On-detector electronic circuits

Luigi Vigani
Oxford in-person meeting
15/11/2021

Overview

Interposers

Gold springs **Endring flex** Gold springs

BoSSL

Interposer flex

Chip

TAB **HDI** TAB

MTP cables (data+sense)

Power+HV cables
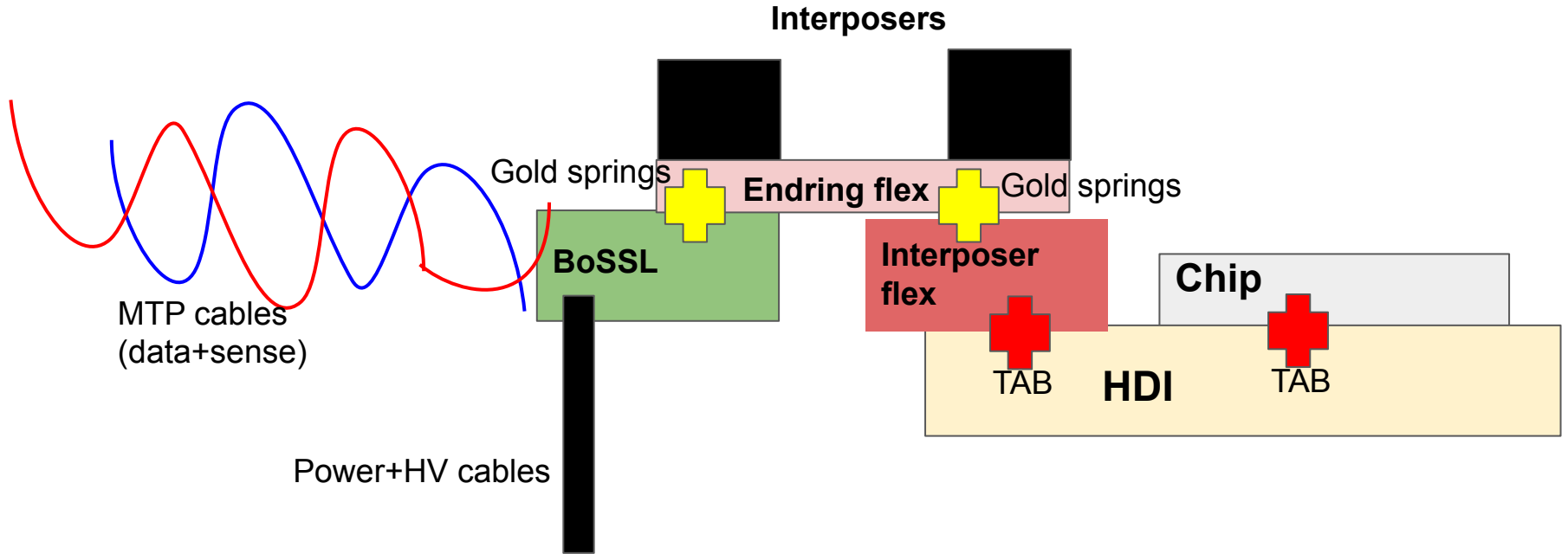
Overview: lines per half-ladder

- LV power (1.8-2 V)
- GND
- HV (20-120 V)
- Data -> 9 LVDS lines
- Clock -> 1 LVDS line
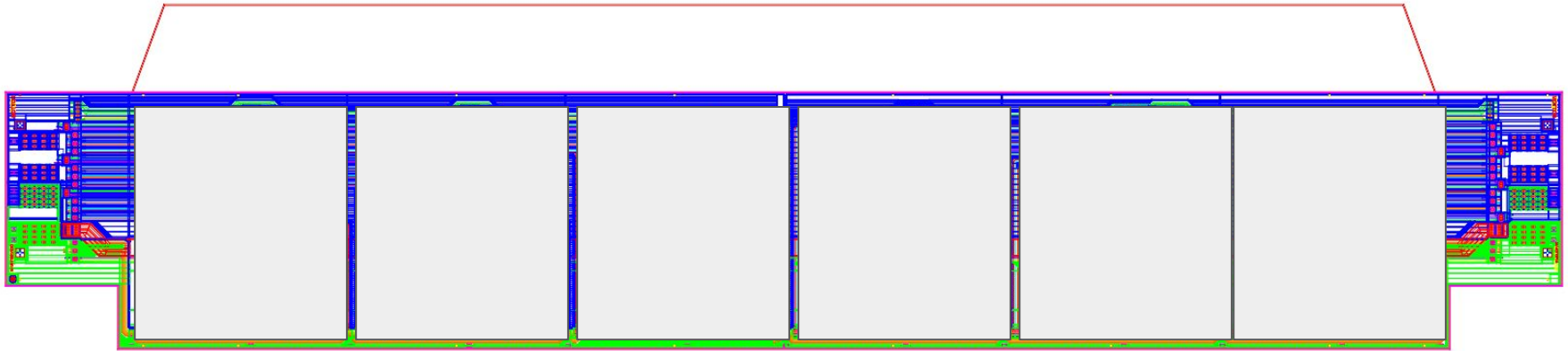- Sync Reset -> 1 LVDS line
- Serial Input ->1 LVDS line
  - Not needed in Mupix10
- SPI lines (single ended, Mupix10 only)
  - 1 Chip Select per chip
  - 1 SPI clock
  - 1 SPI MOSI

**3 DC lines + 11 LVDS lines
Baseline (Mupix11)**

**3 DC lines + 11 LVDS lines
+ 5 single ended lines
Mupix10 6-chip ladders**

3

Mupix10 HDI

Inner layer design

Mupix10 HDI

Inner layer design
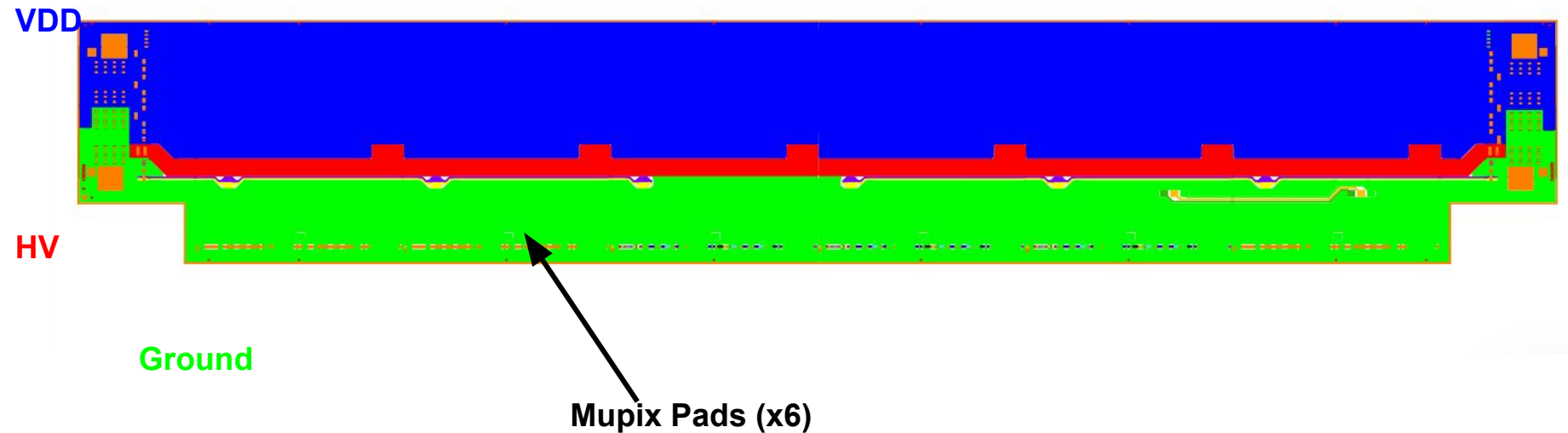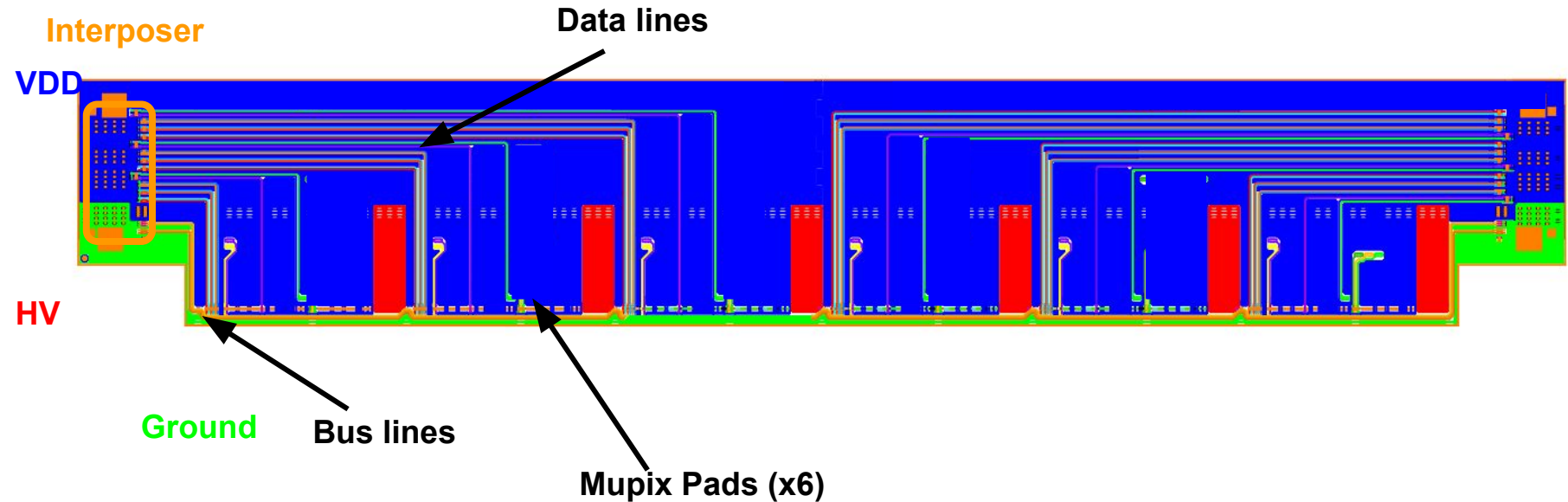
Mupix10 HDI

Inner layer design (no SPI lines)

Bottom layer

VDD

HV

Ground

Mupix Pads (x6)

Mupix10 HDI

Inner layer design (no SPI lines)

Top layer

Interposer

VDD

Data lines

HV

Ground **Bus lines**

Mupix Pads (x6)

Mupix10 HDI

Inner layer design (with SPI lines)

Top layer

Interposer

VDD

SPI lines

Data lines

HV

Ground   Bus lines
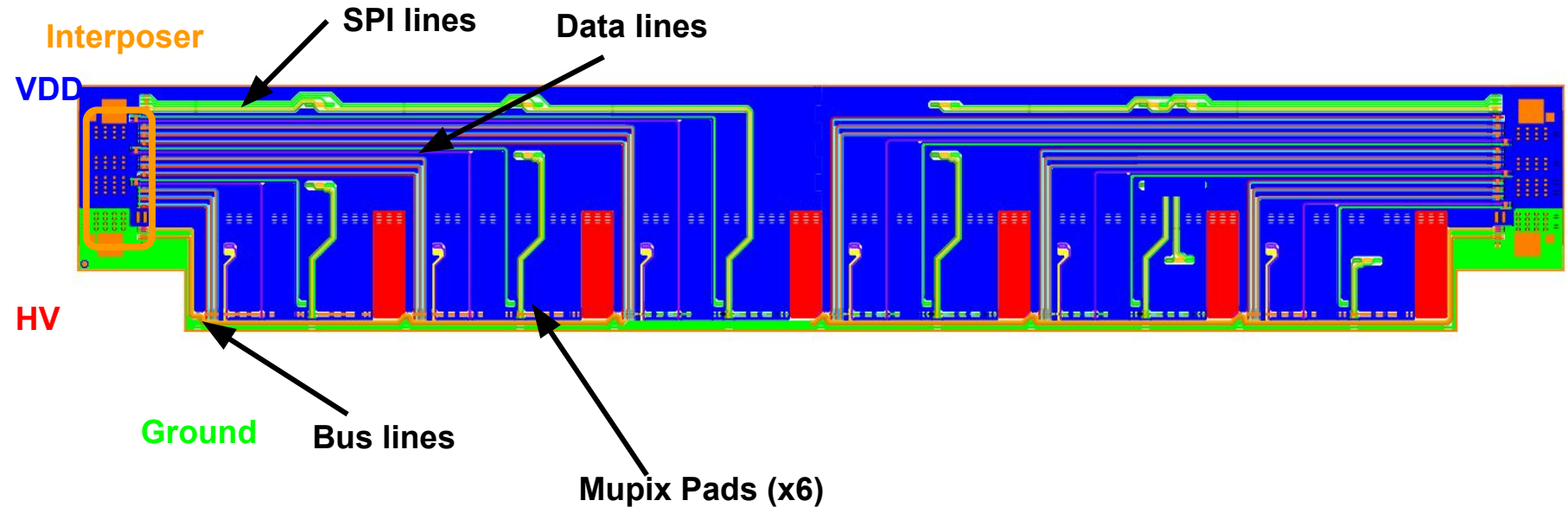
Mupix Pads (x6)

Mupix10 HDI

Inner layer design (with SPI lines)

Bottom layer

SPI lines

VDD

Bottlenecks...

HV

Ground
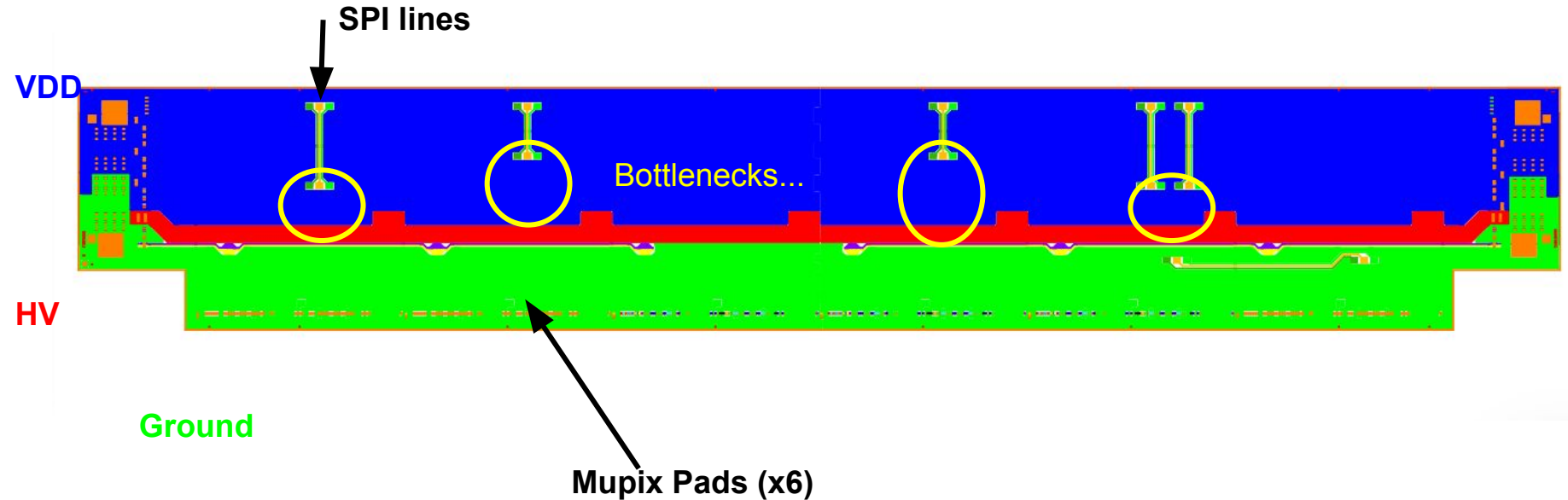
Mupix Pads (x6)

Mupix10 HDI to interposer

Inner layer design (no SPI lines)

Top layer

Interposer

VDD

Data lines

HV

Ground

Bus lines

Mupix Pads (x6)

Interposer flex

Data and sense lines
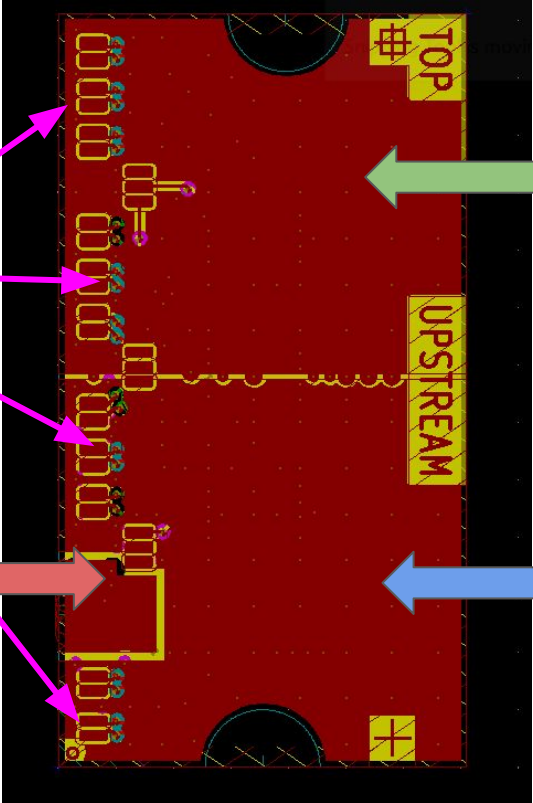
VDD

HV

GND

UPSTREAM

TOP

TAB bonds here!

11

Interposer flex

Sense line routing
towards the middle
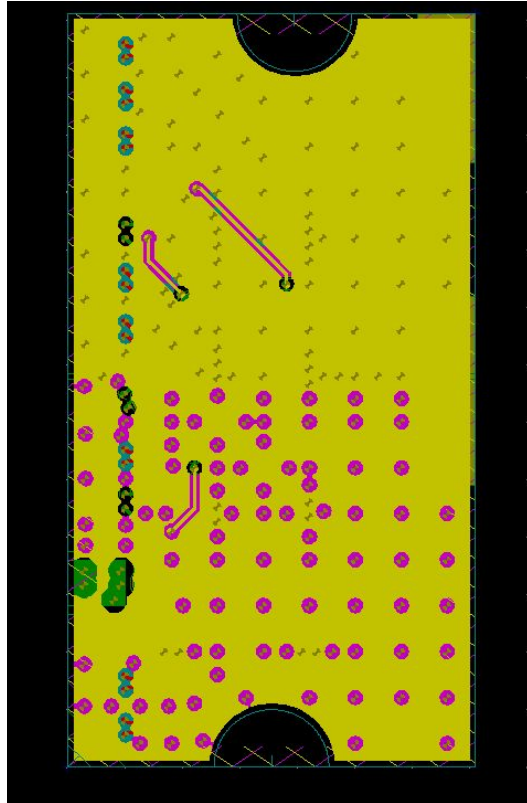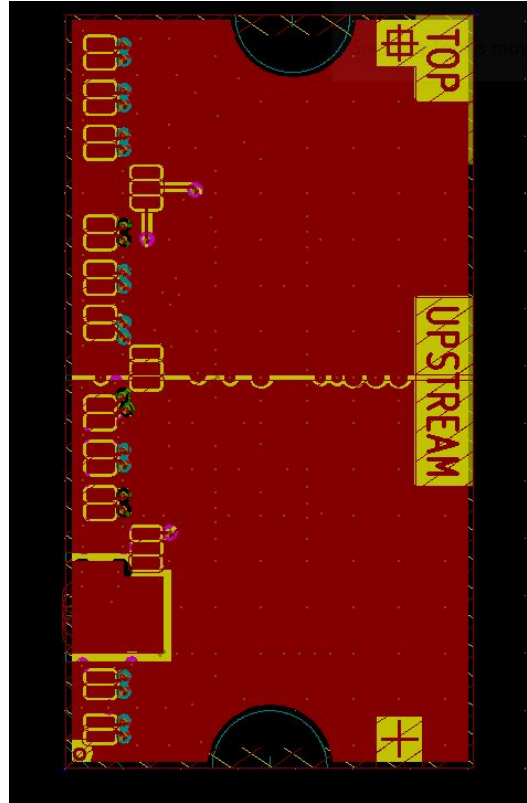
Interposer flex

Top layer

Interposer flex

Sense line routing
towards the middle
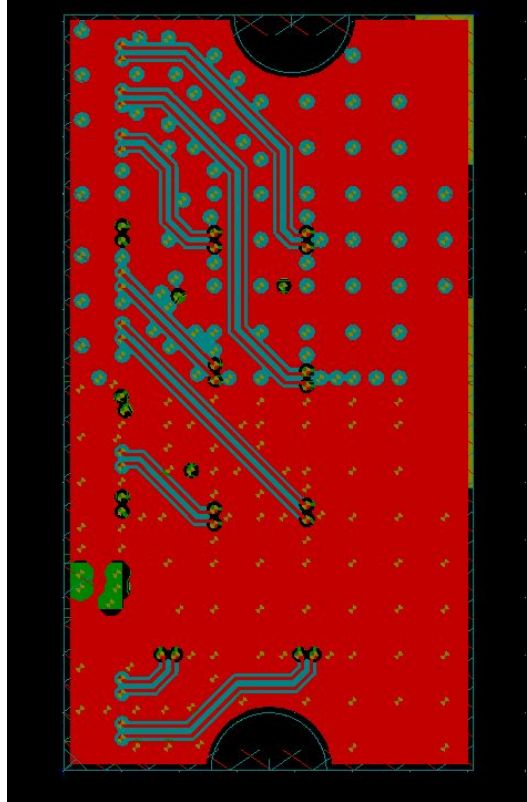
Interposer flex

Connections to gold springs

VDD

HV

GND
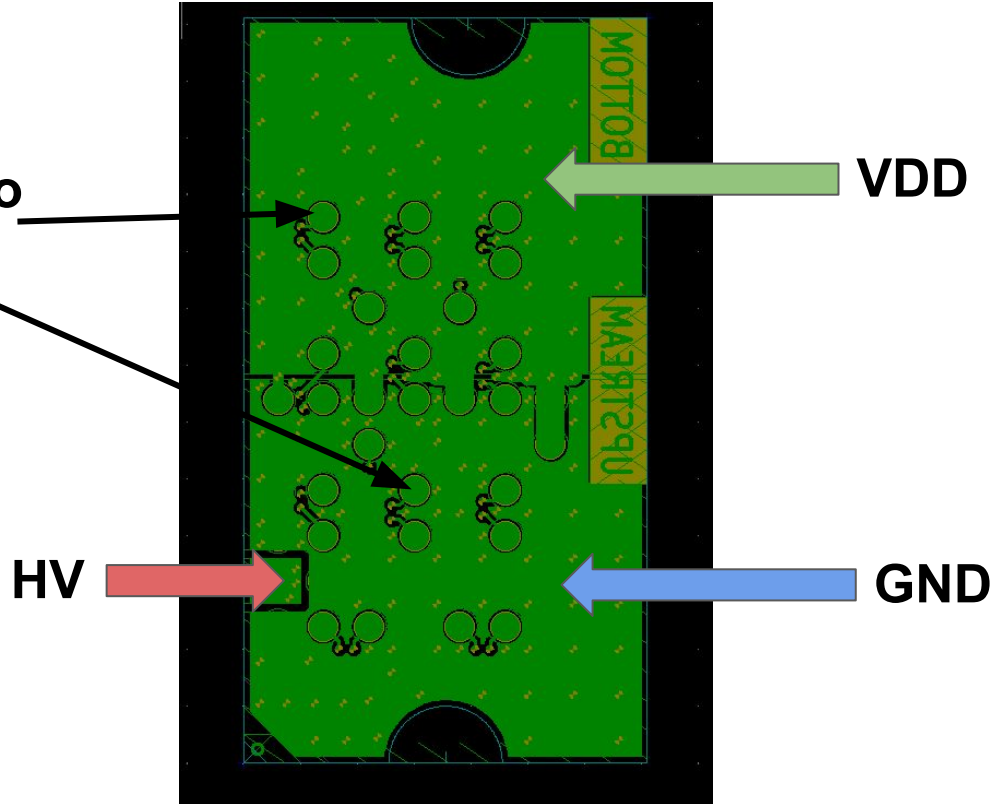
Interposer flex: summary

- Routing of lines from HDI to End-ring flex
- 1 per half ladder
- Copper design
- SwissPCB production
- Multi-layered
- Design for inner layers to be finalized
  - The presented one is old, must be updated

End-ring flex

- Routing from interposers to BoSSL
- 1 per DAQ module (-> half a mechanics module)

It should be wrapped around the End-rings

Design not started

Size and physical constraints need to be verified in in-person mechanics meeting of Nov. 24 in HD
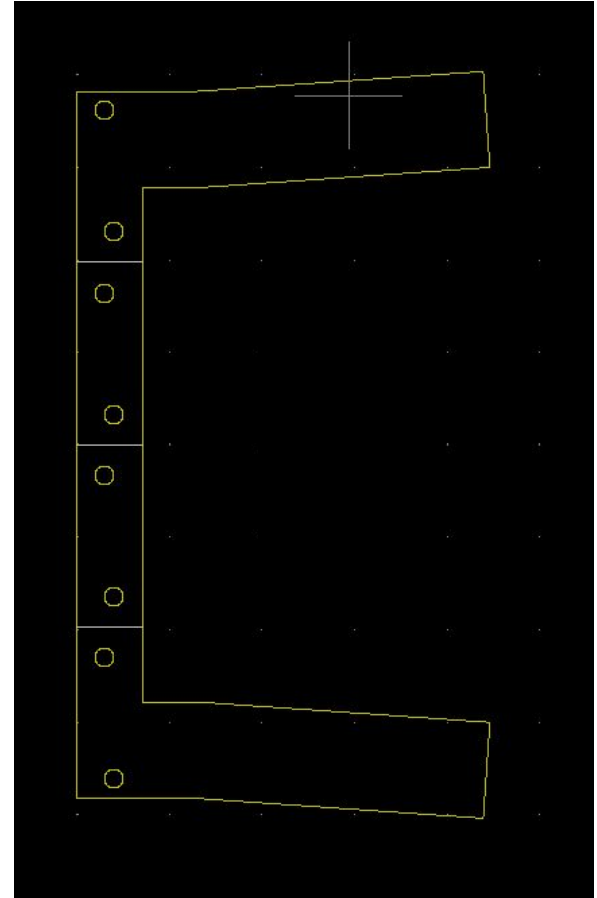
End-ring flex

- Routing from interposers to BoSSL
- 1 per DAQ module (-> half a mechanics module)

It should be wrapped around the End-rings

Design not started

Size and physical constraints need to be verified in in-person mechanics meeting of Nov. 24 in HD
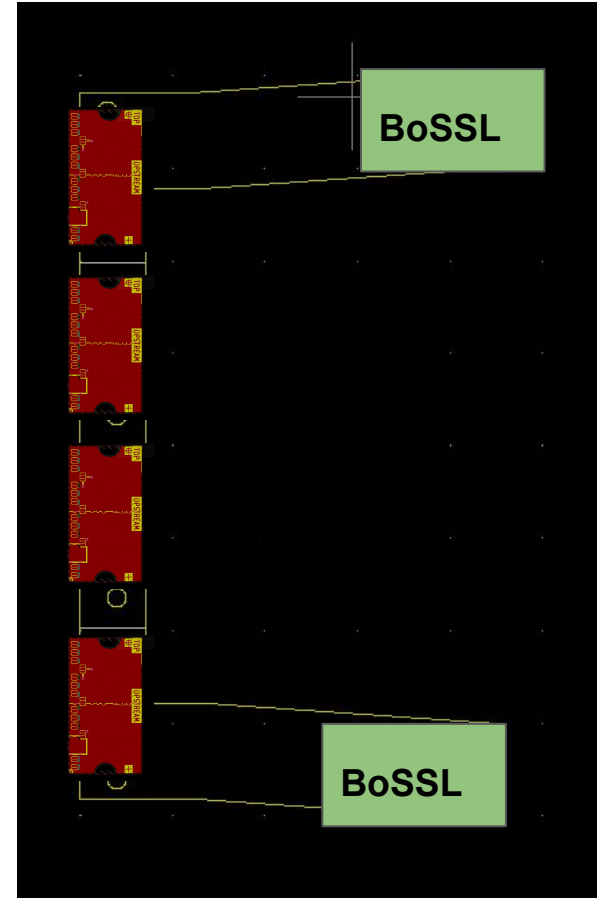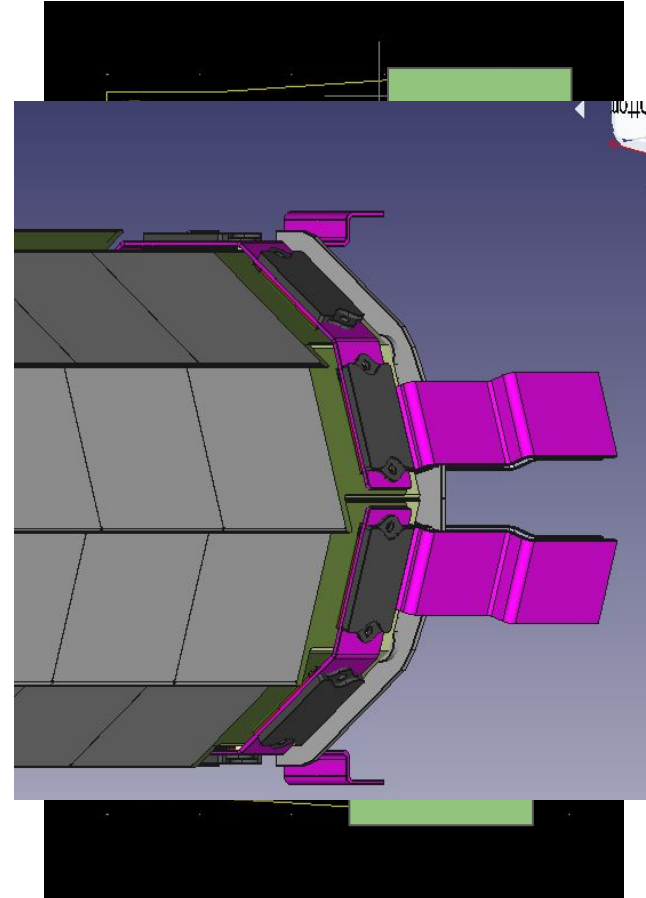
End-ring flex

- Routing from interposers to BoSSL
- 1 per DAQ module (-> half a mechanics module)

It should be wrapped around the End-rings

Design not started

Size and physical constraints need to be verified in in-person mechanics meeting of Nov. 24 in HD

BoSSL

- From End-ring flex through interposer to external cables
- Produced
- Must be verified
  - Tests with micro-twisted pair cables foreseen
  - Placement verified at the in-person meeting on 24 Nov in HD

Conclusions

- For the routing of the signals we need (custom design):
  - Ladder HDI
  - Interposer flex
  - End-ring flex
  - BoSSL board or similar
- Status for inner layers:
  - Ladder HDI:
    - Design finished for Mupix11
    - Produced for Mupix10, to be tested
  - Interposer flex
    - Design started
  - End-ring flex
    - Design to start (verify space constraints)
  - BoSSL
    - Produced