

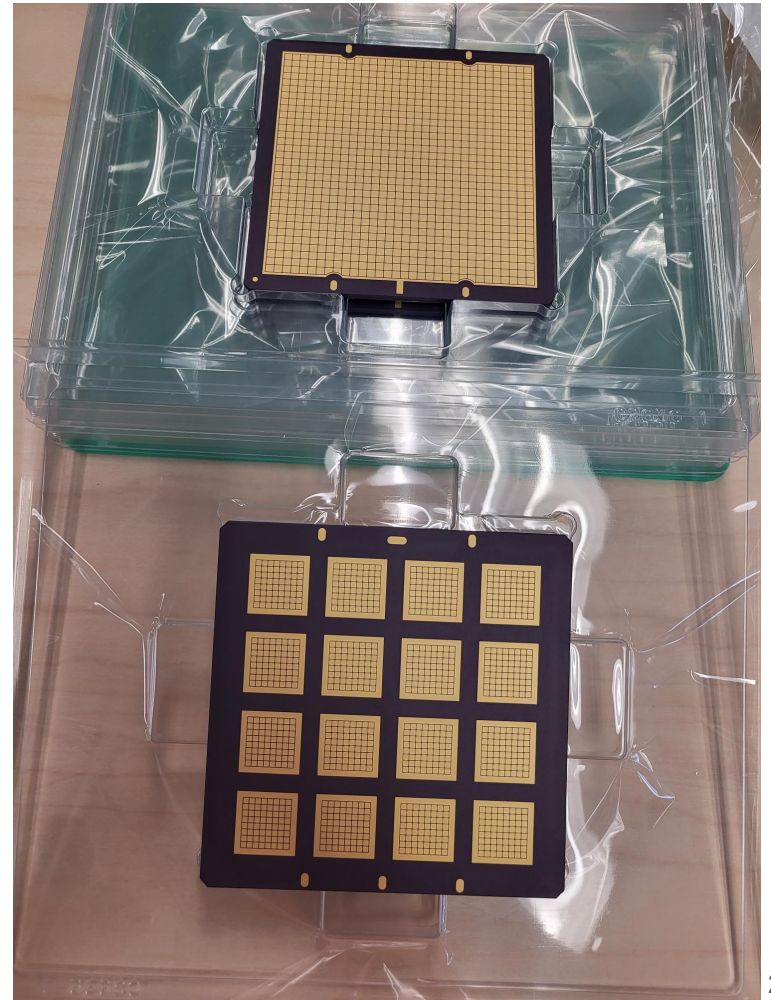
# HRPPD evaluation plans in 2024

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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]

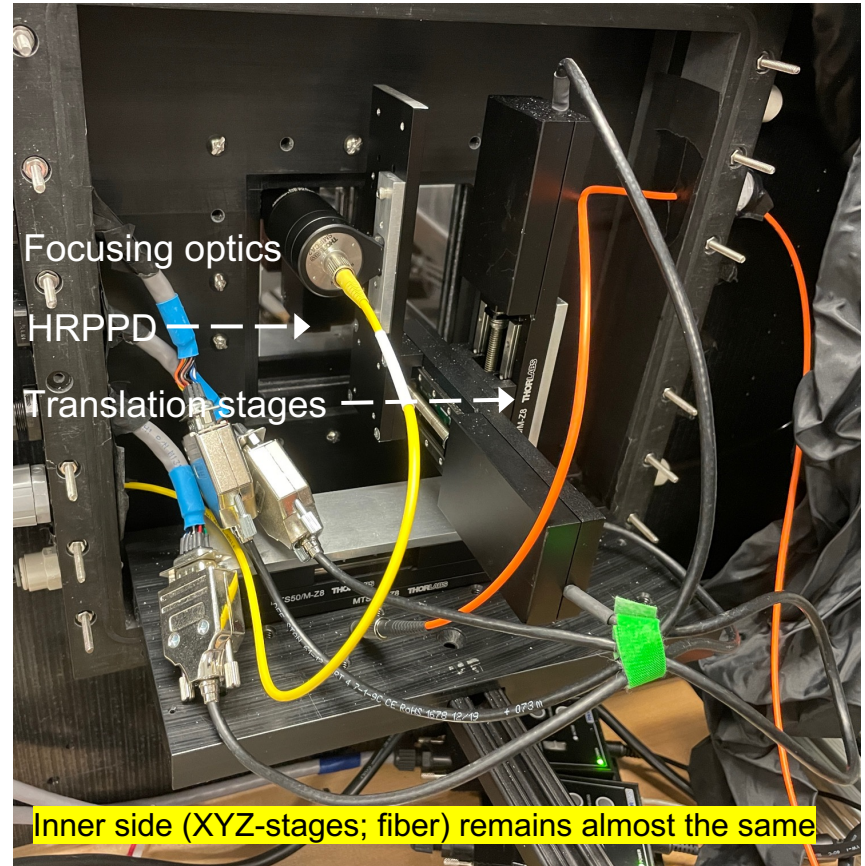
- Should follow the specifications provided in the SOW
- Boundary conditions:
  - No time to ship any of the tiles to Europe and receive them back by pFRICH beam test in May 2024 (?)
    - Any work at INFN & in Glasgow can only start afterwards
  - Realistically, a primary evaluation (in spring 2024) can only happen at BNL (or JLab? or Yale?)
  - Magnetic field tests at Argonne: summer 2024
    - 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
- 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

# 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

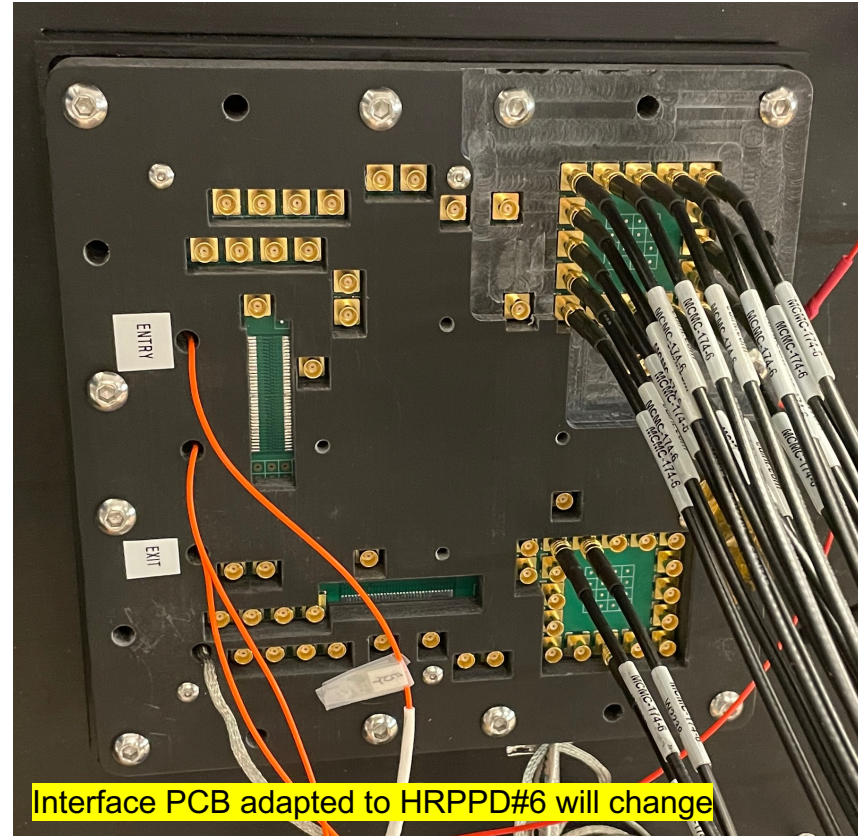


Inner side (XYZ-stages; fiber) remains almost the same

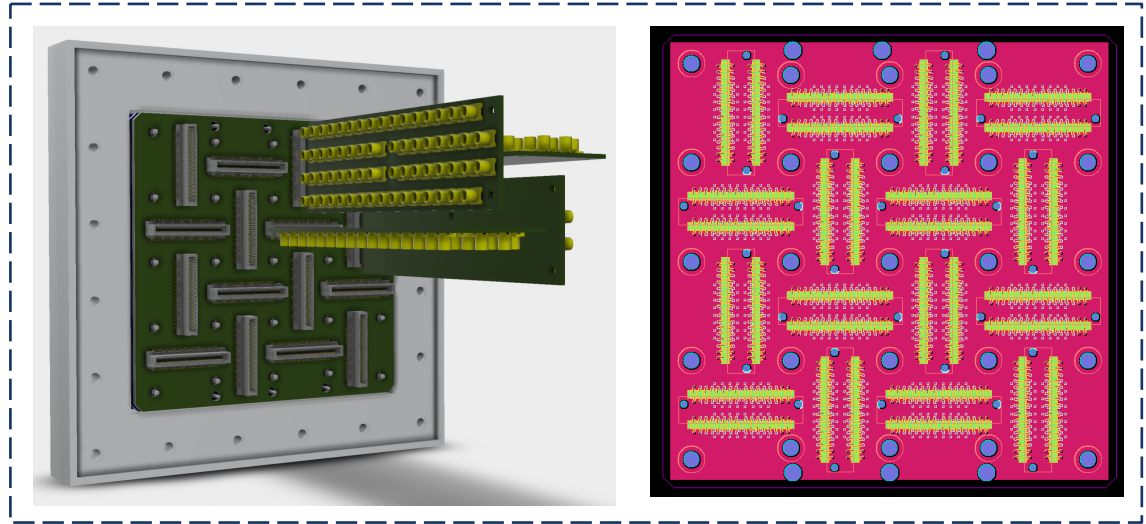
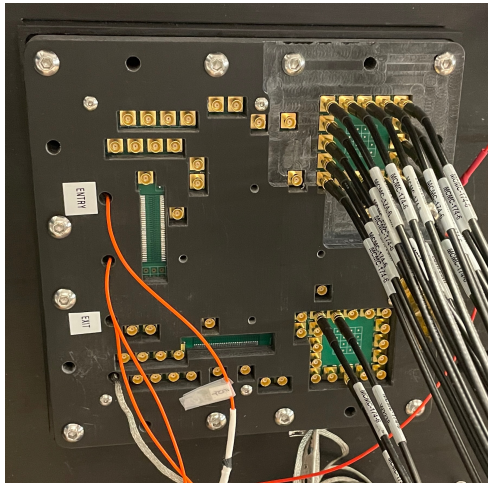


# HRPPD QA station @ BNL

- 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



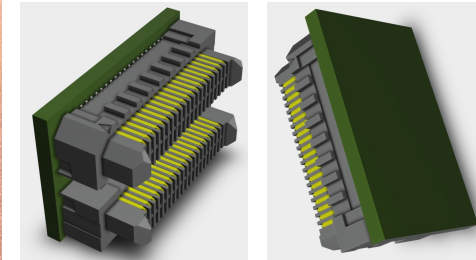
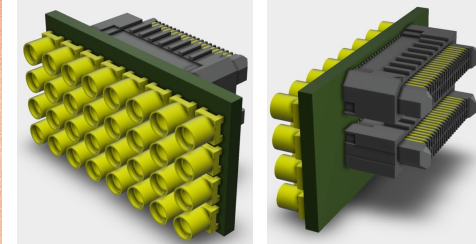
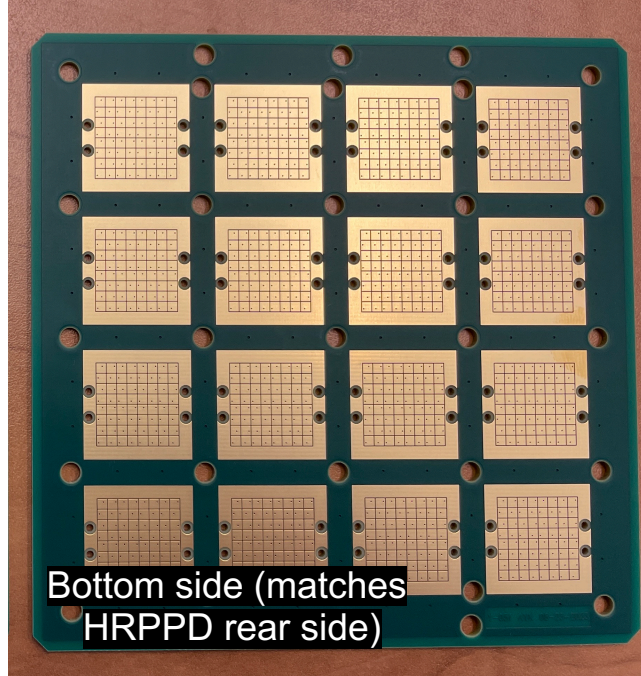
- Recycle existing 64ch MCX adapters, 3D printed clam shell enclosure, etc
- Order another custom PCB with a single 64ch Samtec MEC8 DV per 8x8 pixel field
  - Design is pretty much finalized; proceed with the PO shortly
- Equip one HRPPD quadrant at a time for a scan and shorten to ground all other 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?

