Update
on New LumiCal Module Design at TAU

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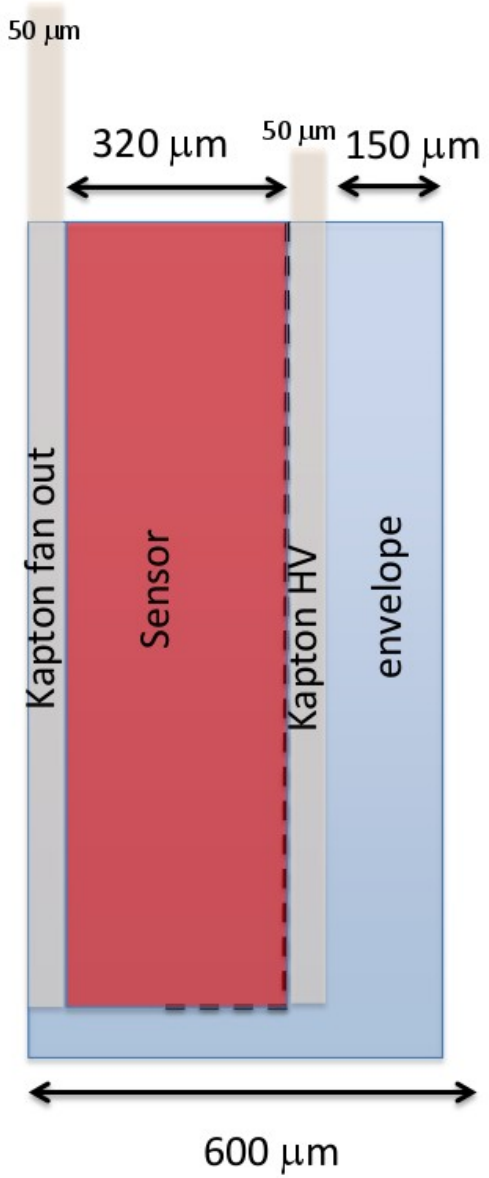
LumiCal Detector Module

The complete “edge” : 600 μm

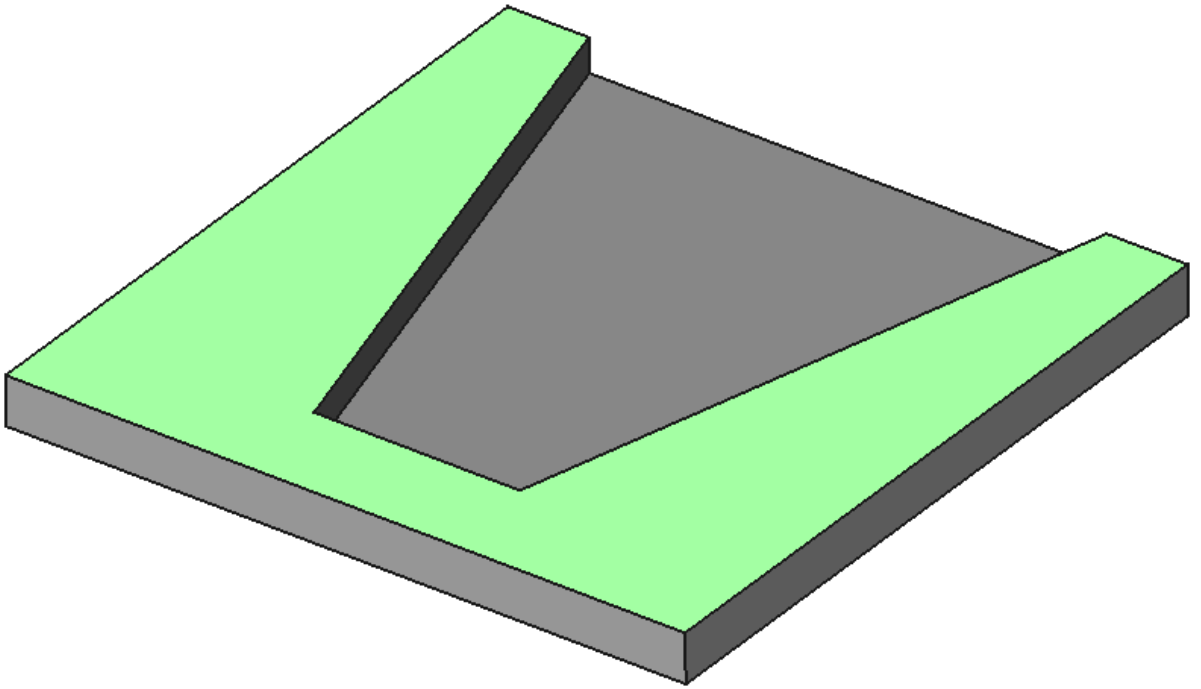
Full detector is 450 μm depth :
- 320 μm detector
- 50 μm kapton HV
- 50 μm kapton fan out
- 30 μm glue

Envelope is 600μm with a 450μm cutting shape inside. It can be machined by 3D printing



Container

- We considered a 3D printing as a possible approach for the production of the container;
- We collaborated with CERN team:
  - One container has been printed on 3D printer;
  - Another has been made from carbon fiber;

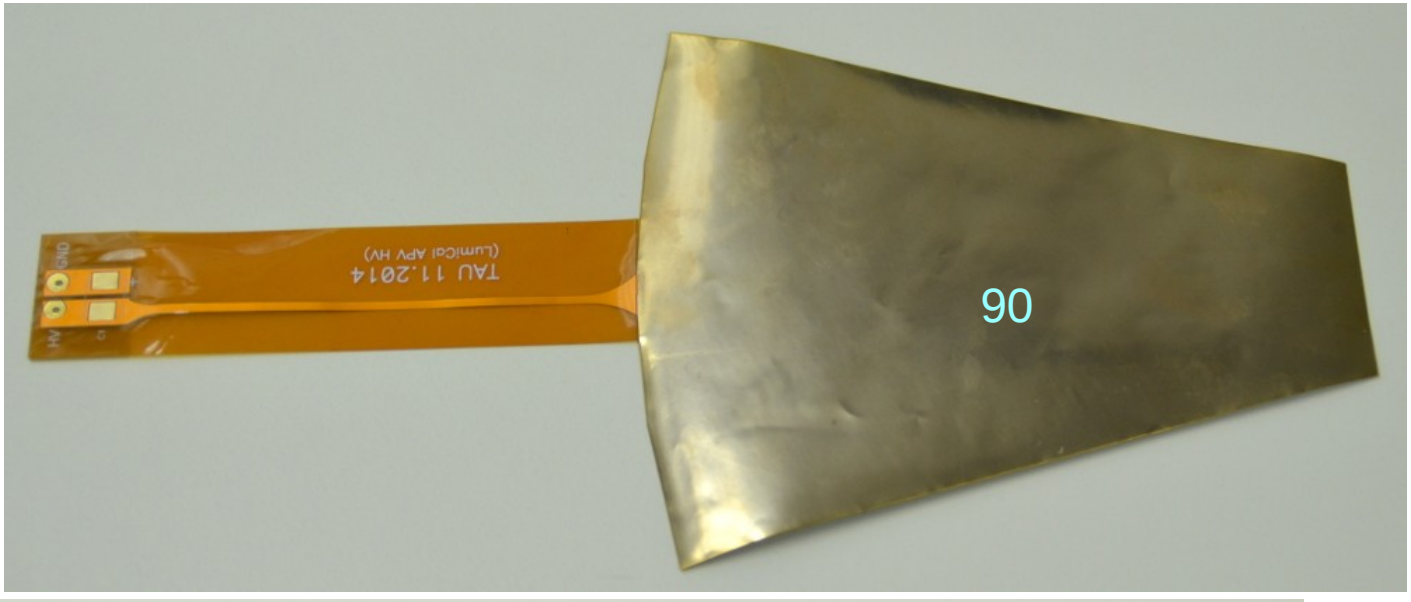


HV and Fan-out

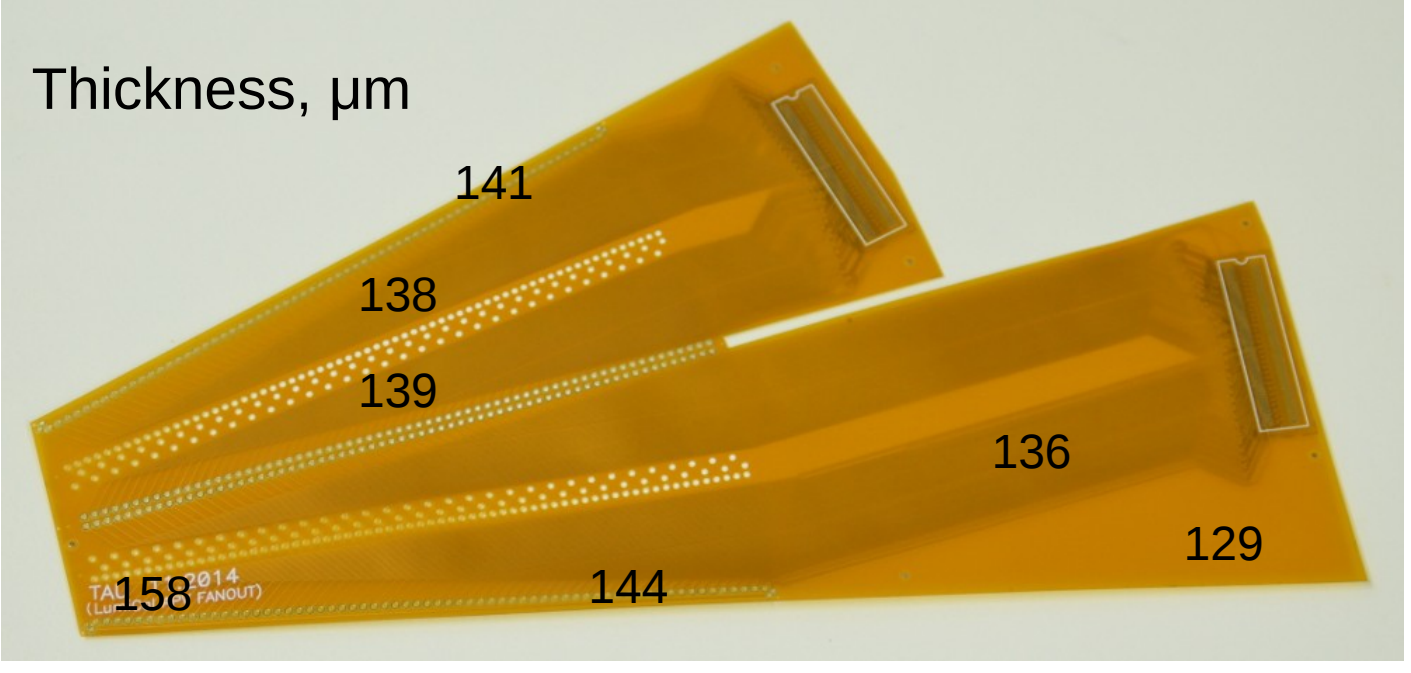
The thickness of the gluing area is 90 µm.

Contact area:

- Kapton: 116 µm,
- Conductor: 136 µm.

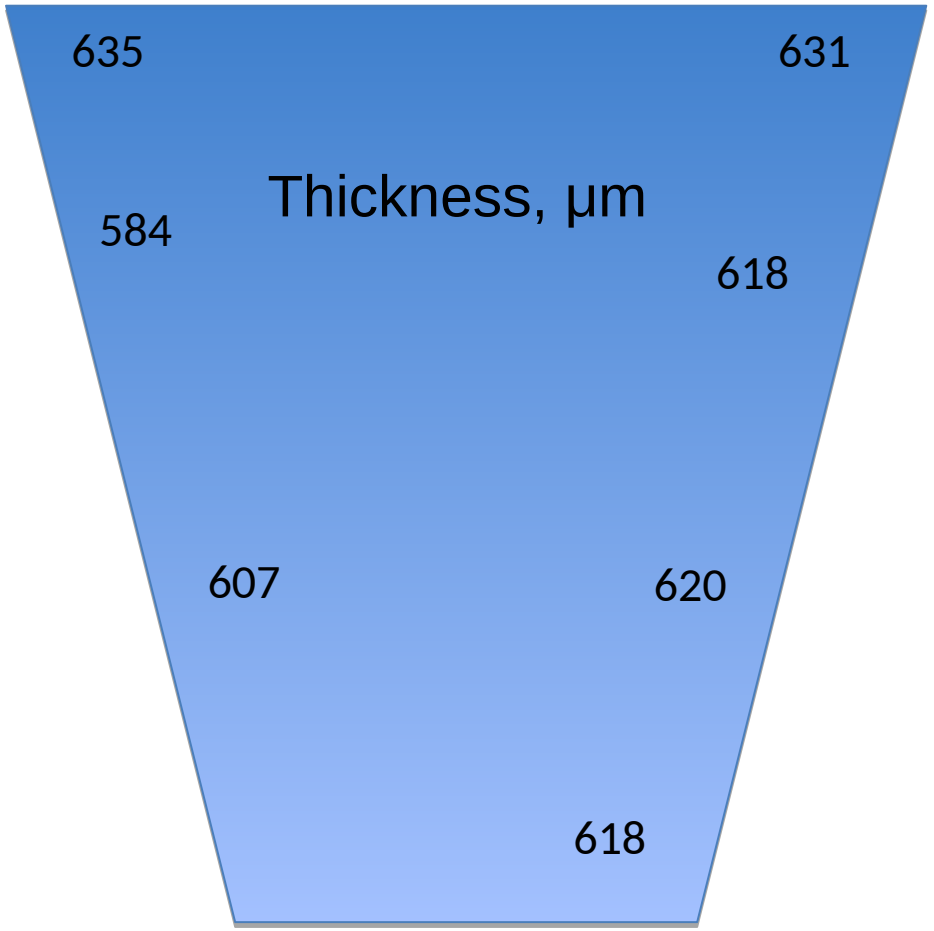


Thickness of fan-out varies in different areas from
129 µm to 158 µm

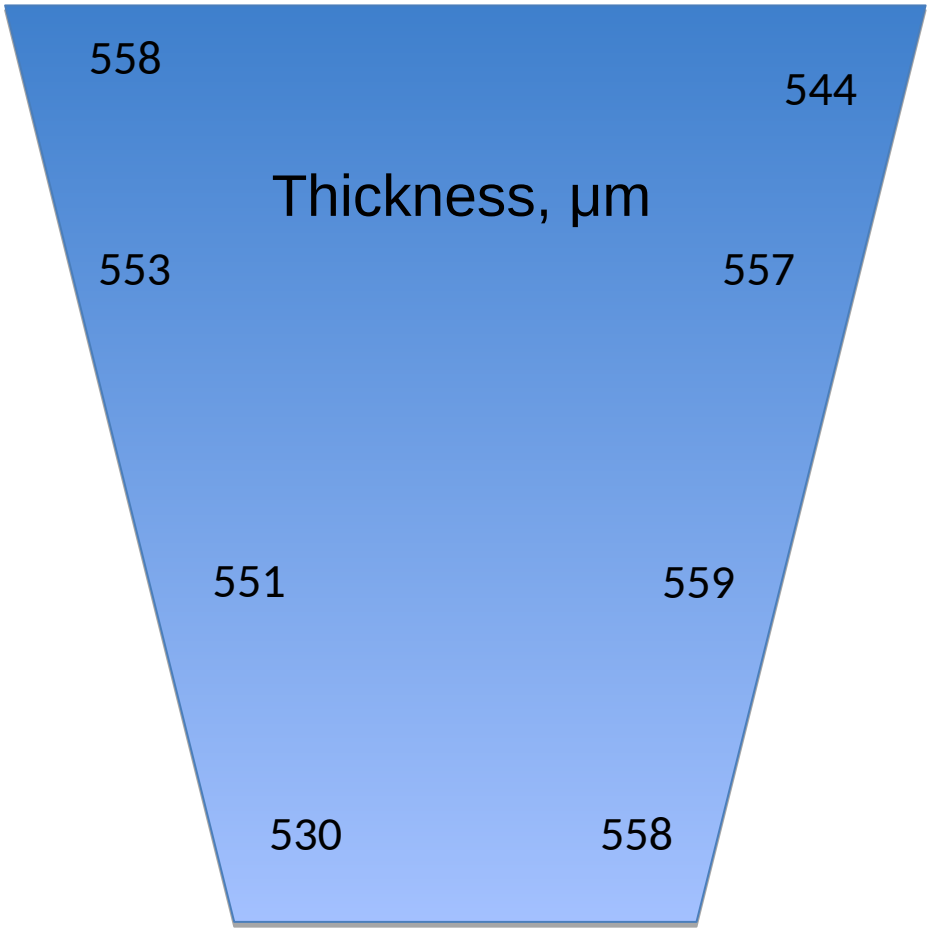


After gluing of kaptons and fake detector

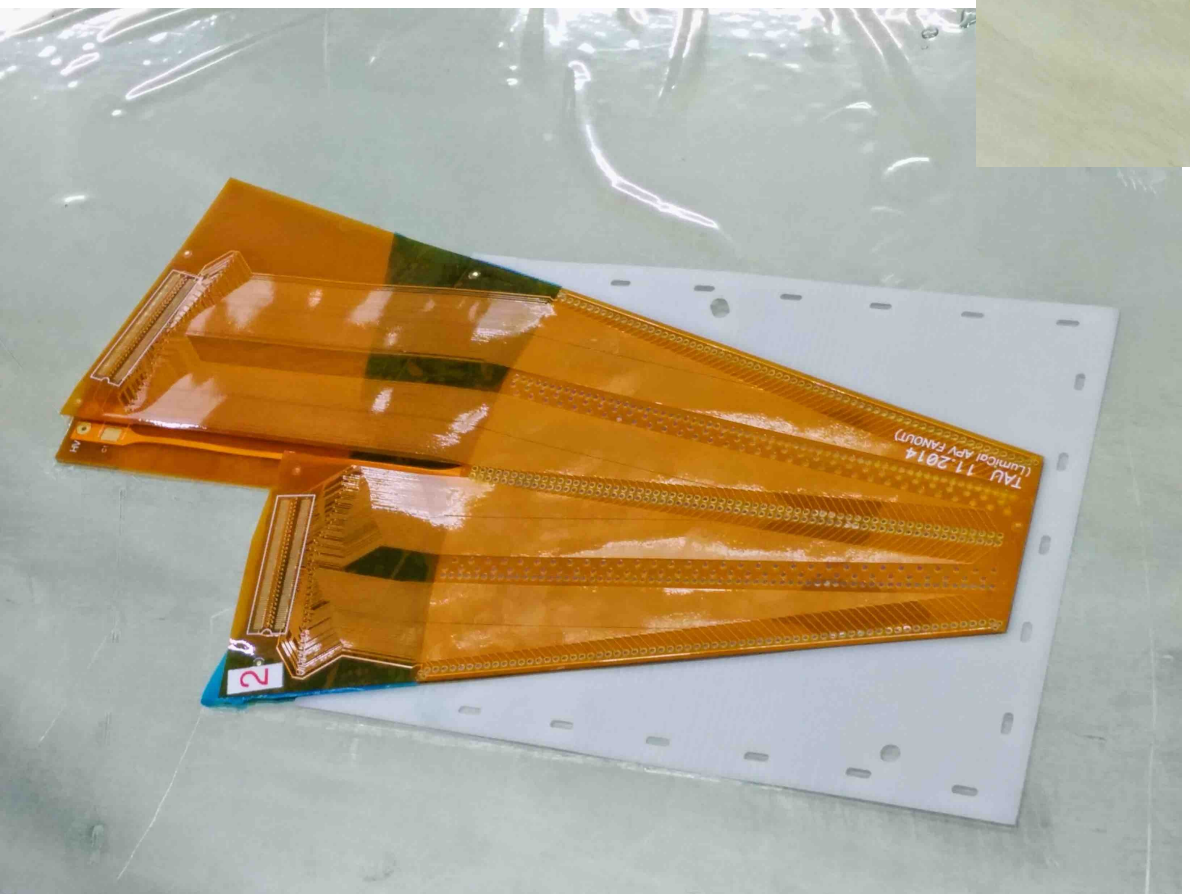
Epoxy gluing



Standard gluing



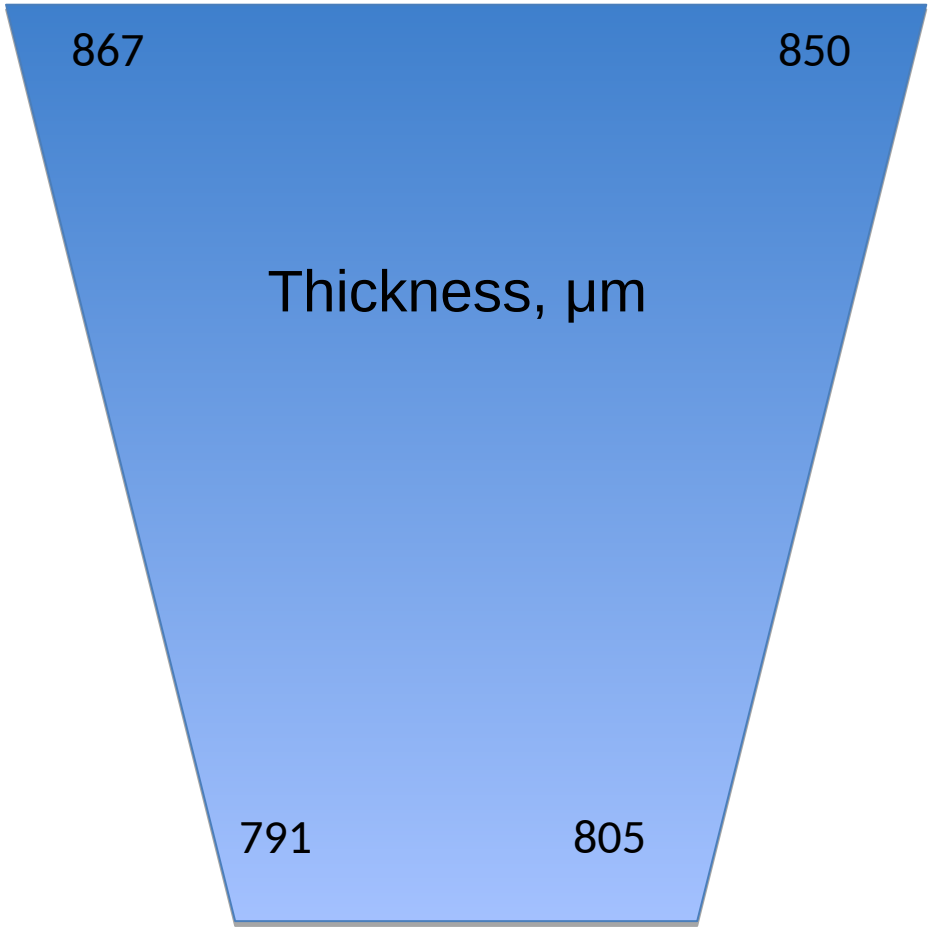
Gluing the envelope



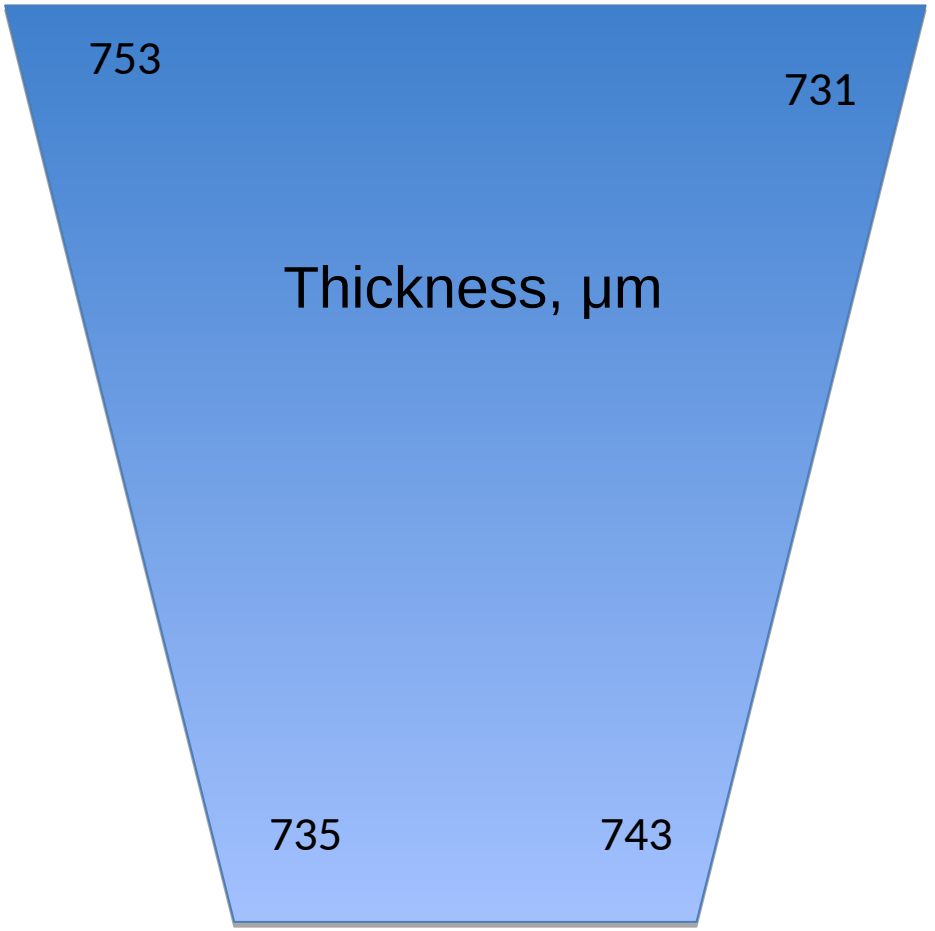
Procedure was destructive for wire bonding connections.

Complete system : detector, hv, fan out and envelope

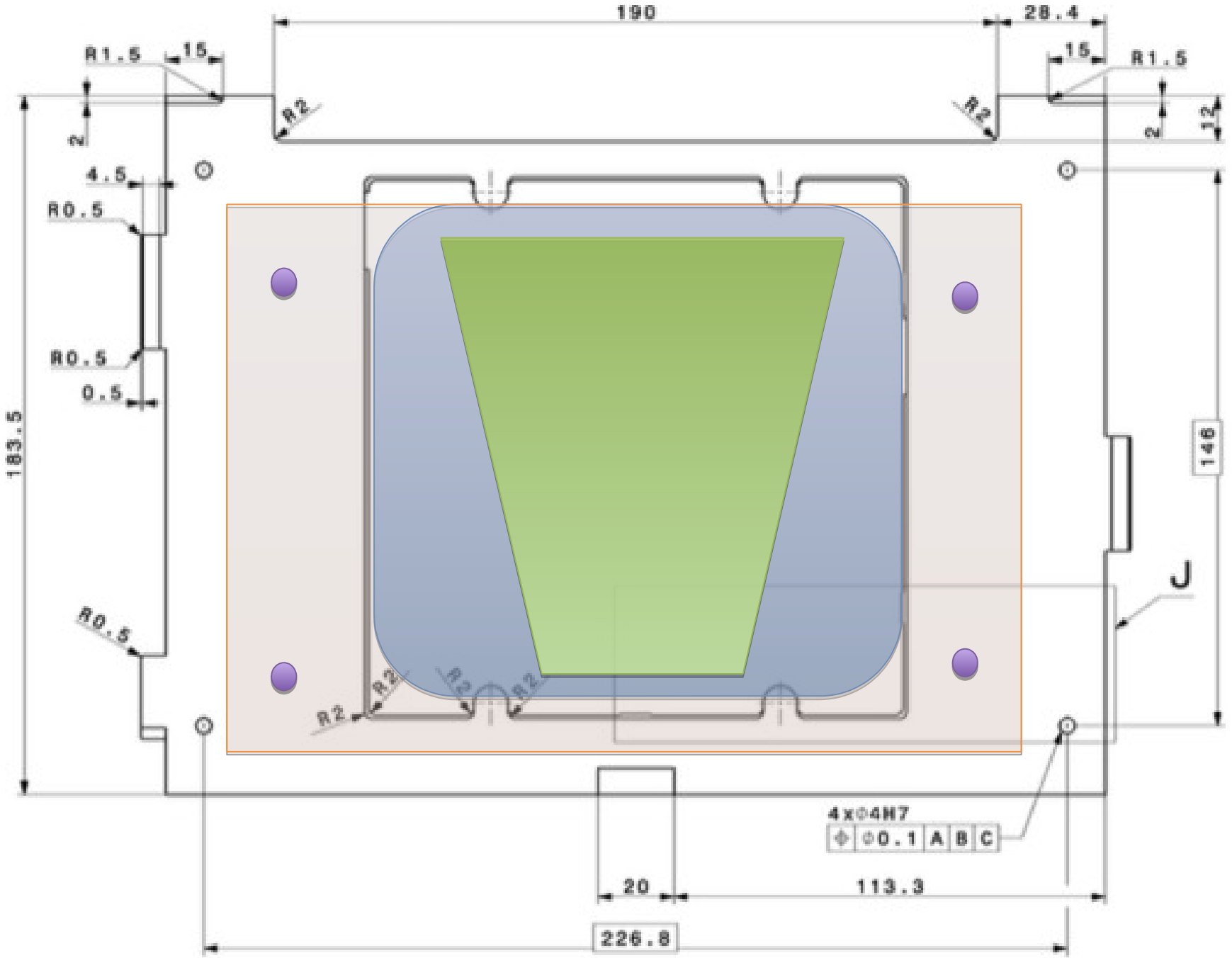
Epoxy gluing on carbon fiber conteiner



Standard gluing on 3D printed container



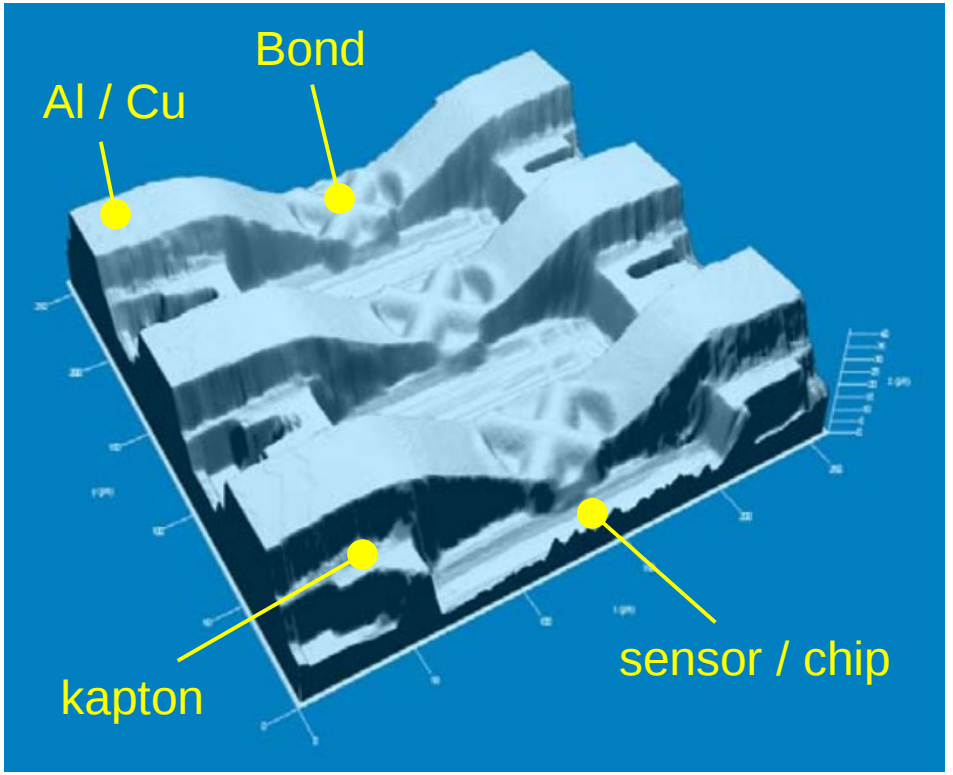
Fixing the envelop on the tungsten



Tape Automated Bonding (TAB)

Laser Scanning Microscopy 3D image of TAB interconnections.

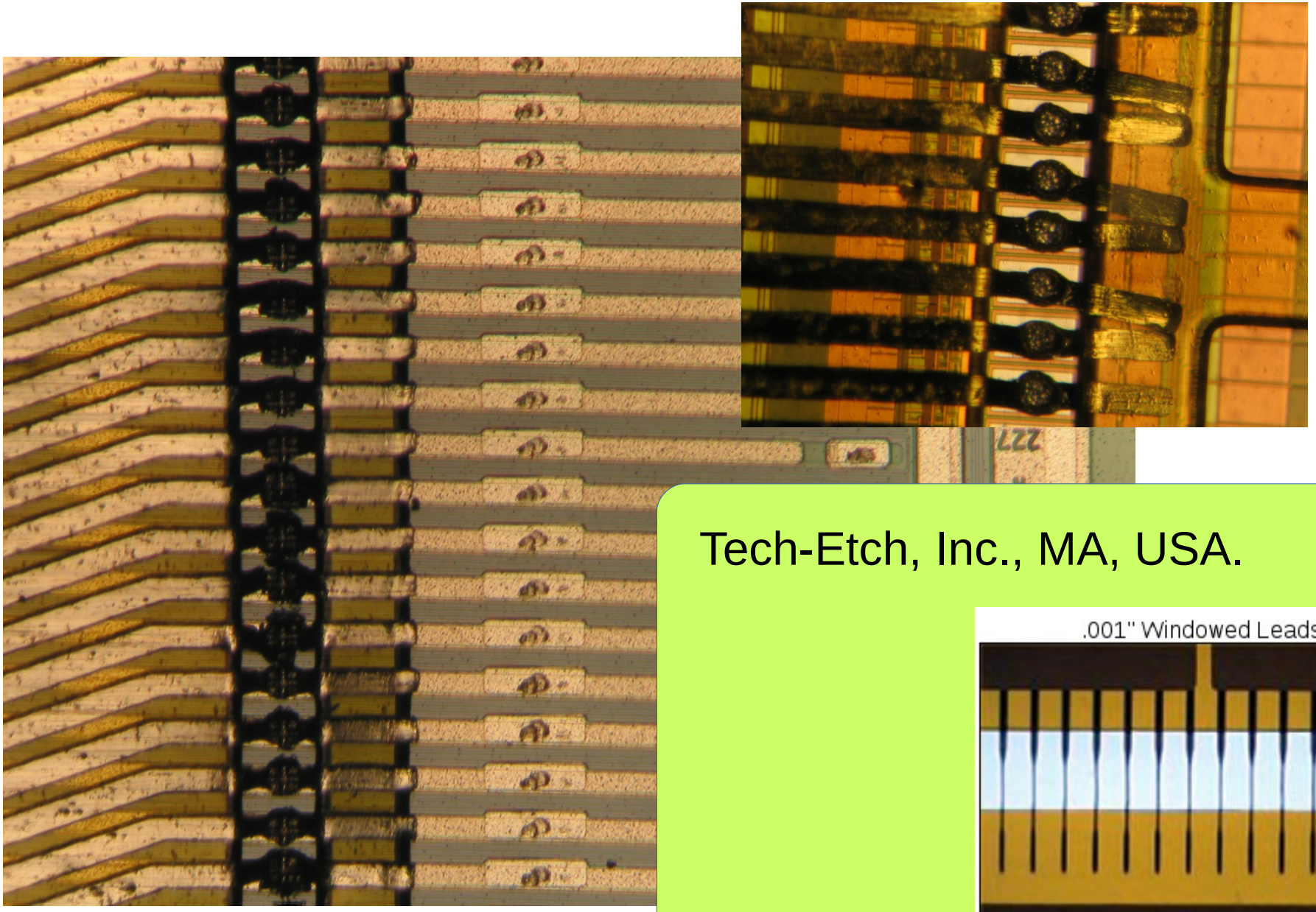
- Ultrasonic bonds are made through opening etched in the polyimide base.
- The bond tool – when pressing the Al towards the bond pad - leaves a specific mark.



Features:

- Single point bonding;
- No wire loop;
- The the bond can be covered by the glue for better protection;
- It is difficult to repair bonding defects.

TAB Solutions



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Summary and Plans

- Two mechanical prototypes of LumiCal modules have been assembled with two types of containers: one produced using 3D printing, another made from carbon fiber.
- Thickness of both prototype is below 900 μm.
- Carbon fiber container provides much higher mechanical rigidity of the module.
- Started working on the mechanical connection of LumiCal module to permaglass frame with tungsten considering thickness constraints and prioritizing solution with higher flexibility in assembly.
- Working on the design of fan-out for TAB bonding to reduce thickness and improve mechanical reliability.