pfRICH Work Packages

Engineering design oversight
A. Eslinger (JLab)

Vessel & mirrors: 3D printing & molding
A. Jung (Purdue)

Vessel: other components & assembly
J. Datta (Stony Brook)

Mirrors: aluminum coating & QA
W. Li (Stony Brook)

Construction coordination
C.-J. Naim (Stony Brook), Z. Tu (BNL)

HRPPD QA station
P. Garg (Yale)

Aerogel QA station
M. Posik (Temple)

HRPPD test stand
A. Kiselev (BNL)

MCP-PMT test stand
R. Montgomery (Glasgow)

Standalone GEANT software & modeling
A. Kiselev (BNL)

Software support in ePIC framework
BNL NPPS group [K. Kauder]

Physics modeling
B. Page (BNL)

DAQ software & firmware
…

Gas system
P. Shanmuganathan (BNL)

HV & LV systems
T. Camarda (BNL)

Cooling system
…

Light monitoring system
F. Barbosa (Jlab)

Frontend electronics
…

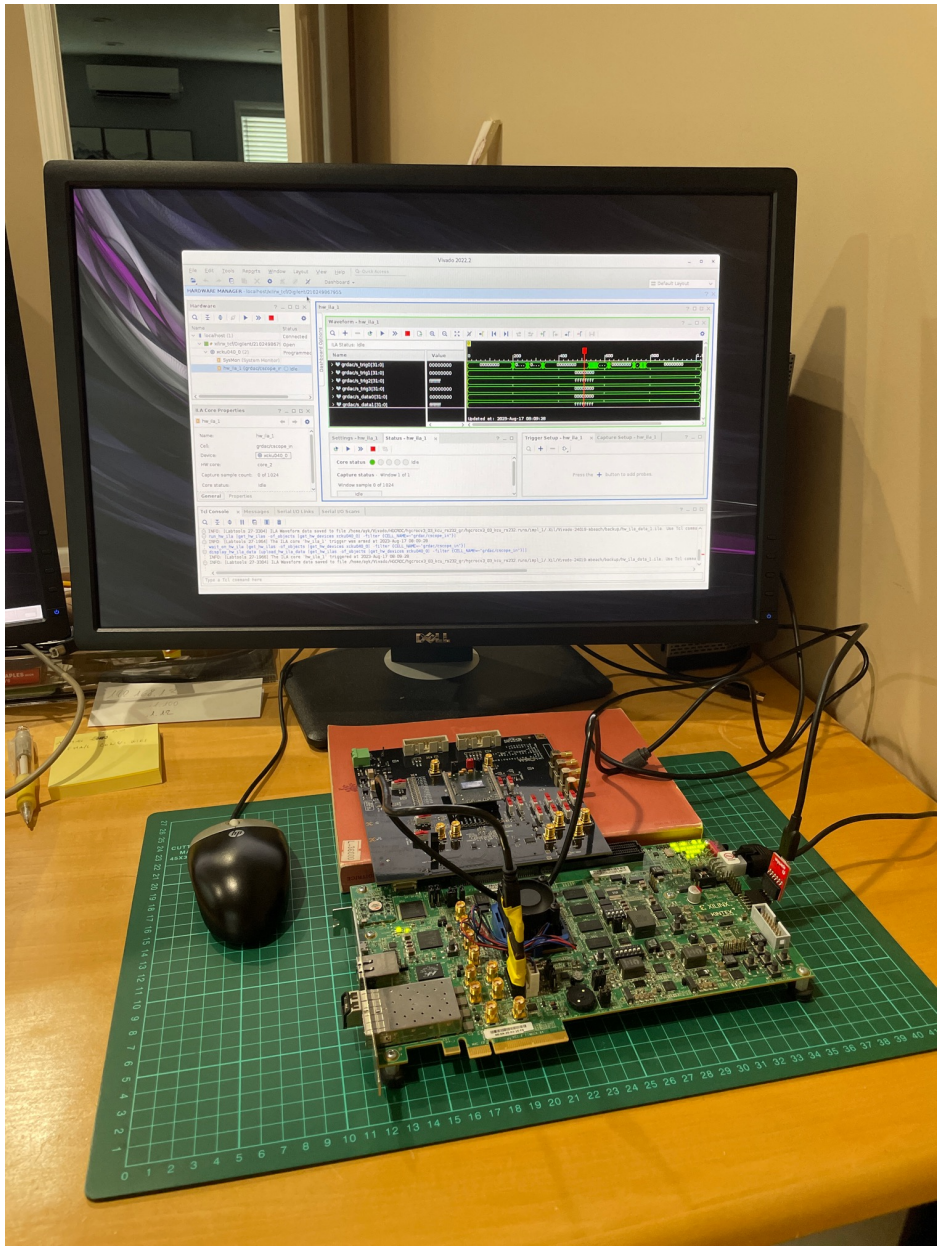
pfRICH is a baseline ePIC detector

Electron-Ion Collider
Record of Decision

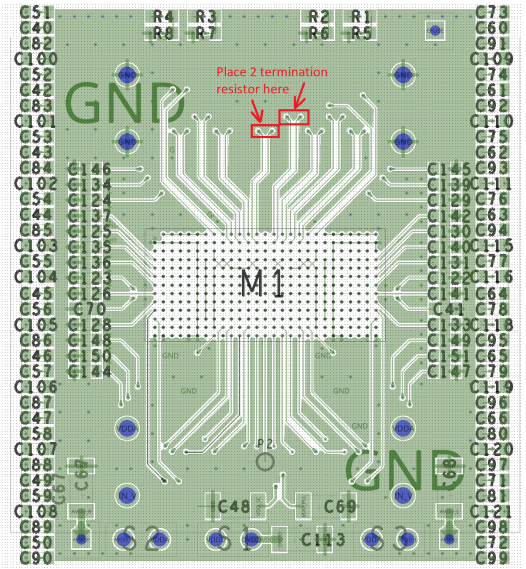
TITLE	pfRICH for backward PID in ePIC
PREPARER	Beni Zihlmann
NUMBER (Supplied by SEG)	EIC-ROD-011
DATE	August 7, 2023
AFFECTED WBS/PROJECT AREA	06.10.04.03 mRICH/pfRICH, 06.10.08 Electronics
STATEMENT OF DECISION (Summary, 1-2 sentences):	
The request by the ePIC collaboration to switch from mRICH to pfRICH as solution for the backward PID is found to have minimal impact on cost and schedule for the project.	

This essentially completes the mRICH -> pfRICH transition process

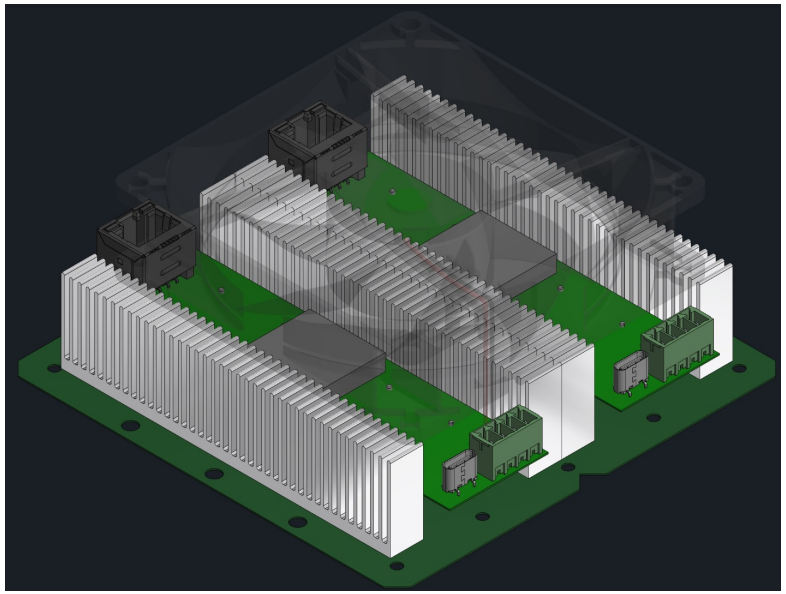
HRPPD FEE update

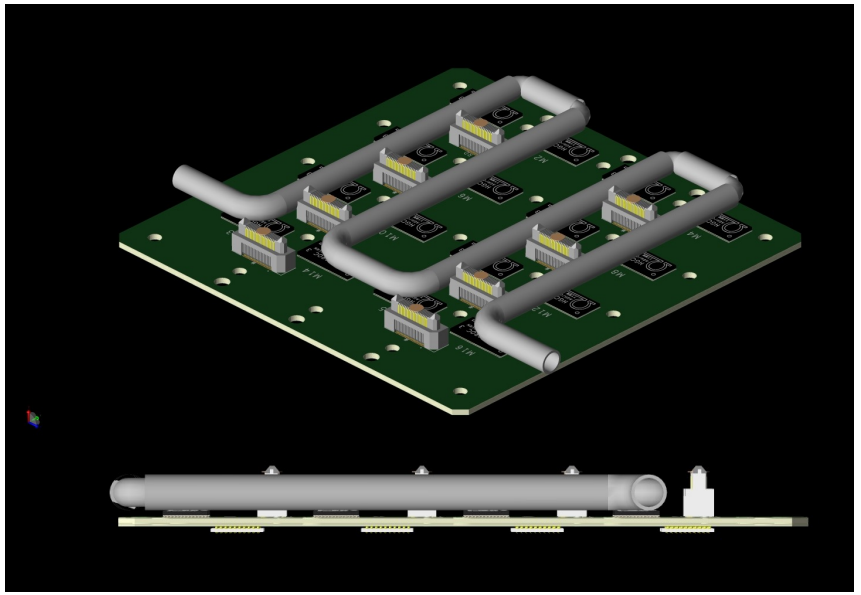


- A small HGCROC3 installation at BNL
  - Essentially a Linux-based copy of Oak Ridge setup
    - KCU105 FPGA kit provided by John Kuczewski (BNL)
    - Carrier board by Norbert Novitzky (ORNL)
    - HGCROC3 mezzanine board by Damien Thienpont (IN2P3)
    - FPGA firmware by Miklos Zeller (Debrecen)
  - Should be sufficient for writing an RCDAQ driver
    - First via USB, then gigabit ethernet
  - Only partially functional so far
    - Issues with on-board termination
    - Making use of John's expertise …
    - … and practical advice by Norbert & Miklos

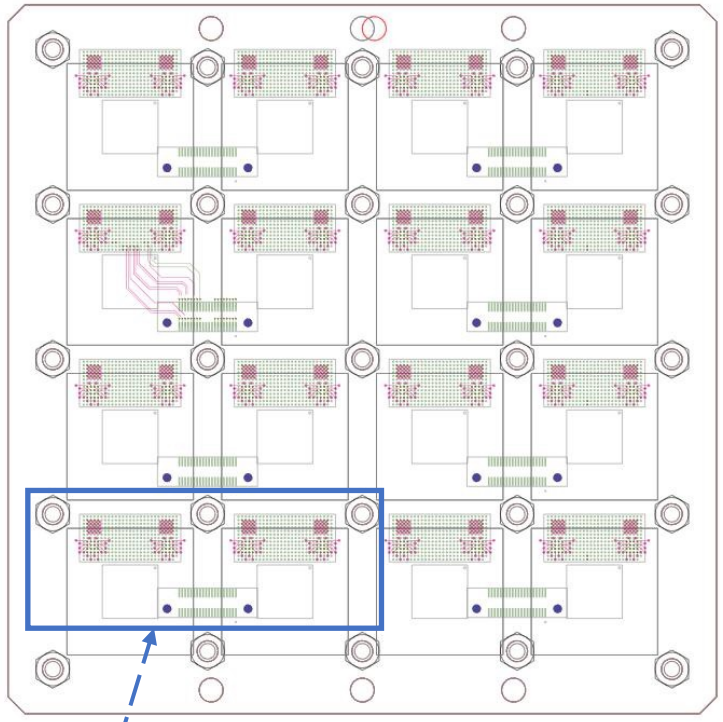


HRPPD FEE update

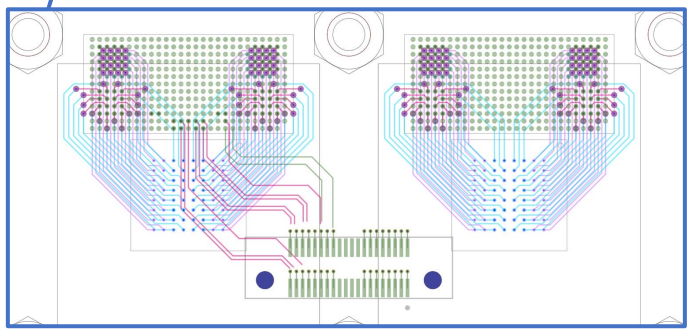


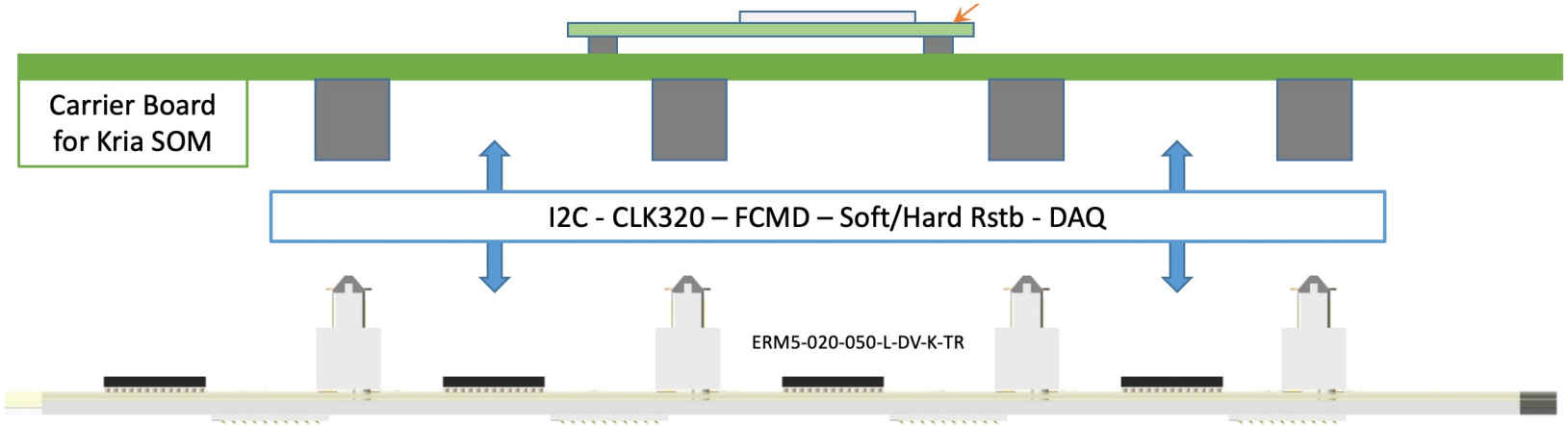


3D integration and cooling options by G. Nagy (Debrecen) and D. Cacace (BNL)



ASIC backplane design
by P. Dinaucourt (IN2P3)





FRONT END BOARD 16 x BGA HGCROC HD 350 0.6mm

pfRICH geometry update in GEANT

- Verified the latest vessel boundary conditions in ePIC geometry
  - Expansion volume got shorter by ~50mm

- Incorporated 3.8 mm thick sapphire window
  - Used to be 5.0 mm thick fused silica
  - So far only chemical composition, density and RINDEX parameterization

- Incorporated a Belle II like aerogel with <n> ~ 1.040
  - Used to be <n> ~ 1.045 (Belle II low refractive index aerogel)
  - A linear extrapolation of RINDEX, ABSLENGTH, RAYLEIGH of <n> ~ 1.045 and <n> ~ 1.055 species

All in all, we are getting a similar performance as before