

# Pixel boards status

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# Introduction

The current design foresees the following boards (in its broadest sense):

Name	Function	Technology
HDI	Chip to endpiece. Power, data.	aluminium flex (LTU)
Interposer flex	HDI fan-out. Power, data.	4-layer flex (SwissPCB)
Endpiece flex	Concentrate 4 ladders. Power, data.	4-6-layer (SwissPCB)
Endring flex	Separate data from power. Possibly: filtering, repeater	4-6-layer (SwissPCB)

Layers 1/2: No endring flex, endpiece flex takes this role.



# Status

- ▶ Final board layouts can't be designed before final chip
- ▶ Readout cable has an impact
- ▶ Will talk about boards for thermo-mechanical mock-up instead
- ▶ Interposer has been proven to work (see talk by Marco Zimmermann in April collaboration meeting)

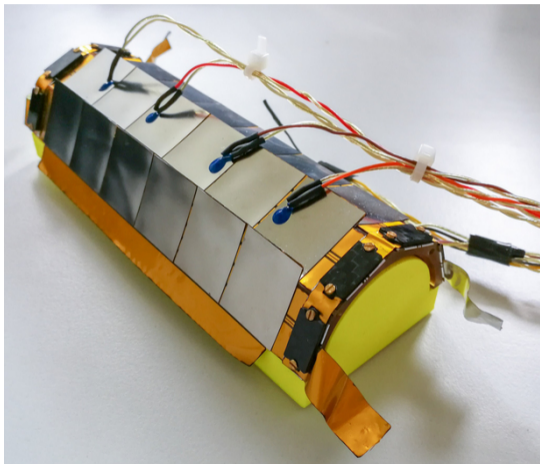


# Status

- ▶ Thermo-mechanical mock-up comes in two flavours:
  - ▶ Tape heaters: lasered meanders on aluminium-polyimide laminate.  
Reasonably cheap, UHD in-house production, doesn't match final material
  - ▶ Silicon heaters: heat meanders on silicon chips, tab-bonded to HDI  
Matches final materials, costly
- ▶ Target: build full central station with tape heaters and representative fraction with silicon heaters
- ▶ Silicon heater option requires all boards  $\Rightarrow$  tests mechanical aspects
- ▶ Function: Heat with target power densities  $250 \text{ mW/cm}^2$  and above. Readout of temperatures (4-wire resistance measurement per L3/4 tape heater or silicon heater)



## Status



L1 one half shell exists  
Works fine. More in the  
making.

Awaiting some mounting  
parts from workshop

Has stainless steel chips  
as placeholders



## Status – Tape-heater

- ▶ L1 ready, more to come
- ▶ L2 in preparation
- ▶ L3/4 in preparation. Tape heaters exist, see mechanical status session
- ▶ „Boards“ are all made of lasered aluminium, not much to learn for the detector



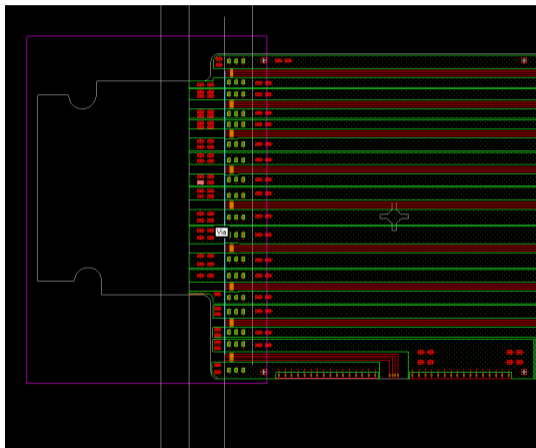
## Status – Si-heater

All types of flexes needed

- ▶ Si heaters exist: 96 pcs. More to be ordered.
- ▶ **L1/2**
  - ▶ **HDI** Designed, ordered with LTU. Expected end of July.
  - ▶ **Interposer flex** Designed, under review.
  - ▶ **Endpiece flex** Design started, awaited in next weeks.
- ▶ **L4**
  - ▶ **HDI** In design, review ongoing. To be ordered after first experience with L1/2 HDI
  - ▶ **interposer flex** Awaits redesign due to change in mechanics (shift of bend position, see mechanics)
  - ▶ **Endpiece flex** Design pending
  - ▶ **Endring flex** Design pending



# Status



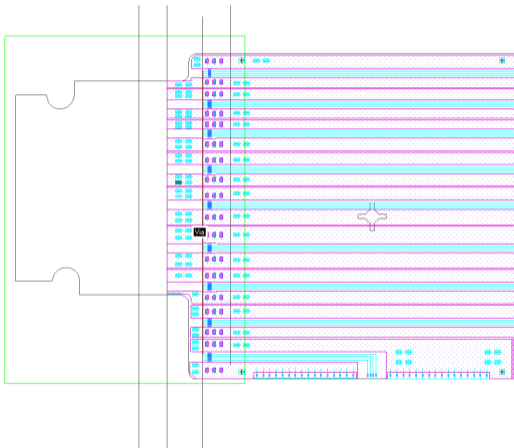
Latest status of HDI design  
(this Mon)

Shows left end, towards  
interposer.





# Status

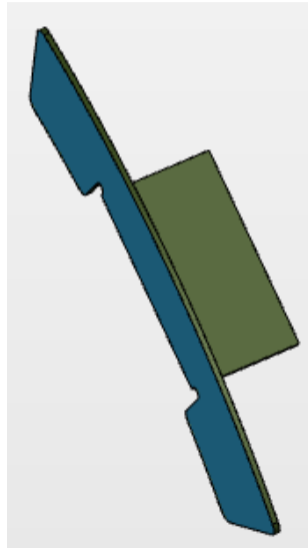
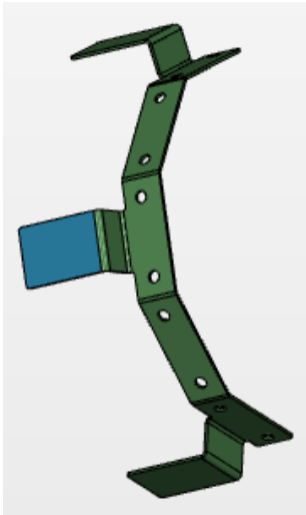


Latest status of HDI design  
(this Mon)

Shows left end, towards  
interposer.



# Status



## Board issues

- ▶ Catching up. Contract issues delayed order of HDI and Si heaters (latter still uncertain, but about 90 available now)
- ▶ Electrical issues. Readout cable has high impact (connector, impedance, need for repeater)
- ▶ Quality control: will be defined for final parts but mechanical lessons will be learned in mock-up.



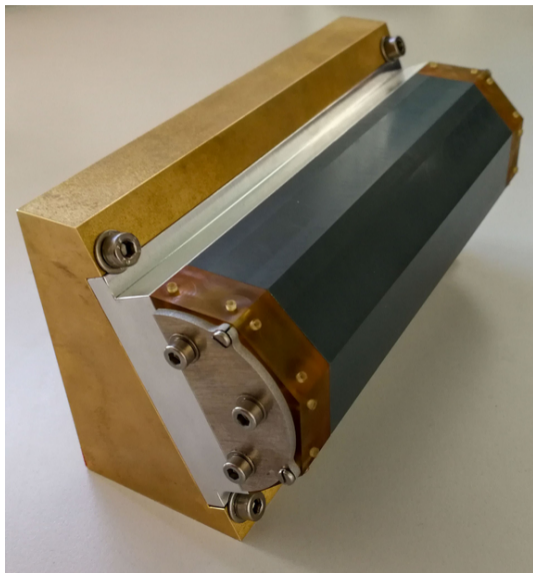
## Boards plans

- ▶ Fabricate tape heater parts this summer. Needed for thermal studies.
- ▶ Ramp-up fabrication of Si-heater at PSU/UHD: Establish procedure for SpTA-bonding. Late summer.
- ▶ Finalise designs of all Si-heater boards. Next weeks.
- ▶ Test mechanical shape of all boards. Late summer, autumn.
- ▶ Operational tests. Autumn.

Goal: end of year all electrical aspects known we can learn from this mock-up



## Mechanical

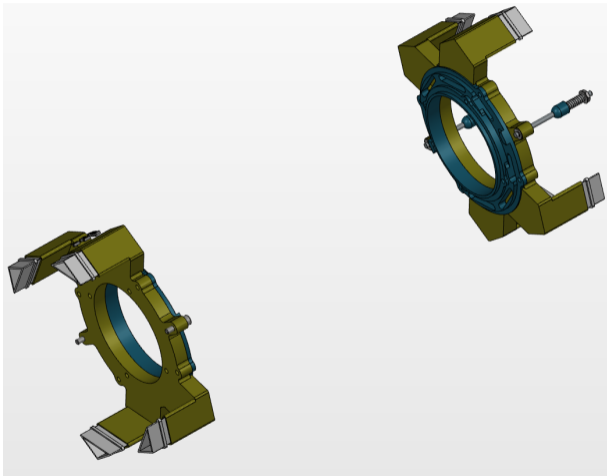


An improved version of the  
ending jig (Simon Muley)

One facet always horizontal.  
By tilting and turning the  
„shoe“ all four ladders can be  
chosen.



# Mechanical



Endring mounts ordered

Will need an adapter to insert it into our test stand.



## Mech plans

- ▶ Fabricate more L1 half-shells, prove feasibility of tooling.
- ▶ Transfer this to L2
- ▶ Fabricate one (two) L1/2 cylinders for thermal testing
- ▶ Move on with Si heaters

Goal: Have a full vertex detector mock-up in Si heater operational by autumn



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