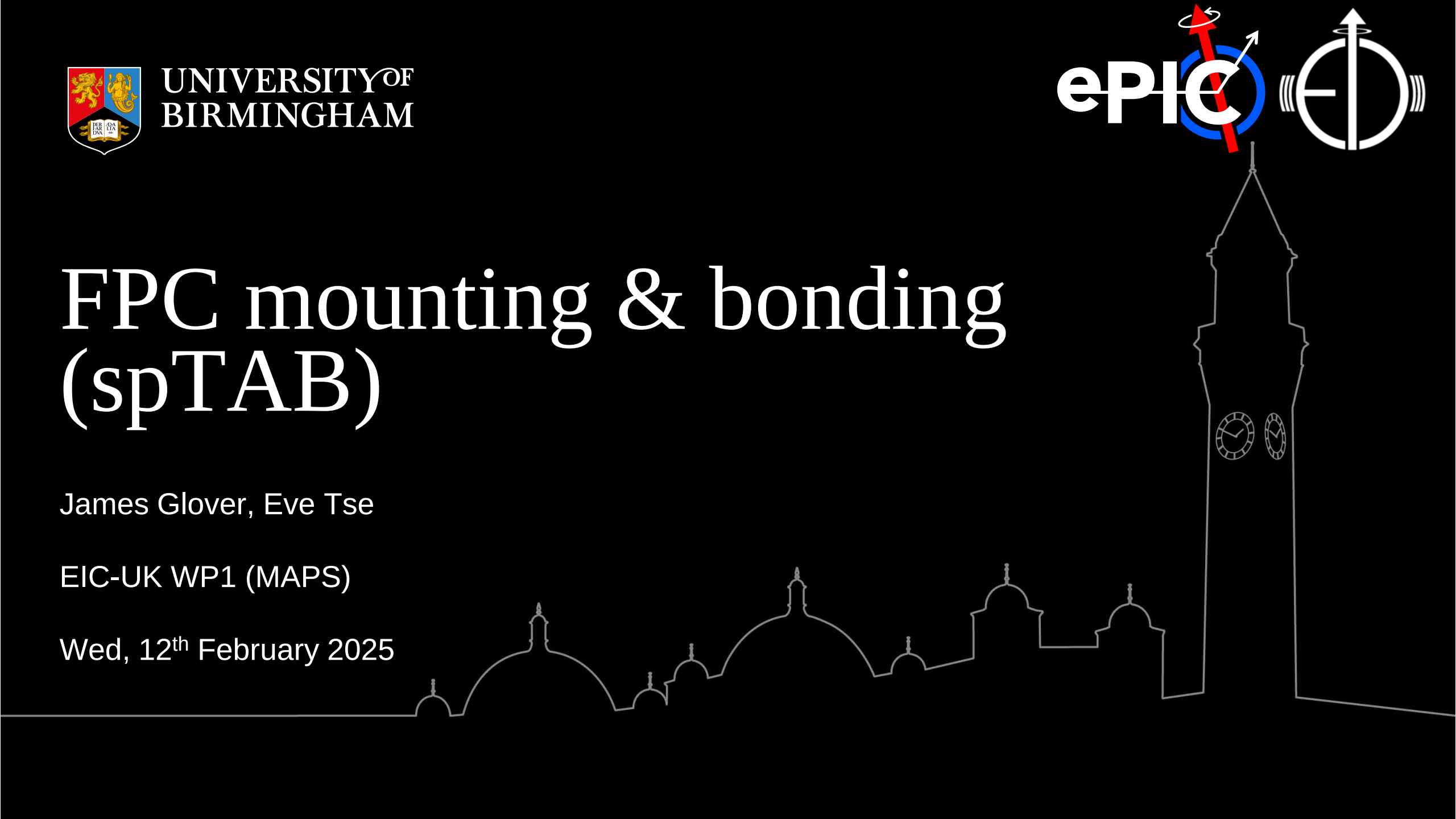


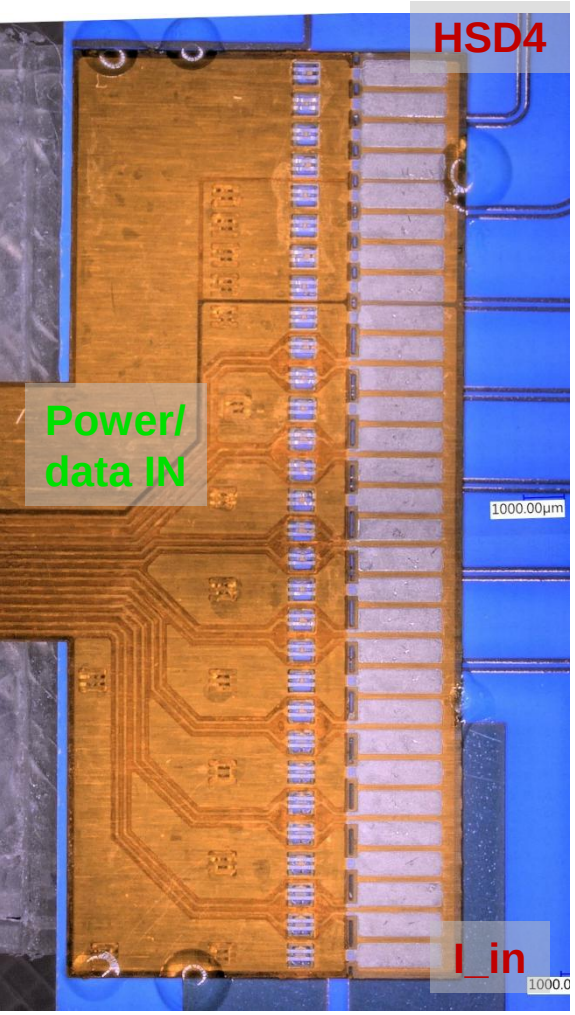
FPC mounting & bonding (spTAB)

James Glover, Eve Tse

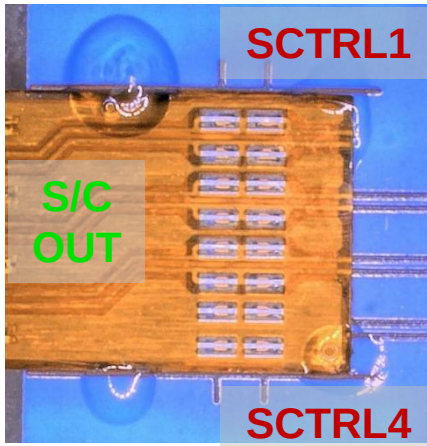
EIC-UK WP1 (MAPS)

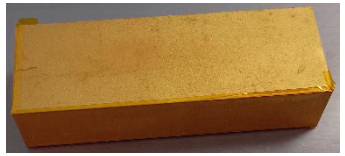
Wed, 12th February 2025

Prototype to PCB mounting (1)



- Following on from bond trials (reported here).
- Mounting and alignment of FPC to PCB.
- Considered adhesives to help hold FPC to PCB.
  - Opted against glue under the FPC, to minimise height offset and prevent glue squeezing out to bond areas.
  - Opted for a UV-cure glue (have familiarity from ATLAS), can be placed on FPC edge and cured dot-by-dot.
  - Used a Kapton coated weight to hold FPC while applying glue.





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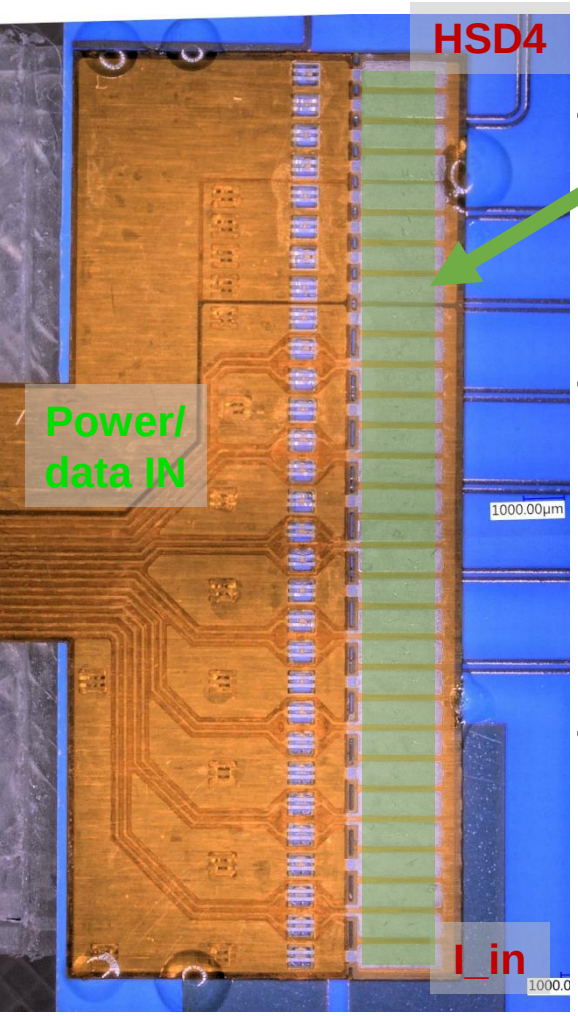
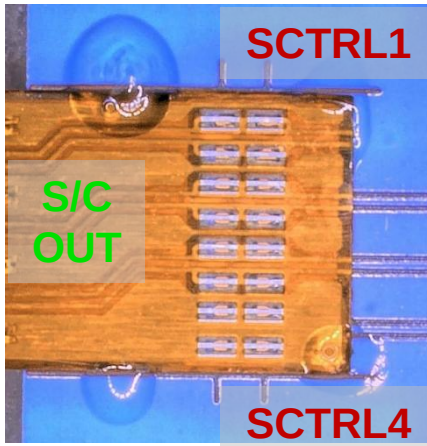
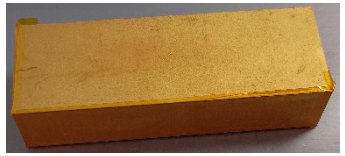
Prototype to PCB mounting (2)



- Additional solder/probe pads on the Power/data IN side of the FPC made holding FPC with the weight straightforward.
- Applied the glues dots on the left before removing weight, additional dots prevent FPC from lifting at the edge (cotton swab used to ensure FPC was flat during curing).
- There was limited locations for the weight on the S/C OUT side of the FPC.
  - Found it harder to keep this side flat.





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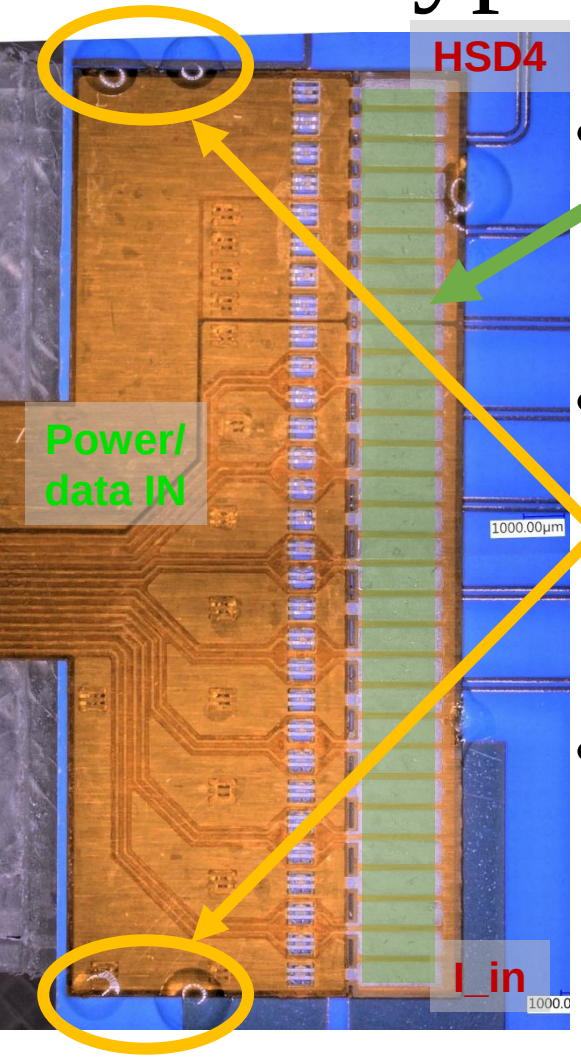

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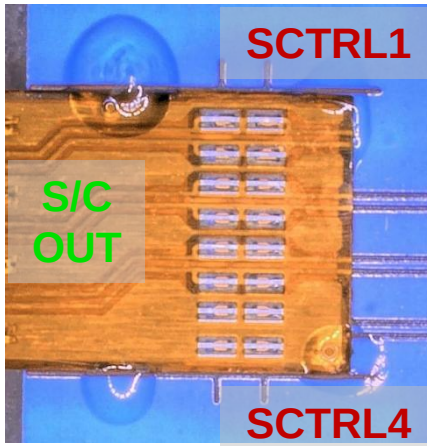

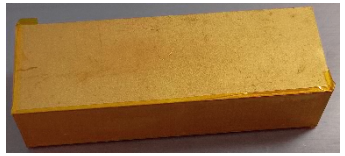

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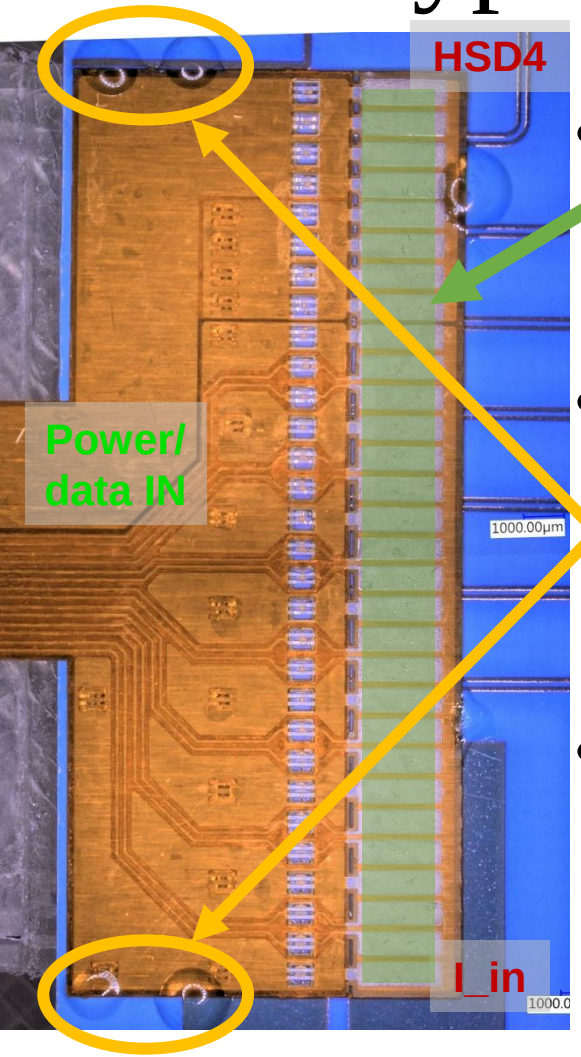

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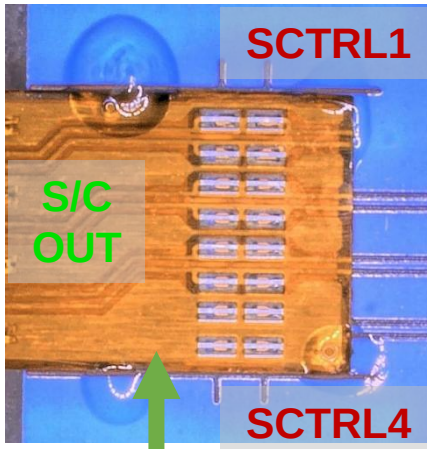
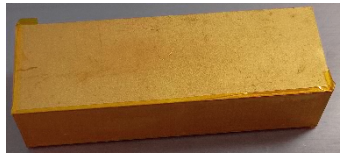
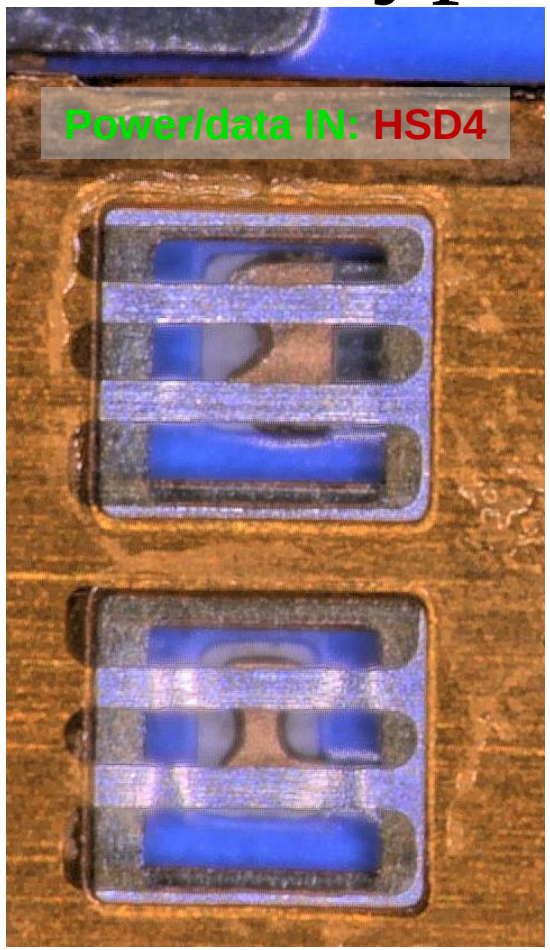
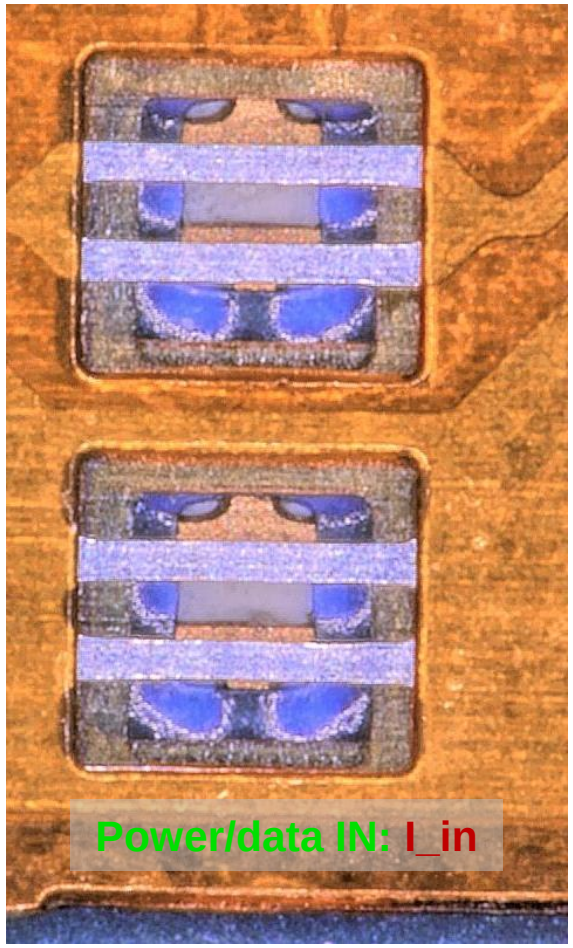
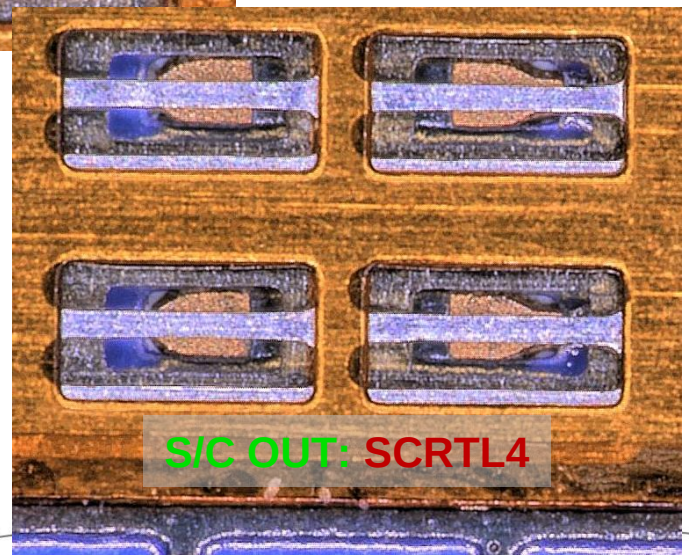




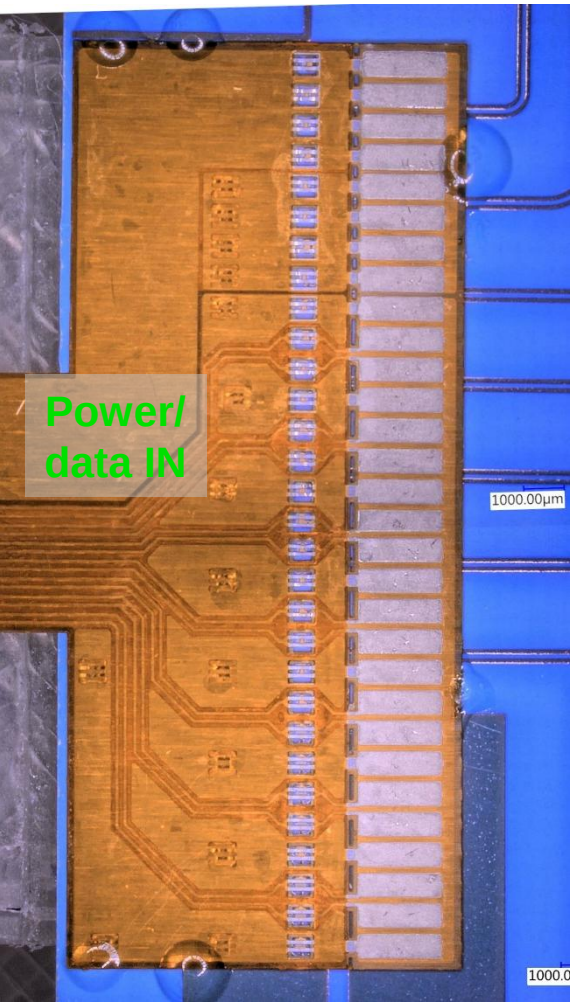
Prototype to PCB alignment

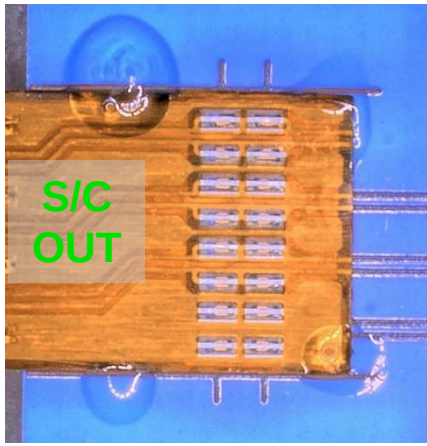






For the eagle eyed!





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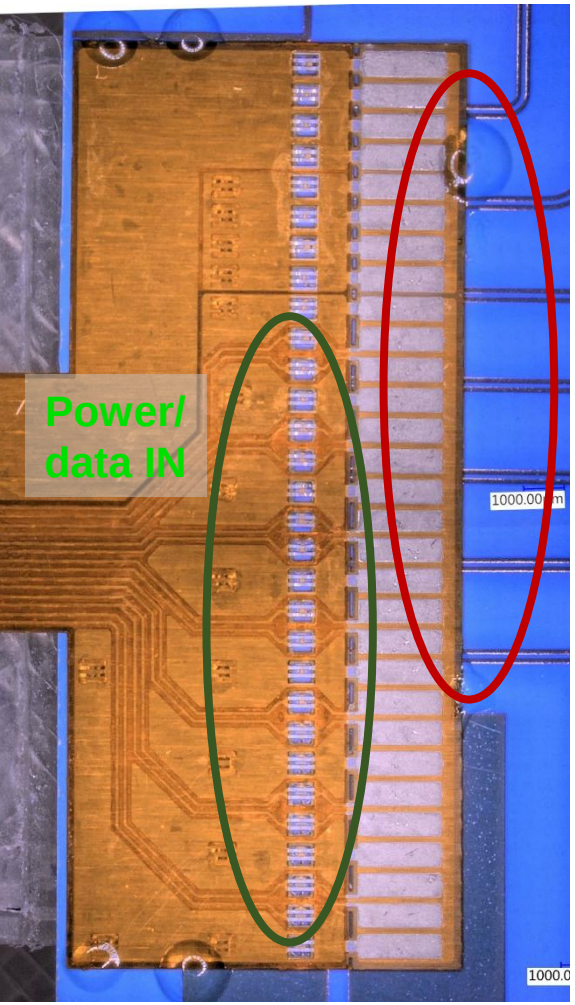
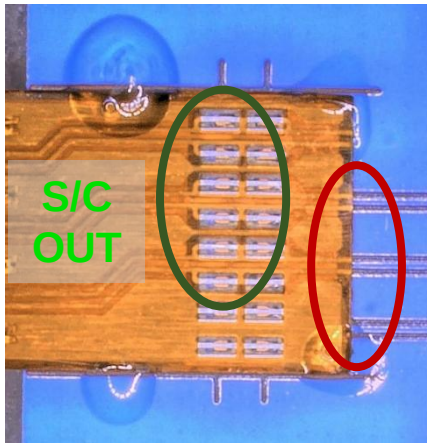
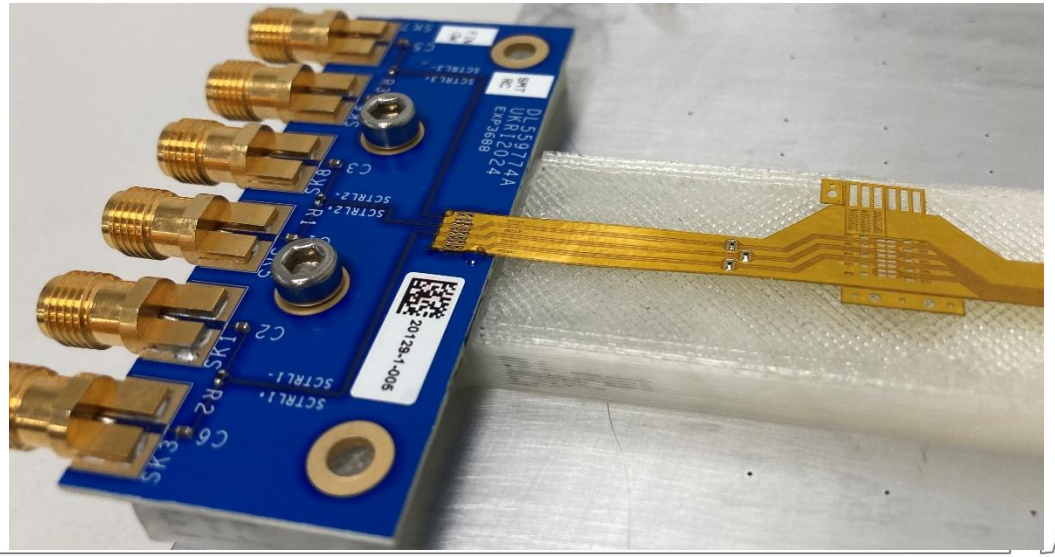


- The differential lines don’t line up!
- We mounted the FPC up-side-down!

PCB differential lines

FPC differential lines



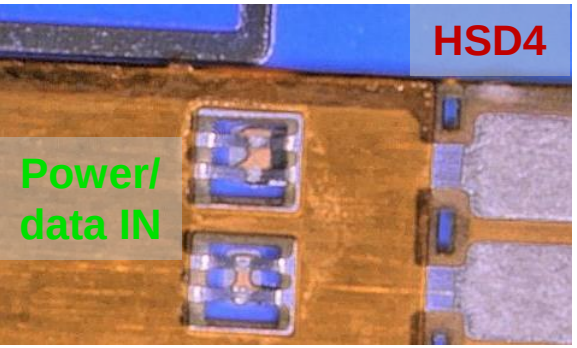


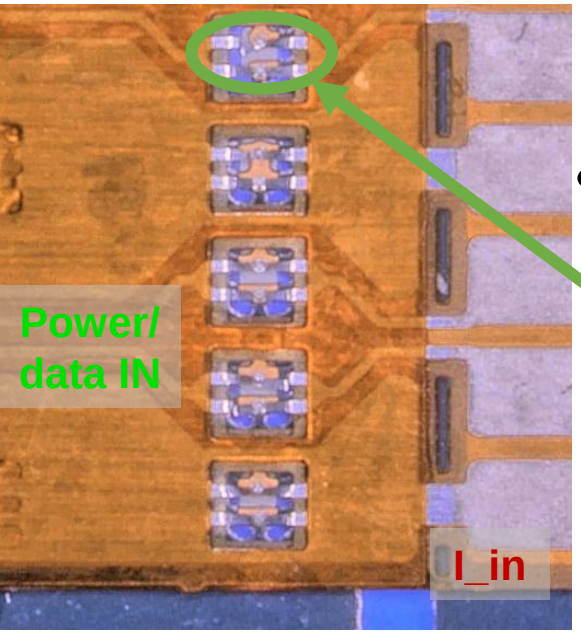
Actual connections

Only interested in the SCTRL1, SCTRL2, SCTRL3 (+&-) lines.
(that run the full length of the FPC and are available on the S/C OUT PCB).

Power/data IN	FPC	S/C OUT
SCTRL1(+)	GND	SCTRL3(+&-)
SCTRL1(-)	HSD1(-)	Not connected
SCTRL2(+)	GND	SCTRL3(+&-)
SCTRL2(-)	SCTRL3(-)	GND
SCTRL3(+)	GND	SCTRL3(+&-)
SCTRL3(-)	SCTRL2(-)	SCTRL1(+)
GND	SCTRL2(+)	SCTRL1(-)
HSD1(-)	SCTRL1(-)	SCTRL2(+)
GND	SCTRL1(+)	SCTRL2(-)

Prototype to PCB bonding

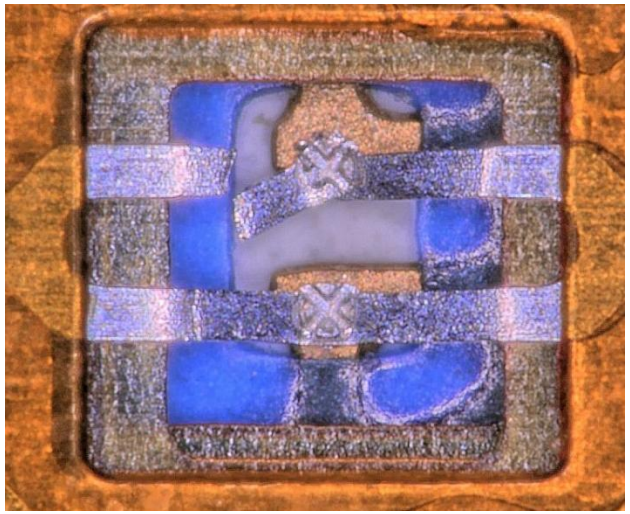


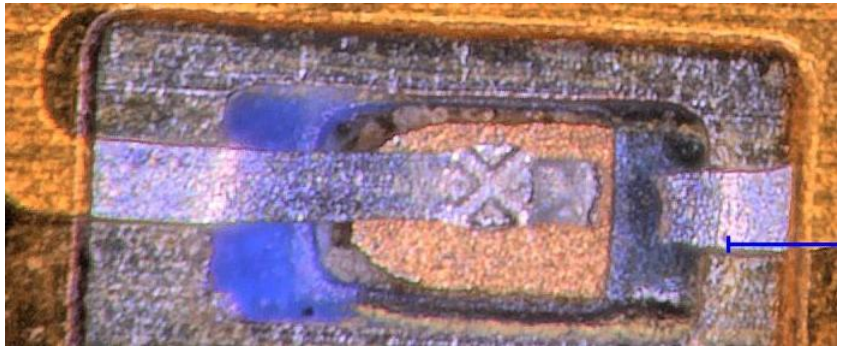


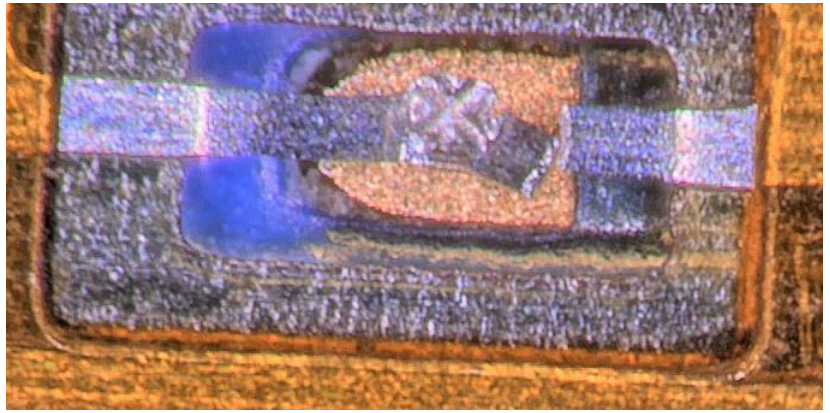
- Kept to the bond settings found to work well from testing.
- Vertical offset between FPC and PCB seemed much smaller than with the (unglued) test structure.
- Observing bonds being done appeared to go very smoothly.
  - A couple of foils had noticeable snapped at either end of FPC, seemed minimal.

Visual inspection (1)

- A detailed visual inspection of the bonds (higher magnification, better lighting and observation angle control) has shown far greater damage to the FPC tracks – esp. S/C OUT side.
- Fully catalogued the damage into a spreadsheet.

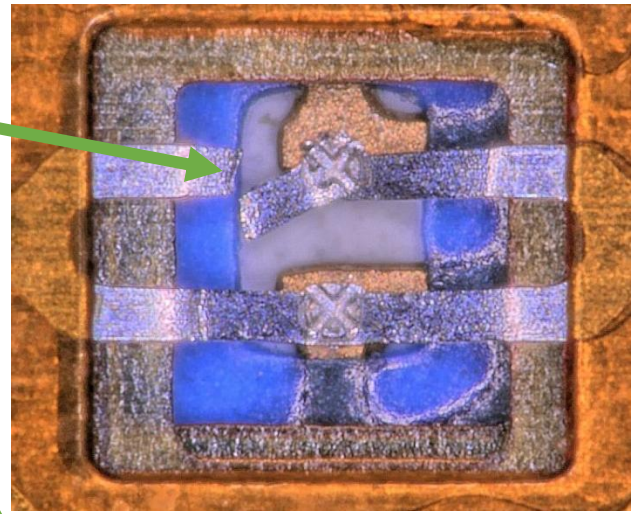


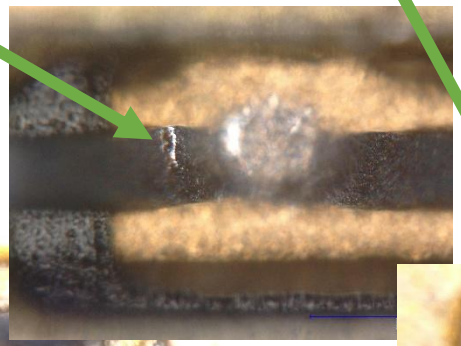


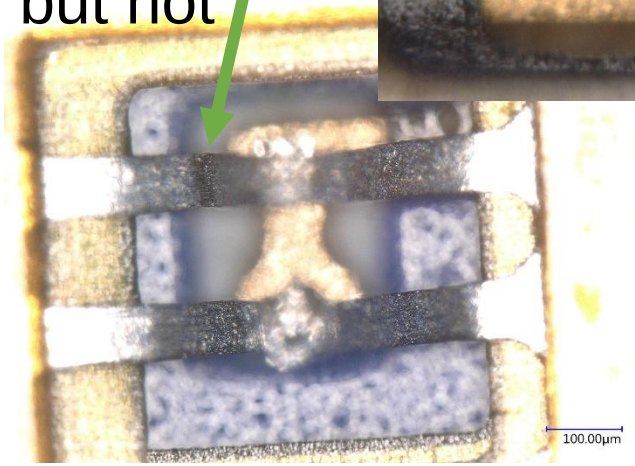


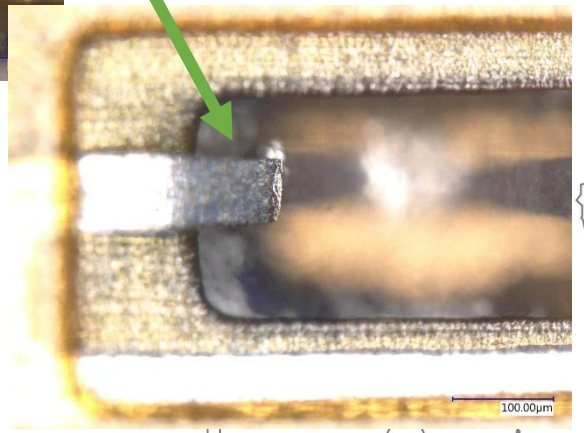
Visual inspection (2)

- Most breaks appears at the edge of the PCB's solder mask (this layer is only 20 µm thick).
- Some irregular kinks in the foil are observed.
- More than 60% of the S/C OUT side show some damage.
  - May still have continuity, but not ideal for HS data Tx.
  - Due to trouble keeping FPC flat at this end?
  - Only ~25% on the Power/data IN side.









Summary

- Need to double-check FPC orientation prior to mounting.
  - Check all differential traces line-up.
  - Make sure termination resistors are removed from FPC.
  - Cut-off solder/probe pads prior to mounting.
    - Need to look at options for holding FPC without this extension.
- Bonding of FPC tracks to PCB pads seems to have good welds.
- Height difference between FPC tracks and PCB pads seems to be at a limit.
  - Keeping FPC flat to PCB surface is must!
    - Additional space on FPC (Kapton extensions) to hold down during gluing.
  - Minimising surface steps within the bond window might help.
    - PCB redesign with larger window in the solder mask is already done.

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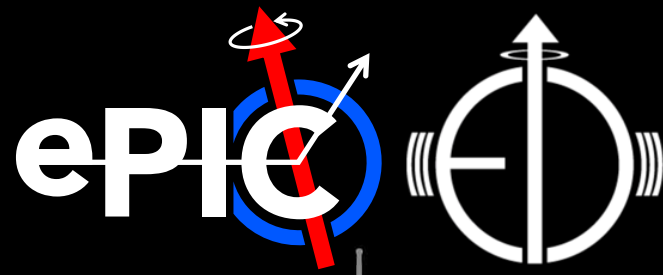
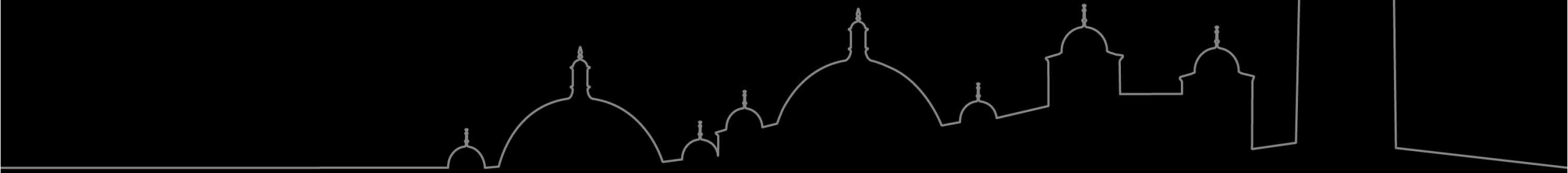


Thank you very much!

Any questions?



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ePIC

Additional (support) slides