ECAL SLAB

1	Short Slab design « BGA»
2	Long Slab design « BGA»
3	Sectional view of the BGA slab
4	Long Slab product news
5	Test beam 2015
6	Test ASU Setup“4 wafers without glue
7	Slab for Test beam 2015
8	Conclusion

1-Short Slab design « BGA»

⇨ The constant:

1.0 – Ecal thickness constant

A

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

B

4x0,22mm C + 1x0,1mm epoxy + W1 + 4x0,22mmC + 1x0,1mm epoxy = *1,96mm + W1*

C

SLAB 8,53mm + W1 + 0,4mm gap = *8,53 mm + W1*

D

SLAB 8,53mm + W2 + 0,4mm gap = *8,53 mm + W2*

E

4x0,22mm C + 1x0,1mm epoxy + W2 + 4x0,22mmC + 1x0,1mm epoxy = *1,96mm + W2*

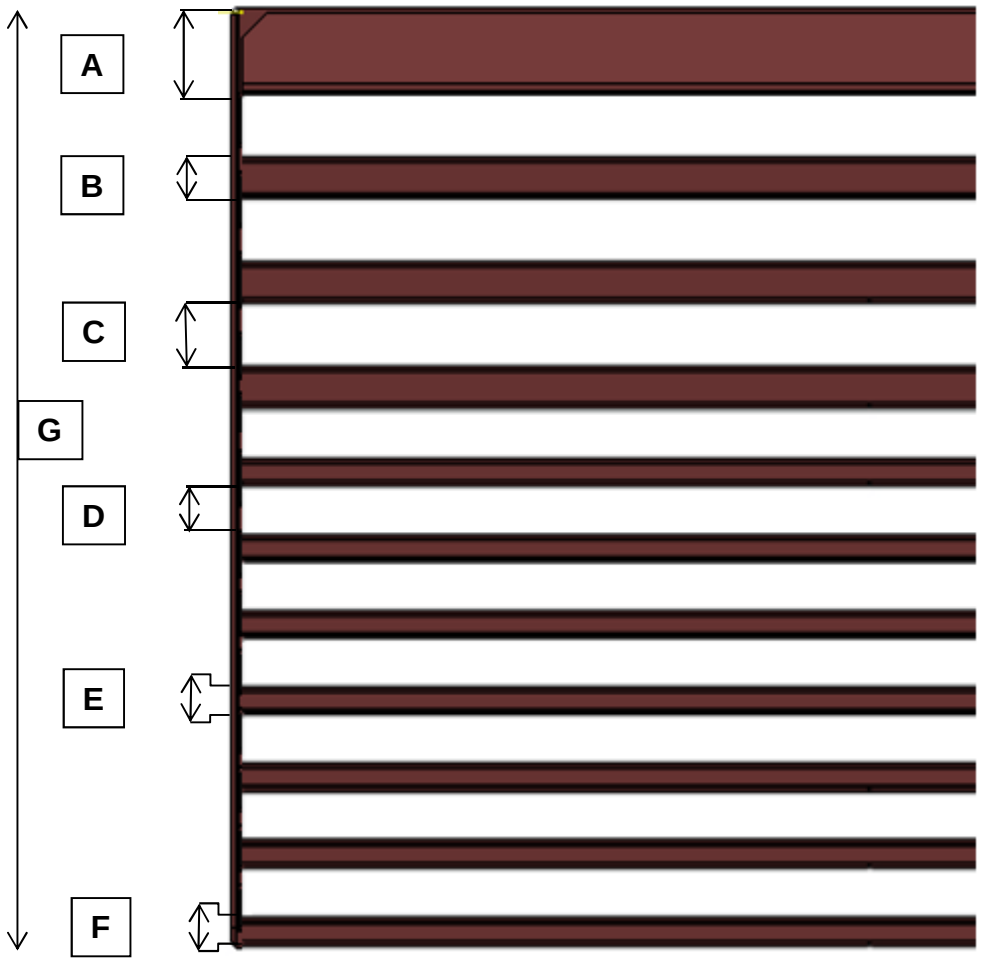
F

2x0,22mm C + 1x0,1mm epoxy + 1x3,5mmW+ 1x0,1mm epoxy + 1x2mm C+ 4x0,22mmC = 7,02 mm

G

16,94mm + N1 x(1,96 mm+W1) + N1 x(8,53mm+W1) + N2 x(8,53mm+W2) + N2 x(1,96 mm+W2) + 7,02 = ?

N1= number of tungsten W1 layer thickness 1
N2= Number of tungsten W2 layer thickness 2

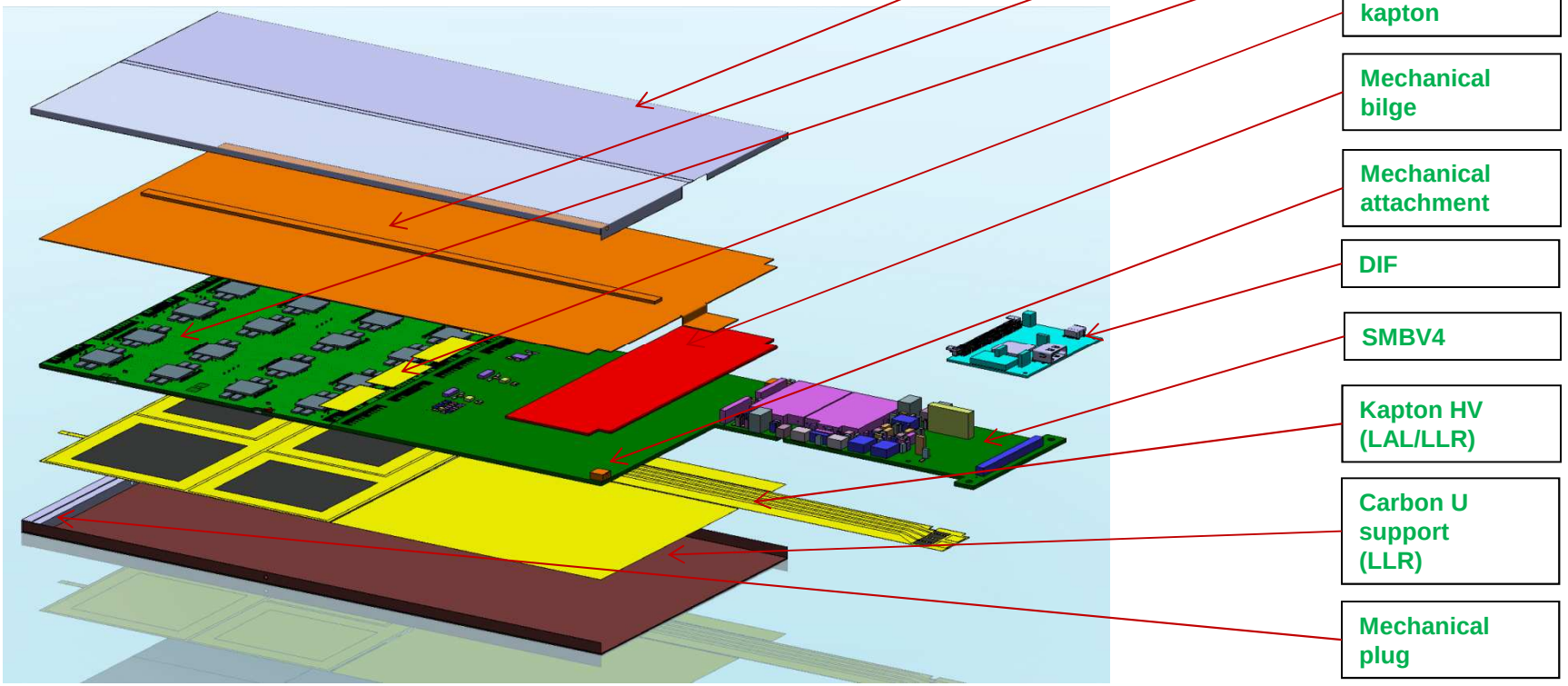


1-Short Slab design « BGA»

⇨ The goal:

1.1 – Approach the final design with the short SLAB

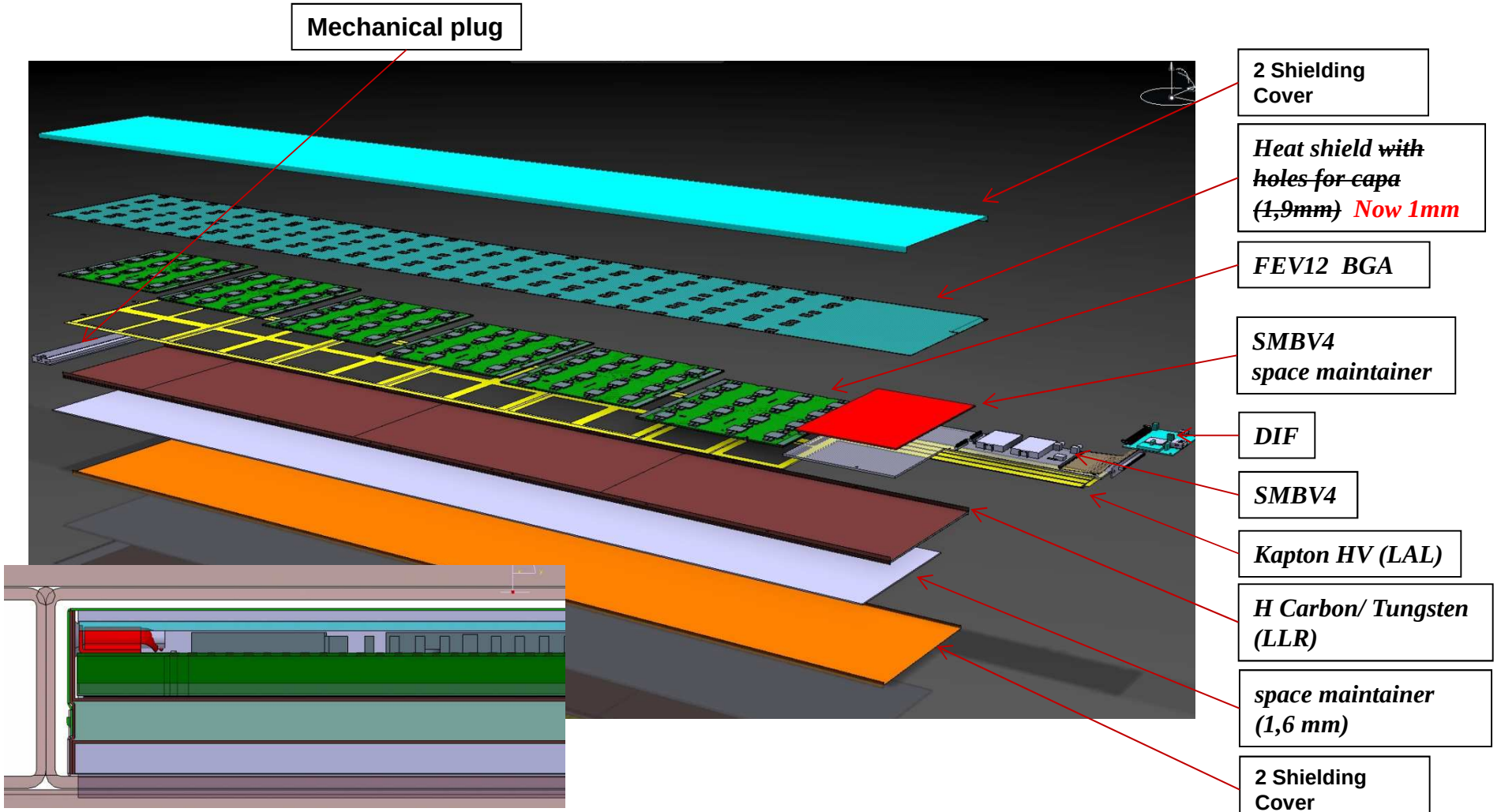
- *Have the same part of the long slab (as much as possible)*
- *Provide for the management of all these parts for assembly*
- *Ensure the industrialization of all the parts*



2-Long slab setup « 6 ASU »

⇨ The goal: *H slab with 6 FEV11 BGA for ECAL and 10 for ENCAP*

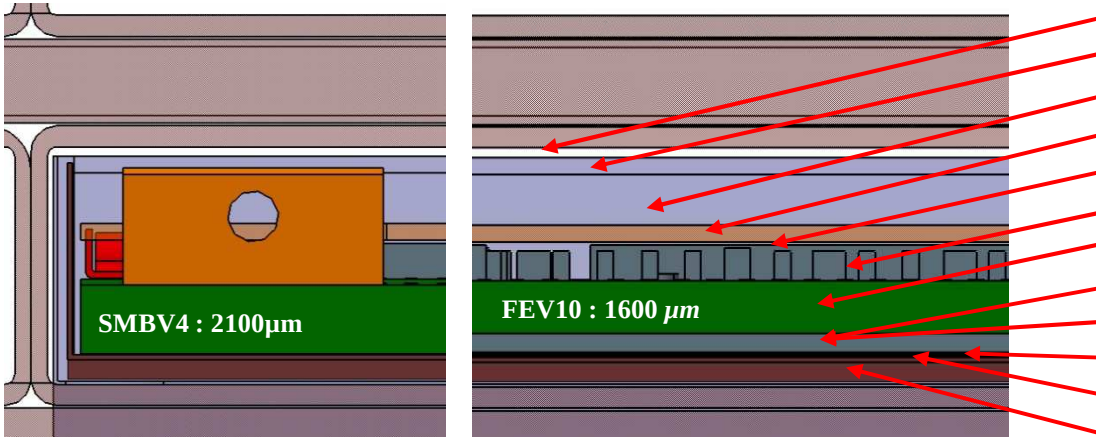
2.0 – Define long SLAB, 24 Kaptons for interconnection!



3-Sectional view of the BGA slab

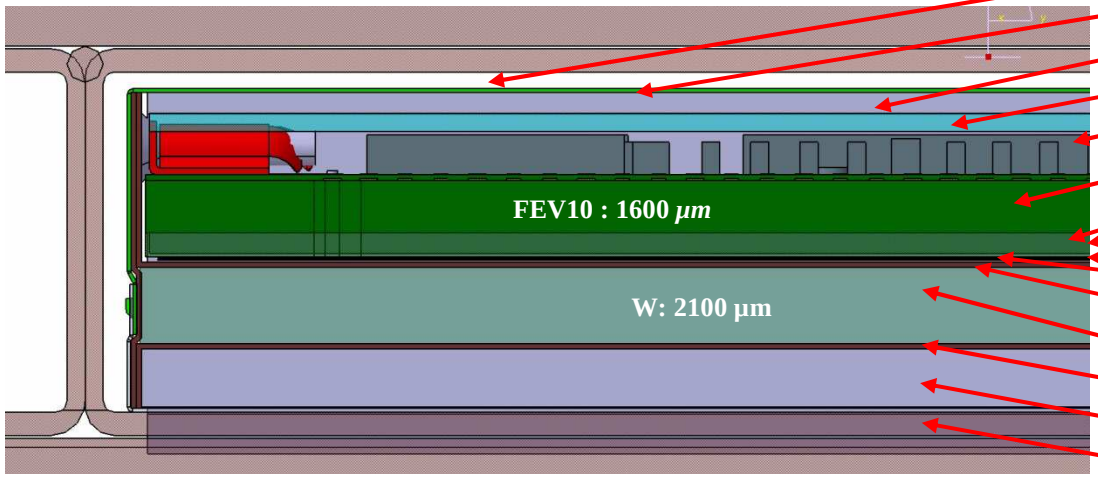
3.0 – SLAB THICKNESS

⇨ Conservative design: Short U Slab CIP BGA, height of cell 7,3 mm



- ⇨ *Gaps (slab integration) : 410 µm*
- ⇨ *Shield Cover : 100 µm*
- ⇨ *Gaps : 1859 µm*
- ⇨ *Heat shield : 500 µm (LLR)*
- ⇨ *Pad thermique : 100 µm (LLR)*
- ⇨ *Chips : 1100 µm*
- ⇨ *PCB FEV 10 : 1600 µm (flatness ok)*
- ⇨ *Thickness of glue : 250 µm (LPNHE)*
- ⇨ *Thickness of wafer : 325 µm (LLR)*
- ⇨ *Thickness of glue : 150 µm (LAL)*
- ⇨ *Kapton® film HV : 100 µm (LAL)*
- ⇨ *Thickness of Carbon : 800 µm (LLR)*

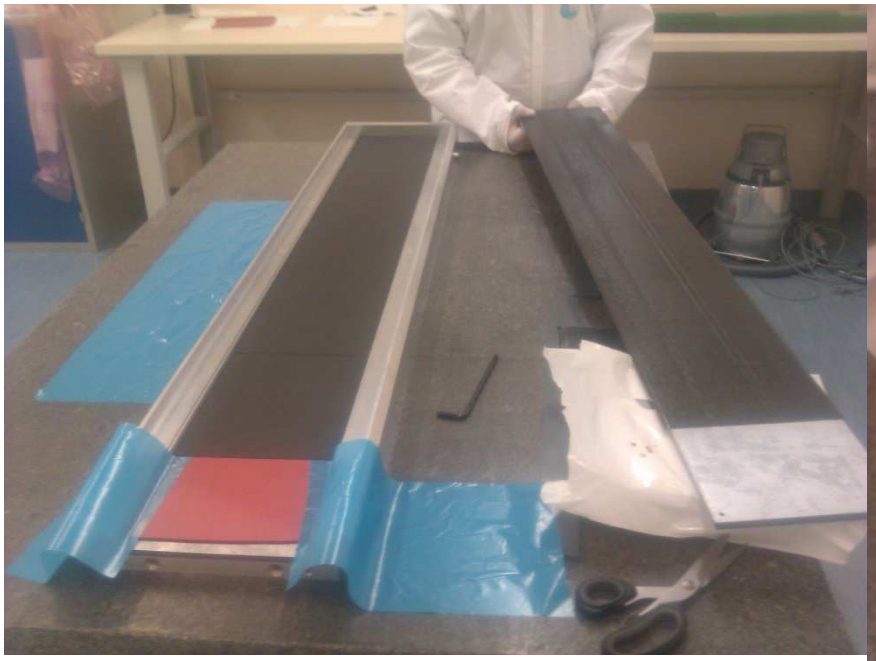
⇨ Asymmetrical H design: height of cell 9,4 mm



- ⇨ *Gaps (slab integration) : 425 µm*
- ⇨ *Shield cover : 100 µm*
- ⇨ *Gaps : 600 µm*
- ⇨ *Heat shield : 500 µm*
- ⇨ *Chips BGA: 1100 µm*
- ⇨ *PCB : 1600 µm*
- ⇨ *Thickness of glue : 250 µm (LPNHE)*
- ⇨ *Thickness of wafer : 325 µm (LLR)*
- ⇨ *Thickness of glue : 150 µm (LAL)*
- ⇨ *Kapton® film HV : 100 µm (LAL)*
- ⇨ *Thickness of Carbon : 200 µm (LLR)*
- ⇨ *Thickness of W : 2100 µm*
- ⇨ *Thickness of Carbon : 200 µm (LLR)*
- ⇨ *Thickness of space maintainer : 1650 µm (LLR)*
- ⇨ *Shield cover : 100 µm*

4-Long Slab product

⇨ **News:** *4.0 – Long slab fully in carbon*



We are now able to build a H
We have already built one long H fully in carbon
In 2015, we will produce one long slab with W.

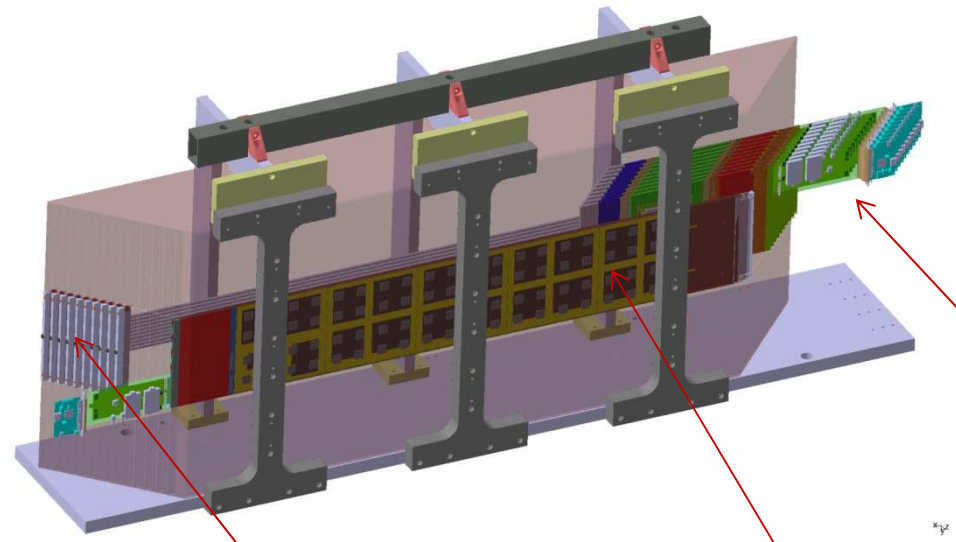
5-Test beam 2015

⇨ The goal:

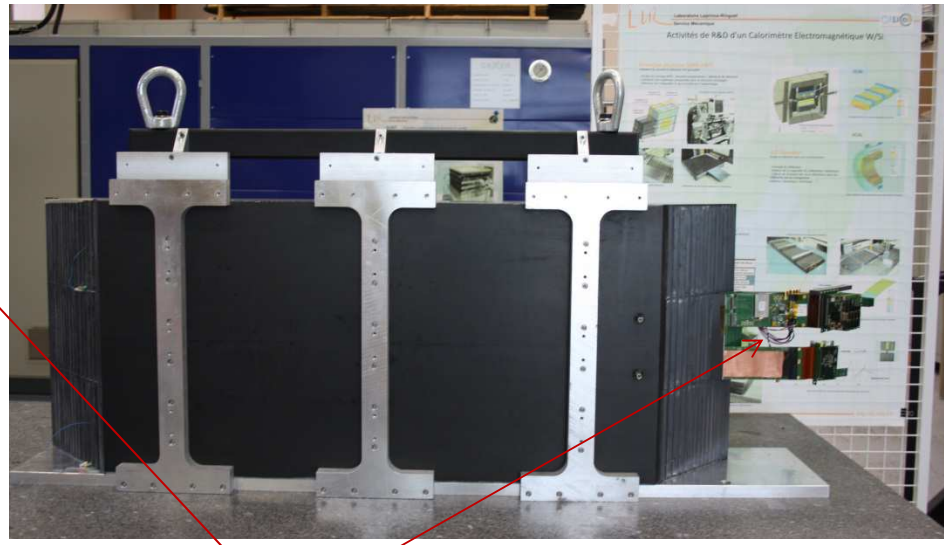
5.0 – Next test beam (if electronic test and cosmic test are OK)

- *10 short SLAB with 4 wafers per slab.*
- *Possible to add 4 short slab but 1 wafer per slab.*
- *1 long SLAB with only 4 wafers*

Future Ecal setup



present Ecal setup



System for Securing the position

Long slab with 6 ASU and 4 wafers

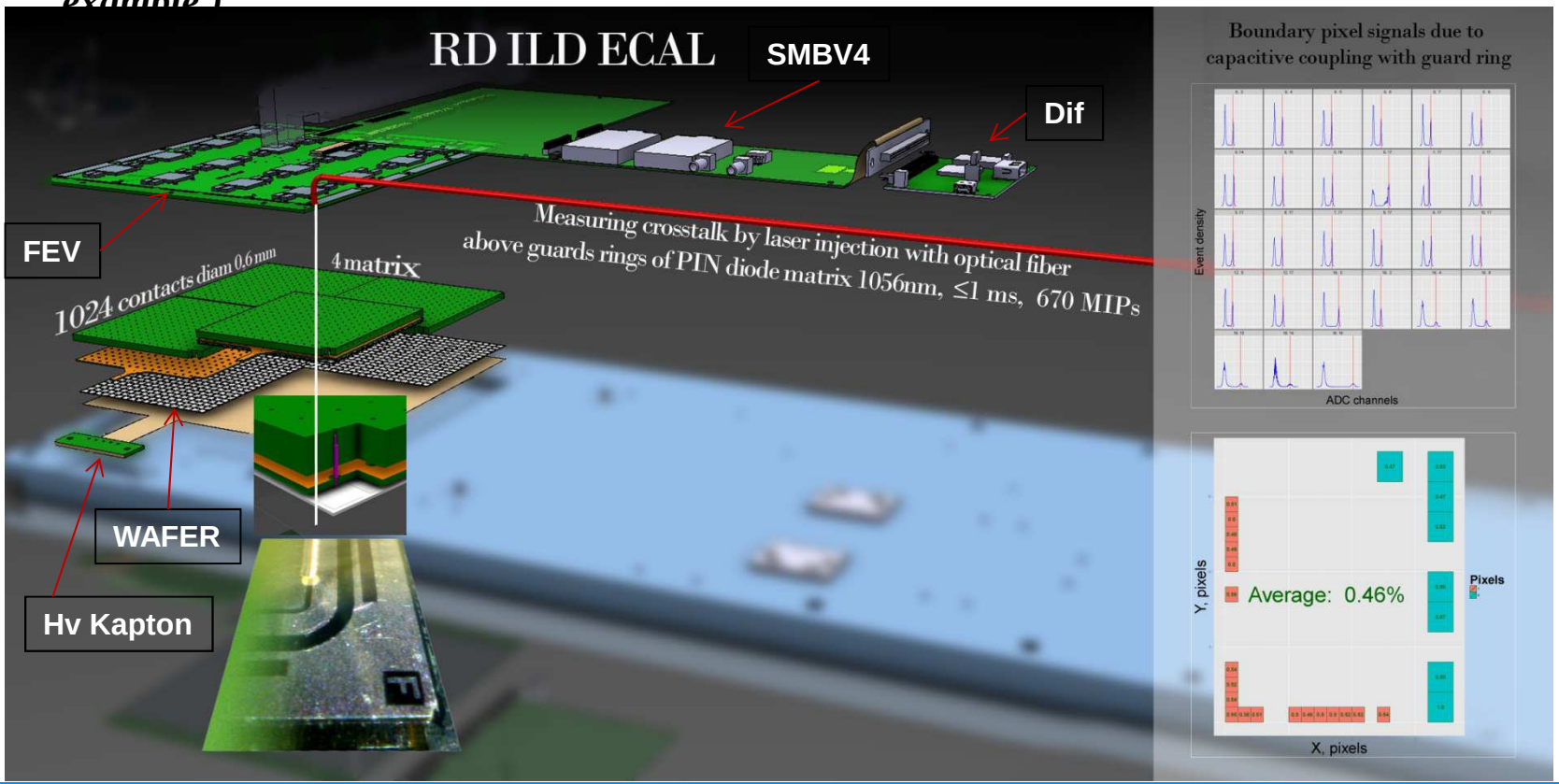
10 short slabs

6-ASU Setup“4 wafers without glue”

⇨ The goal:

6.0 – 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 (or not). LLR has built 4 setup like this (laser injection example)

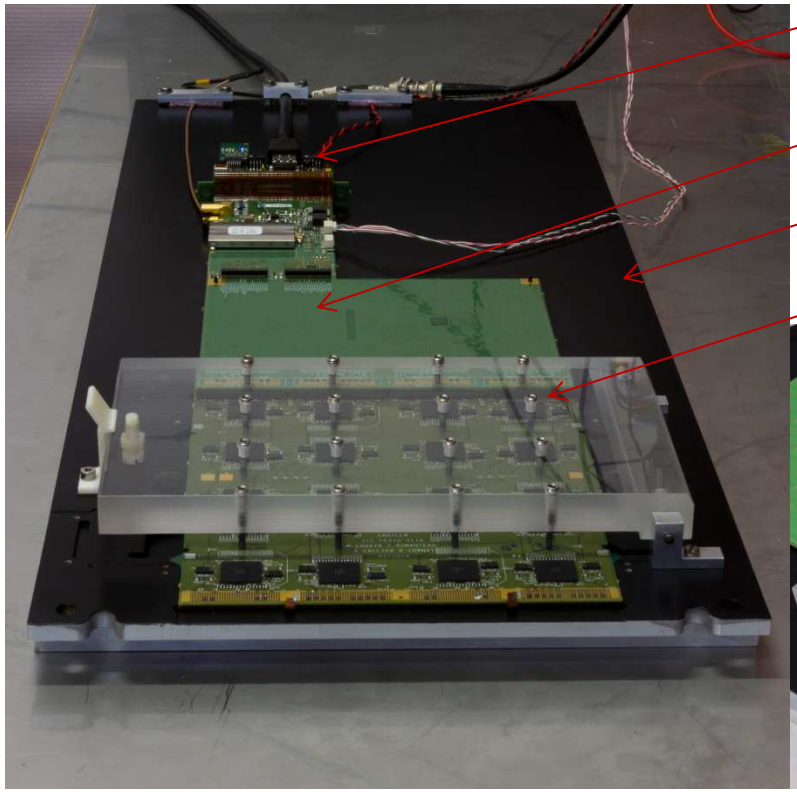


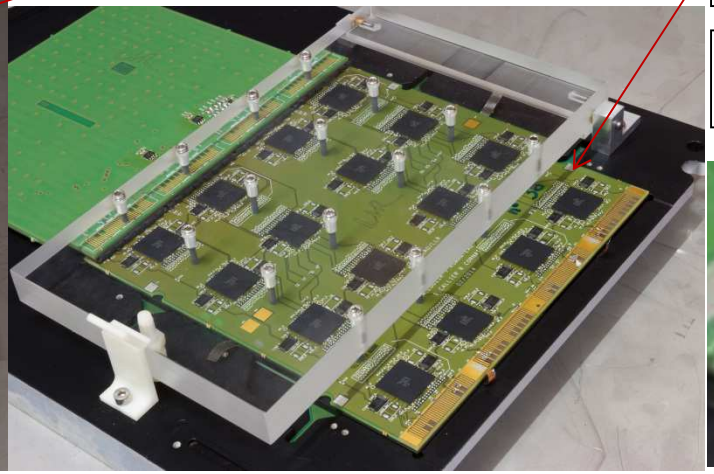
6-ASU Setup“4 wafers without glue”

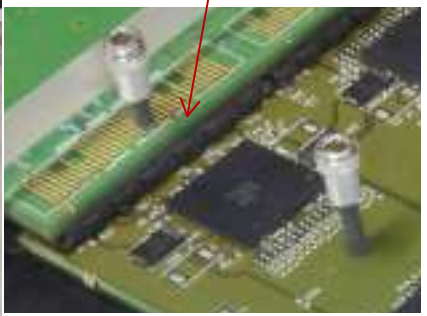
⇨ The goal:

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

- ***Very good reproducibility of the contacts!*** *(30 min for testing 1 FEV 16 chip and 4 wafer)*
- ***Very reasonable noise >15 with a gain of 1.2pF***
- ***1024 achievement Scurves in parallel !***







Dif

SMBV4

Mechanical support for 1024 Test Probes

FEV10 and SMBV4 COVER PRESSURE

WAFER CAVITY under the FEV10

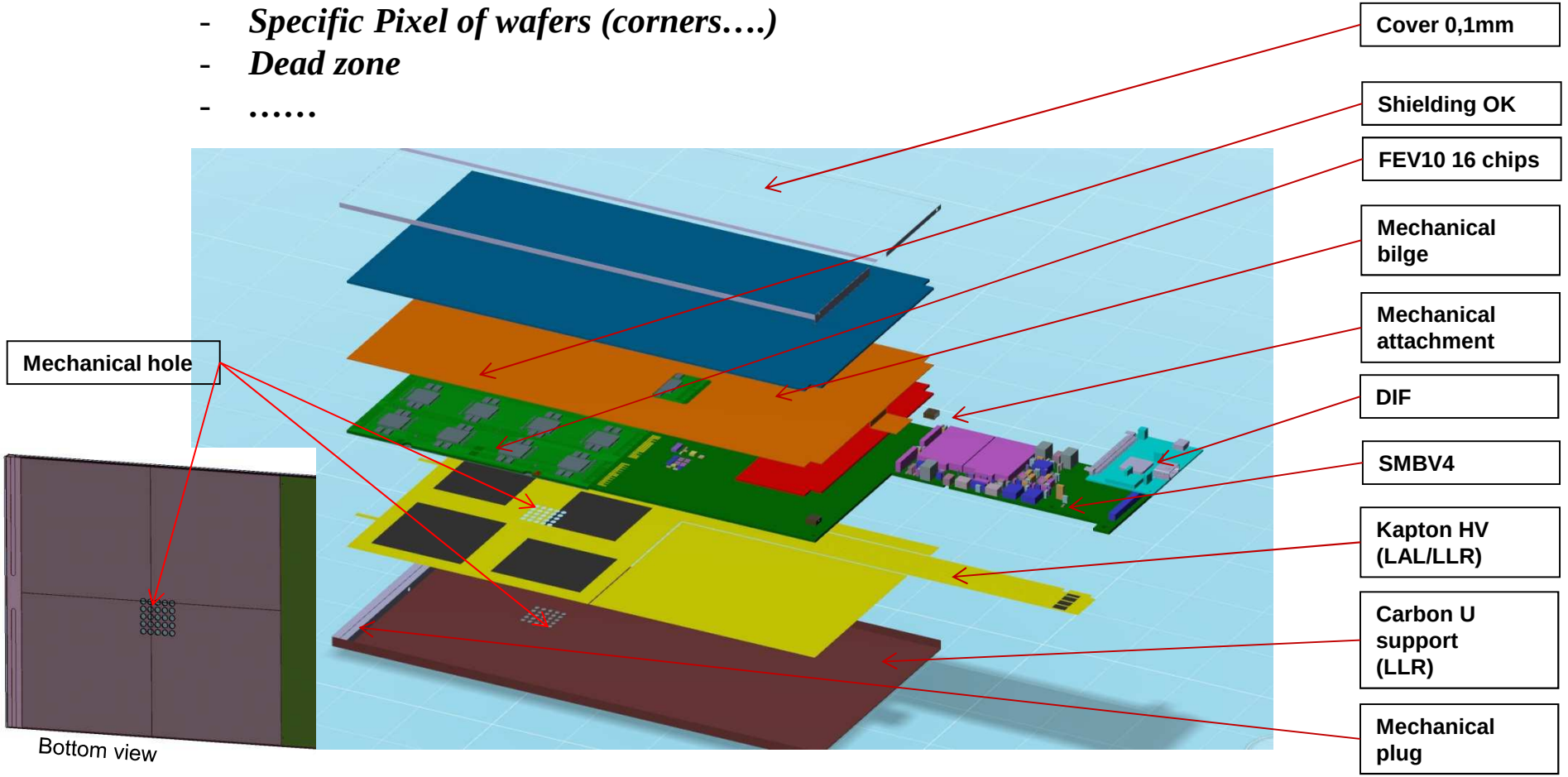
Connector designed by the LLR

7-Slab for Test beam 2015

⇨ The goal:

7.0 – Testing the response of the short SLAB with 4 wafer in particular zone

- *Guar-ring*
- *Specific Pixel of wafers (corners….)*
- *Dead zone*
- *……*

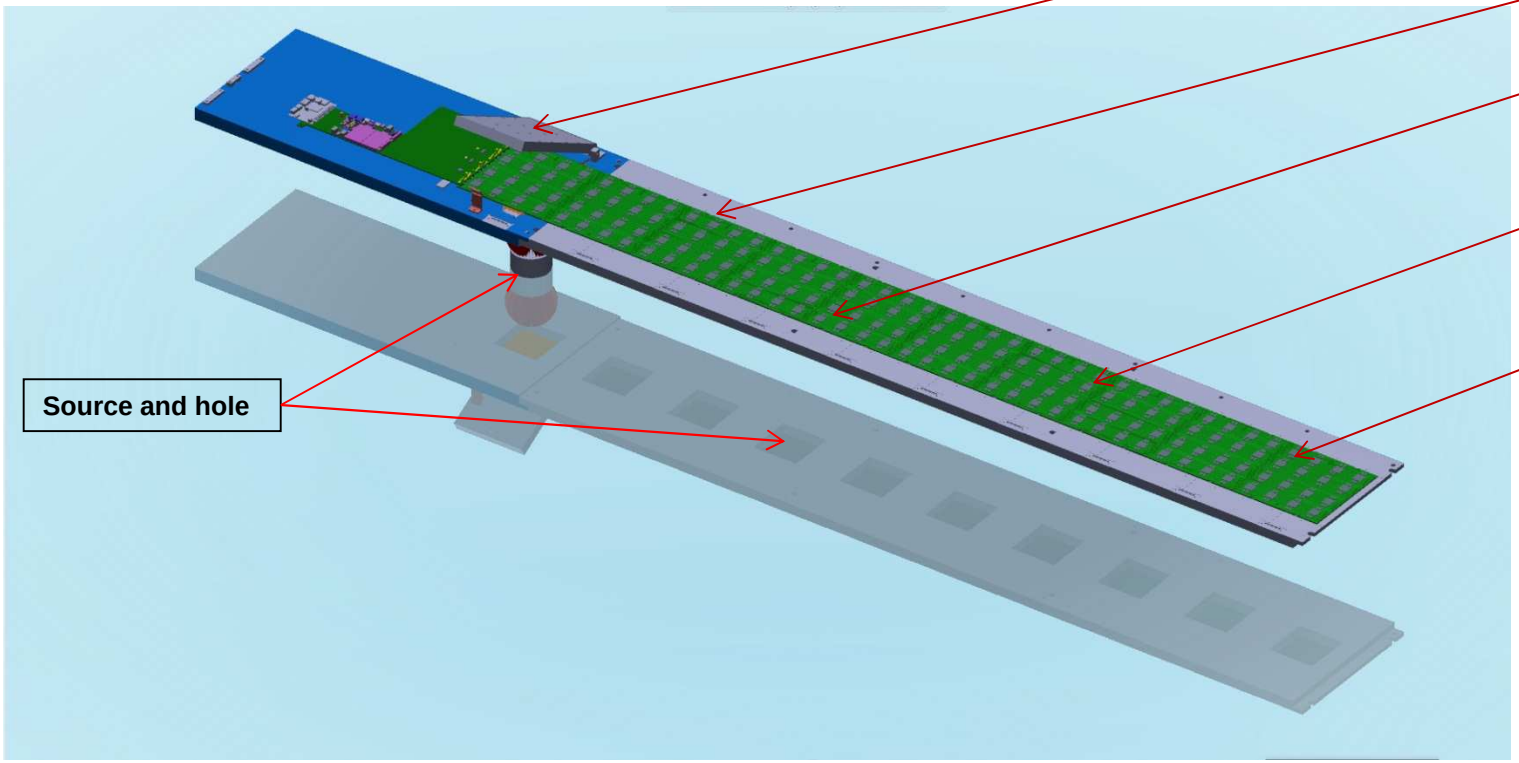


7-Slab for Test beam 2015

⇨ The goal:

7.1 – Testing the response of the Long SLAB with 1 and perhaps 40 wafers!

- *quality of the first wafer signal relative to the last wafer*
- *Specific Pixel of wafers (corners)*
- *DAC Testing……*
- *and surprises!!!*



Conclusion

⇨ **Conclusion:**

- ***In 2015, we will produce the next long slab in carbon and another one in Tungsten***

- ***We have found an industrial solution for build the cover of 0,1mm thickness and 0,3 m of length, the next step is 1m of length.***

- ***All the 4 ASU setup are completed , it 's now possible to acquire data without sticking 4 wafers of 1024 pixels.***

- ***It's now possible to test all the function of an ASU in less than ½ H!***

- ***We will prepare the future test beam of 2015 " if the production of all slab is ok"***