

# **Some highlights and news on ePIC PID developments of common interest**

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**ePIC Collaboration Meeting, Frascati, 01/24/2025**

# Activities / developments of common interest

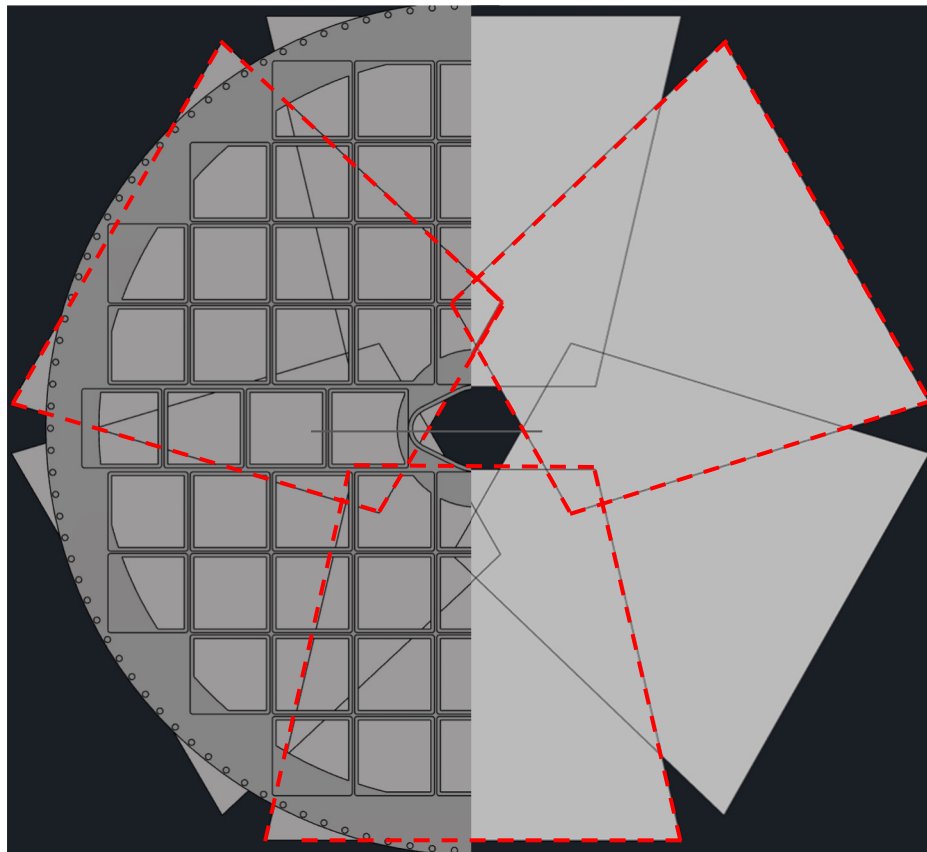
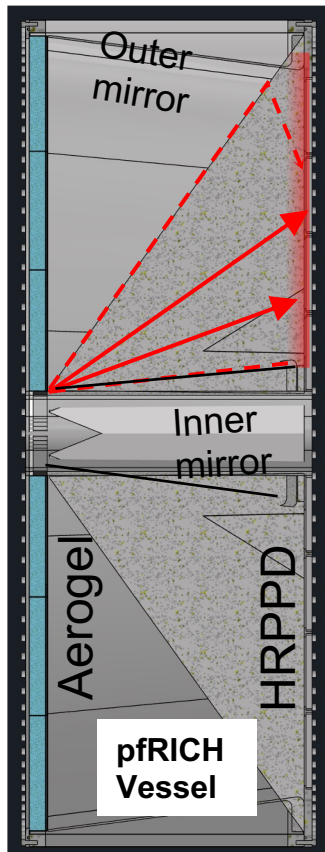
## ➤ dRICH / pfRICH

- Everything related to aerogel -> talk by Matt (Bernd)
- Mirror production and QA -> talks by Kong & Marco, also **a slide in this talk**
- Laser monitoring system -> **slides by Bill in this talk** (also of interest for hpDIRC?)
- Reconstruction software

## ➤ pfRICH / hpDIRC

- Everything related to HRPPDs
  - Systematic performance evaluation @ BNL & JLab
  - Readout interface(s) [BNL, Debrecen, Orsay; but now also JLab] -> **a slide in this talk**
  - B-field studies by INFN Trieste / Genova & BNL
  - Aging studies [*INFN Trieste / Genova, BNL, JLab; Yale, UT Arlington*]
- Photek MCP-PMT vs HRPPD evaluation @ Glasgow -> **slides by Rachel in this talk**

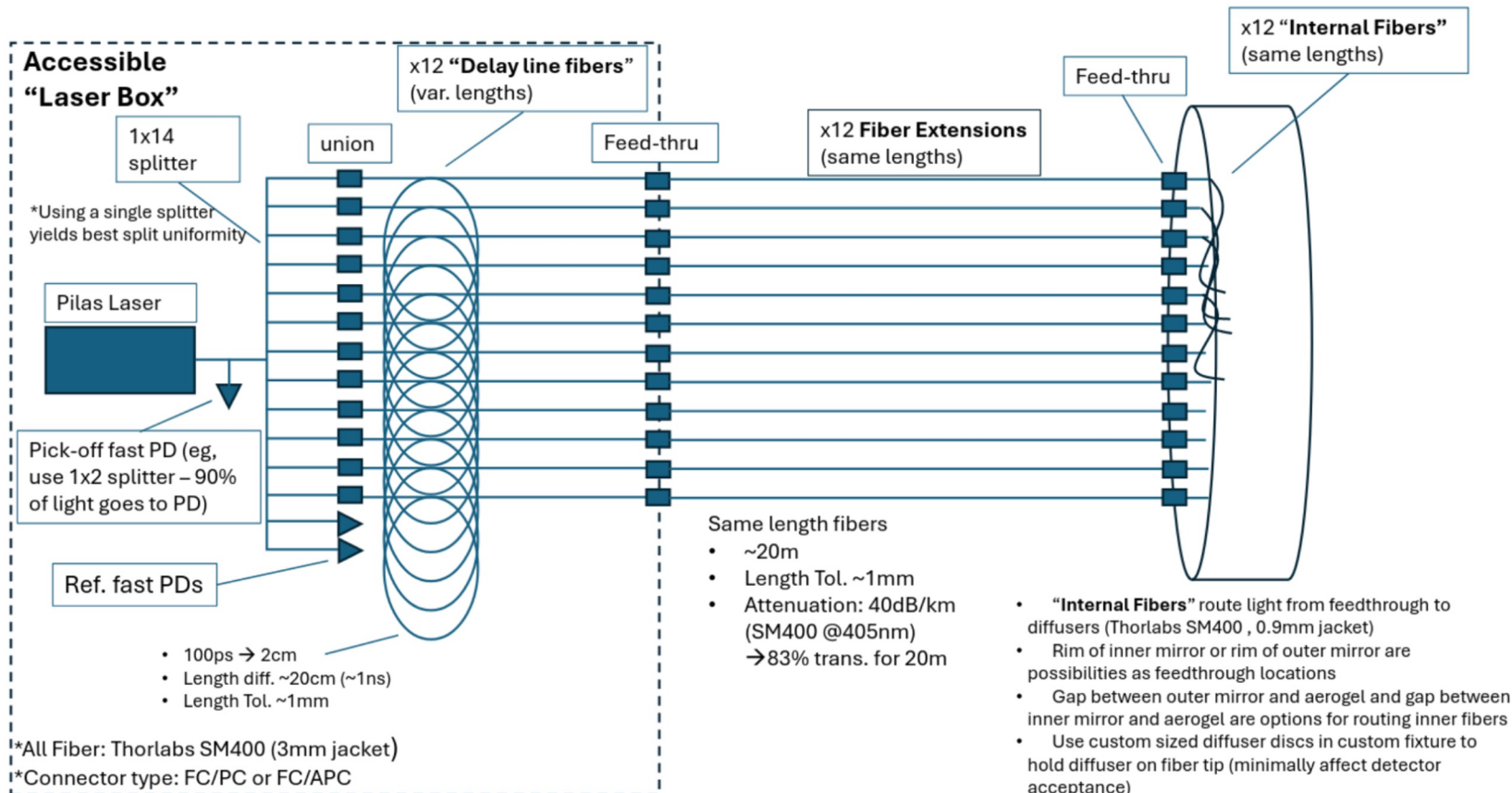
# pfRICH laser monitoring system



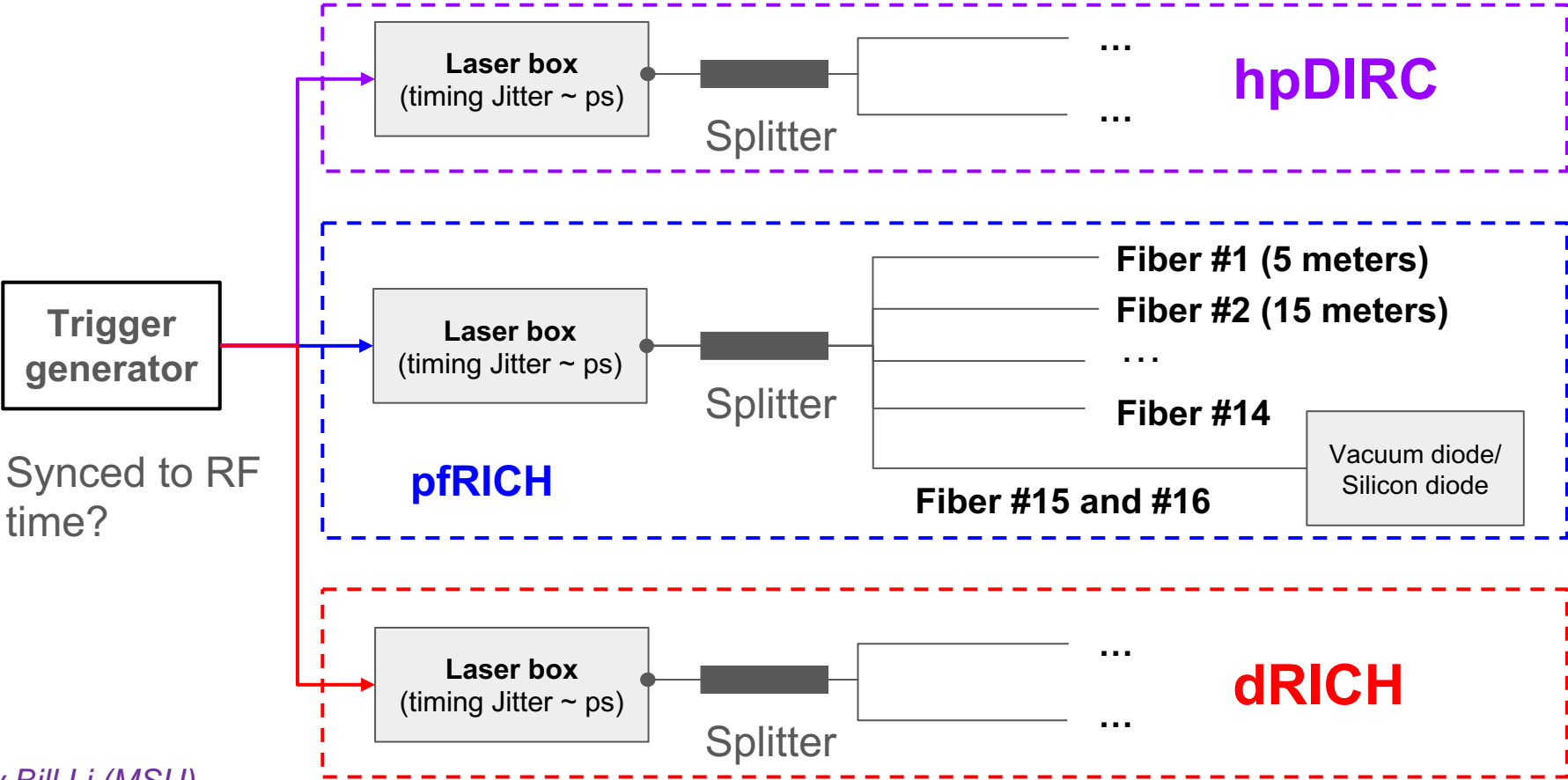
## Design considerations

- Array of 6 fibers may be used for direct illumination of HRPPDs + array
- 6 fibers may be used to reflect light off of the mirrors
- 40 cm coverage (50 degree square diffuser)
- “Red” lasers fire 5-10 ns (different fiber length)
  
- Timing delays, gain calibration / stability, perhaps QE monitoring and mirror reflectivity control

# pfRICH laser monitoring system



# A partly unified system across pfRICH/dRICH/hpDIRC ?

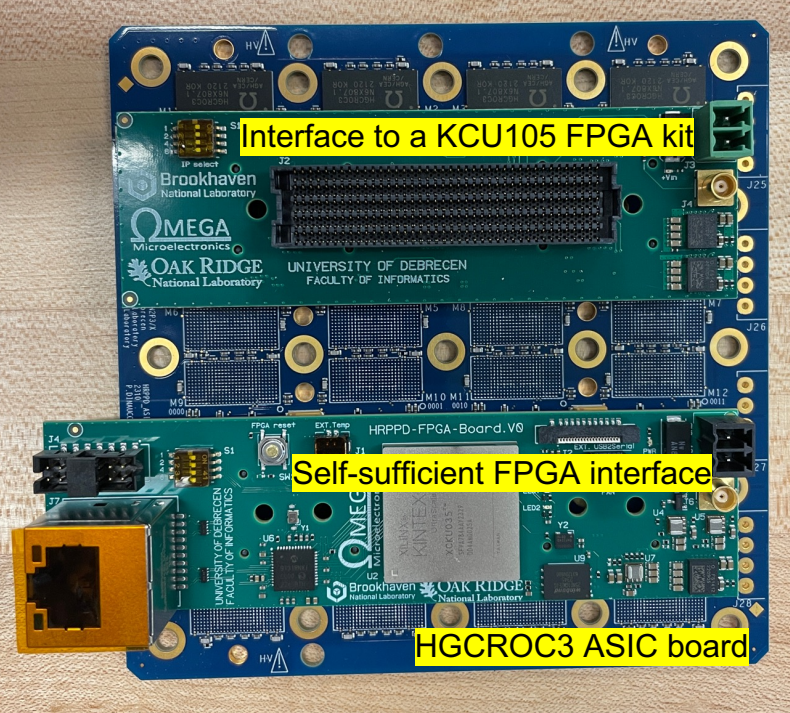


# A partly unified system across pfRICH/dRICH/hpDIRC ?

- **Similar DAQ and Slow Control implementations**
- **Same hardware components**
  - Common spare parts repository for expensive items, such as a PiLas laser system
  - Same type of fiber and diffusers
- **Design engineering considerations**
  - Timing resolution requirement
  - Laser signal diffused patterns: coverages and overlaps
  - Mounting themes and holders
- **Ongoing PED effort to answer common questions**
  - Small profile diffuser (~0.5mm diameter) with square pattern possible? (Integration)
  - Minimum bending radius and signal loss? (Engineering)
  - Validate and optimize the envelopes with Ray Trace program

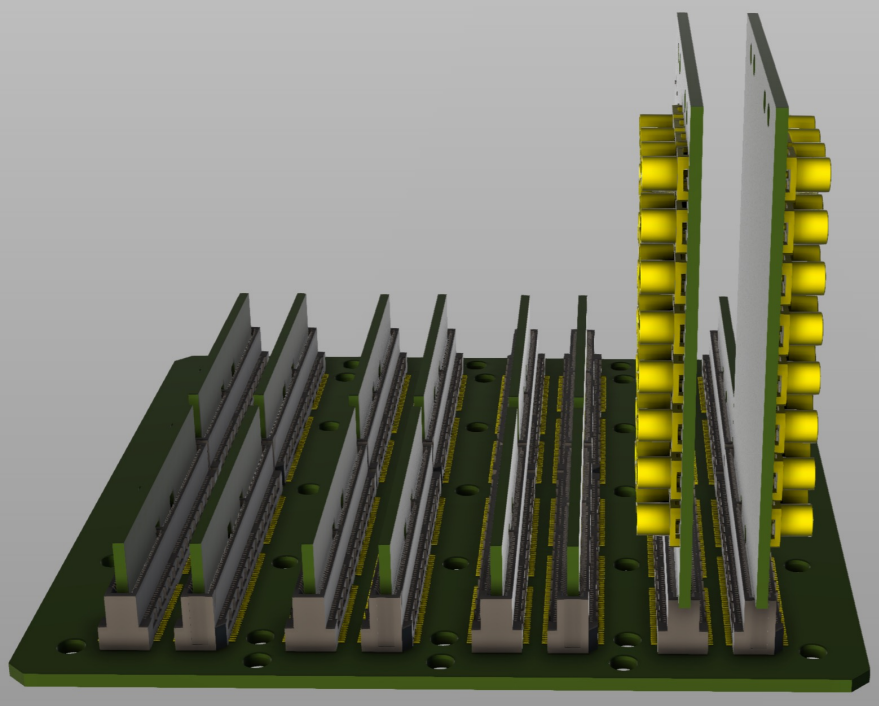
# HRPPD readout interface(s)

ASIC backplane



➤ A “TOA/ADC for HRPPDs” proof of principle measurement is the main goal

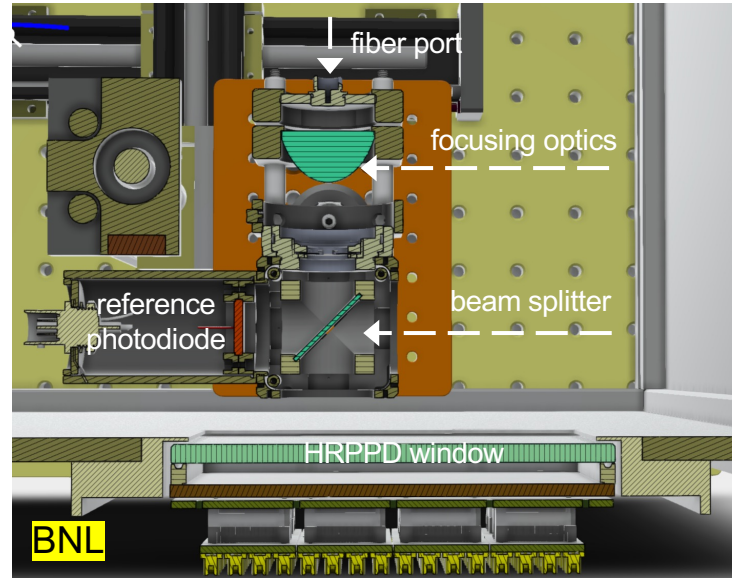
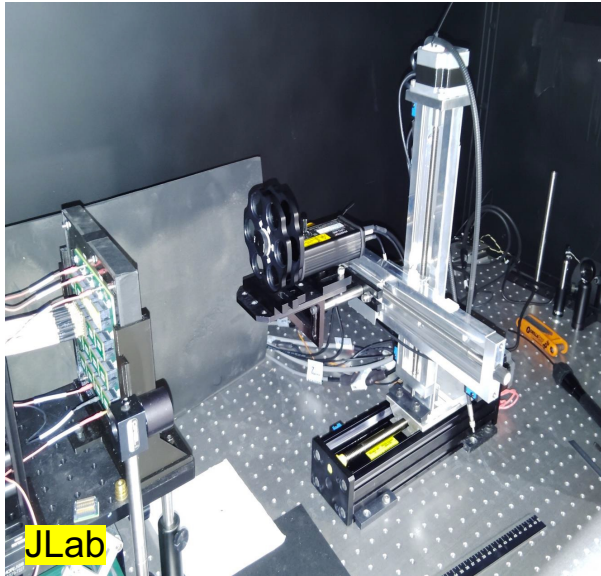
Passive backplane + plugin cards



➤ Production of seven backplanes is in progress (expect to be finished by March) 7



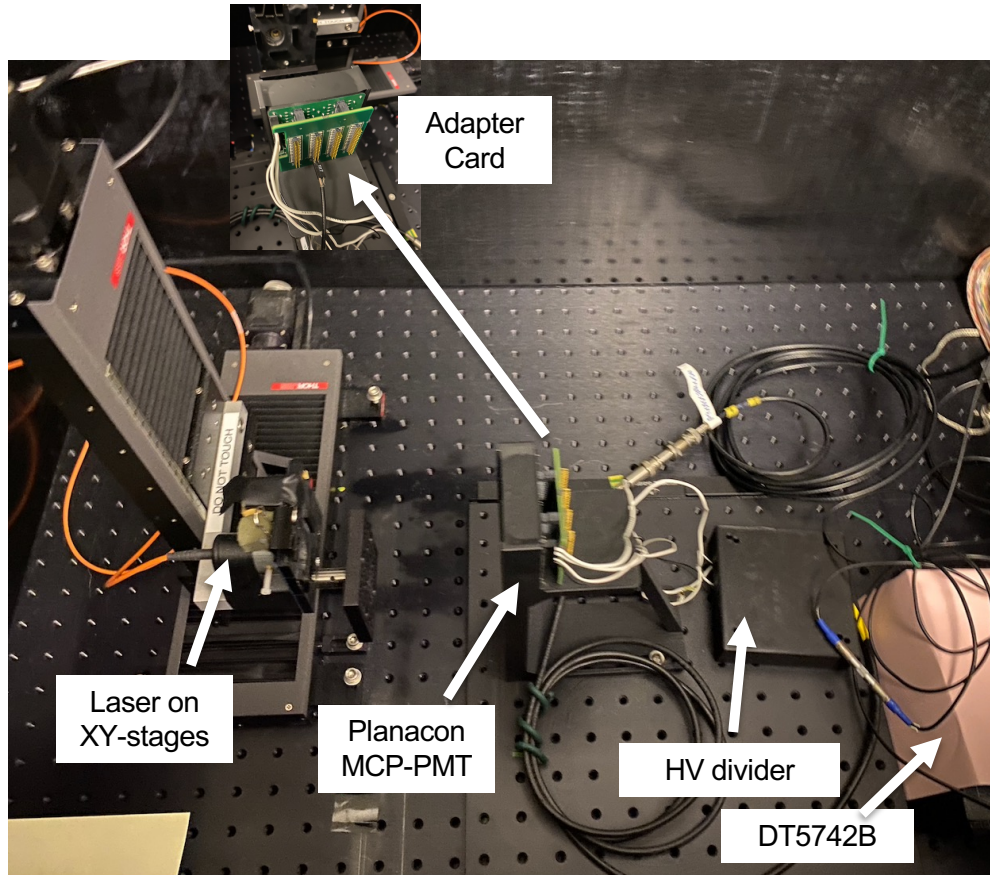
# HRPPD QA stations



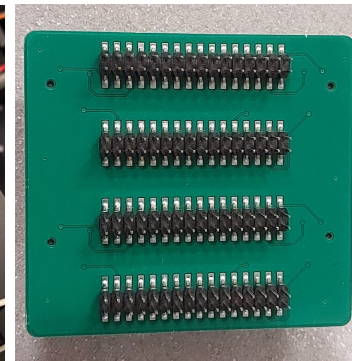
- There is also an LAPPD test stand at INFN Trieste suitable for HRPPD studies ...
- ... and a clone of the old BNL HRPPD setup at Yale (with HRPPD #6 on a loan)
- Glasgow test stand (next slide) can also be used for HRPPDs



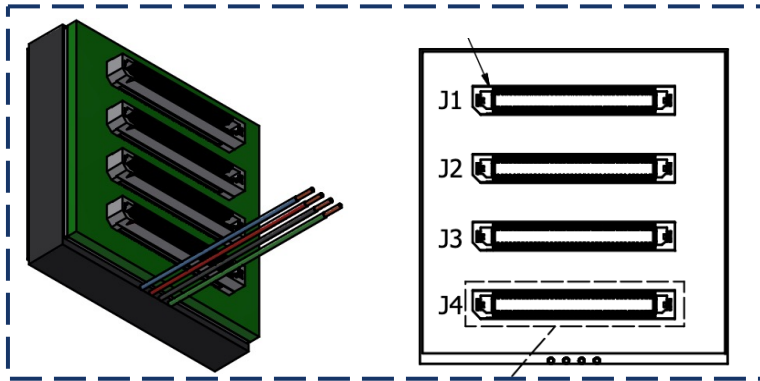
# MCP-PMT test stand @ Glasgow



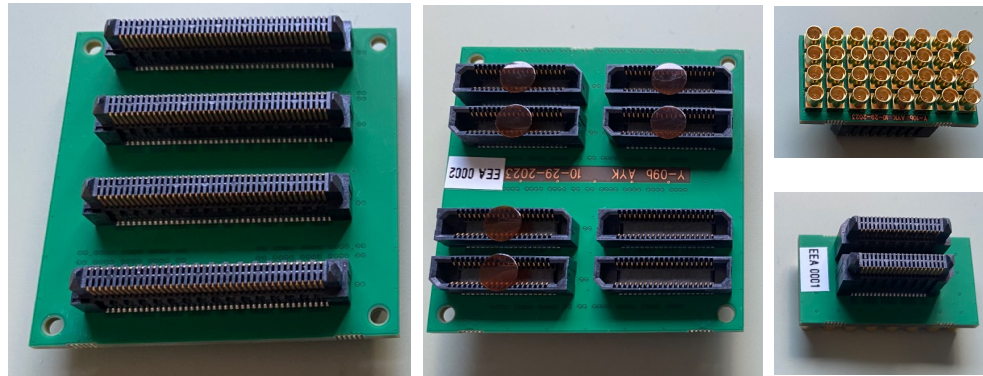
- Borrowed Planacon XP85112-S-BA MCP-PMT from GSI
  - This is the one which was thoroughly tested at Erlangen by A. Lehmann
  - Will be used as a reference tube
- Constructed HV divider
- Adapter board for connecting to CAEN V1742 digitizer and MCX cables manufactured



# Photek MCP-PMT evaluation @ Glasgow



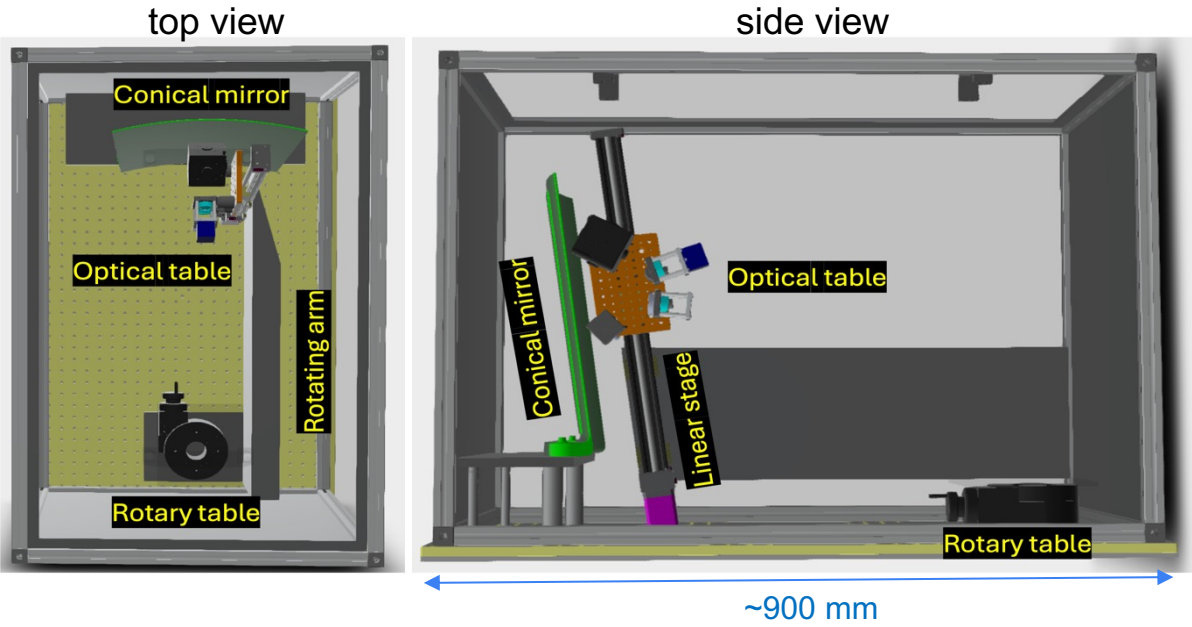
2" Photek Auratek stock configuration



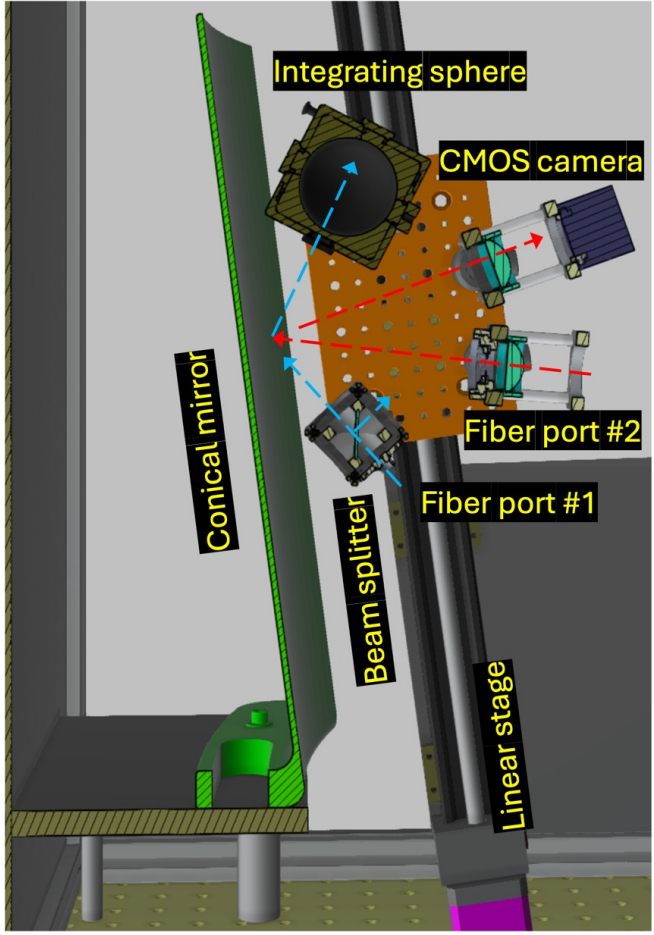
An adapter to "HRPPD world" (Y05f-like board + MMCX)

- Photek Auratek MAPMT253 16x16 pixel Multi-anode MCP-PMT ordered by JLab in Dec 2023
  - Shipment to Glasgow by mid February 2025 confirmed!
- Adapter boards available (see pictures above), MMCX-MCX cables made
- A 32-channel V1742 digitizer and a PCI card by CAEN delivered
  
- Also: good prospects of sending one HRPPD to Glasgow for a side-to-side comparison

# A new mirror QA station at BNL



- A large 24"x36" dark box with a  $\{z, \phi\}$  motion control system and a dual-purpose optical head
- **Red arrows:** 2D surface shape profiling optical path
- **Blue arrows:** reflectivity measurement optical path



side view: optical head

# Summary

- Areas of common interest clearly exist
  - Hardware QA installations
  - Hardware components to build and / or share
  - Reconstruction software
  - Design ideas
  - Experience / expertise sharing
  - Communication with the vendors
  - Interface to DAQ & Slow Control
  - ...
  
- So far, a case-by-case communication and / or ad hoc meetings