ECAL LONG SLAB
R&D

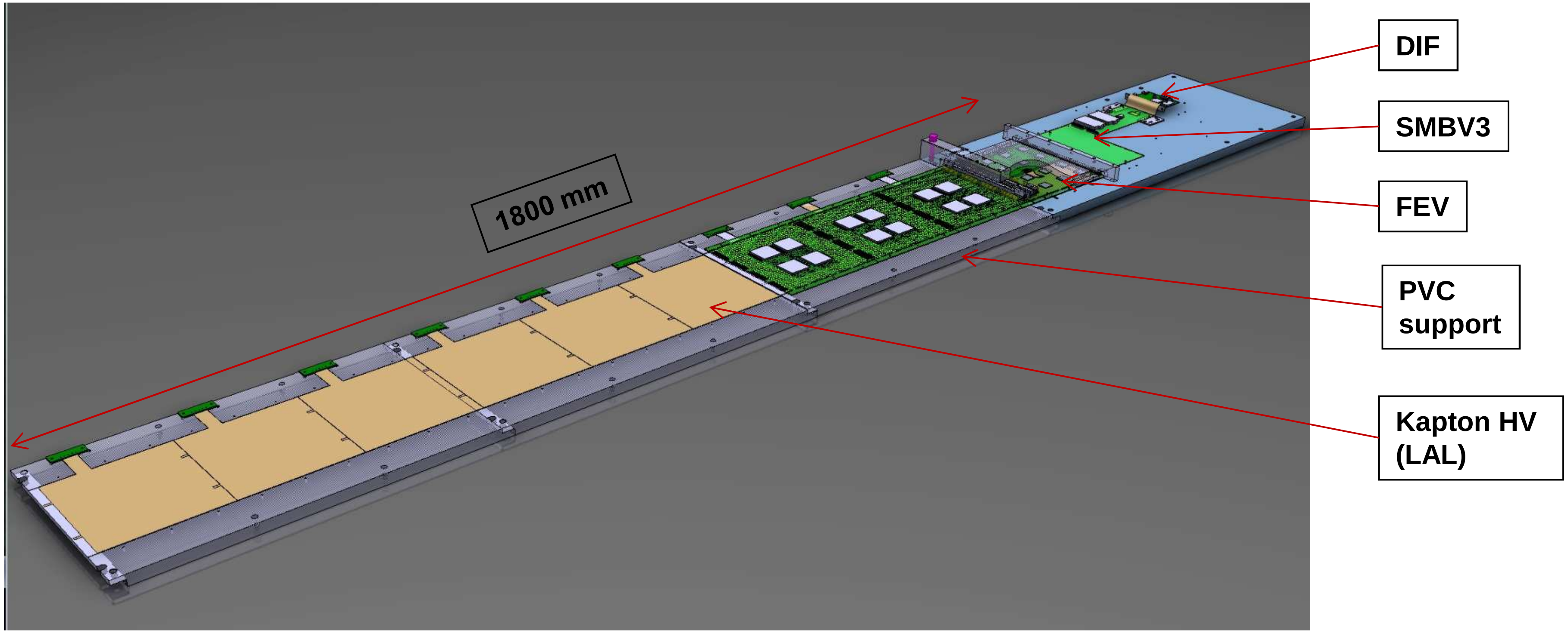
1	Long Slab setup « 10 ASU »
2	ASU Setup “4 wafers without glue”
3	Long asymmetrical H slab
4	Asymmetrical H Mould
5	Conclusion

Long slab setup « 10 ASU »

⇨ The goal:

1.0 – inter-connection of 10 FEV

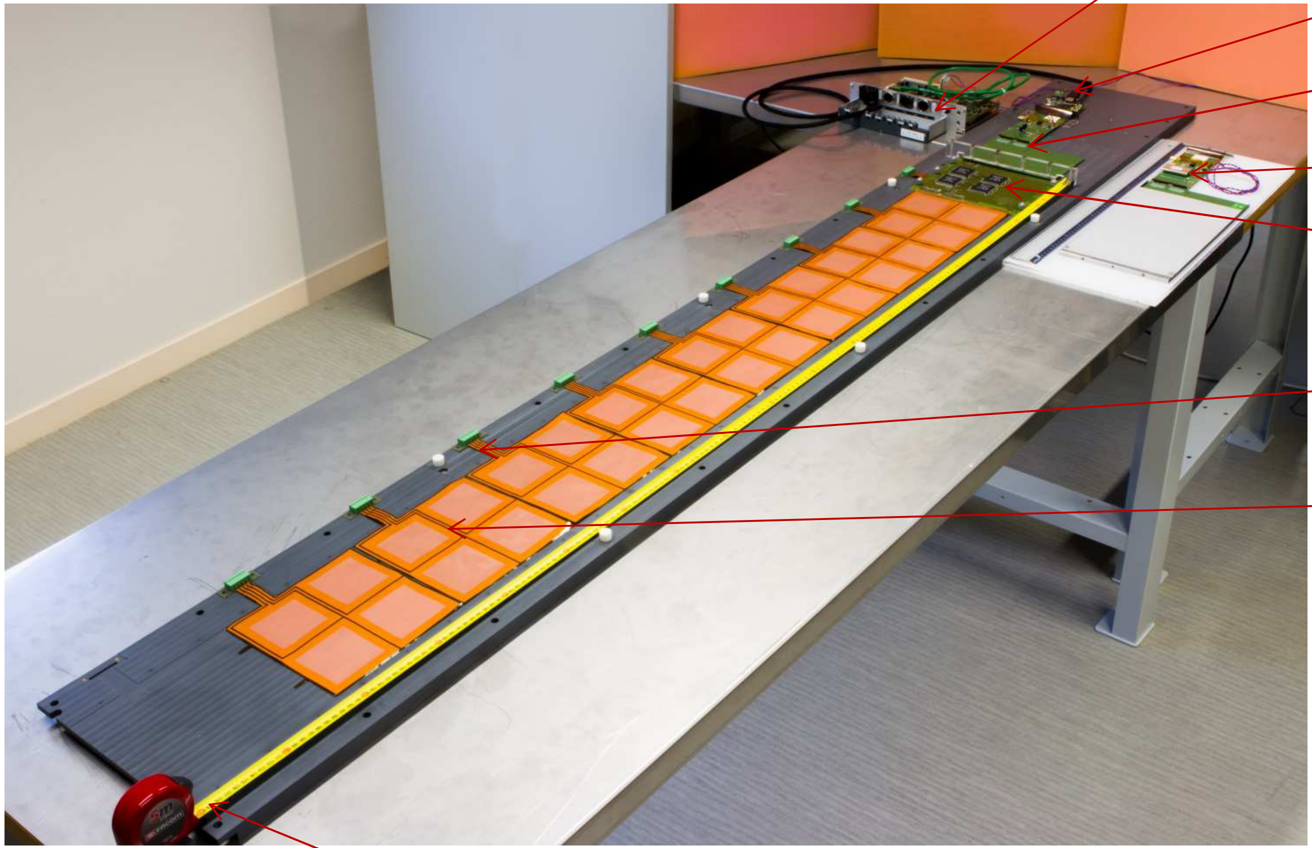
- *Realize a test bench to verify inter-connections and data taking on 10 ASU*
- *Keep a possibility to easily disassemble it in order to move to a test beam*



Long slab setup « 10 ASU »

⇨ Our realization:

1.1 – inter-connection of 10 FEV



GDCC

DIF

SMBV3

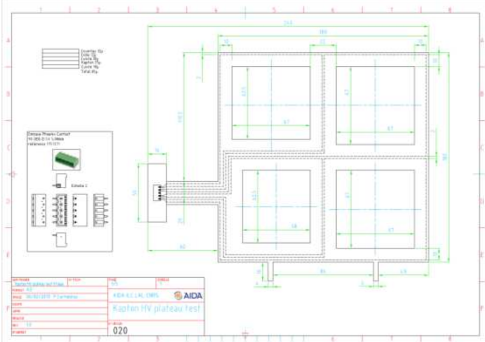
Short Slab

FEV

HV Connector (Wafer by Wafer)

Kapton HV (LAL)

1800 mm for 10 ASU

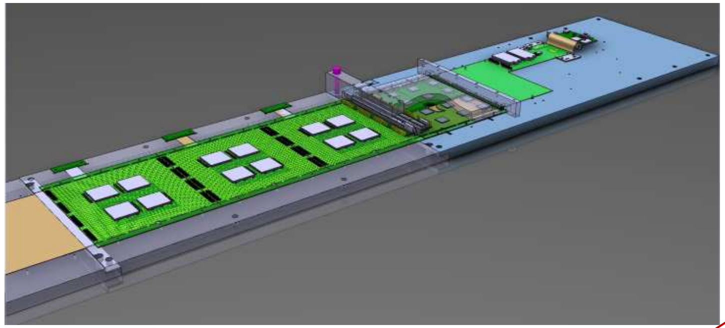


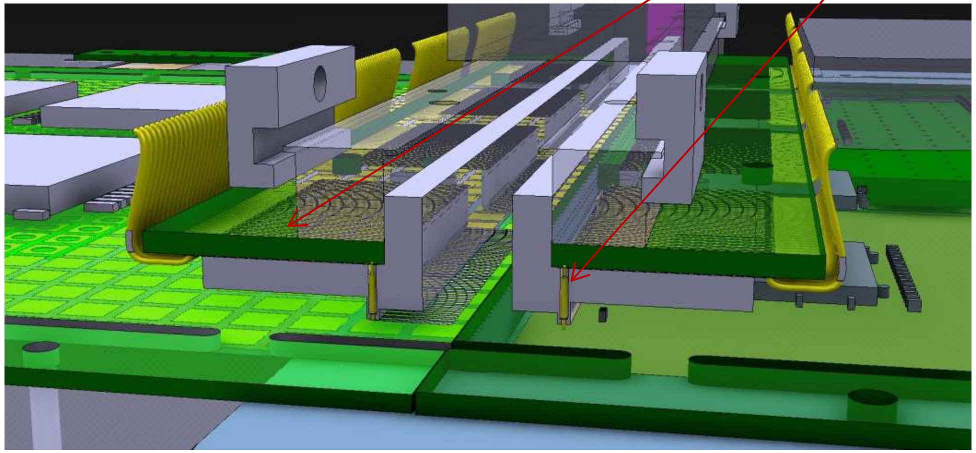
Long slab setup « 10 ASU »

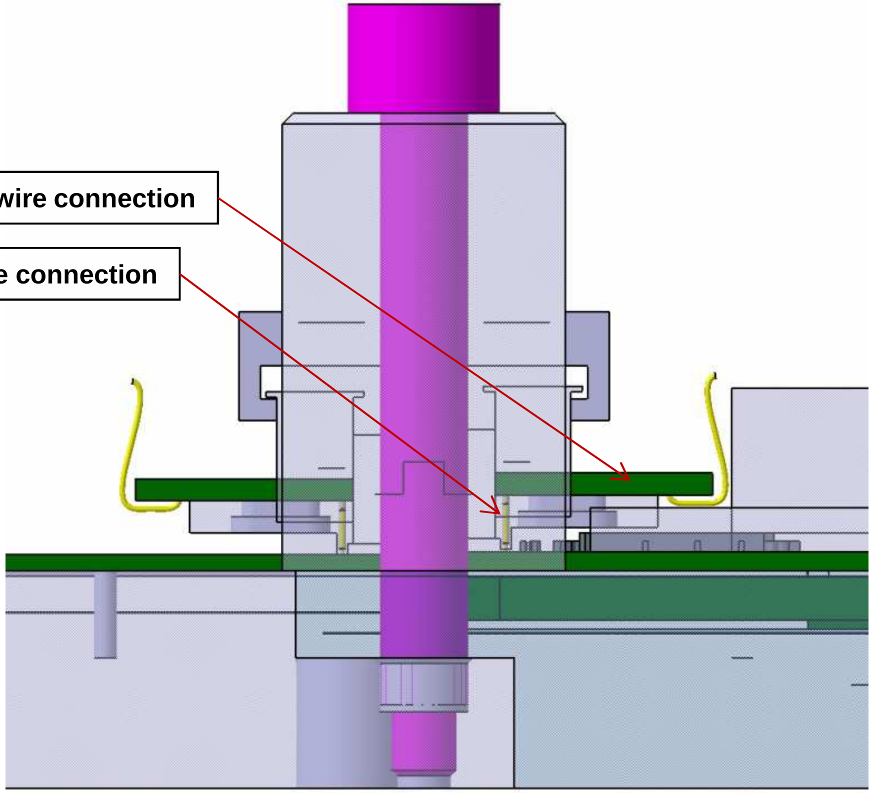
⇨ The goal:

1.2 – Temporary connection FEV 8 or 9

- *Realize a system with temporary FEV interconnections in order to verify the data transfer*







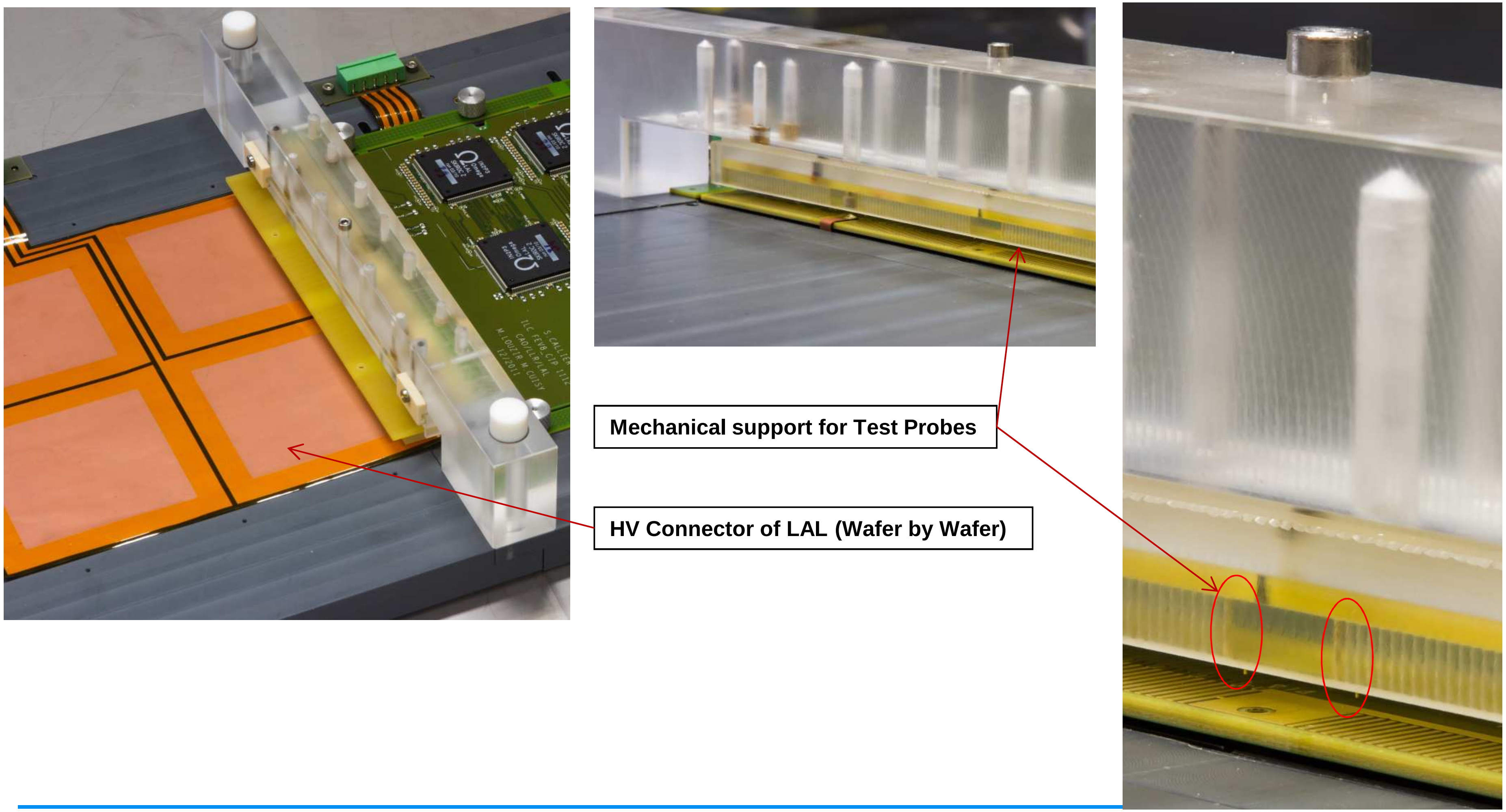
PCB wire connection

Probe connection

Long slab setup « 10 ASU »

⇨ Our realization:

1.3 – Temporary connection of FEV 8 or 9



Mechanical support for Test Probes

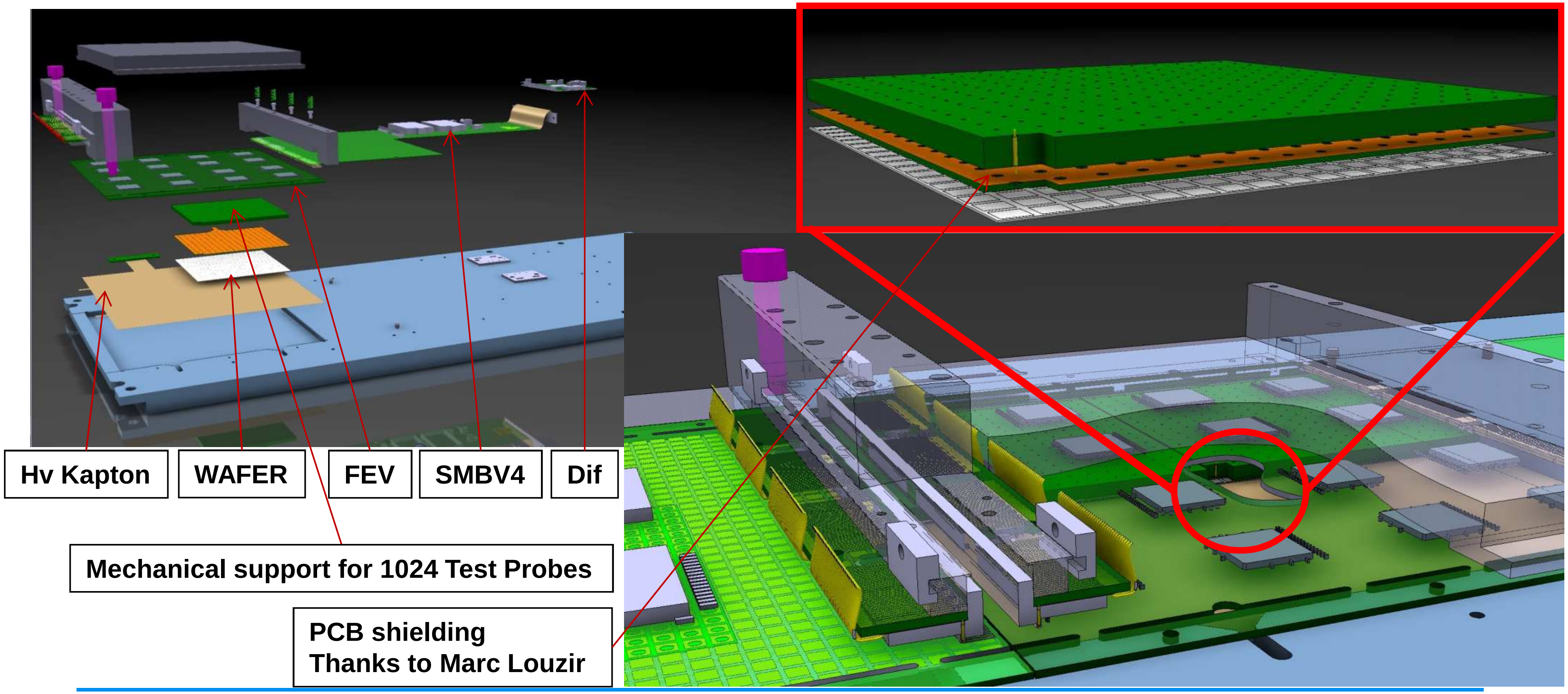
HV Connector of LAL (Wafer by Wafer)

ASU Setup"4 wafers without glue"

⇨ The goal:

2.0 – Setup option with support of test electric probes for connecting WAFER to FEV

- ***Realize an assembly with removable wafer in order to acquire cosmic data. This assembly will test the entire acquisition chain (Wafer-FEV-SMBV4-DIF-GDCC-CCC-PC-Software) before the wafer gluing operation. The first test was realized last week***



Hv Kapton

WAFER

FEV

SMBV4

Dif

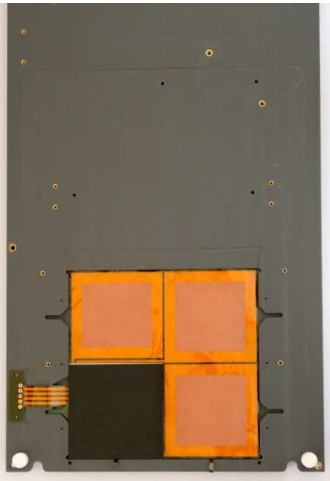
Mechanical support for 1024 Test Probes

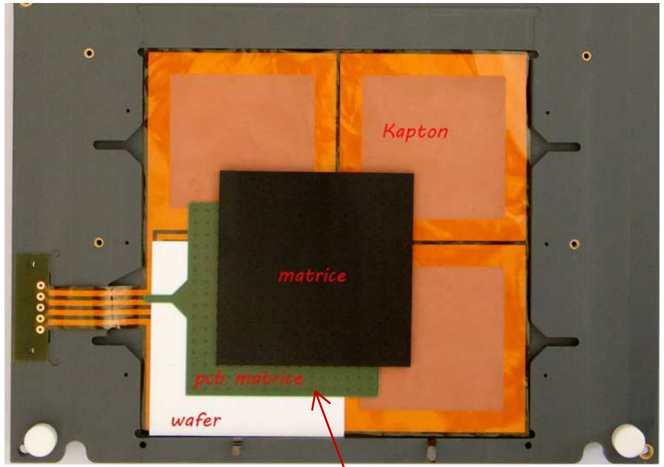
PCB shielding
Thanks to Marc Louzir

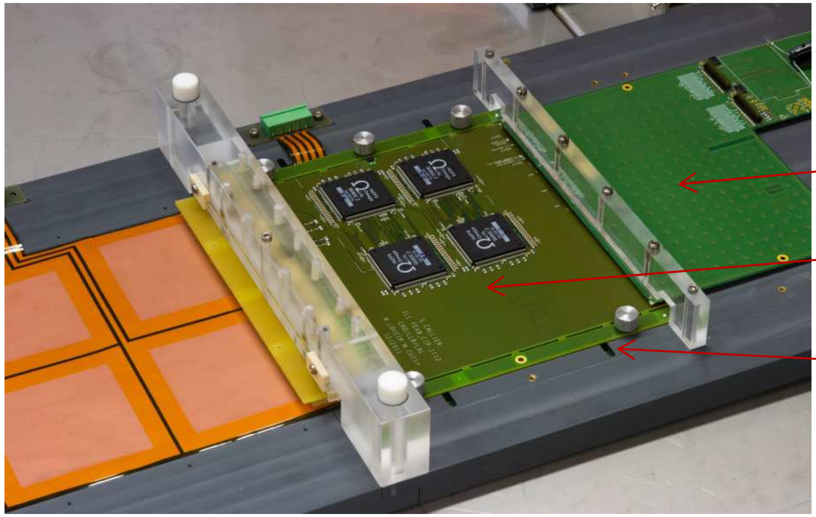
ASU Setup“4 wafers without glue”

➪ The goal:

2.1 – Setup option with support of test electric probes for connecting WAFER to FEV







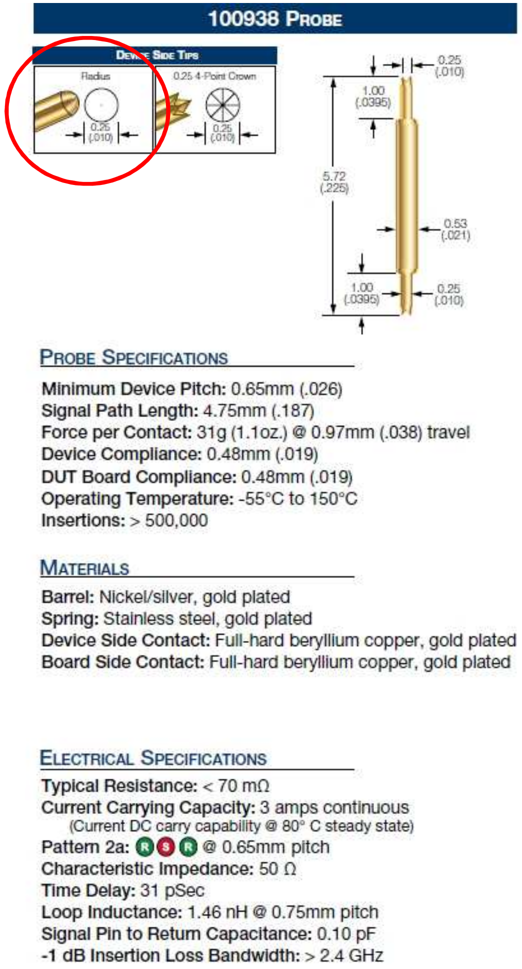
PCB shielding
Thanks to Marc Louzir

SMBV4

FEV 8

Area PCB shielding
ground connection

!



100938 Probe

Device Side Tips

Radius
0.25 (.010)

0.25 4-Point Crown
0.25 (.010)

0.25 (.010)
1.00 (.0395)
5.72 (.225)
0.53 (.021)
1.00 (.0395)
0.25 (.010)

Probe Specifications

Minimum Device Pitch: 0.65mm (.026)
Signal Path Length: 4.75mm (.187)
Force per Contact: 31g (1.1oz.) @ 0.97mm (.038) travel
Device Compliance: 0.48mm (.019)
DUT Board Compliance: 0.48mm (.019)
Operating Temperature: -55°C to 150°C
Insertions: > 500,000

Materials

Barrel: Nickel/silver, gold plated
Spring: Stainless steel, gold plated
Device Side Contact: Full-hard beryllium copper, gold plated
Board Side Contact: Full-hard beryllium copper, gold plated

Electrical Specifications

Typical Resistance: < 70 mΩ
Current Carrying Capacity: 3 amps continuous
(Current DC carry capability @ 80° C steady state)
Pattern 2a: R S R @ 0.65mm pitch
Characteristic Impedance: 50 Ω
Time Delay: 31 pSec
Loop Inductance: 1.46 nH @ 0.75mm pitch
Signal Pin to Return Capacitance: 0.10 pF
-1 dB Insertion Loss Bandwidth: > 2.4 GHz

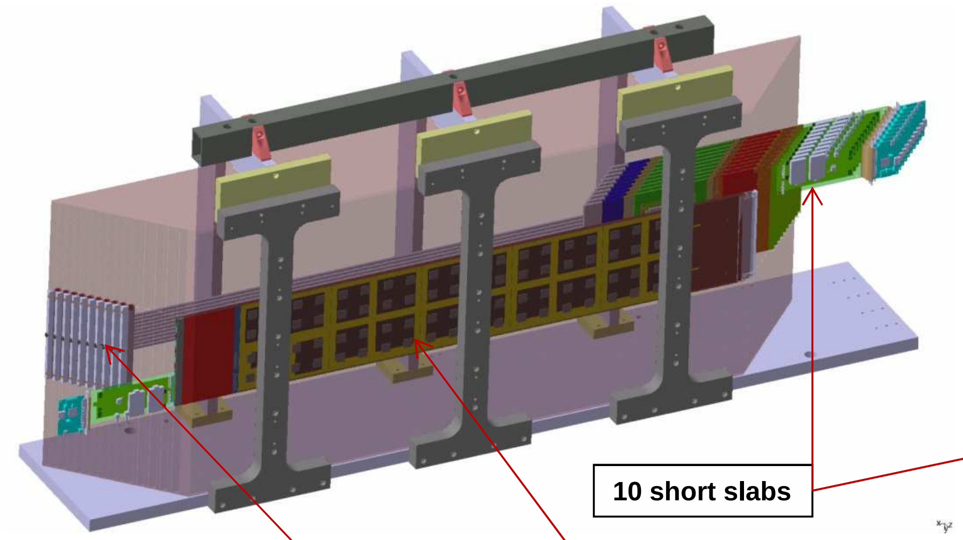
Long asymmetrical H slab

⇨ The goal:

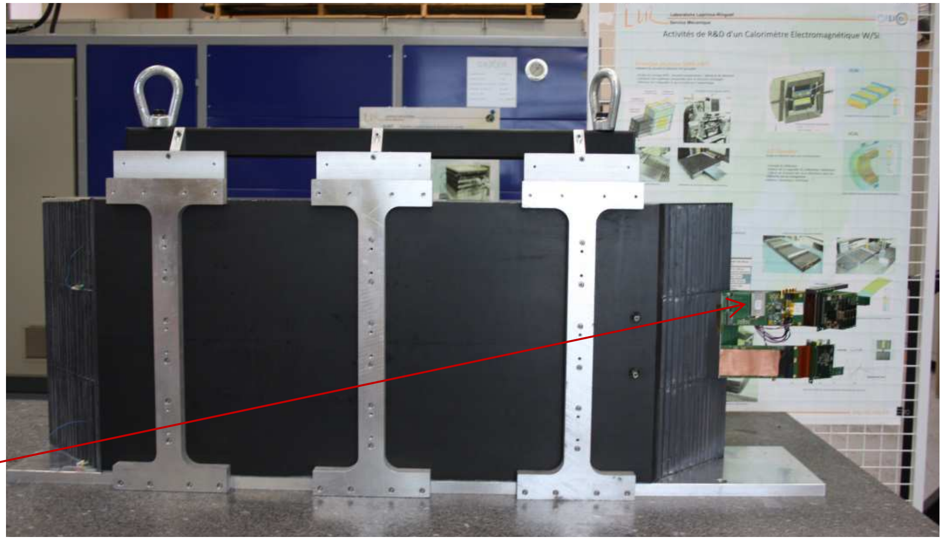
3.0 –Realized a long slab with H shape designed for the ECAL module. The setup intended for the future beam test is presented below. We have already a mechanical system for securing the position of the short slab (designed by Alain Bonnemaison, LLR)

- ***10 short Slabs FEV9 or FEV8***
- ***1 long Slab FEV9 (5 ASU)***

Future Ecal setup



present Ecal setup



10 short slabs

System for Securing the position

Long slab with 5 ASU

Long asymmetrical H slab

⇨ Ecal physical prototype

Ecal structure Design with15 alveolars

3.1 – CURRENT THICKNESS

A
4x0,22mm C+ 1x15,3mmC+ 3x0,22mmC+
1x0,1mm epoxy =16,94mm

B
4x0,22mm C + 1x0,1mm epoxy + 1x4,2mmW +
4x0,22mmC + 1x0,1mm epoxy = 6,16mm

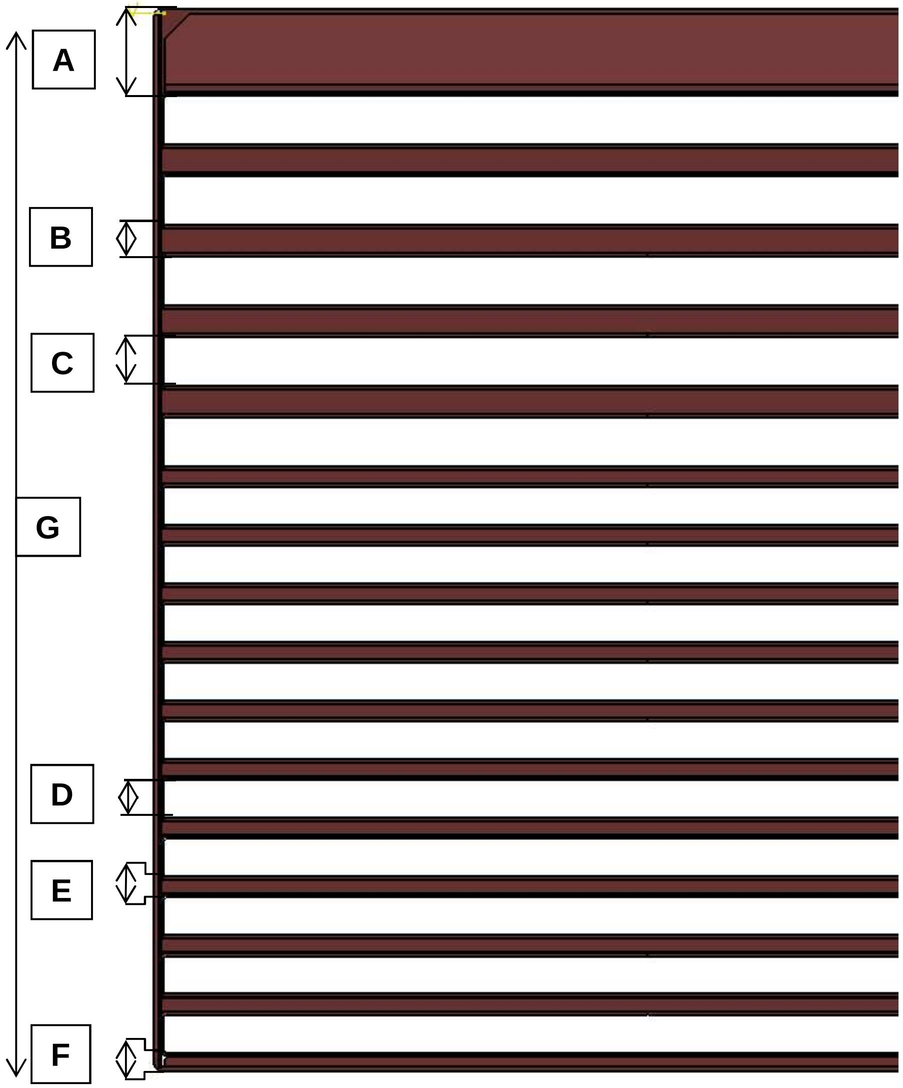
C
SLAB 9,1mm (with 4,2 mm W) +
0,3mm gap = 9,4 mm

D
SLAB 7mm (with 2,1 mm W) +
0,3mm gap = 7,3 mm

E
4x0,22mm C + 1x0,1mm epoxy + 1x2,1mmW +
4x0,22mmC + 1x0,1mm epoxy = 4,06 mm

F
2x0,22mm C + 1x0,1mm epoxy + 1x2mmC+
4x0,22mmC + 1x0,1mm epoxy = 3,52 mm

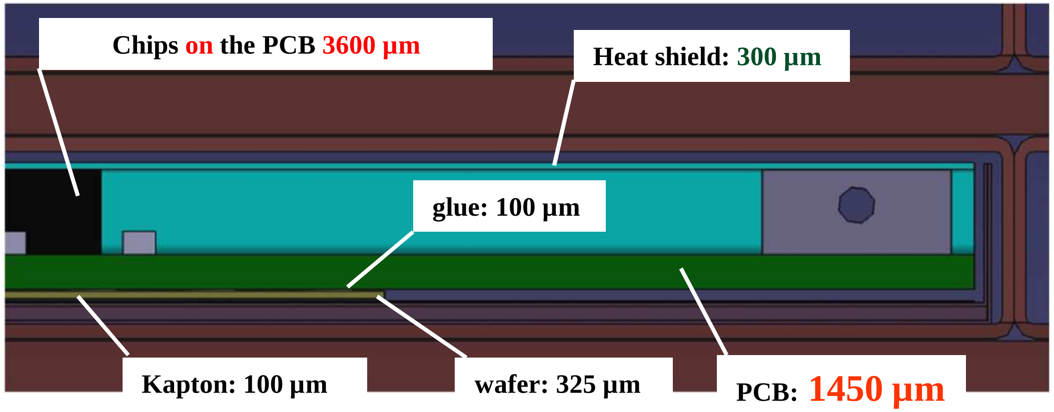
G
16,94mm+ 4x6,16 mm+ 10x4,06mm+5x9,4
+10x7,3+3,52 = 205,7 mm



Long asymmetrical H slab

3.2 – SLAB THICKNESS

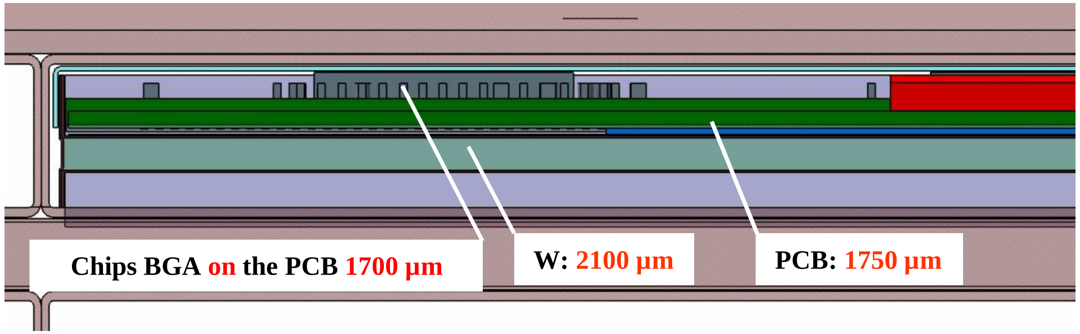
➪ **Conservative design: Short U Slab CIP, 1 SI detection layer per Slab**



➪ *Gaps (slab integration) : 300 µm*
➪ *Heat shield : 300 µm (LLR)*
➪ *PCB : 1450 µm (flatness ok)*
➪ *Chips : 3600 µm*
➪ *Thickness of glue : 100 µm (LPNHE)*
➪ *Thickness of wafer : 325 µm (LLR)*
➪ *Thickness of glue : 100 µm (LAL)*
➪ *Kapton® film HV : 100 µm (LAL)*
➪ *Thickness of Carbon : 900 µm (LLR)*
➪ *Thickness of scotch : 125 µm (LAL)*
~~➪ *Thickness of W : 2100/4200 µm*~~

➪ **Asymmetrical H design: 5 ASU detection on 1 layer per Long Slab**

The expected slab thickness is 9,1 mm **if** :

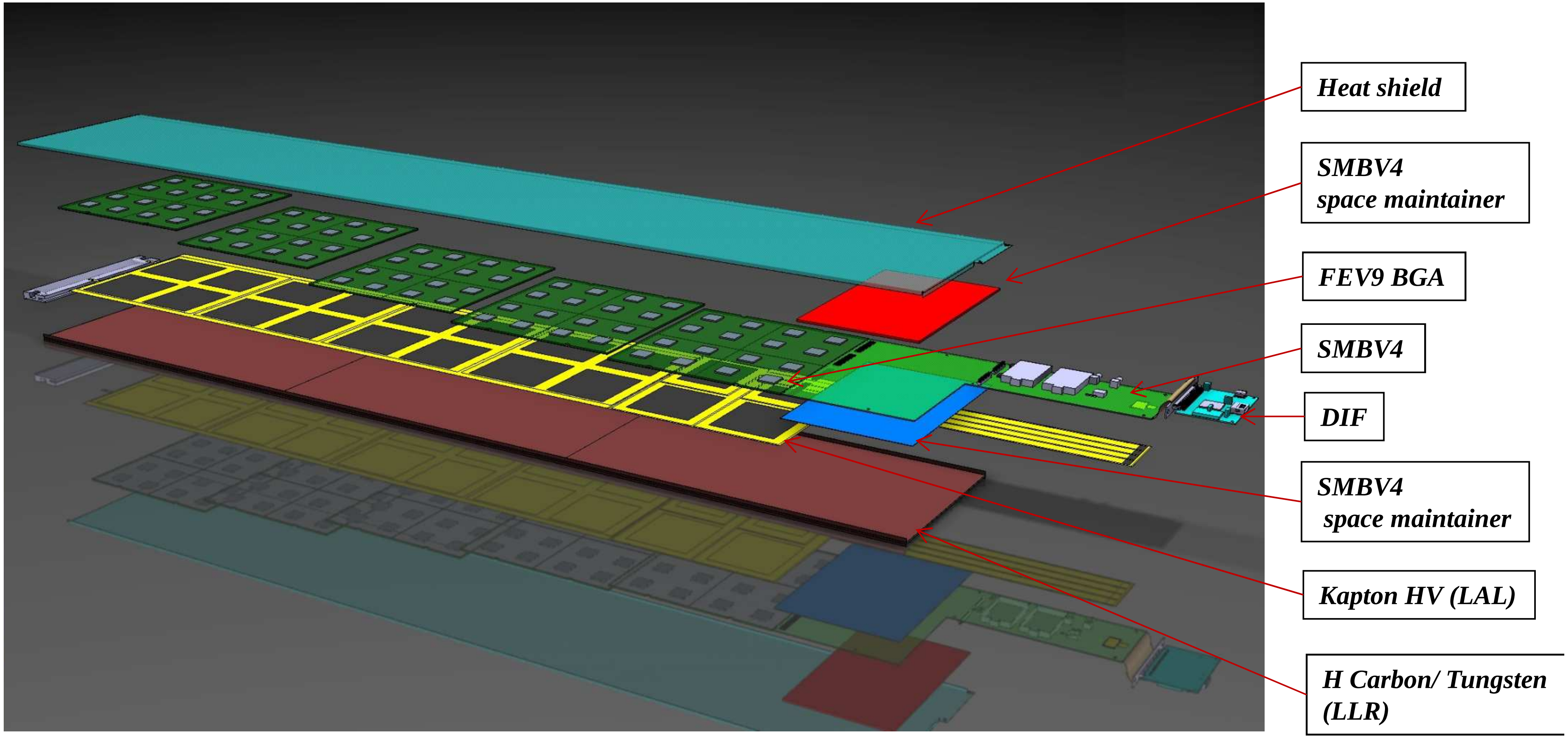


➪ *Gaps (slab integration) : 300 µm*
➪ *Heat shield : 500 µm (LLR)*
➪ *PCB : 1750 µm (flatness ok ?)*
➪ *Chips BGA: 1700 µm*
➪ *Thickness of glue : 100 µm (LPNHE)*
➪ *Thickness of wafer : 325 µm (LLR)*
➪ *Thickness of glue : 100 µm (LAL)*
➪ *Kapton® film HV : 100 µm (LAL)*
➪ *Thickness of W : 2100 µm*

Long asymmetrical H slab

⇨ Our design: *"H slab with 5 FEV9 BGA"*

3.3 – LONG SLAB component

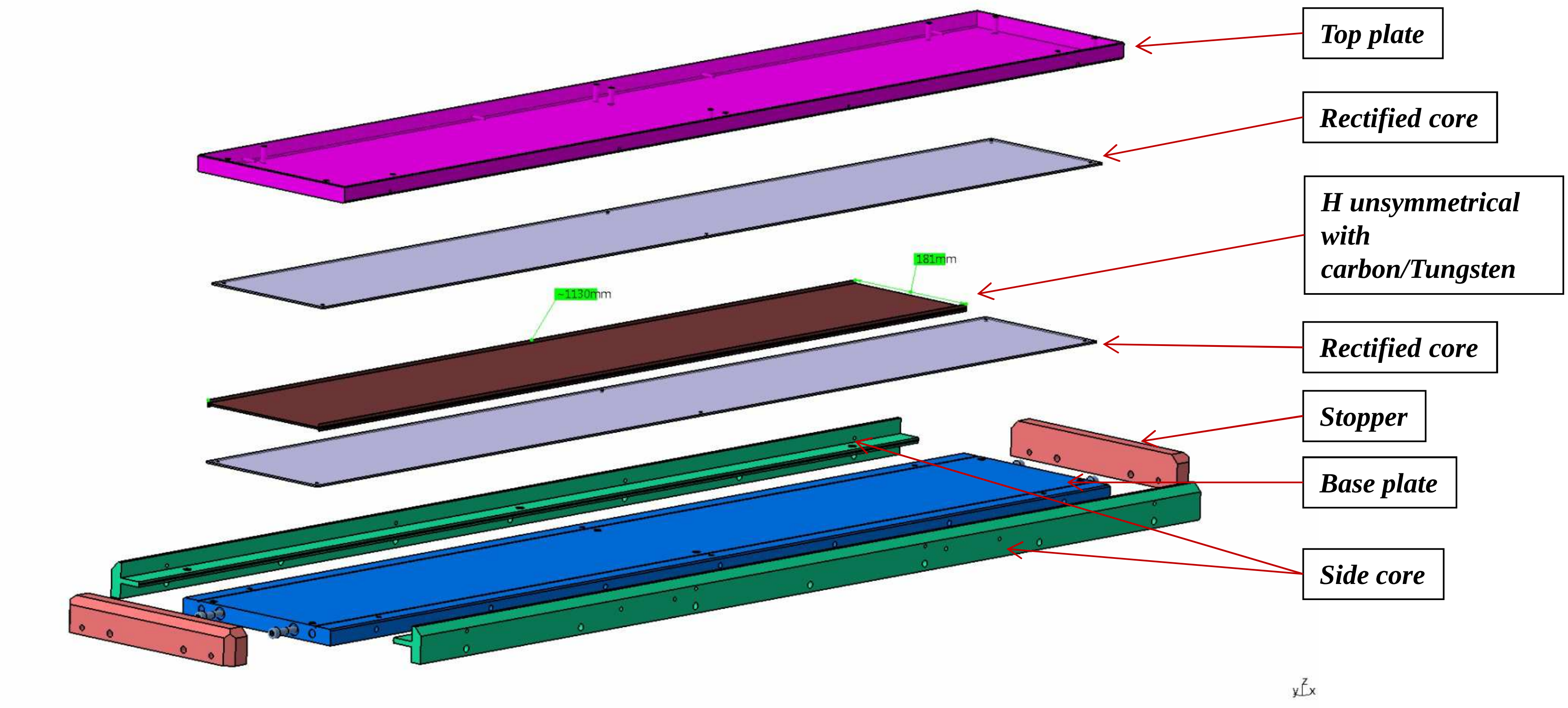


asymmetrical H mould

⇨ Our design: *"H slab with 5 FEV9 BGA"*

4.0 – H mould will ensure :

- A flatness of + / - 0.05 mm to 180mm
- Integration of 2.1 mm of tungsten within the H structure
- Compatibility with alveoli of 9.4 mm high and 182.3 mm long.



Top plate

Rectified core

H unsymmetrical with carbon/Tungsten

Rectified core

Stopper

Base plate

Side core

⇨ Conclusion:

5.0 – Conclusion

- H Mould → The design will be completed by the end of September 2013
- H Long Slab → The first prototype will be moulded in the end of November 2013
- Long slab setup → The setup has just been assembled last week (07/09/2013)
- ASU setup → The setup has finish and the test has just started on 07/09/2013