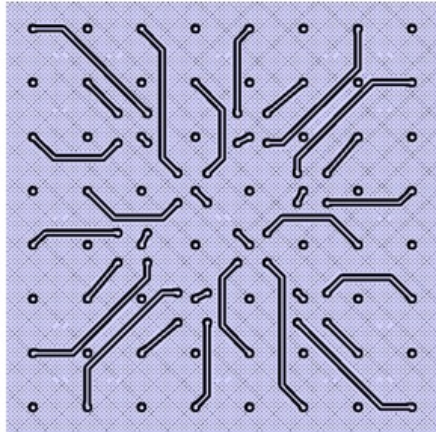


Status of the EIC HRPPD interface backplane re-design

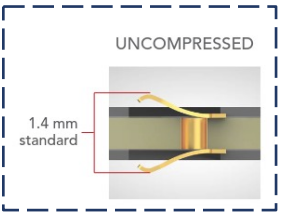
Alexander Kiselev (BNL)

eRD110 meeting, July 17, 2024

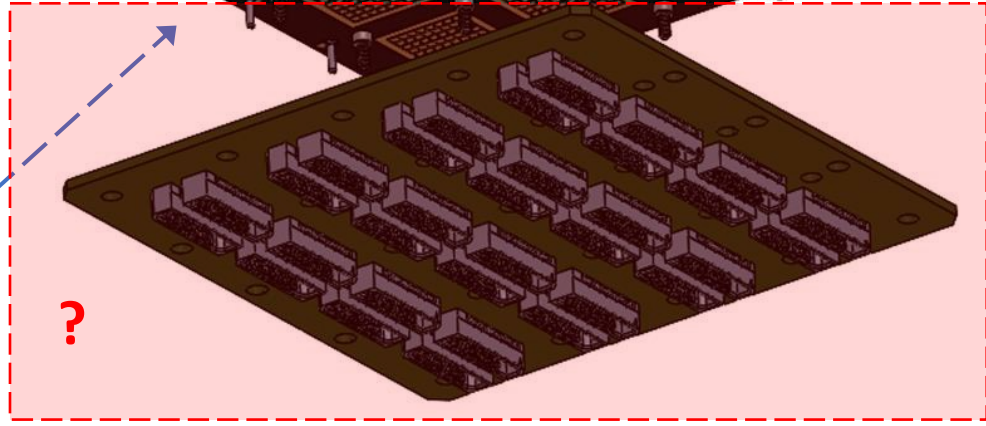
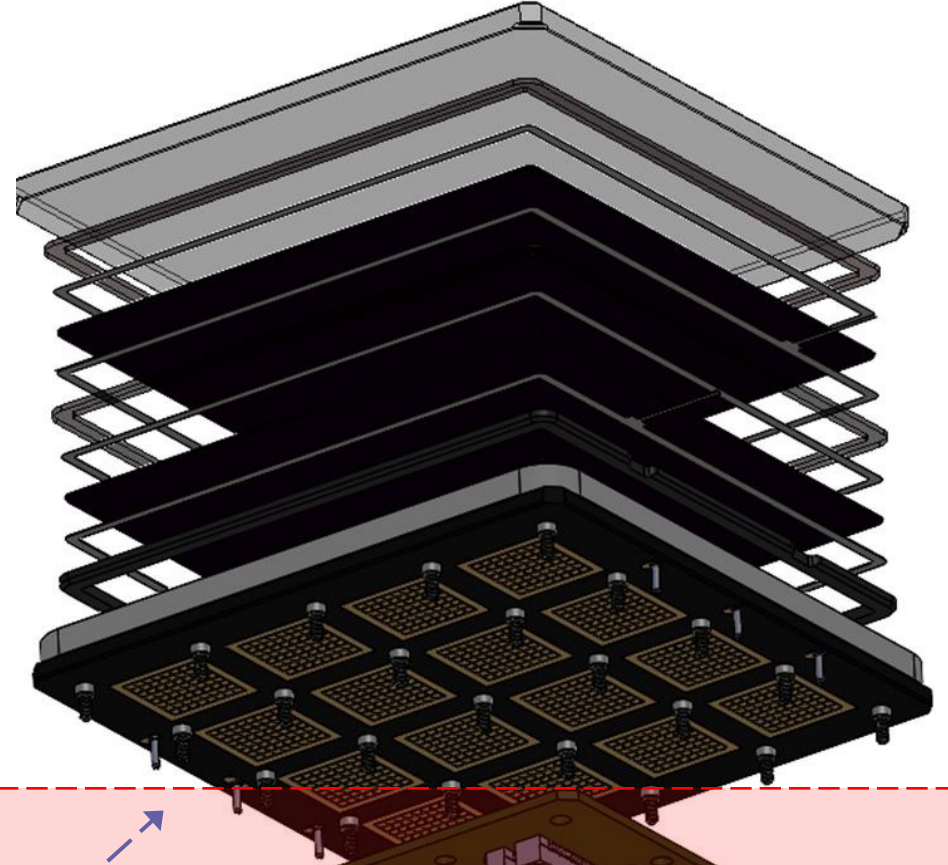
EIC HRPPD assembly



pad pattern compressed from 3.25mm to 2.00mm pitch



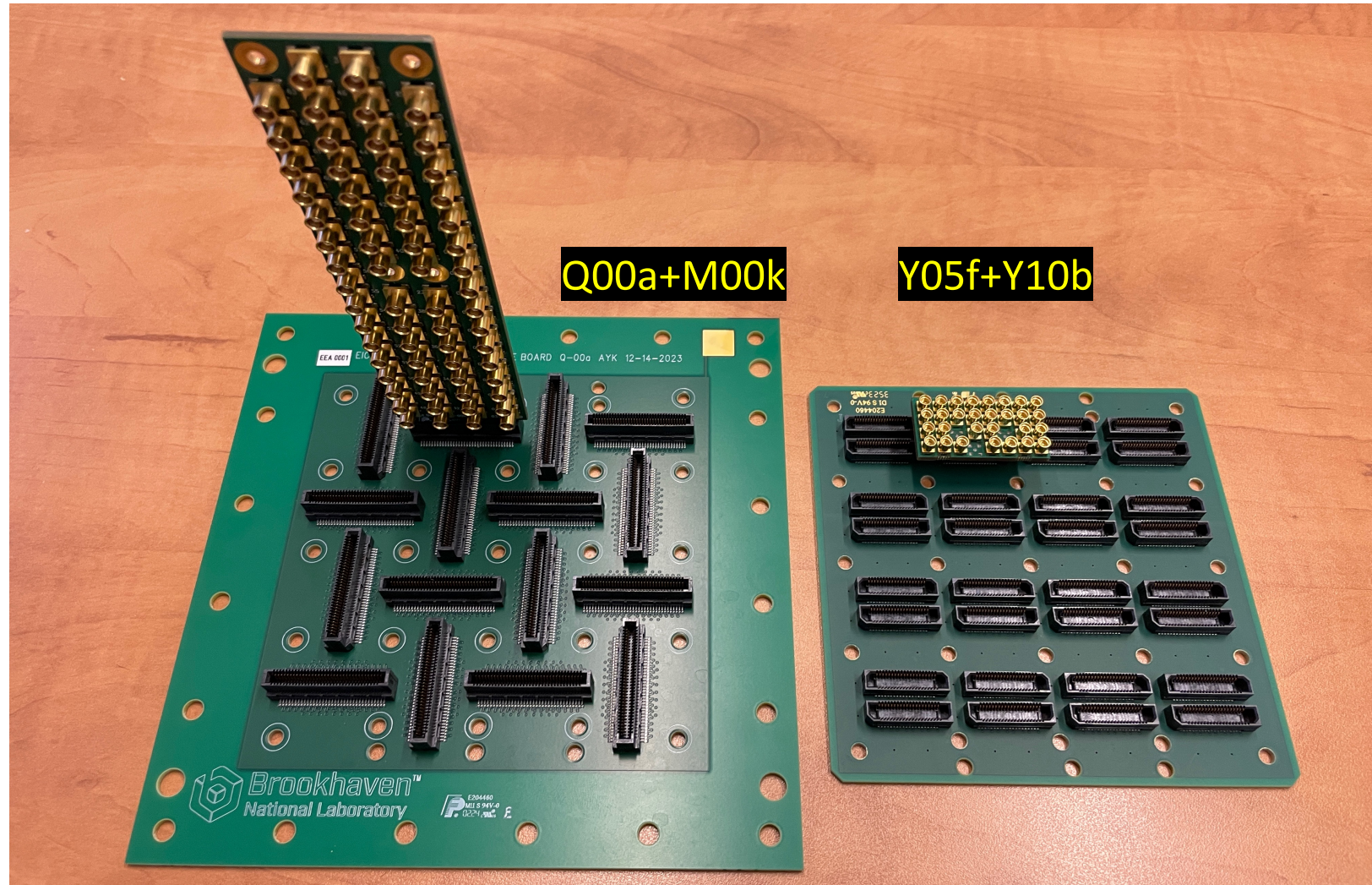
- Fused silica window
- MCPs, spacers, etc
- Side wall
- Anode plate (Y03h), a pre-routing ceramic circuit board
- Compression interposers (not shown)
- Interface PCB (Y05f)



4x4 spots, each with 8x8 square pads; 3.25mm pitch

Charge path: (1) vacuum side anode pads -> anode plane stackup -> air side pads -> compression interposers -> (2) interface PCB -> MMCX adapter PCB -> pigtail RG-316 (?) cables -> 6" RG-174 cables -> V1742 digitizer

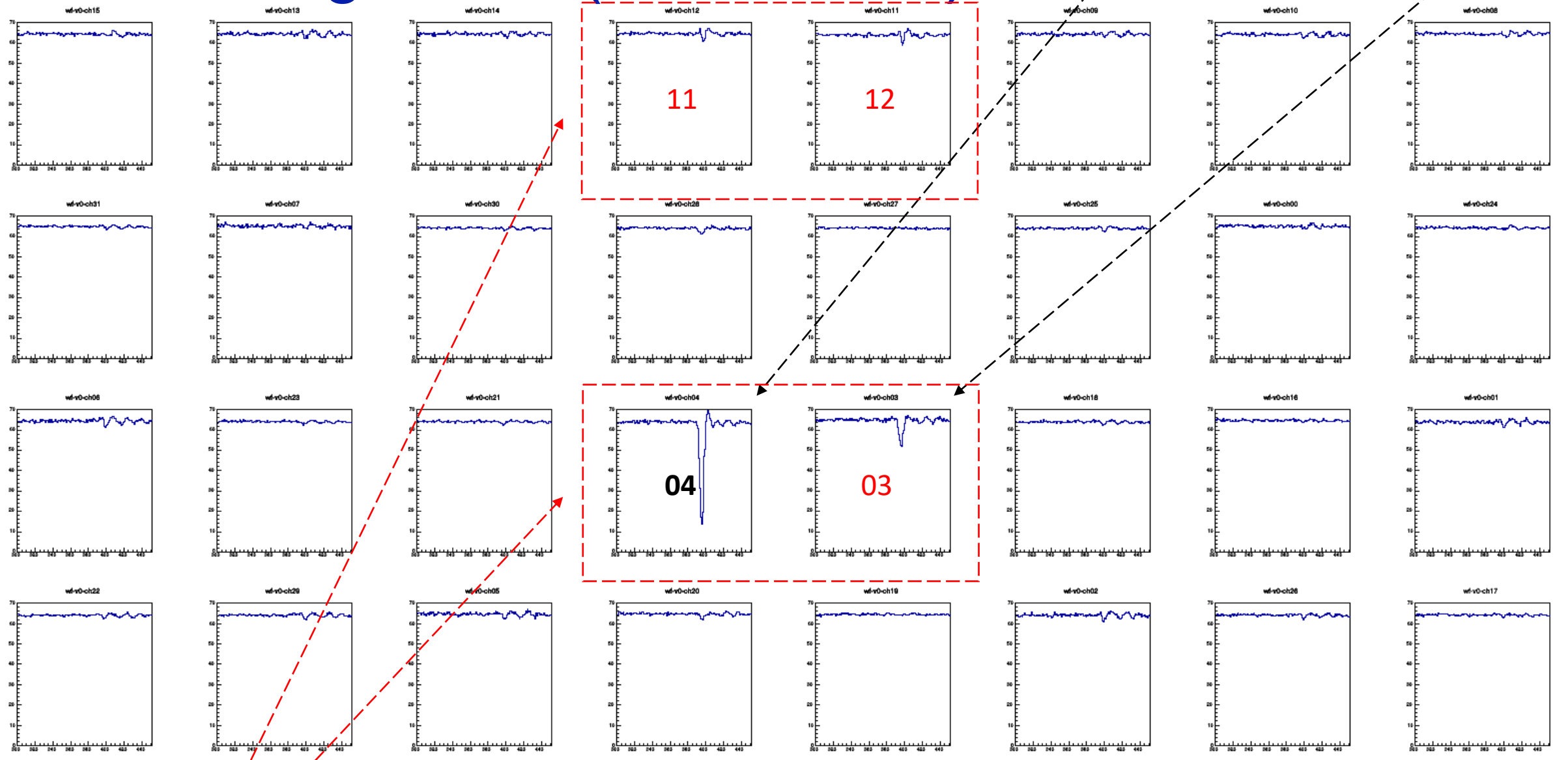
Two different EIC HRPPD interfaces exist



- Have pretty much different routing schemes -> should exhibit different cross-talk pattern?

Crosstalk signature (Y05f board)

70 mV



Laser spot here

+ "normal" charge sharing

These four pads are neighbors on a Samtec ERF8 connector

Waveforms (single event): bottom half of one 8x8 pixel field

30 ns

Electronics channel routing of a single 4x8 pad area

Channel numbering 00 .. 31 as connected to a single V1742 digitizer
 (physically different for these two backplane types)

Neighbors on the
 Samtec connector
 (cross-talk evidence)

Y05f backplane

15	07	G	14	06	13	05	G	12	04	11	03	G	10	02	09	01	G	08	00
31	23	G	30	22	29	21	G	28	20	27	19	G	26	18	25	17	G	24	16

Samtec ERF8 / ERM8 connector pinout

Q00a backplane

G	30	28	26	24	22	20	18	16	14	12	10	08	06	04	02	00	G
G	31	29	27	25	23	21	19	17	15	13	11	09	07	05	03	01	G

One half of a Samtec MEC8-DV connector pinout

Essentially all channels are neighbors
 (and no ground separation between finger rows either)

Matching set of four channels

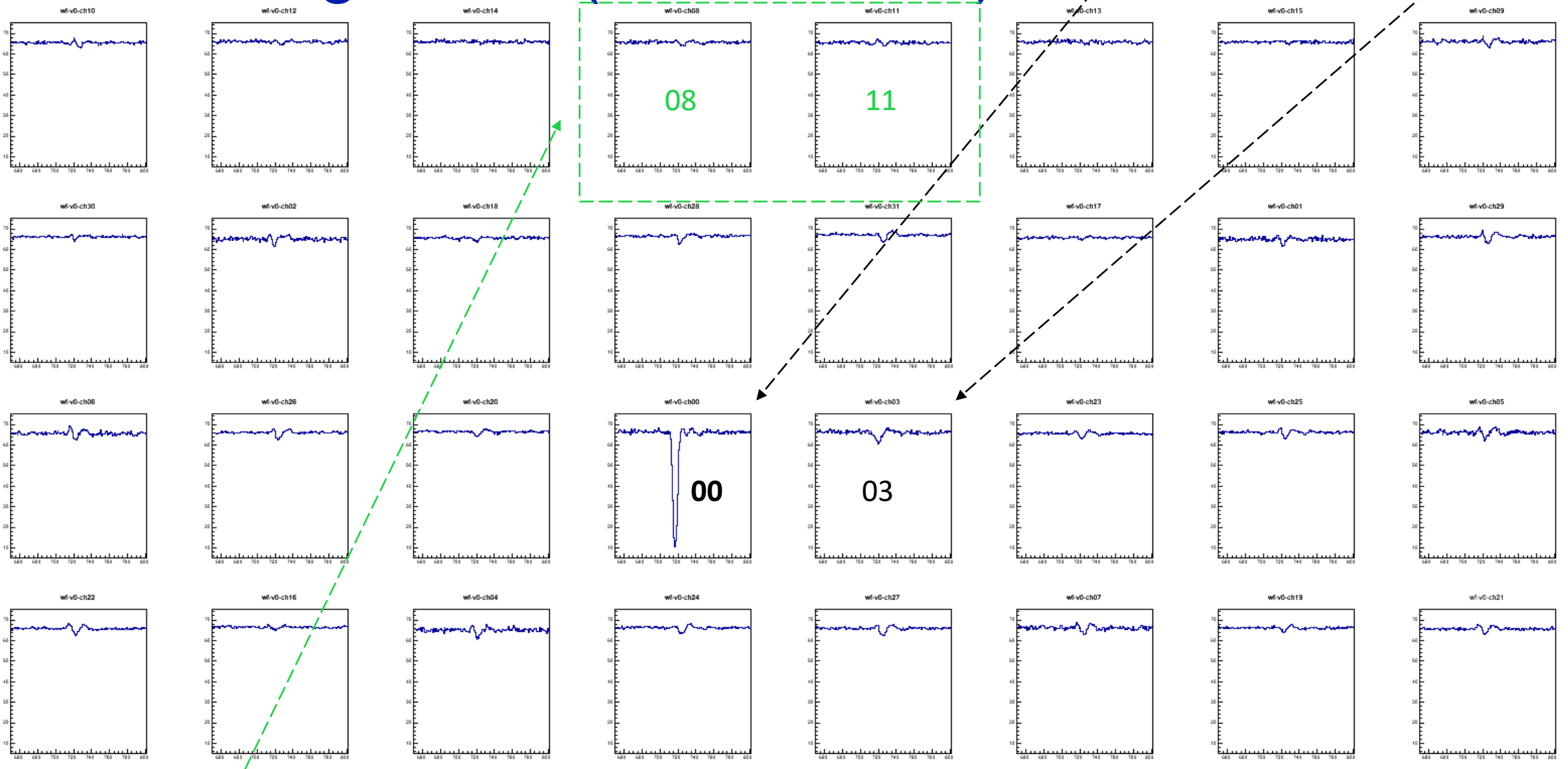
- If X-talk originates in the backplane:
- (1) expect it to be less localized in Q00a
 - (2) expect physical pads corresponding to Y05f channels be not much different from other neighbors

Crosstalk signature (Q00a board)

The same spot

“normal” charge sharing

70 mV

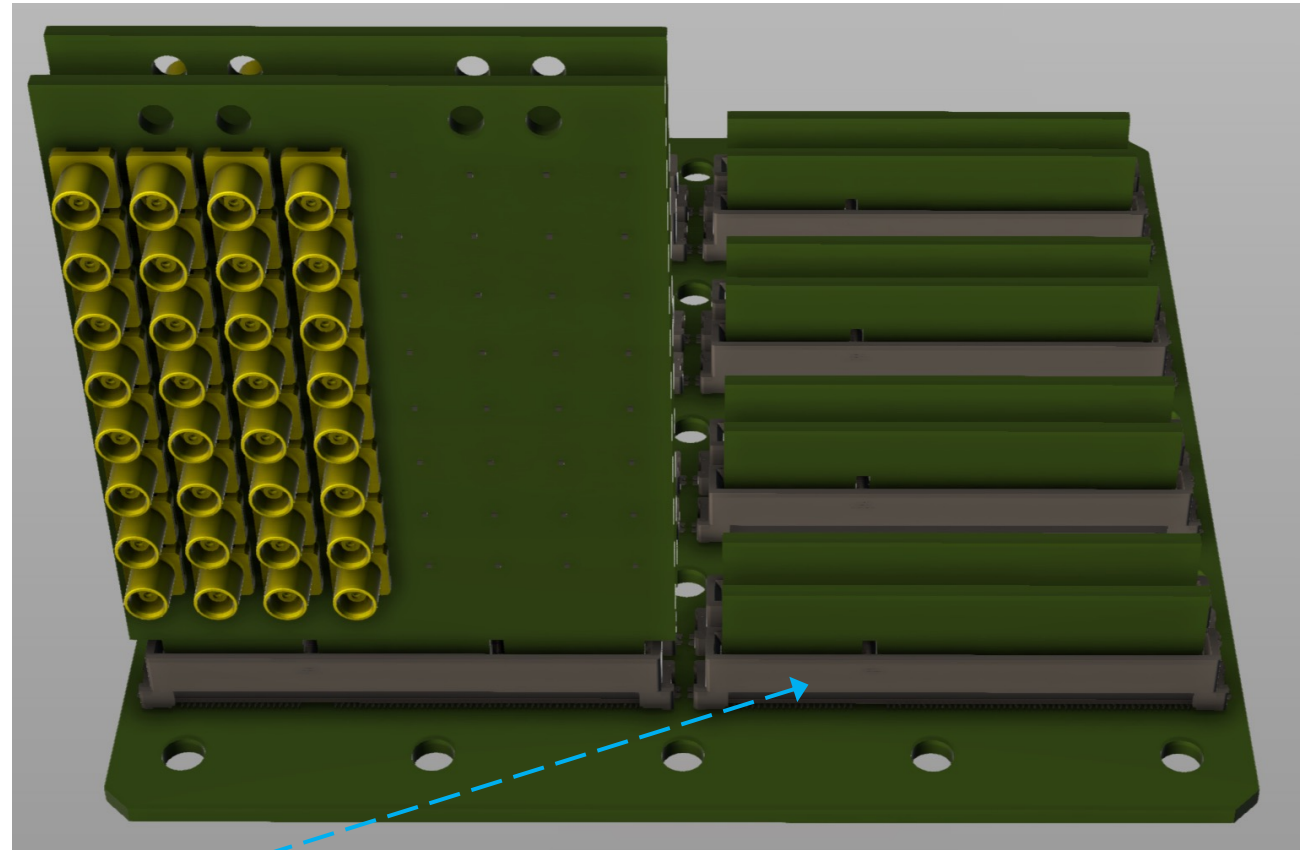
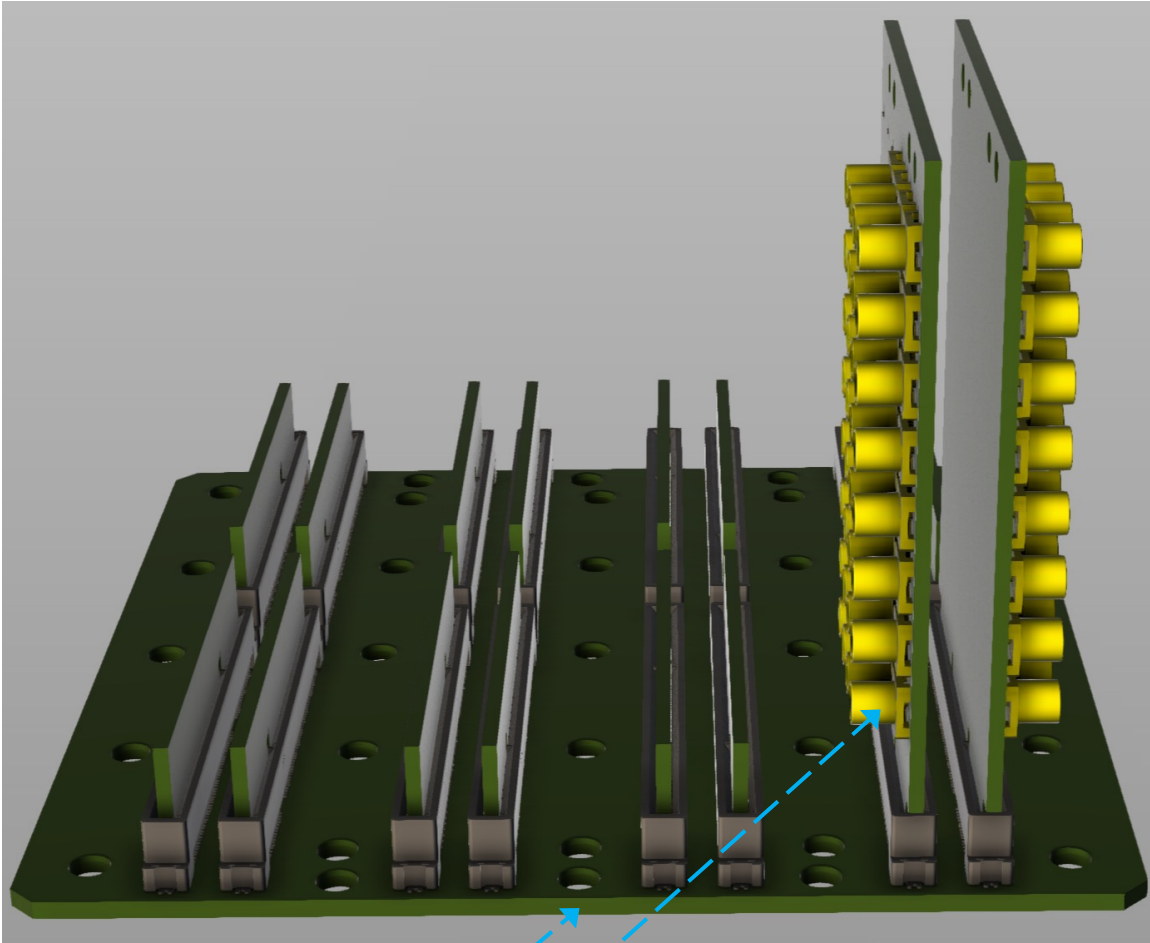


The same two physical pads look “better” than several other ones

Waveforms (single event): bottom half of one 8x8 pixel field

30 ns

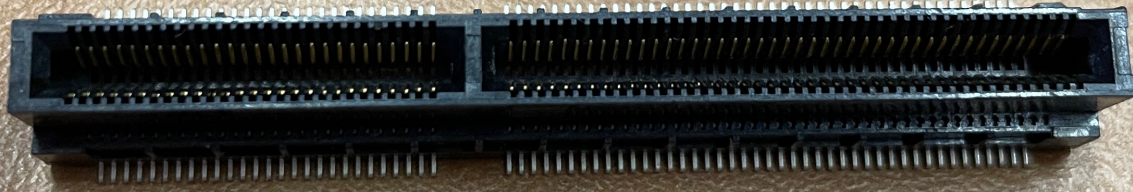
Re-designed HRPPD interface backplane



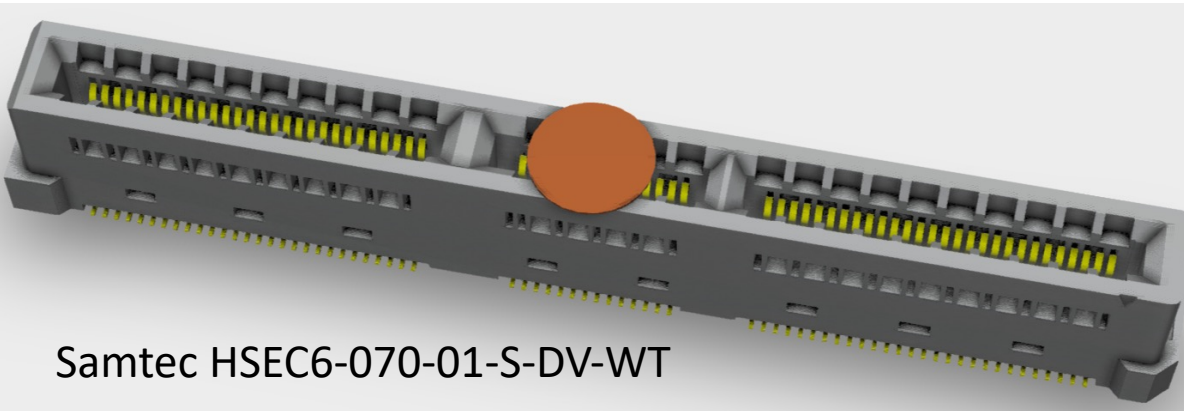
- Multi-layer boards, 140-pin Amphenol Cool Slim Edge connectors, trace isolation
 - Q02b: backplane itself (can be used with vertically mounted ASIC plugin cards if needed)
 - M02b: MCX adapter cards in 1-2 selected slots
 - S02b: 50 Ohm termination boards in all other slots

Edge connector choice, final round

Samtec MEC6-170-02-L-DV



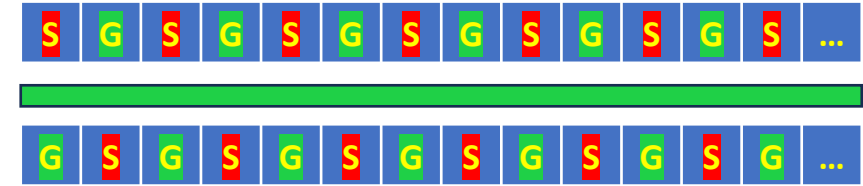
- Contact pins look like the “worst” ones
- Too wide footprint (would still fit)



Samtec HSEC6-070-01-S-DV-WT

- Optimized for DP usage (pin grouping)
- Weld tabs

effective
pinout



Amphenol Slim Cool Edge (2x70 pins)



- Plastic body looks like the “worst” one
- Too long (yet fits)

Samtec HSEC8-130-01-S-DV



- 30 pin pairs only (need at least 31)

Next steps

- Finalize Q(MS)02b backplane design, apply for PED funding, order N sets
 - Drawings sent out to experts for their feedback
 - Cost estimate is known [have quotes for Q(MS)01a which was a somewhat more complicated build]
 - Feel free to join if you are willing to contribute
- Rohde & Schwarz NA equipment expected this week (today?)
 - Confirm the cross-talk origin
- Focus on other pending design topics and related activities
 - HRPPD HGCROC3 ASIC backplane evaluation
 - Systematic evaluation of the first 5+2 HRPPDs
 - High voltage scheme improvements
 - Preparation to a final round of EIC HRPPD re-design (PED continuation proposal)