



Outer Barrel Wirebond Protection

11 - 14 December 2023 - First Visit

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February 2024



Motivation

What is Wire-bond Mechanical Protection?

WBMP is a carbon-fiber cover “**canopy**” extending over the wire bonds.

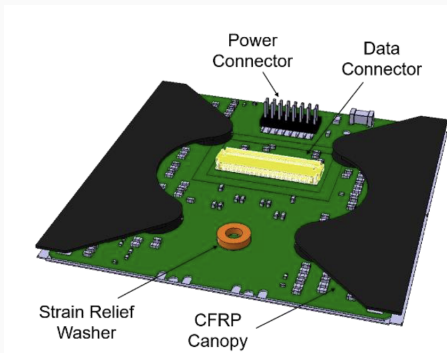
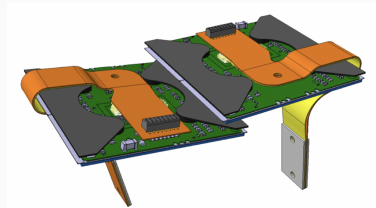
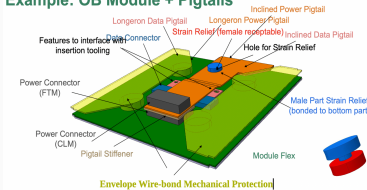


Figure 1: The WBMP canopies are bonded to the flex during the module assembly process.

Why WBMP?

- Need for WBMP in the OB modules:
 - To prevent damage caused by pigtails, which are routed atop the wirebonds along the longerons.

Example: OB Module + Pigtails



- To prevent damage during cell loading and cell integration stages.
- Parylene coating doesn't provide an sufficient protection against squashing by pigtails.

Why WBMP?

- Potting was the preferred solution in the early stages of the project. However, none of the potting compounds investigated by the community was compatible with the module specifications (wire-bond failures after irradiation + thermal cycling [Talk](#))
- Chosen solution based on CFRP canopies covering the wire-bond areas (mechanical barrier between the pigtails and the wire-bonds)

WBMP - Assembly

Canopy – Geometry

- Roof part: Covering and protecting wire-bonds.
- Spacers part: Interface with module flex (attachment points to the pick-up points on the modules) & ensure correct height

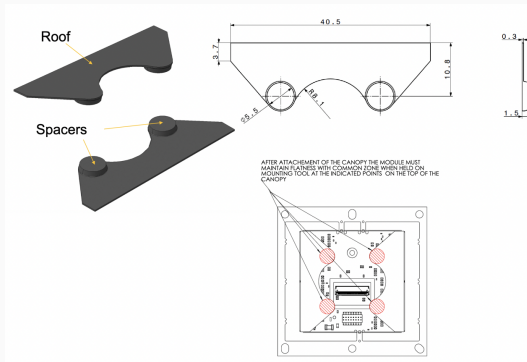
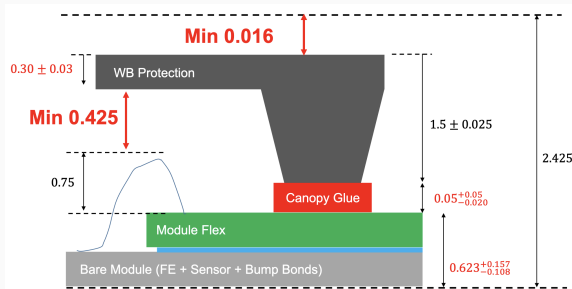


Figure 2: The drawing of mechanical protection and sample

Canopy - Assembly in Module

- Hight should be in the envelope (2425 μm).

WBMP Assembly



- The roof part is 300 ± 30 μm thick plates.
- Target thickness of glue layer: 50^{+50}_{-20} μm
- The total thickness of spacer part is 1500 ± 25 μm to keep areas of wire-bonds.

Mechanical Protection Edge

- Mechanical protection edges should be inside Sensor and ASIC edges.

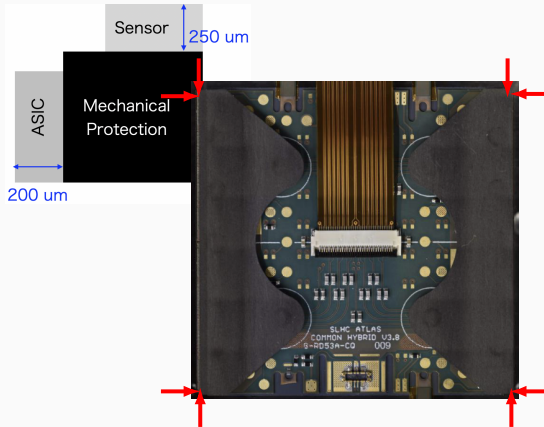


Figure 3: The geometry of mechanical protection on the module

Measurement Procedure

Pillars need to be sanded down to:

- Allow electrical connectivity.

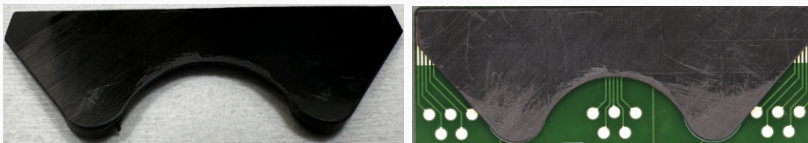


Figure 4: Manual sanding and cleaning of top side of canopy's pillar.

Electrical Resistance Measurements

Resistance measurement:

- Threshold is up to 80 Ω .

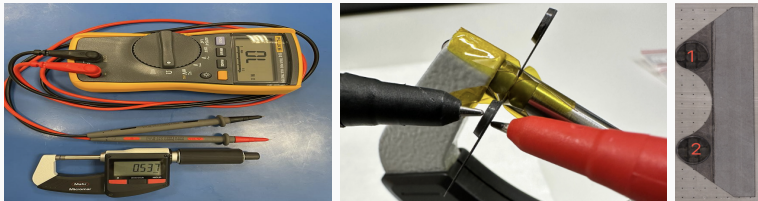


Figure 5: Resistance Measurement between top and bottom of corresponding WBP pillar and how to read the canopy's pillar.

Despite sanding, connectivity measurement is difficult to make, due to highly oscillating values being read, depending on the contact location on the canopy.

Metrology Measurements

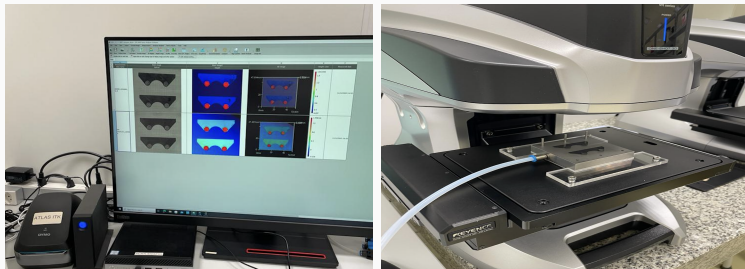


Figure 6: WBMP Metrology Measurements.

Metrology Measurements

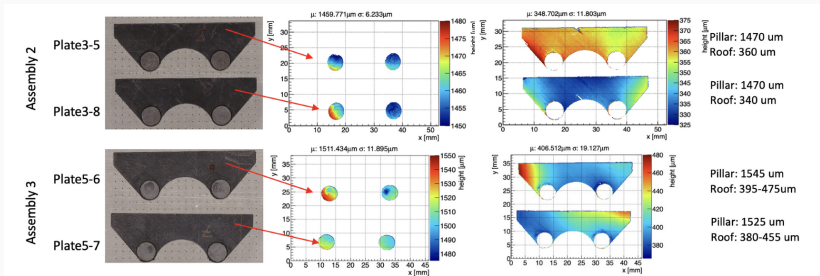


Figure 7: WBMP Metrology Measurements.

Results

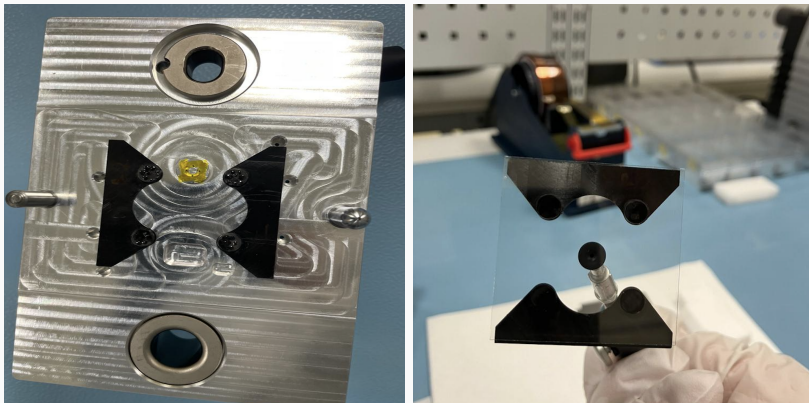


Figure 9: WBMP attached to a glass tile.

Measurements at LPNHE

Metrology Measurements

- We received a pair of canopies.
- The metrology measurements takes almost (50min) one hour per canopy.

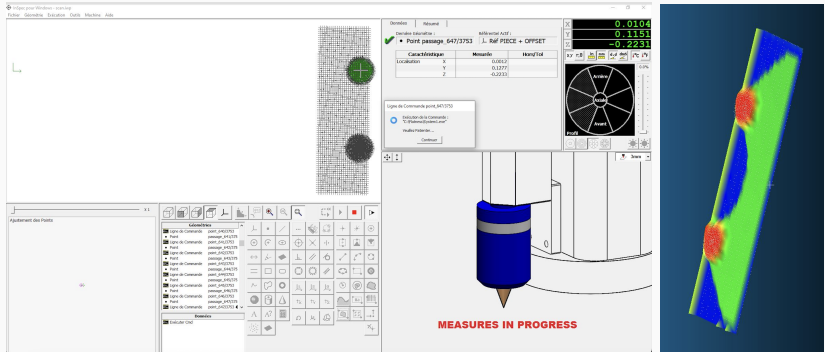


Figure 10: Metrology measurements using Chromatic Sensor.

Upcoming Measurements

- We received the glue tool.
- The next step is to attach/glue the WBMP to a module (glass tile, test-PCB, dummy module, ..).

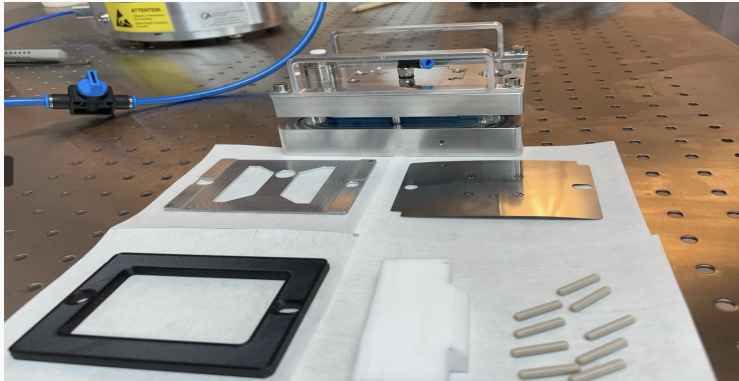


Figure 11: Glue tool.

Manabu - Site Qualification:

https://edms.cern.ch/ui/file/2648149/1/SQ_OBWP_v5_pptx_cpdf.pdf