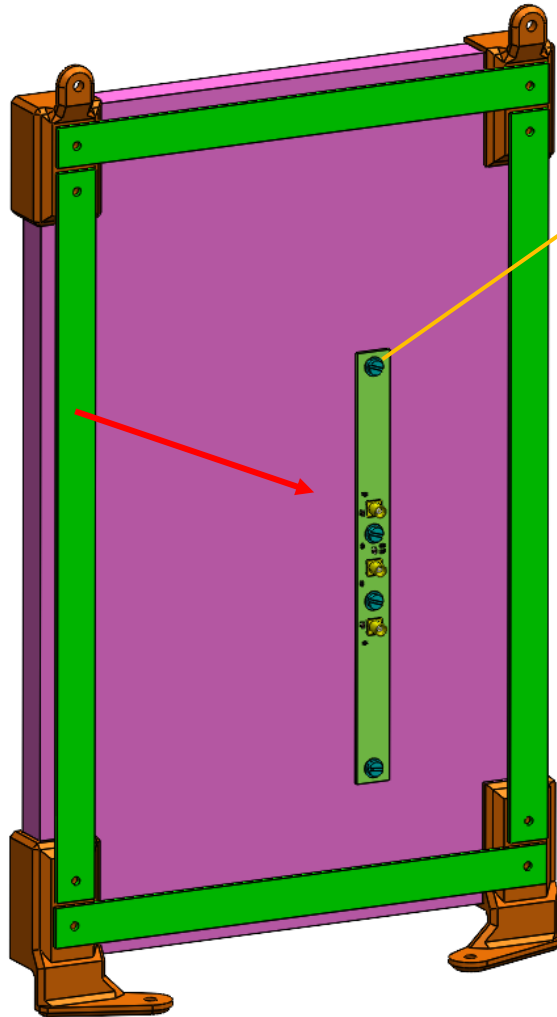


12x SiPM
Hamamatsu
S13360-3050VE

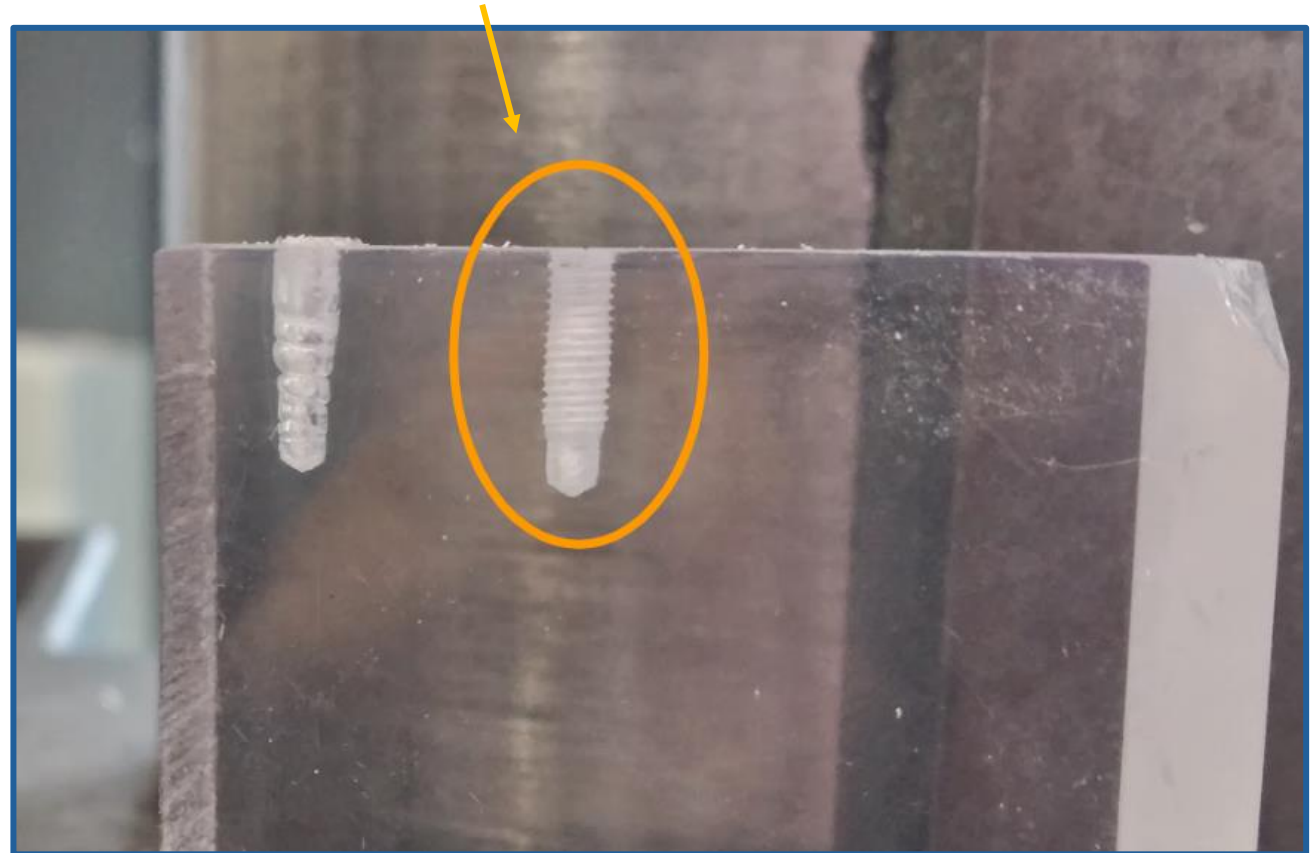


Detailed description of the design

PCB Positioning



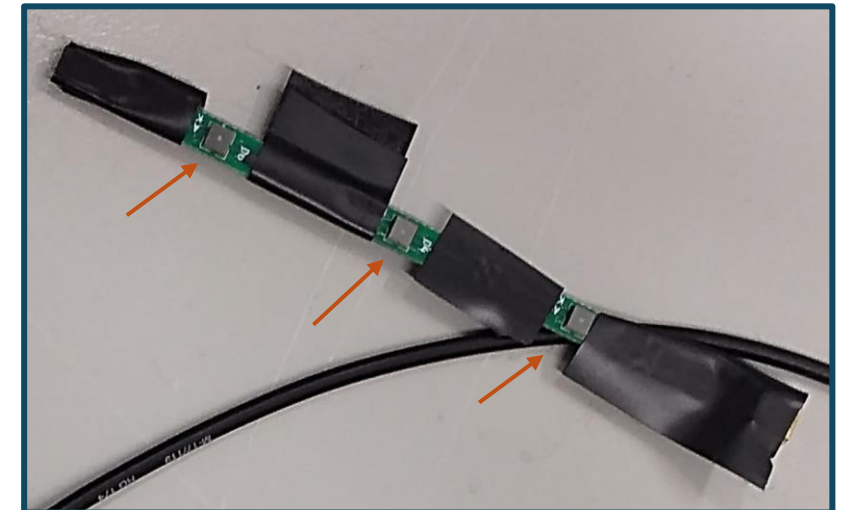
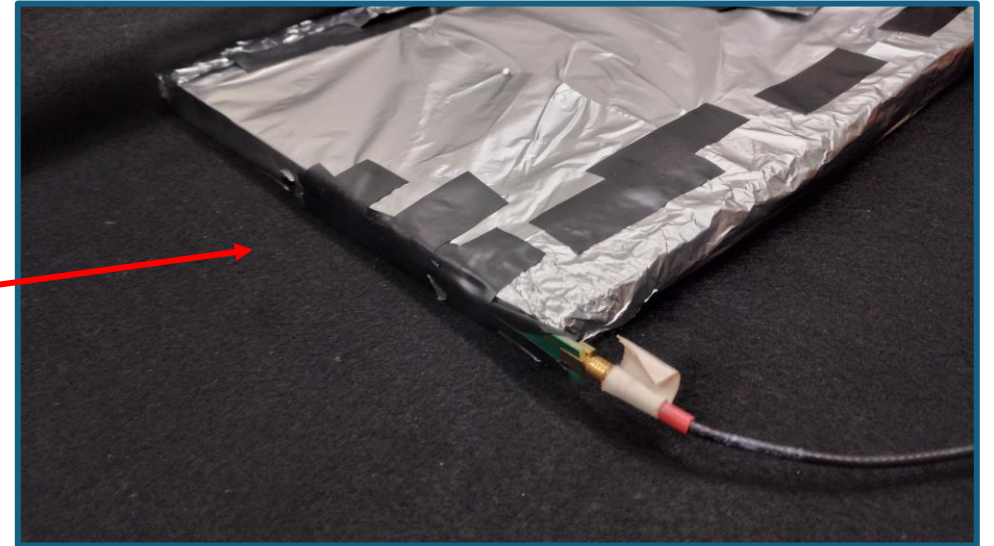
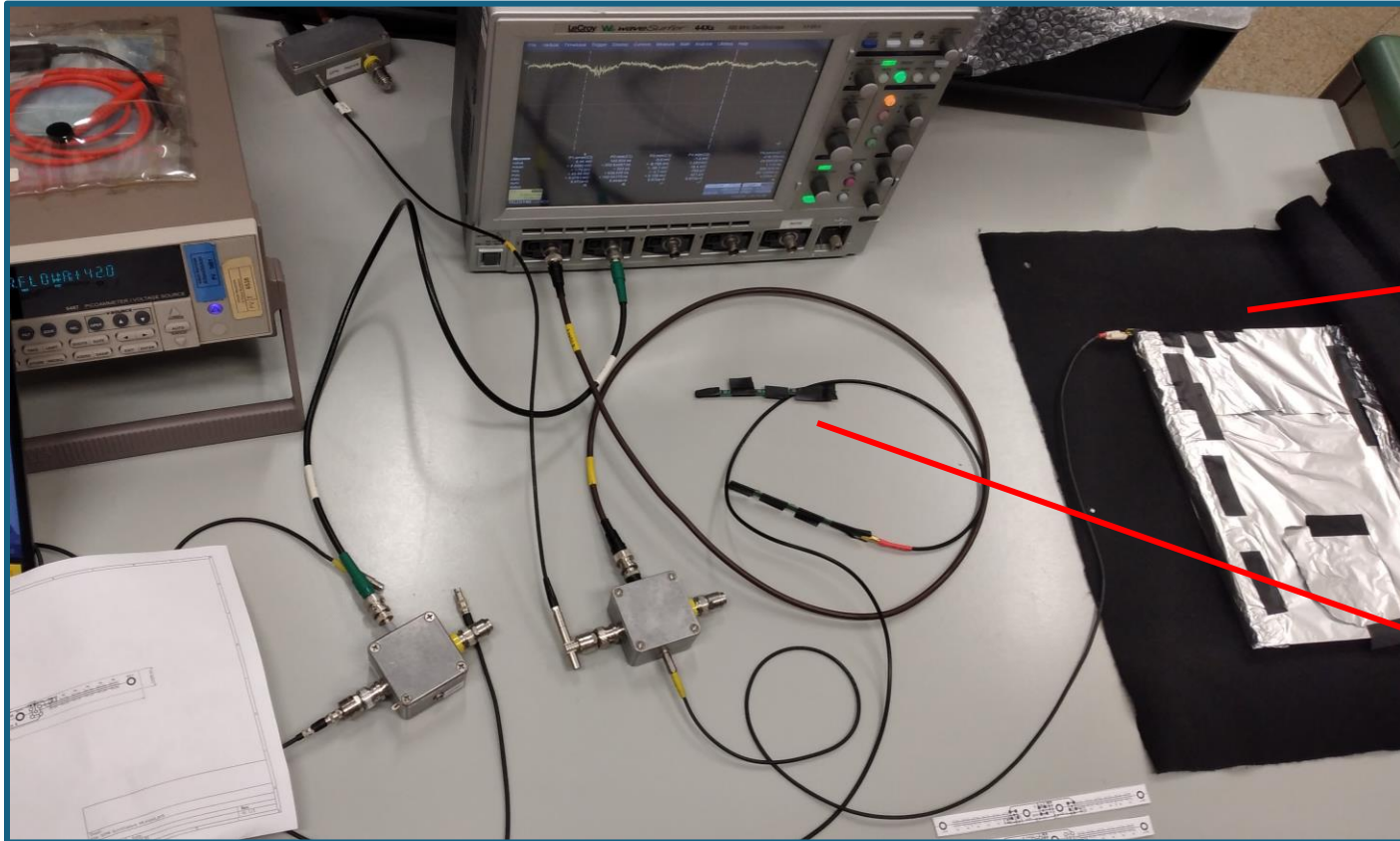
M3 Nylon screws entering in the scintillator



Thread Creation Test

Detailed description of the design

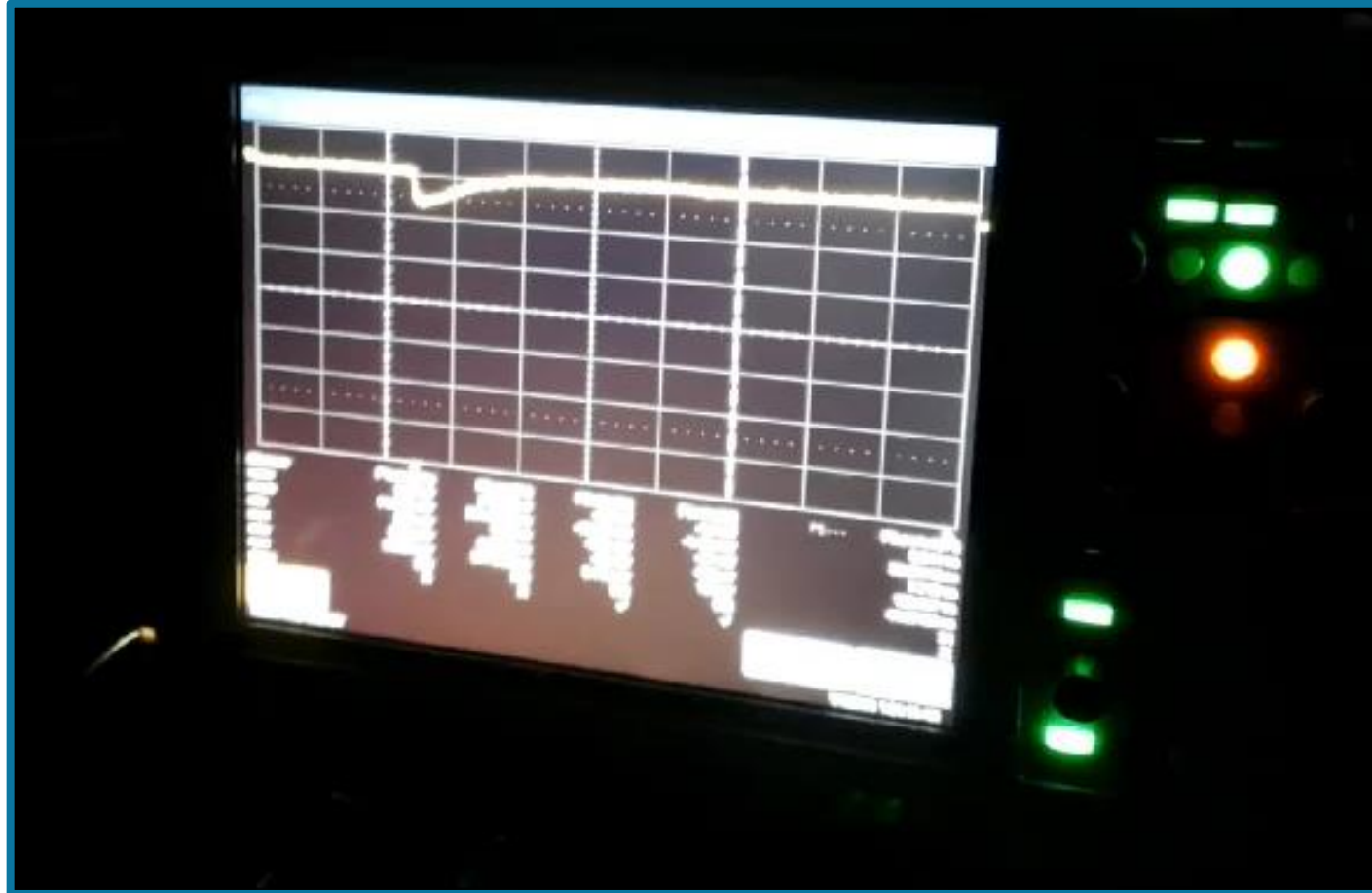
Acquisition test



Test with a PCB with 3 SiPM

Detailed description of the design

Acquisition test



Input Voltage (V)	N. Of Events	Avg. Lateral Surface (mV)	Avg. Main Surface (mV)
42	430	-10.2	-10.8

Detailed description of the design



Response to Heating Test

Mica Layers

Scintillators cover

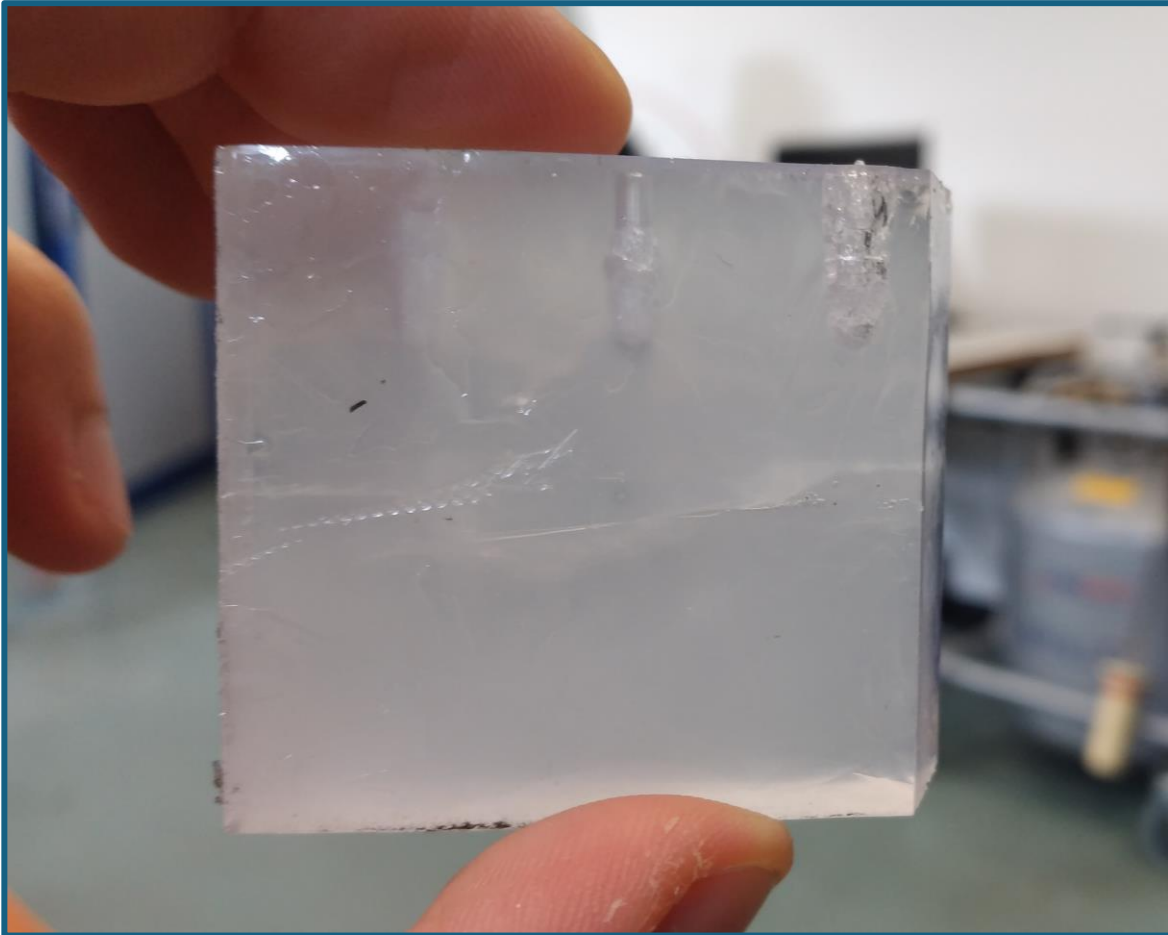
→ 50 μm Aluminum foil

→ One or two light protection black layers

(Similarly to ATRAP)

Detailed description of the design

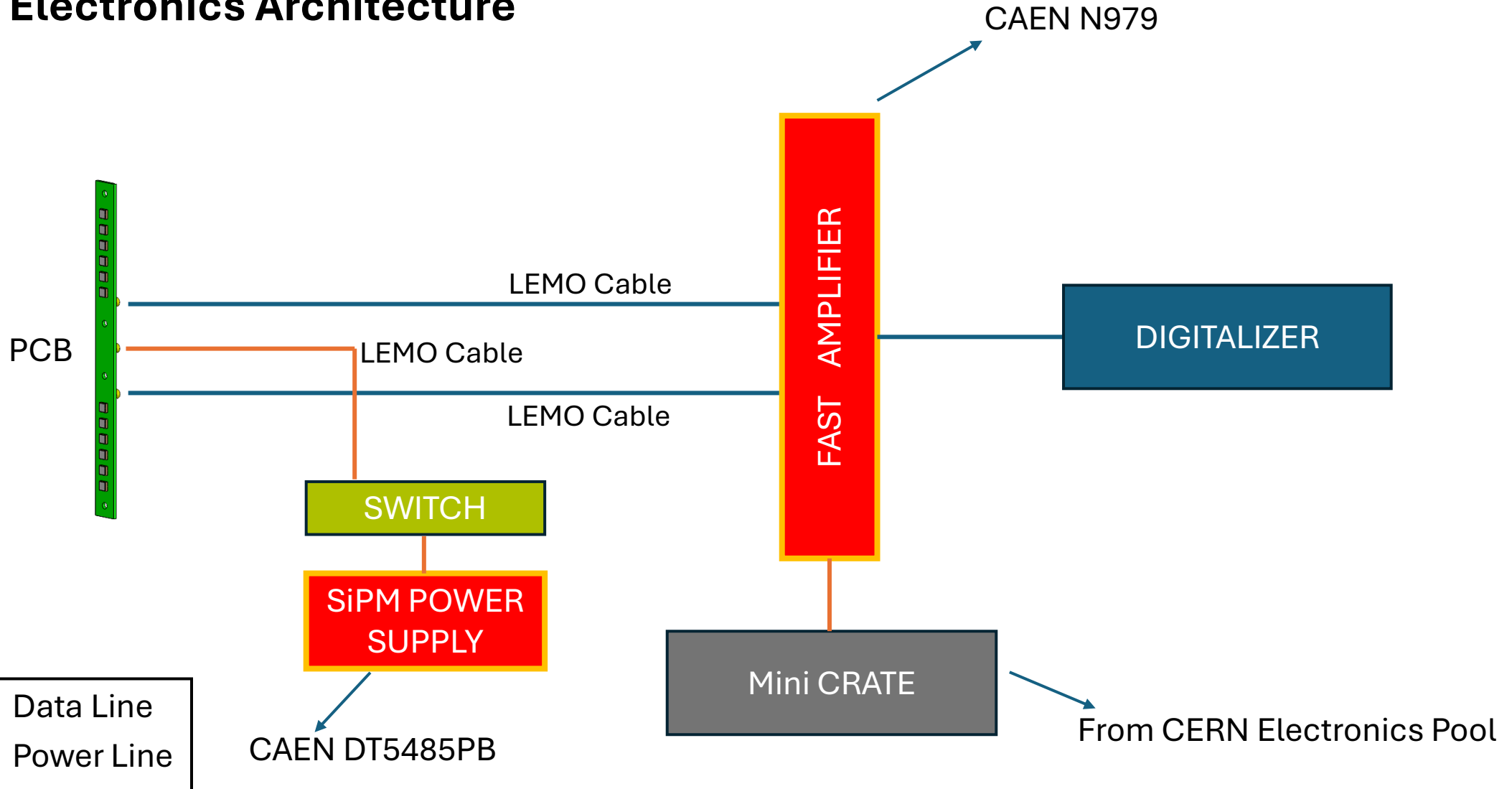
Response to Heating test result



→ Scintillator completely damaged even with two layers of thermal insulation

Detailed description of the design

Electronics Architecture



Progress assessment

ID	COMPONENT	Q.TY	DESIGN	MANIF/ PURCH	DELIVERED	TESTED	ASSEMBLED	VALIDATED	IT TO D
	SBS_CSH_Horizontal scintillator	6							
	BS_BOT_Vertical scintillator	2							
	SS_BOT_Vertical scintillator	4							
	SBS_CSH_Lower angular no CLO A	3							
	SBS_CSH_Lower angular no CLO B	3							
	SBS_CSH_Lower angular CLO A	3							
	SBS_CSH_Lower angular CLO B	3							
	SBS_CSH_Upper angular handles A	3							
	SBS_CSH_Upper angular handles A	3							
	SBS_CSH_Upper angular CLO A	3							
	SBS_CSH_Upper angular CLO A	3							
	SBS_CLO_Upper angular A	3							
	SBS_CLO_Upper angular B	3							
	SBS_CLO_Lower Angular A	3							
	SBS_CLO_Lower Angular B	3							
	FS_Scintillator	1							
	FS_Lower angular A	1							
	FS_Lower angular B	1							
	FS_Upper angular A	1							
	FS_Upper angular B	1							
	BS_CSH_Lower connection	2							
	BS_CSH_Vertical connection	2							
	BS_CSH_Lower horiz conn	1							
	BS_CSH_Upper horizz 200mm conn	2							
	BS_CSH_Upper horizz long conn	2							
	BS_CLO_Horizz conn (equal)	2							
	BS_CLO_Vertical conn	2							
	SS_CSH_Upper horiz long conn	4							
	SS_CSH_Upp horiz 200mm conn	4							
	SS_CSH_Vertical conn	4							
	SS_CSH_Low horizz long conn	4							
	SS_CSH_low horizz 200mm conn	4							
	SS_CLO_vert conn	4							
	SS_CLO_horizz conn	4							
	FS_Vert conn	4							
	FS_horizz conn upp	1							
	FS_horizz conn low	1							
	SBS_CSH_Handles	6							
	M3 Nylon Screws	52							
	M3 Metal screws + washer?	126							
	M4 screws + washer	16							
	LEMO cables	39							
	Fast Amp/Digit/crate	1							
	Aluminum cover	1							
	Black cover	1							
	PCB	13							

N. COMPONENTS	342
PROGRESS	
DESIGN	73,32%
PURCHASE/MANUFACTURE	22,51%
DELIVERY	18,57%
TEST	17,11%
ASSEMBLY	0,00%
VALIDATION	0,00%
TOTAL	21,92%
LEGEND for design phase	
Not started	0%
Dimensions defined	25%
Design on cad started	50%
Only minor adjustments	75%
Ended	100%
LEGEND for Pur./Manif. Phase	
not started	0%
Price defined	25%
Manufacture Started	50%
Bought/Manufactured	100%

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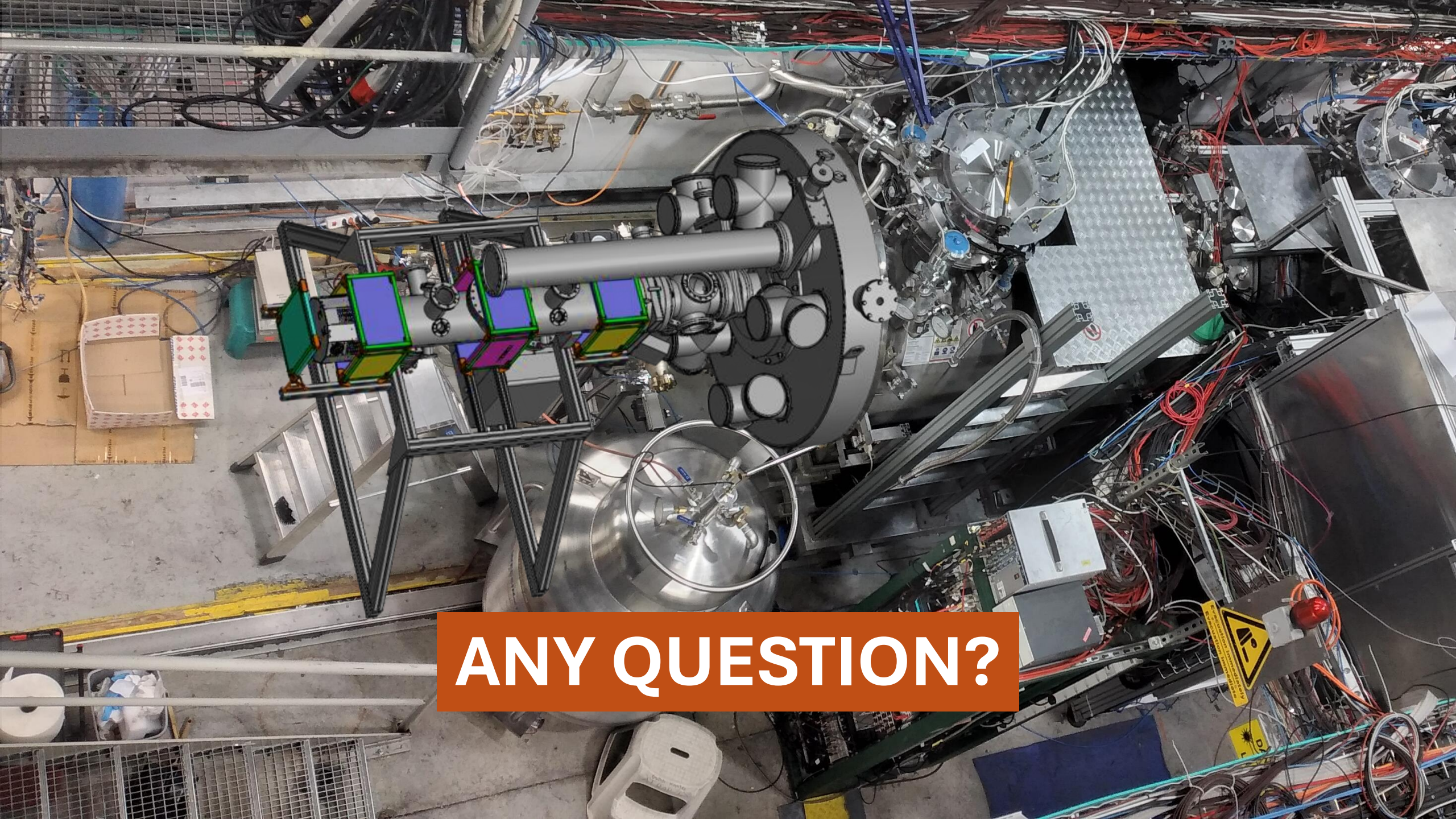
In Summary

What has been done so far:

- Developed the mechanical design
- Proved it is possible to obtain good measurements from the SiPMs
- Defined a suitable electronics architecture

What are the next steps:

- End the mechanical design
- Finalize the electronics architecture
- Assembly the scintillators and measure their efficiency
- Buy/manufacture every component
- Assembly SARA



ANY QUESTION?