PXD2 Module Assembly/Repair HLL

- status May 2022-

Gabriela Genao, Martin Hensel, Marija Jegorova, Christian Koffmane, Silvia Krivokuca, Carina Schlammer (MPP), LA

Code	state	remark
L1_61 - 55_IB & 52_IF	Kapton displaced at BWD	Kapton replaced on ladder …
W59_OB2	Tested analogue	Had severe problems, used as guinea pig for Cu dip, Later resolved: was issue with probecard → **class A module**
W53_OB2	Tested analogue	got SWB2.1, broken SW1 repl. with SWB2.2, then changed back to new SWB2.1 passed all tests with 2nd probe card → **class A module**
W44_OB2	w/o kapton	Seg. fault → kapton removal&reflow w/flux at DHPs, Kapton removed at MPP, reflow at DHPs done, **seg. Fault gone but still JTAG config issues → set aside**
W68_IF	Fully assembled → **Bonn??**	JTAG issue seen at DESY, verified at HLL - JTAG unstable, best option: → kapton removal&reflow w/flux at balcony, Kapton removed at MPP, reflow done, **JTAG now stable → got kapton → ??**
W60_IB (PXD9-20)	Fully assembled, kapton removed at MPP	tested with probe card after water damage → SWB Problem → needs **replacement of all SWBs**
W70_IF	Probe card tested → functional but "C grade"	got SWB2.1, many missing gate lines, probably sensor issue, **only for backup/lab tests**
W55_OB2	Probe card tested, failed, module lost	Module got SWB2.2, damaged at rework/excessive testing → **module lost**

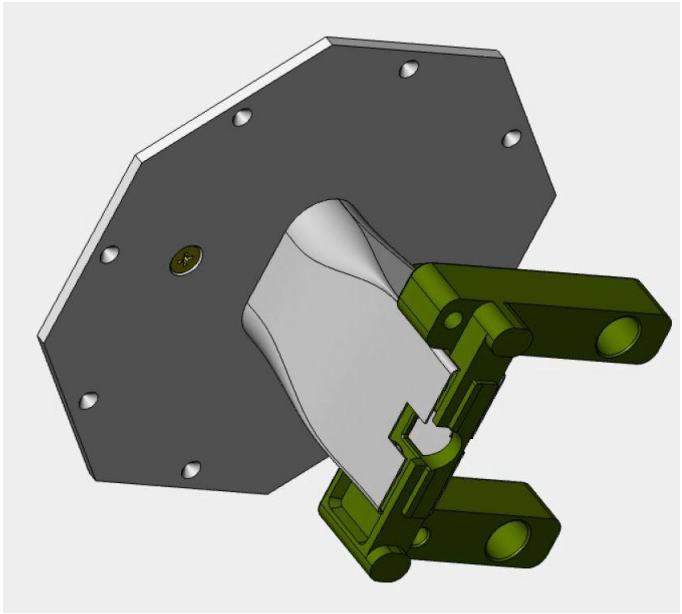
- For today
  - Few pictures from kapton replacement on ladder level

L1_61 history challenge

- Ladder assembled and passed all tests Nov. 2020
- Mounted on first PXD2 HS July 2021
  - **14 July 2021**: Tests on HS showed JTAG problem on BWD side (W55_IB),
  - Dismounted from HS
- Optical and x-ray inspection revealed displacement of kapton → wire bonds broken
  - Root cause unknown, possibly overheated during tests, not clear when this happened
  - On FWD side (W52_IF) no visible damage .. I guess ..
  - **12 July 2021: last test of FWD side before HS mounting, test after mounting??**

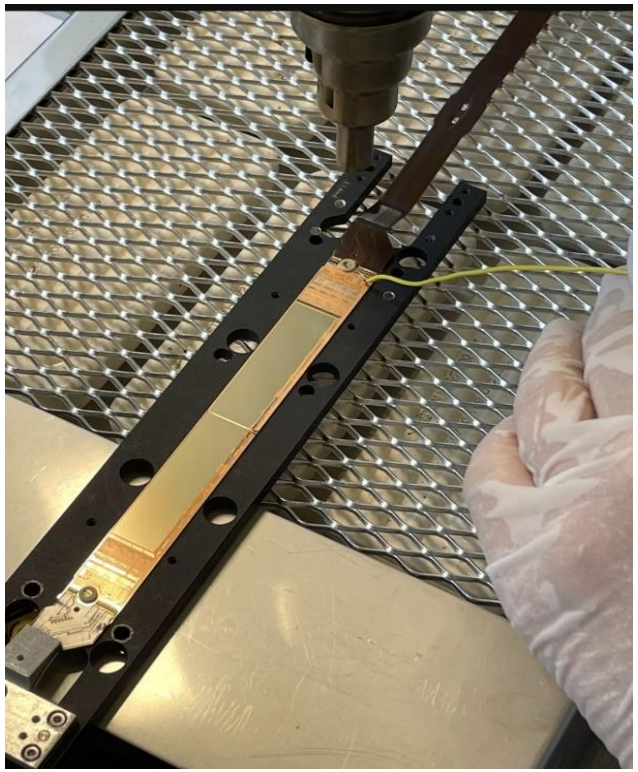
- Challenge
  - Replace kapton after ladder assembly → requires new procedure/tooling

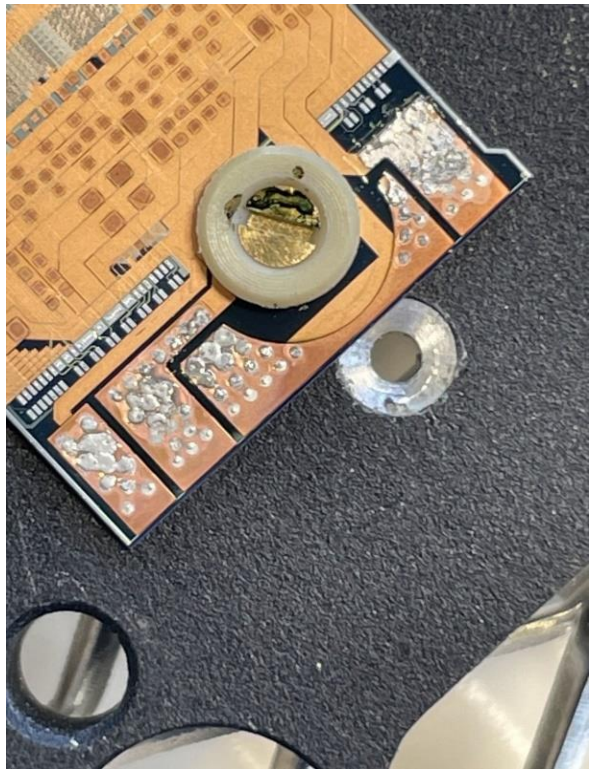
- Procedure
  - Modify ladder jig to allow alignment of kapton to ladder
  - Mount ladder on modified jig (tooling available)
  - Remove old kapton on heat plate/hot air soldering
  - Modify tooling for kapton fixture to ladder during soldering
  - Design and produce new tool for rework station
  - Test and practice with dummy ladder

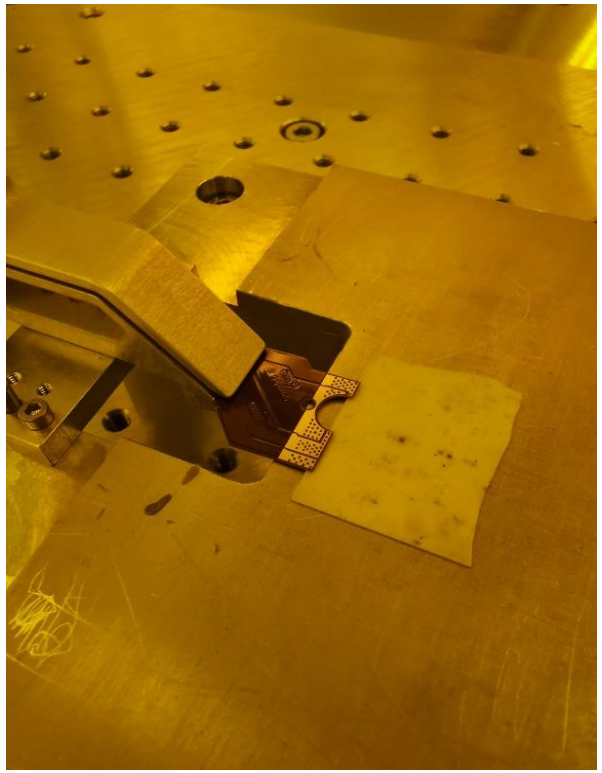


Kapton removal

- Modified ladder jig designed by David and manufactured at MPP
- Ladder removed from original jig and placed on new jig → remove old kapton
- 70 °C from below, further heat by hot air soldering from above
- Print solder pattern on new kapton

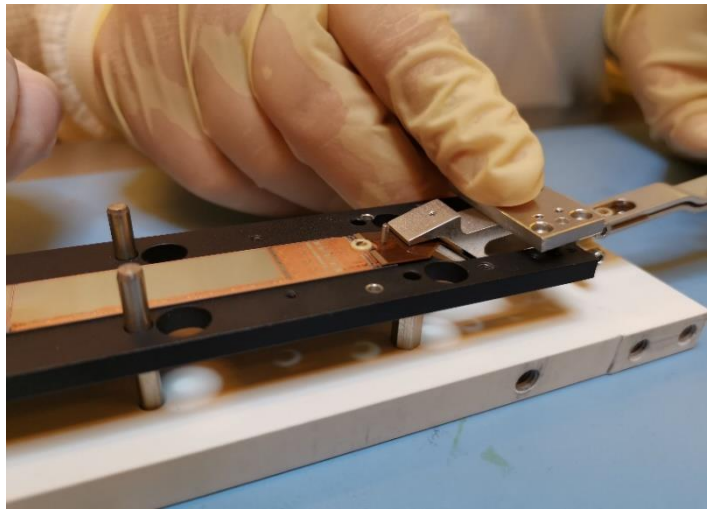


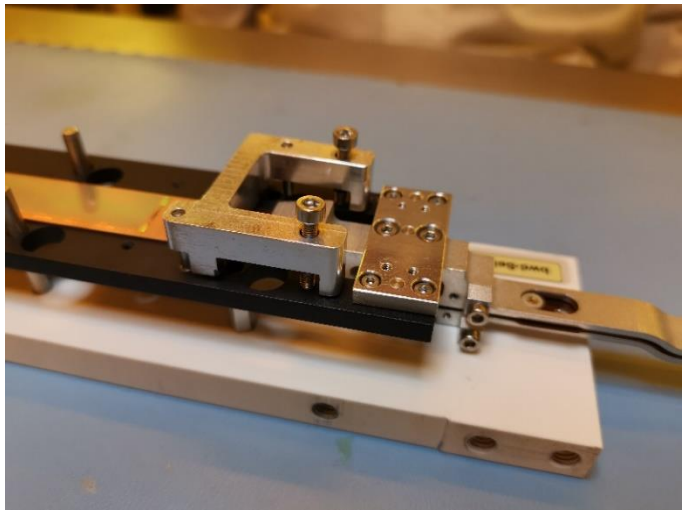


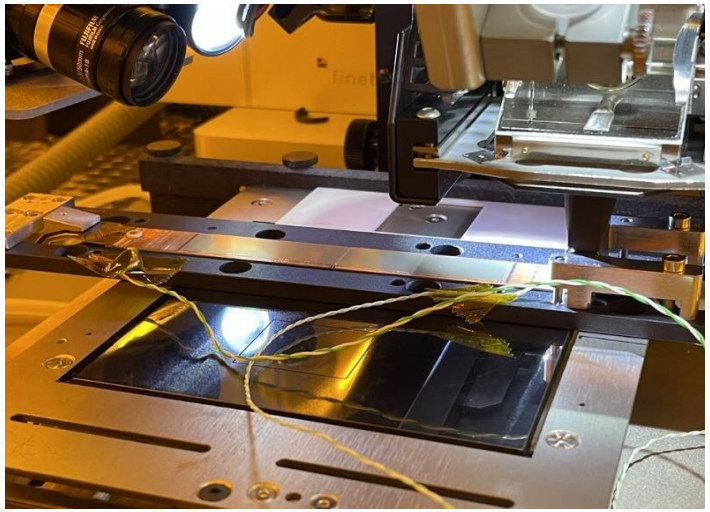


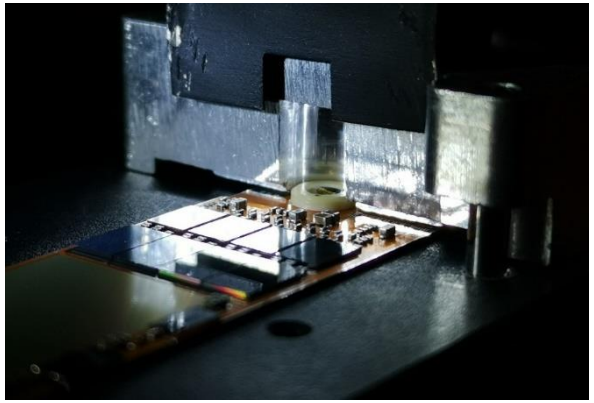
kapton alignment and soldering

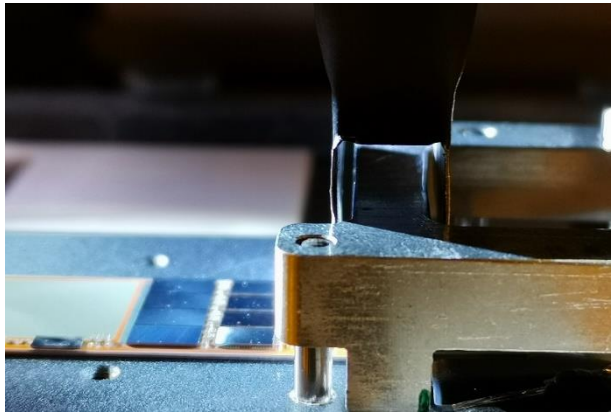
- Position kapton and fix kapton jig to ladder jig
- Place assembly in rework station using dedicated tool for heating
- Optimize temperature profile with dummy ladder





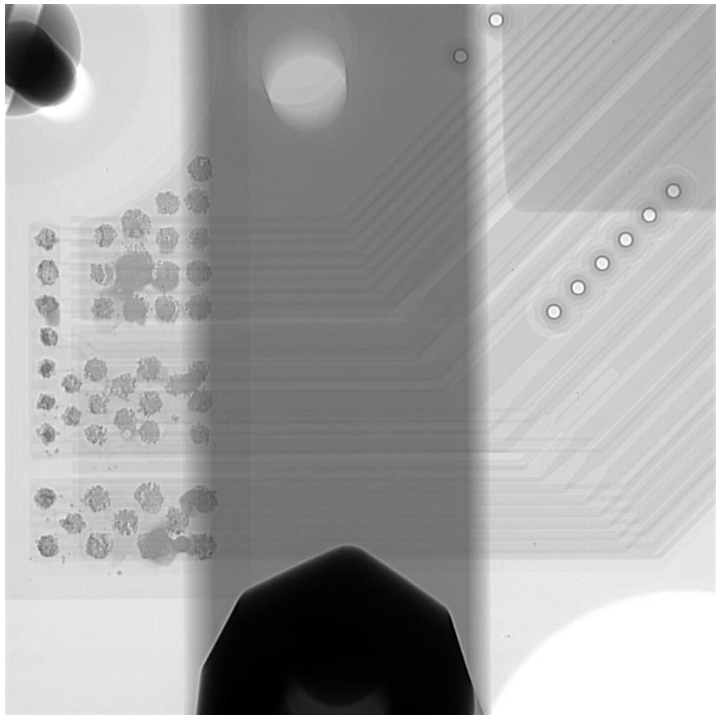




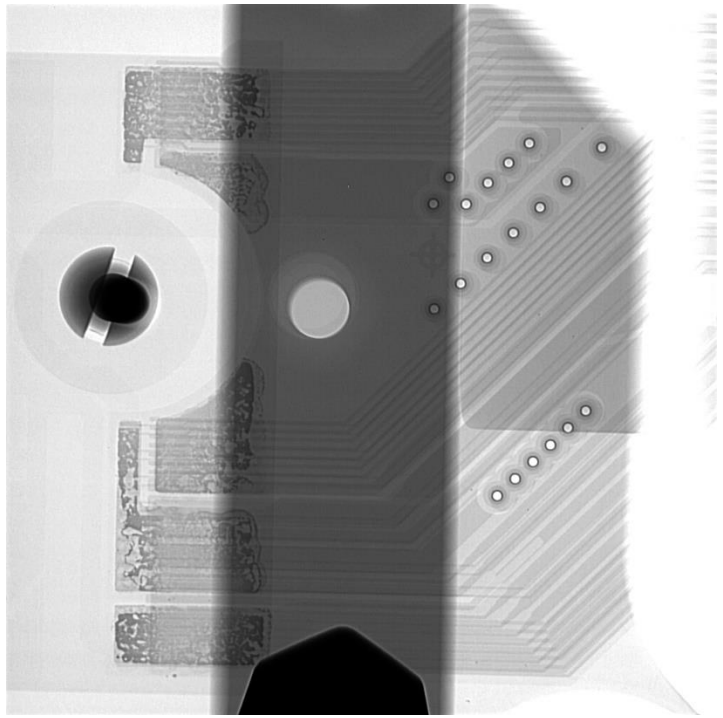


The result - Excellent cooperation between Carina (MPP) and Silvia (HLL)!!

- Temperature profile was set to have enough heat at one end (~170°C), keeping the other as cold as possible (~70°C)
- Three profiles necessary, with intermediate x-ray, to get best result



From 1st to 3rd trial



- Wire bonding without problems at MPP
- **BWD side fully functional again, but FWD side has now JTAG problems**
- **Needs follow up … did not give up yet ….**
- **We can also exchange the FWD side if needed … News from MPP??**