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OB FPC prototyping

WP3 Electrical interfaces



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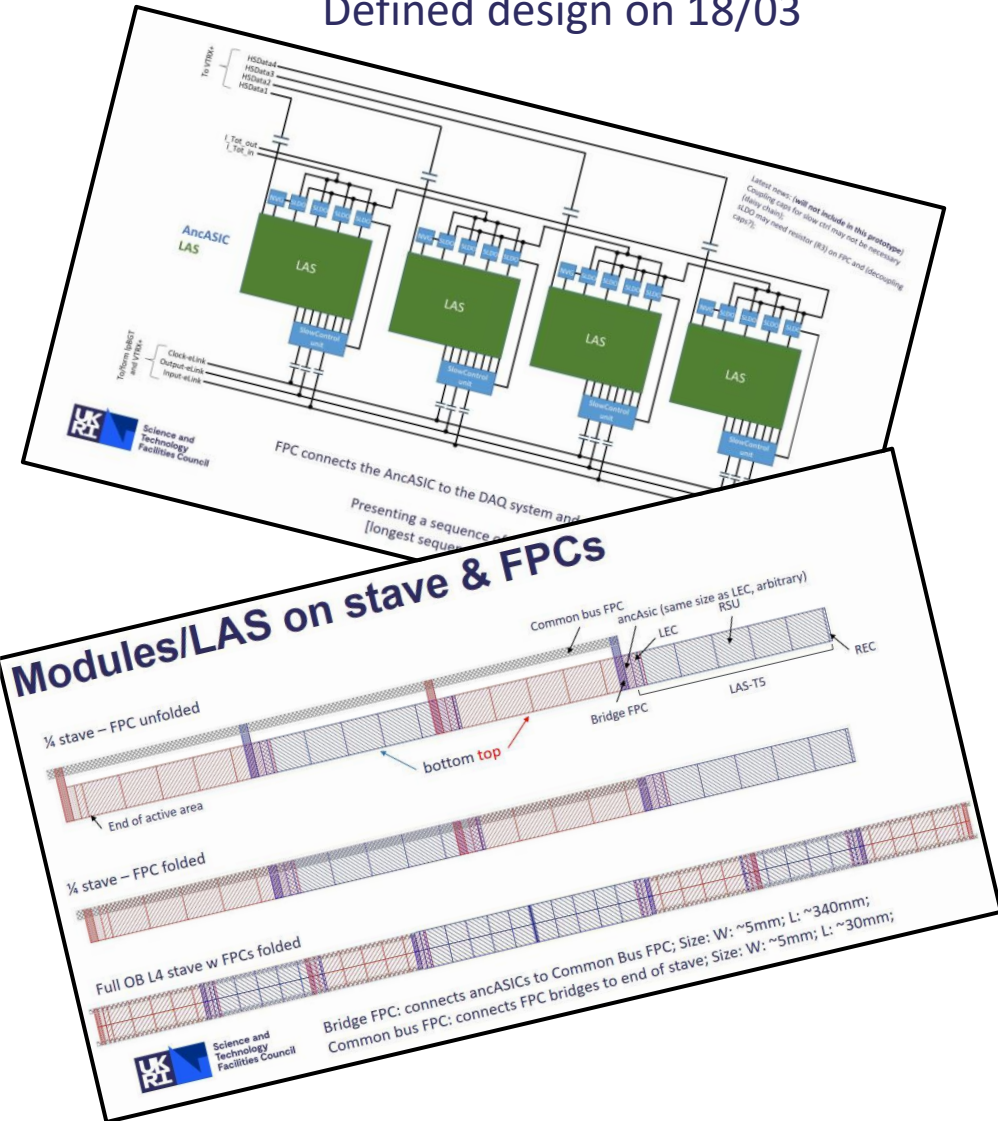
Update on Low TLR OB prototype

- Design completed and reviewed;
- Flexis under production at RPE LTU;
 - Potential delay with payments and T&C agreement due funds approvals within STFC; (proactively acting on it)
- Discussion on distribution:
 - Oxford, summer student (time pressure);
 - LANL;
- Towards a tests plan:
 - Oxford w RAL have setup ready for summer student;
 - Daresbury working of finalisation;
 - LANL;

Recap on the Low TRL OB prototype

Defined design on 18/03

Reviewed design on 16/05



Current status/updates

3

- ❖ Preliminary design (based on latest information from Andy, v03) is complete and sent for review this Monday

The schematic cross-section shows an M-FPC assembly with dimensions: 23.6, 6.6, 35, 6.15, 35, 5.7, 35, 5.25, 35, 4.8. Total length is 418. The assembly consists of an M-FPC (Signal Layer, Spacer Layer, GND Layer) and four B-FPC-A/B units (Signal Layer, Spacer Layer, GND Layer). A note indicates 'Control wires (not included)'. The bottom right corner shows 'SMD' and contact information: 'viatcheslav.borshchov@cern.ch, ihor.tymchuk@cern.ch'.

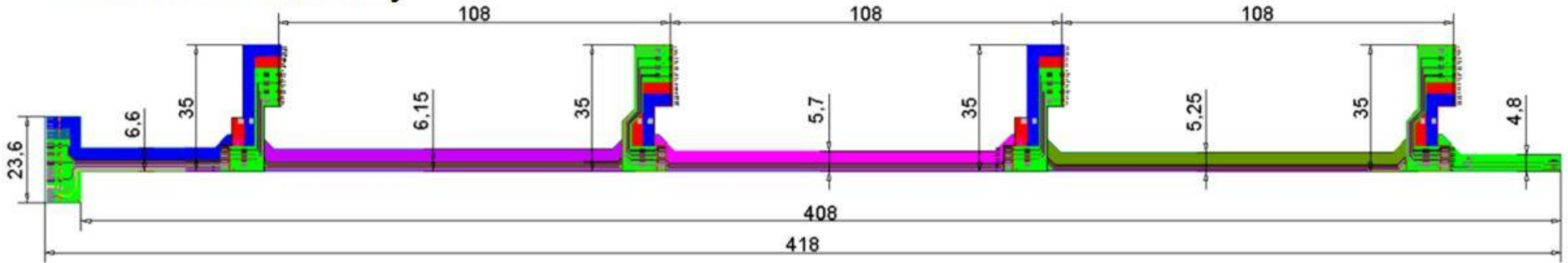
May 16, 2024

Learning curve on how to exchange info between LUT and STFC (we use different design sw)

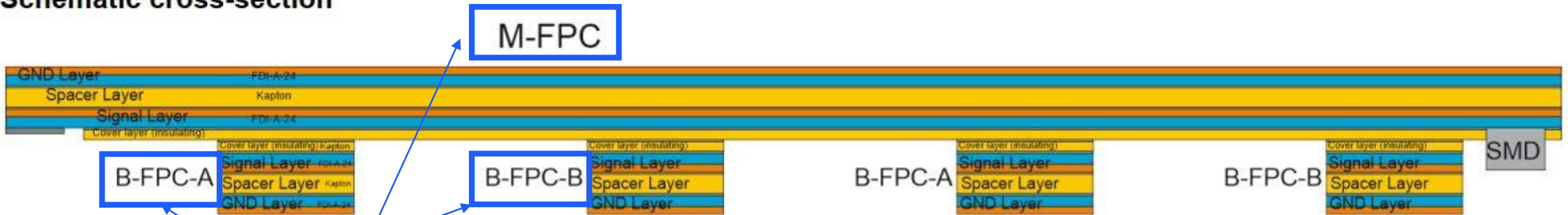
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Schematic cross-section



3 type of FPCs

Base cross-sections for the FPCs (reminder)

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Cover layer - FDI-A-24 + spacer 25um

Added on top for insulation (folding approach)

Cover layer (insulating)	Kapton
Glue ~5um	
Signal Layer	FDI-A-24
Glue ~5um	
Spacer Layer	Kapton
Glue ~5um	
GND Layer	FDI-A-24

Cover Layer 12.5um

Height (H):

Height1 (H1):

Width (W):

Width1 (W1):

Separation (S):

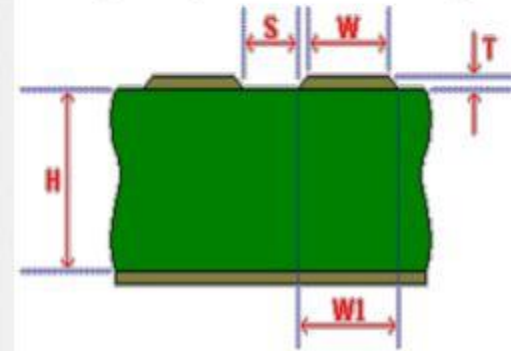
Thickness (T):

Dielectric Constant (Er):

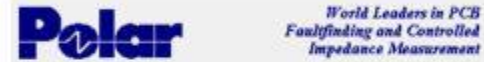
Differential Impedance (Zo):

Total thickness ~100um

Edge-coupled Surface Microstrip



Note: estimating done in CITS25 software from Polar Instruments



Outcome:
difference in impedance
is not too significant (2 Ohm)

Cover Layer 25um

Height (H):

Height1 (H1):

Width (W):

Width1 (W1):

Separation (S):

Thickness (T):

Dielectric Constant (Er):

Differential Impedance (Zo):

Total thickness ~110um

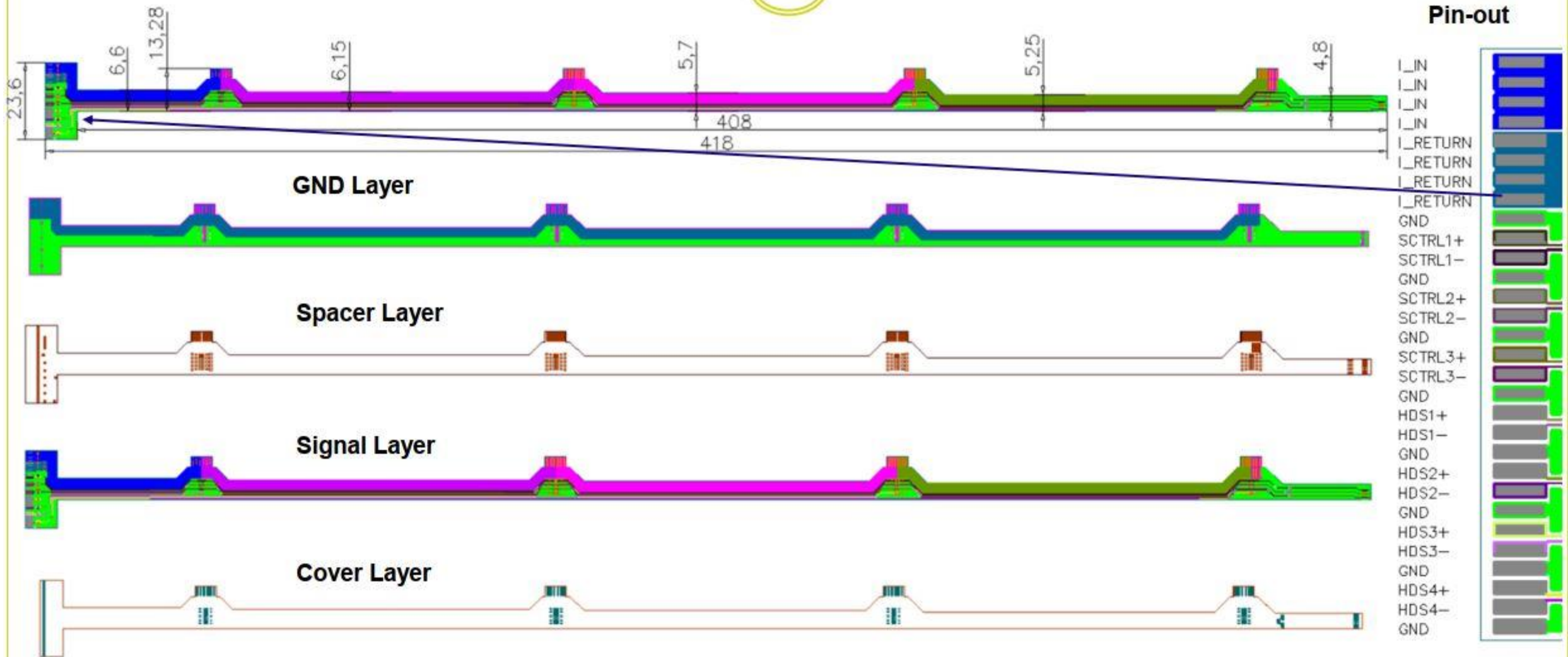
Notes:

- polyimide film 25um presently at LTU is available,
- polyimide film 12,5um presently at LTU not available yet

Width of traces – 70um
Space between traces – 130um
Pitch of traces – 200um

Main FPC: layers

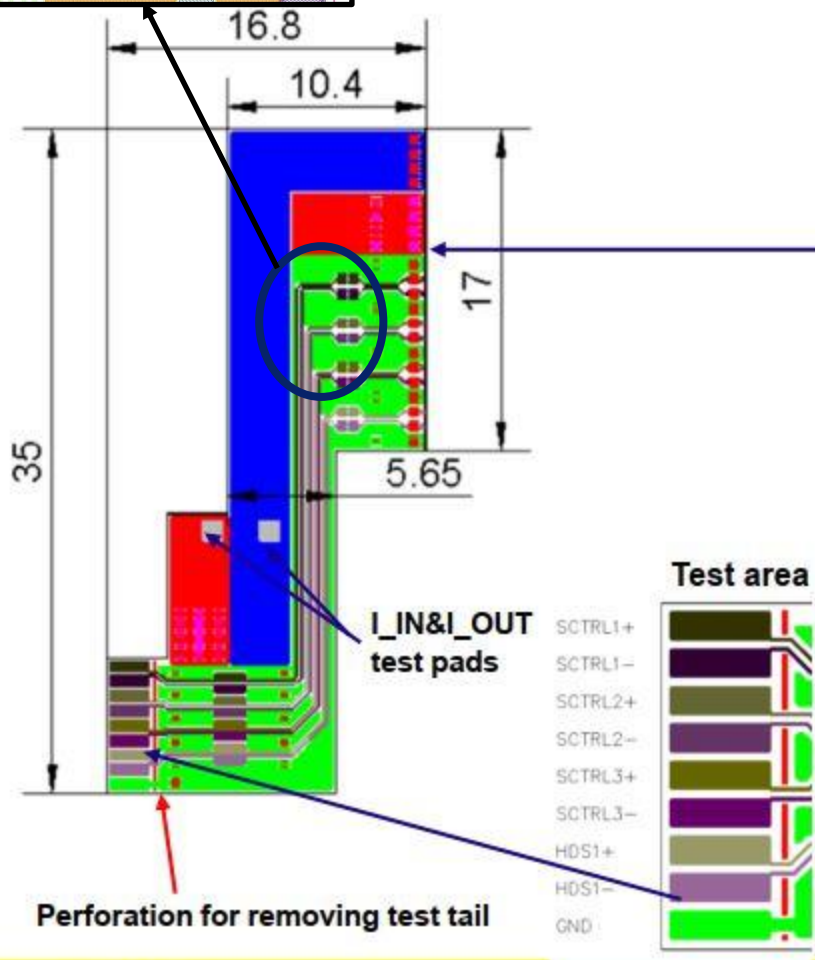
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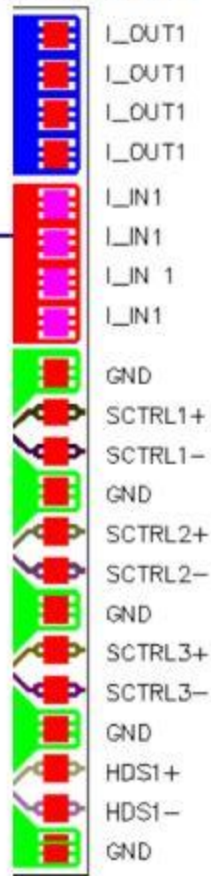
Bridge-FPCs

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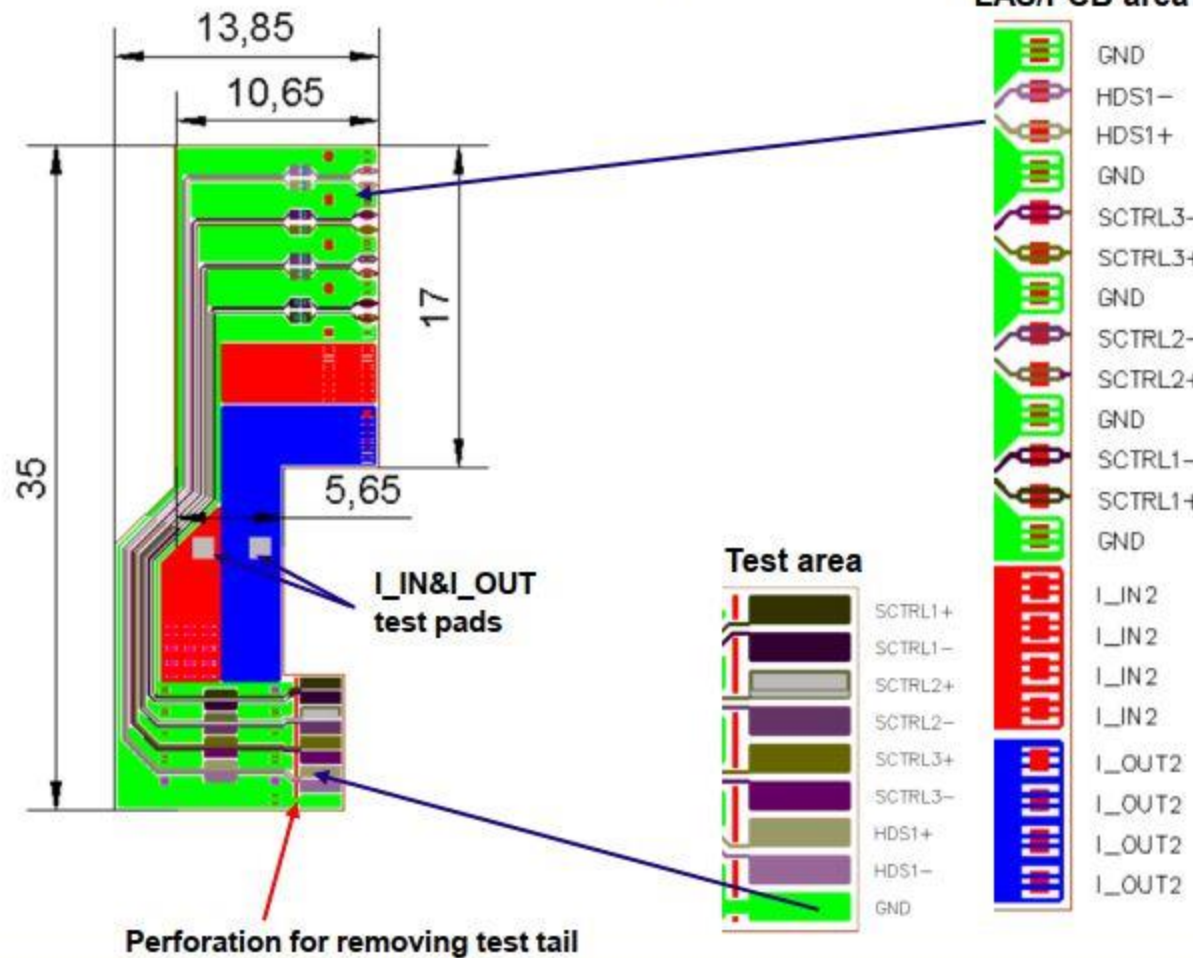
B-FPC Type A



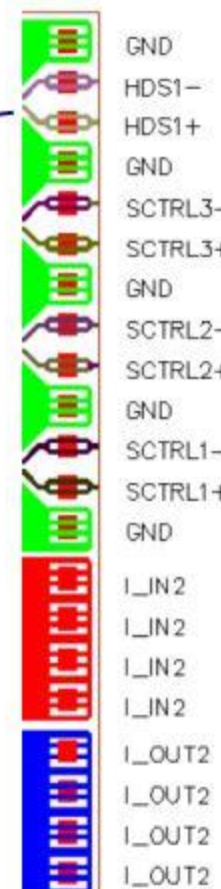
LAS/PCB area



B-FPC Type B



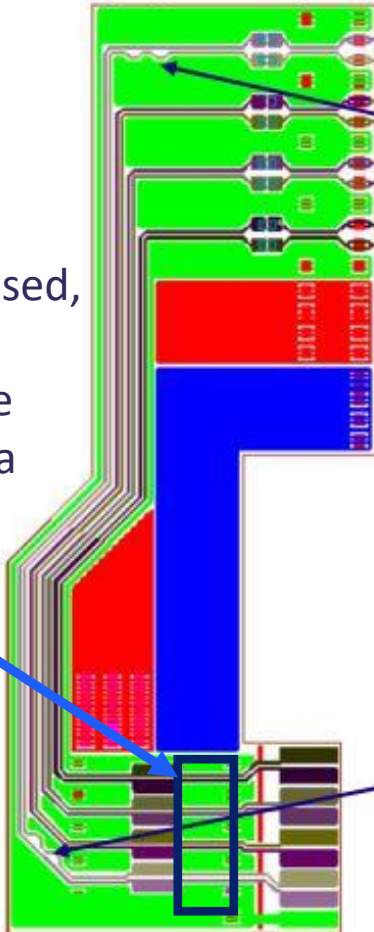
LAS/PCB area



Implemented modification

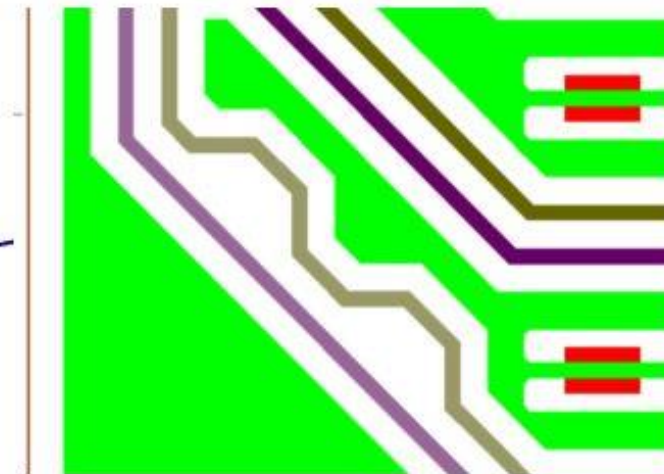
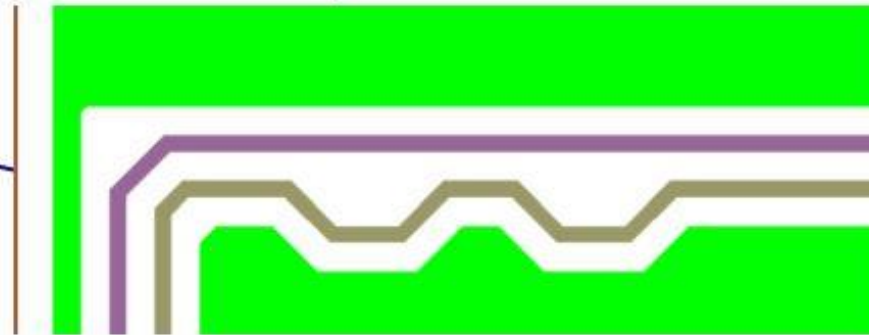
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B-FPC Type B
(signal layer)



Long stubs, not optimised,
but there is a coverlay
opening to remove the
track manually (e.g. via
scalpel)

DONE: „Serpentines,, on shorter high
speed trace are added



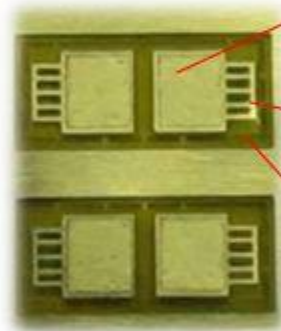
All resistors and capacitors are 0201
(0.6mm x 0.30mm)

Features of mounting SMD components and connectors

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For manufacturability increasing SMD components and connectors are mounting on small flexible carriers (flex-mounts) by soldering and after that connecting to board or cable by SpTAB

**Flex-mounts
for SMD component**

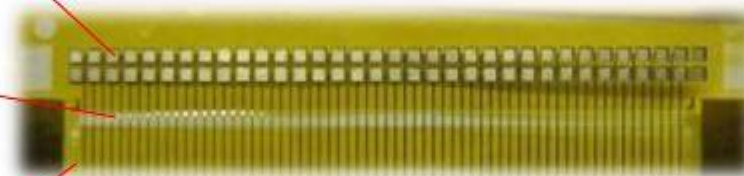


Ni + SnBi layer (pads for soldering) ~ 2+8 μm

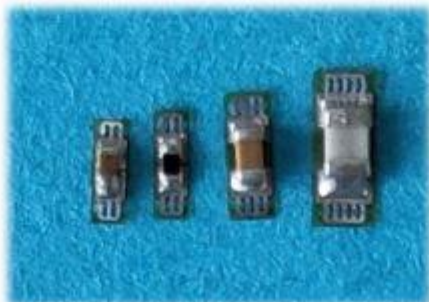
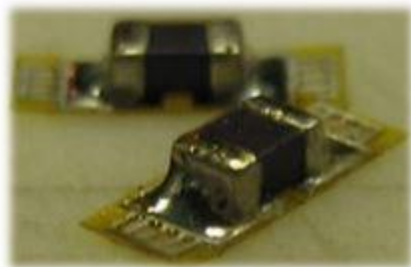
Aluminum layer (traces for bonding) ~ 15-30 μm

Polyimide layer ~ 10-20 μm

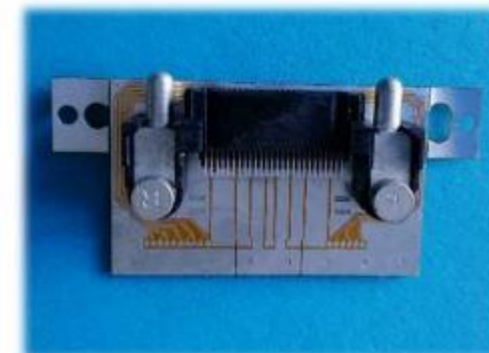
Flex-mounts for connectors



SMD components on flex-mounts



Connectors on flex mounts



- Procurement:
 - Quantities:
 - 4 fully assembled (2 DL, 2 OX);
 - 4 M-FPC bare;
 - 16 B-FPC:
 - 8 B-FPC-A bare;
 - 8 B-FPC-B bare;

- Sent agreement to sign, with STFC admin



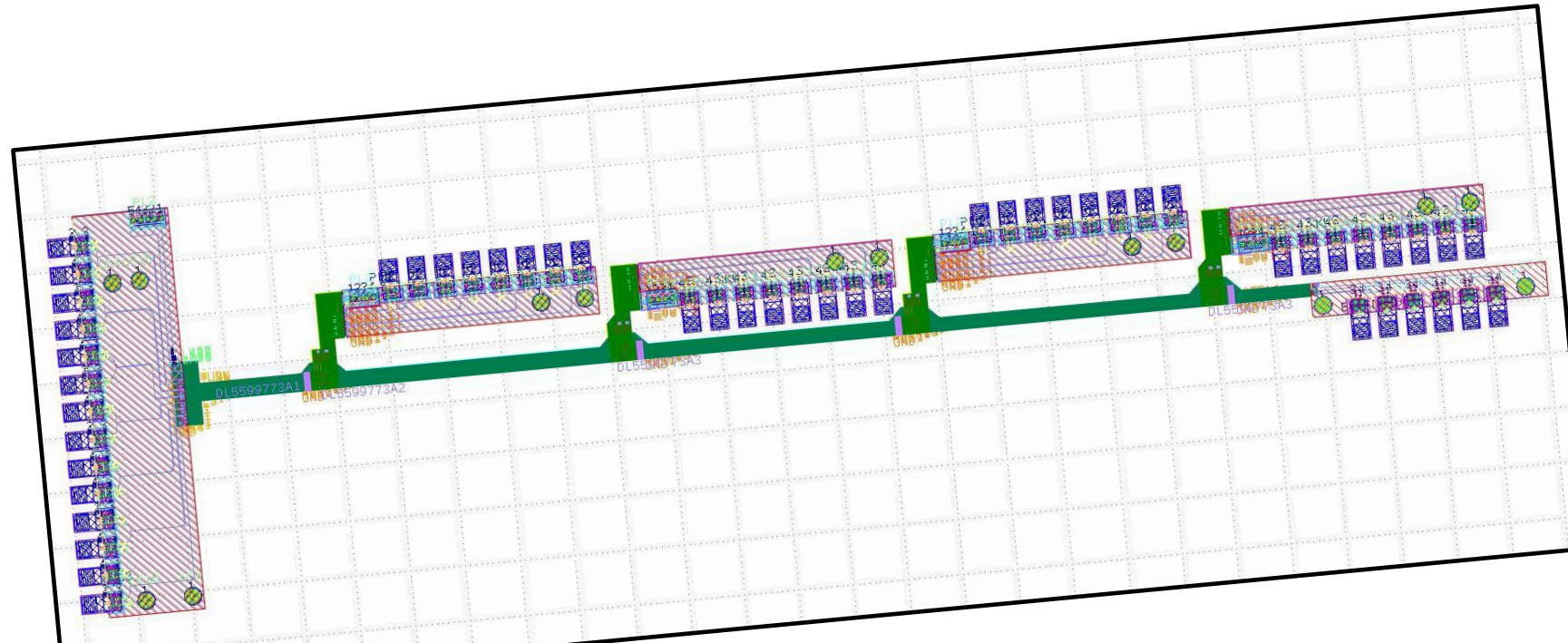
Bill to:
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QUOTATION nr. ePIC SVT-1
Quotation date: June 10, 2024

LLC "Research and Production Enterprise "LTU"
bld.3, Novgorodska str.,
Kharkiv, Ukraine, 61145
email: info@ltu.ua
www.ltu.ua

Test plan

- Interface board design started;
- Test plan to be finalised at Daresbury (next week);
- Todd at Oxford ready to test (via summer student) and has an initial plan;





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Thank you

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