

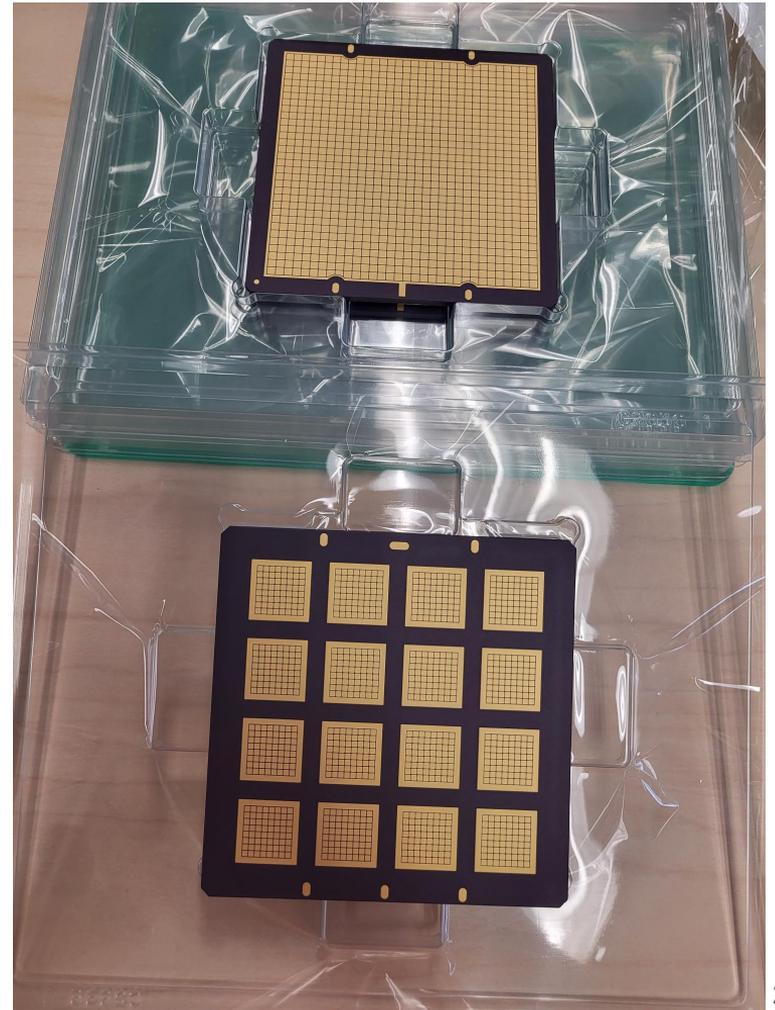
HRPPD evaluation plans in 2024

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ePIC TIC Meeting, December 4, 2023

HRPPD manufacturing

- All ten Kyocera anodes received by now
 - Should suffice for five HRPPDs assuming >50% yield
- Flatness tests are very encouraging
- Next steps of the QA procedure
 - Verify pad connectivity
 - Verify compatibility with the UHV
 - Verify C_d and trace resistivity (at BNL)
- Right now, Incom is sealing a HRPPD based on the Techtra plate (then it gets sent to BNL)
- Samtec interposers expected this week
- If everything goes smoothly, we should really see a first functional “EIC HRPPD” tile by Christmas



HRPPD evaluation procedure [slide from Nov,6]

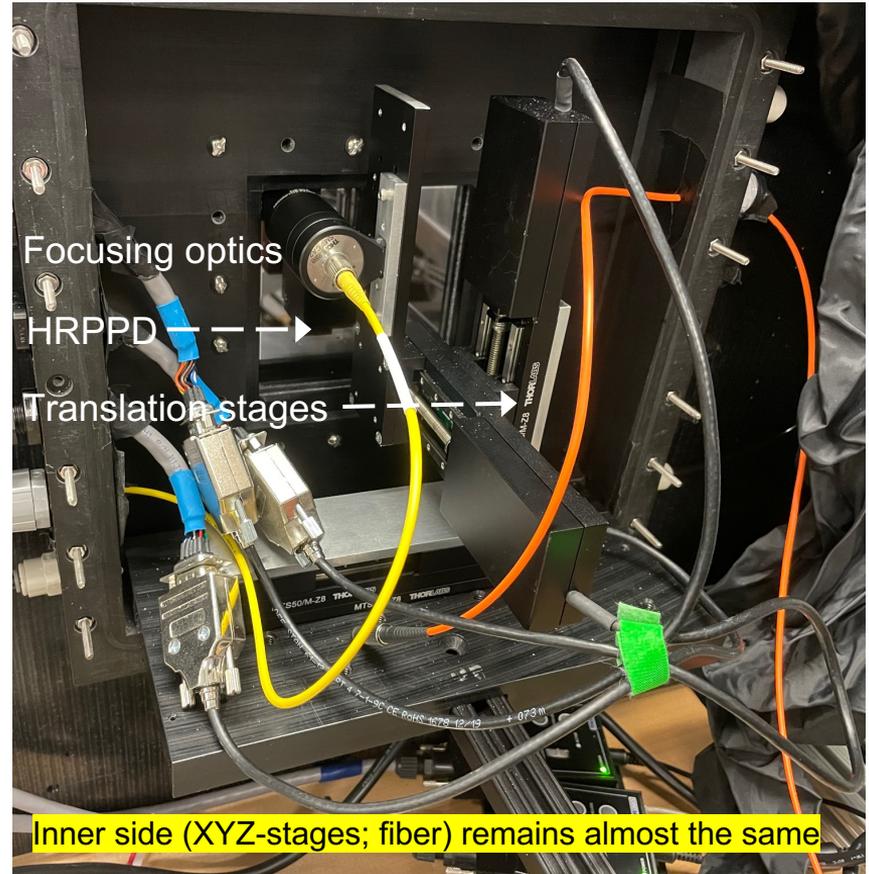
- Should follow the specifications provided in the SOW
 - Boundary conditions:
 - No time to ship any of the tiles to Europe and receive them back by pFRICH beam test in May 2024 (?)
 - Any work at INFN & in Glasgow can only start afterwards
 - Realistically, a primary evaluation (in spring 2024) can only happen at BNL (or JLab? or Yale?)
 - Magnetic field tests at Argonne: summer 2024
 - A discussion in the eRD110 meeting last week
 - See what PED funds can we get
 - Come up with a plan on a time scale of a couple of weeks
 - A full comprehensive study should not be expected
 - But a reasonable semi-automated spot check of all basic parameters we can certainly perform
- eRD110 meetings on Nov,2 [& Dec,14 ?]
A meeting with JLab & USC colleagues on Nov,8
Yale colleagues visiting BNL on Nov,5 & Dec,5

HRPPD QA station @ BNL

- Consolidate all HRPPD-related equipment in a new lab space during this coming week
 - A slightly modified existing dark box
 - 2" XY-translation stages (>52mm travel) suffice to scan a single quadrant of a 104mm x 104mm HRPPD active area at a time, pixel by pixel
 - PiLas (picosecond) and Elmo (femtosecond) lasers
 - DAQ PC, NIM & VME crates, 8x V1742s
 - LED pulser box by Fernando [for QE measurements]



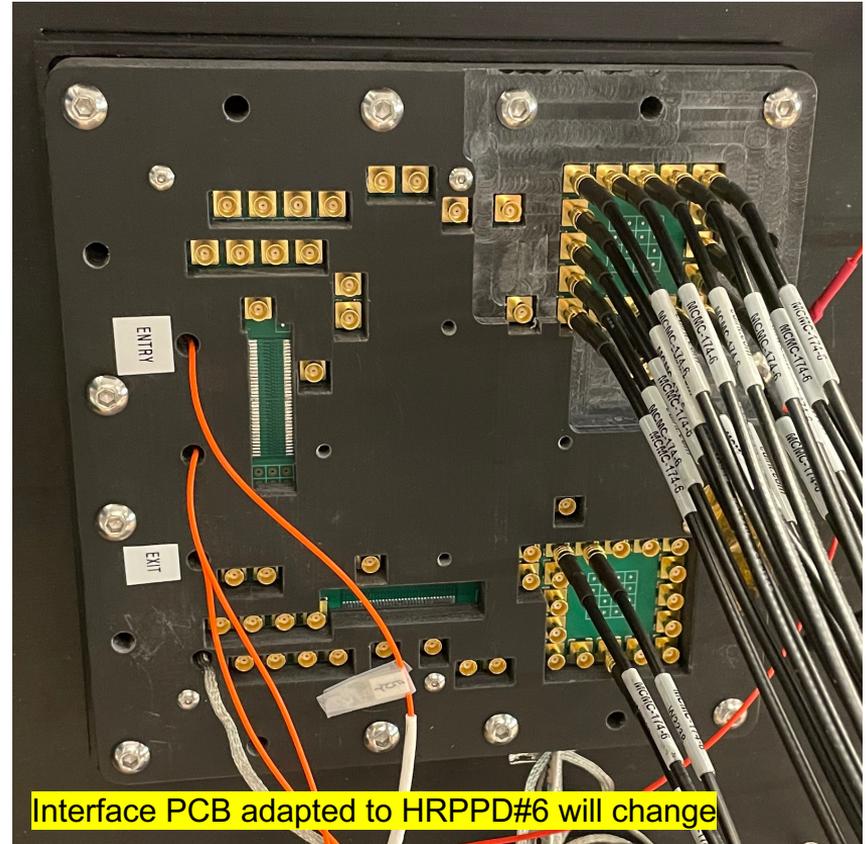
LED pulser box



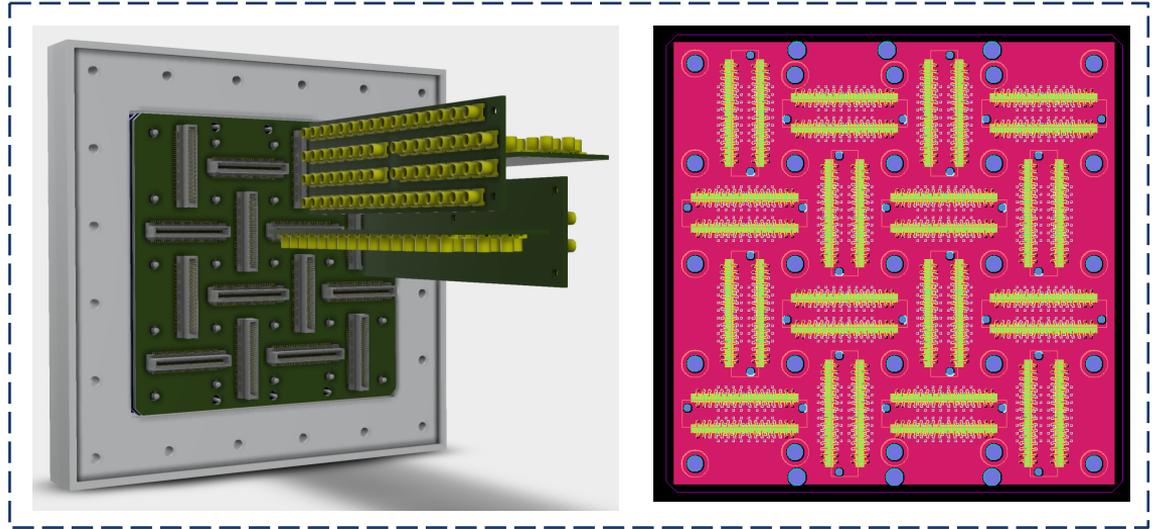
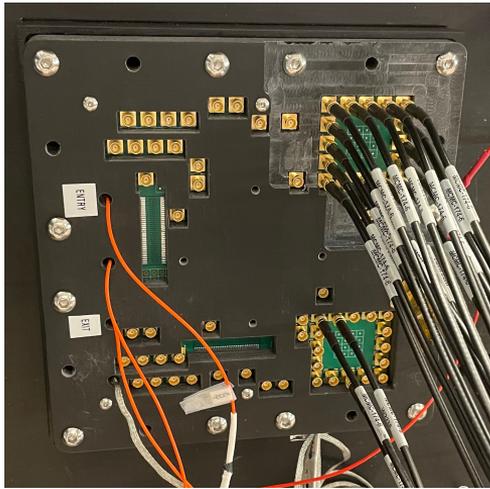
Inner side (XYZ-stages; fiber) remains almost the same

HRPPD QA station @ BNL

- Optimize data taking procedure
 - Synchronize DRS4 configuration with the XY-stage positioning (we are interested only in the illuminated pad data for these scans)
 - Read out only one of the 8x4 DRS4 chips and only the first 136 out of 1024 samples at 5GS/s (event size reduction from ~50kB to <2kB)
 - Then both the data volume and the CPU needs are manageable (assume 10^5 events per pixel @ ~5kHz, with ~5% single photon events)
- Plan to perform per pixel surface scans:
 - PDE (*in a counting mode*) & gain uniformity, timing
 - DCR in a self-triggering mode at 2.5GS/s (?)
 - QE via a direct photocathode current measurement



HRPPD passive interface #2

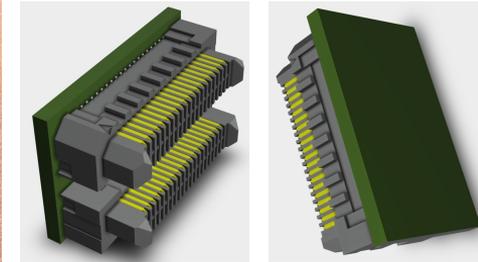
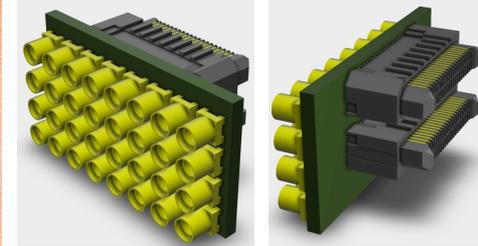
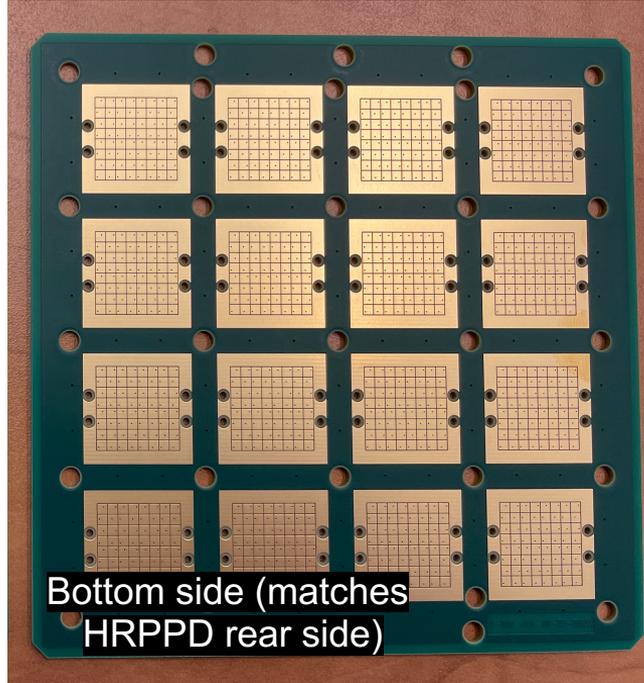


- Recycle existing 64ch MCX adapters, 3D printed clam shell enclosure, etc
- Order another custom PCB with a single 64ch Samtec MEC8 DV per 8x8 pixel field
 - Design is pretty much finalized; proceed with the PO shortly
- Equip one HRPPD quadrant at a time for a scan and shorten to ground all other connectors
- Do not touch either HRPPD (after the installation) or translation stages (ever)
 - Rather reposition the MCX adapters and the fiber inside of the dark box

Other parts of the evaluation procedure

- Magnetic field resilience studies at Argonne in summer 2024
 - Parasitic to MCP-PMT evaluation
 - Staffed by Argonne, BNL, JLab, USC
 - Main objective: gain and timing performance recovery in a “typical” pfRICH and hpDIRC B-field
- Photocathode ageing studies by INFN
- Side by side Photek Auratek & Incom HRPPD evaluation in Glasgow
- A separate test stand at JLab
- A Brookhaven test stand clone at Yale
- Work on HRPPD HGCROC3 ASIC backplane

HRPPD passive interface #1



- The boards were received weeks ago, nothing new here
- Order for small Samtec -> MMCX adapter cards placed last week

Mostly of interest for colleagues @ INFN, Glasgow, Jlab & Yale

Beam test plans in 2024

- Default option: both “HRPPD” and “pfRICH” parts at Fermilab in May 2024
- Other possible options (in Europe, then “HRPPD” setup only?):
 - DESY in June 2024 (parasitic to AC-LGAD team)
 - Staffed by Glasgow, 1-2 people from BNL, ..?
 - In parallel with LHCb PID folks?
 - Perhaps in parallel with dRICH?

