



Some ideas on module assembly

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- Requirements
- oVTX procedure
- iVTX procedure

Some requirements & key aspects

- Should use materials already radiation tested
 - Glue from LHC experiments
 - **Controlling the glue thickness**
 - Quantity of glue has to be measured (weight or volume) before dispensing
 - Masks are used to control the position, size and height of glue drops
 - Rectangle-shape drilled with many holes in various sizes
 - Material to be carefully chosen
 - Stencil technique to equalize glue with spatula or dedicated tool
 - Alignment
 - Some parts have noticeable marks (flex, sensors)
 - Flexes need ears to allow for dowel pins, to be cut at some point
 - Others don't (TPG, cooling plate) => constraints come with cutting precision
 - Cutting edges of sensors to be handled
 - Planarity of jigs hosting sensors is critical to avoid sensor damage during pressure application
 - May not be easy for long modules (13 sensors)
 - Procedure should be replicable, assembly sites will be qualified
 - Assumption:
 - parts are qualified before assembly (sensor are probe-tested)
 - Pictures are taken after each steps
- } Used by ALICE-ITS2 & ATLAS-ITk

Procedure overview – oVTX 1/2

1. N sensors positioned, front-up, by a machine on the sensor-jig and vacuum sucked in position
 - Sensor-jig has a room for flex-extension
2. Flex flipped & vacuum sucked on a matching flex-jig
 - Alignment through dowel pins at flex level
 - flex-jig maintains flex extension (IpGBT+VTRX+)
3. Glue dispensed on the flex through a mask with stencil method
 - Glue quantity scaled in advance
 - Possibly multiple masks to cover all module length
 - Masks either throwable or re-usable after cleaning
4. After mask removed, flex-jig is flipped over sensor-jig
 - Alignment through dowel pins at jig level
5. Glue curing with possibly some weight on top of flex-jig

6. Vacuum relaxed, flex-jig is removed
 - module maintained in position on sensor-jig by dowel pins for transport to bonding machine
7. Wedge-bonding with module vacuum sucked on flex-jig
 - Dowel pins probably removed during bonding, then replaced to maintain position for transport to test bench
8. Test of module
9. Next step is module mounting with module-jig
 - Module-jig has recess for boundings & cover to allow for shipment
 - Module is position with dowel-pins in flex ears
 - Ears are cut at module mounting on ladder structure

■ Material

- 3 jigs: sensor, flex, module
- Various dowel pins
- Syringe for glue dispensing
- Masks and spatula
- Glue

■ Equipment

- Placement machine
- Scale for glue weight
- Bonding machine

Procedure overview – iVTX 1/2

1. 4-sensor-block position on block-jig using dowel pins with a flat face on 2 sides and vacuum sucked in position
 - Sensor-block handled manually with vacuum pick-up pen
 - Dowel pins removed after operation
 - Step should work if RDL present on sensor-block
2. TPG position on tpg-jig using dowel pins with a flat face on 2 sides and vacuum sucked in position
 - Tpg-jig design takes allows for finger-pieces and flex
3. Finger-pieces attached to TPG
 - No opinion on mean of attachment
 - Operation possibly postpone at the end of the procedure
4. Glue dispensed on TPG through a mask with stencil method
 - Glue quantity scaled in advance
 - Mask either throwable or re-usable after cleaning
5. After mask removed, block-jig is flipped over tpg-jig
 - Alignment through dowel pins at jig level
6. Glue curing with weight on top of block-jig
7. Vacuum relaxed on block-jig only, which is removed
 - module maintained in position on tpg-jig by vacuum

8. Fixture of flex <= If no-RDL, additional procedure similar as oVTX 2-6 steps to attach flex
 - No clear idea here for final flex
9. Wedge-bonding with ladder still vacuum sucked on tpg-jig
10. Vacuum released, ladder removed from tpg-jig and installed on transportation/test box
11. Test of module

■ Material

- 2 jigs: sensor-block, tpg
- Transportation box
- Various dowel pins
- Mask for glue dispensing
- Spatula
- Glue

■ Equipment

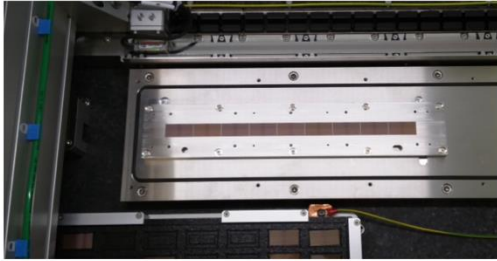
- Scale for glue weight
- Bonding machine

Procedure development

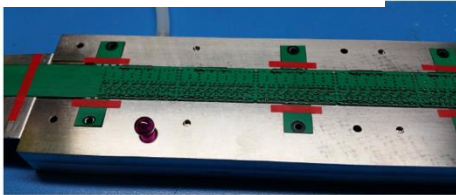
- These procedures need developments: 2027-2028
- Possibly different procedures for initial mock-ups demonstrating cooling/support
- To be repeated in various places with various options

A. Di Mauro

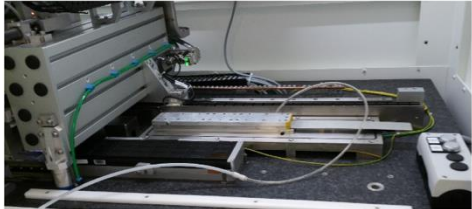
FROM ALICE – ITS2



Chip alignment

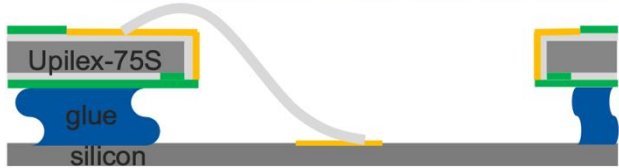
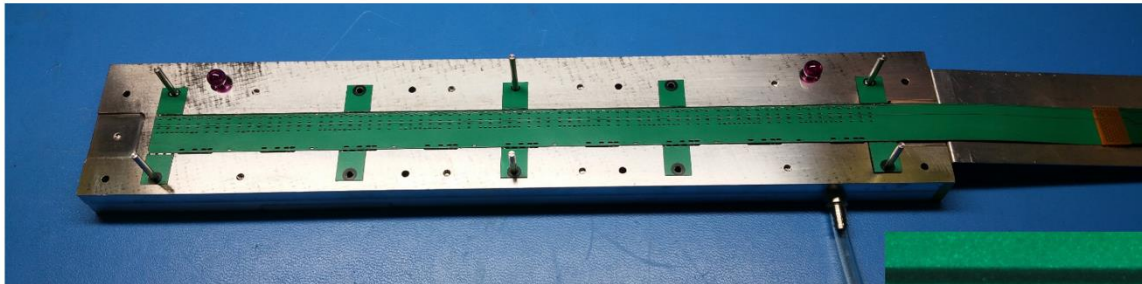


Glue deposition on FPC (Ablestik 45 W)



FPC+chip connection and curing (RT for 12h)

IB HIC ready for wire bonding



Upilex-75S
glue
silicon

Wire bonding

