LAPPD / HRPPD update

Alexander Kiselev (BNL)

eRD110 Consortium Meeting, April 3, 2023

News since the last eRD110 meeting in February

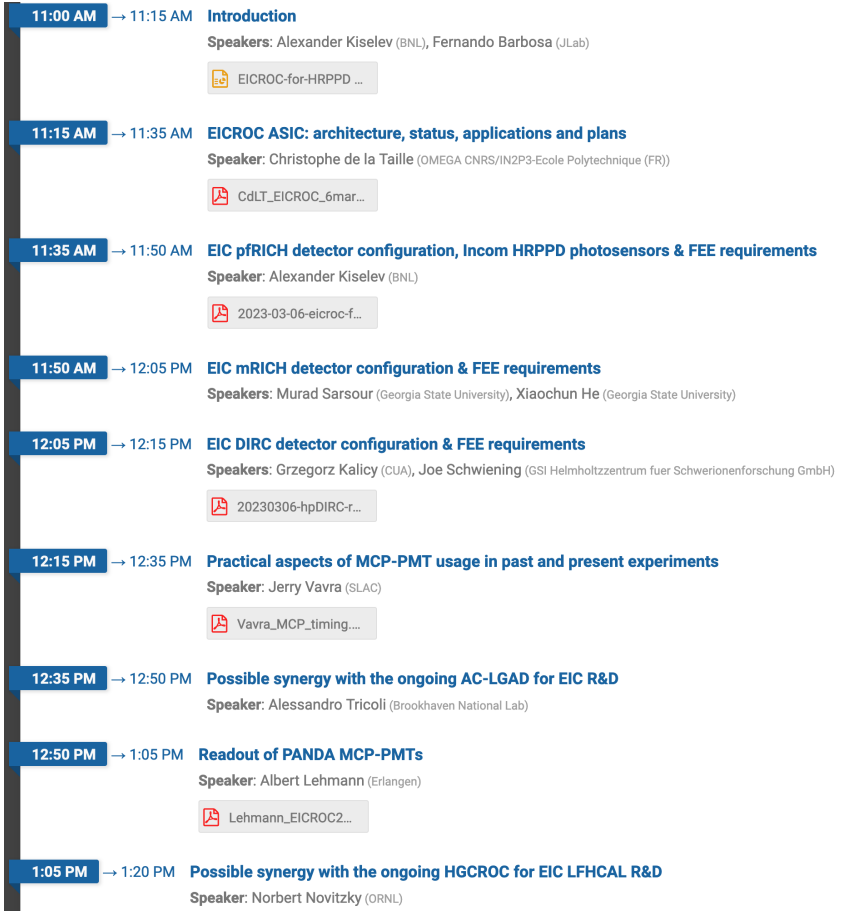
- “EICROC for EIC HRPPD/MCP-PMT photosensors” meeting over zoom on March 2023
- LAPPD / HRPPD magnetic field measurements at Argonne: data analysis stage
  - Talk by Junqi, Zhengqiao & Mark

- Somewhat related: mRICH / pfRICH review https://indico.bnl.gov/event/18499

- EIC-Incom PED contract paperwork is still “in progress”
- BNL / Incom / Techtra R&D work is ongoing in parallel

- HRPPD #6 arrived at BNL
- A virtual LAPPD Workshop #3 will take place on April 20, 2023

“EICROC for EIC HRPPD / MCP-PMTs” meeting



11:00 AM → 11:15 AM **Introduction**
Speakers: Alexander Kiselev (BNL), Fernando Barbosa (JLab)
EICROC-for-HRPPD ...

11:15 AM → 11:35 AM **EICROC ASIC: architecture, status, applications and plans**
Speaker: Christophe de la Taille (OMEGA CNRS/IN2P3-Ecole Polytechnique (FR))
CdLT_EICROC_6mar...

11:35 AM → 11:50 AM **EIC pfRICH detector configuration, Incom HRPPD photosensors & FEE requirements**
Speaker: Alexander Kiselev (BNL)
2023-03-06-eicroc-f...

11:50 AM → 12:05 PM **EIC mRICH detector configuration & FEE requirements**
Speakers: Murad Sarsour (Georgia State University), Xiaochun He (Georgia State University)

12:05 PM → 12:15 PM **EIC DIRC detector configuration & FEE requirements**
Speakers: Grzegorz Kalicy (CUA), Joe Schwiening (GSI Helmholtzzentrum fuer Schwerionenforschung GmbH)
20230306-hpDIRC-r...

12:15 PM → 12:35 PM **Practical aspects of MCP-PMT usage in past and present experiments**
Speaker: Jerry Vavra (SLAC)
Vavra_MCP_timing....

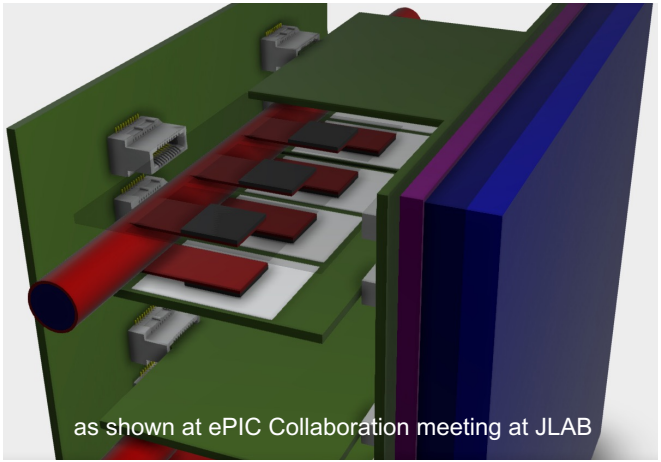
12:35 PM → 12:50 PM **Possible synergy with the ongoing AC-LGAD for EIC R&D**
Speaker: Alessandro Tricoli (Brookhaven National Lab)

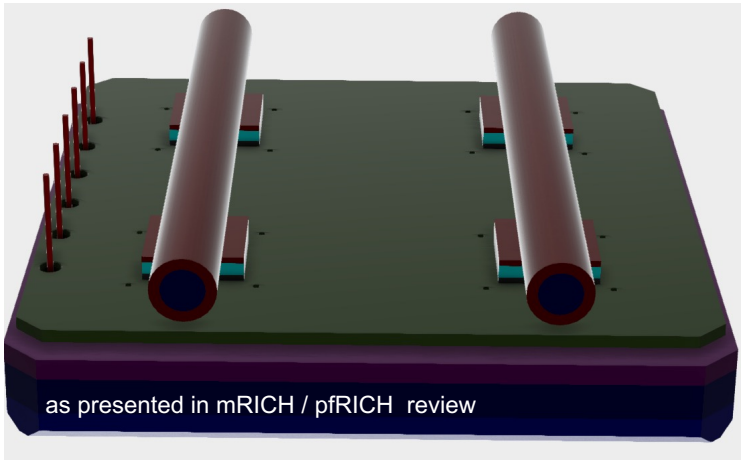
12:50 PM → 1:05 PM **Readout of PANDA MCP-PMTs**
Speaker: Albert Lehmann (Erlangen)
Lehmann_EICROC2...

1:05 PM → 1:20 PM **Possible synergy with the ongoing HGCROC for EIC LFHCAL R&D**
Speaker: Norbert Novitzky (ORNL)

- Took place on March 6, 2023: https://indico.bnl.gov/event/18539/
  - Organized in a collaboration with eRD109
  - mRICH / pfRICH / DIRC representatives
  - EICROC designers
  - MCP-PMT experts
  - AC-LGAD & LFHCAL colleagues
- No showstoppers identified
- Synergies with other ePIC ASIC-related efforts confirmed
  - HGCROC as a path forward in 2023/2024

HRPPD / FEE concept change



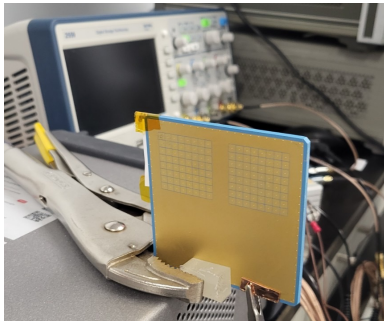


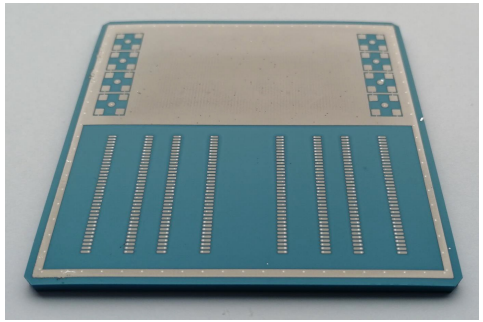
- Capacitively coupled HRPPDs
- 24x24 pad pixellation
- Waveform digitizer ASIC (Nalu)
- Vertical integration + a backplane

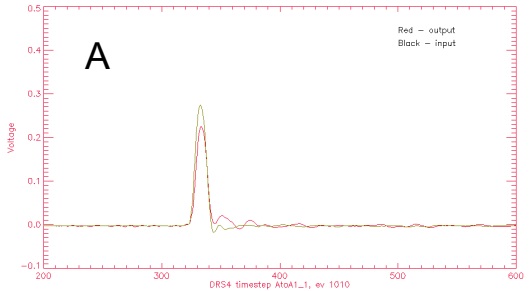
- DC-coupled HRPPDs
- 32x32 pad pixellation
- TOA / ADC ASIC (EICROC)
- Flat integration

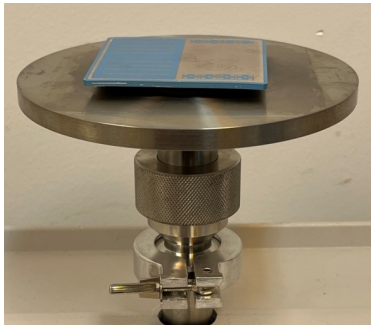
News from the HRPPD re-design front

- First two 3” multi-layer ceramic anode plates by Techtra were examined at Incom
  - Flatness is tolerable on a 3.0mm thick plate, less so on a 2.5mm thick one
  - Vacuum tightness of the 3.0 mm plate confirmed
  - No cross-talk introduced in the ceramic stack
  - Certain signal degradation observed on long (5 cm) traces



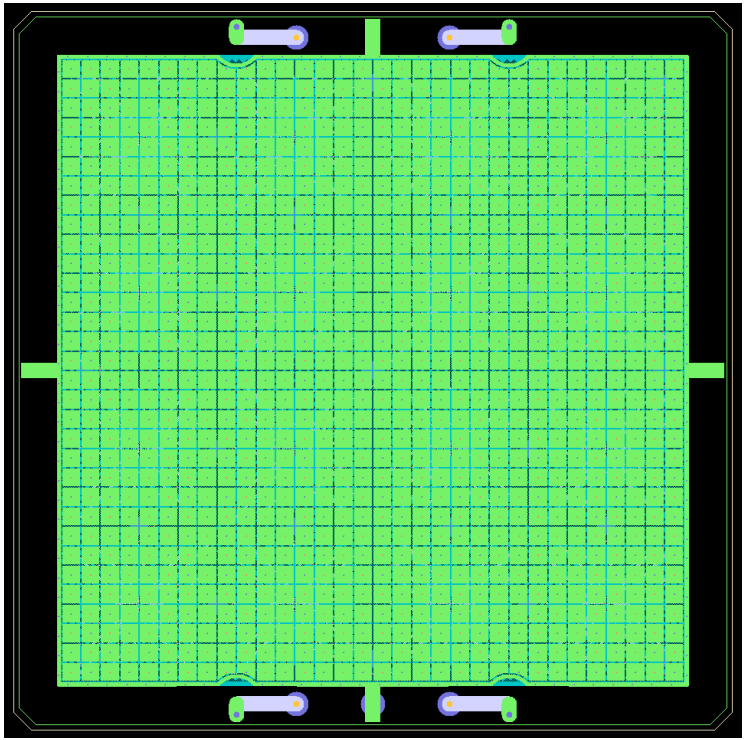




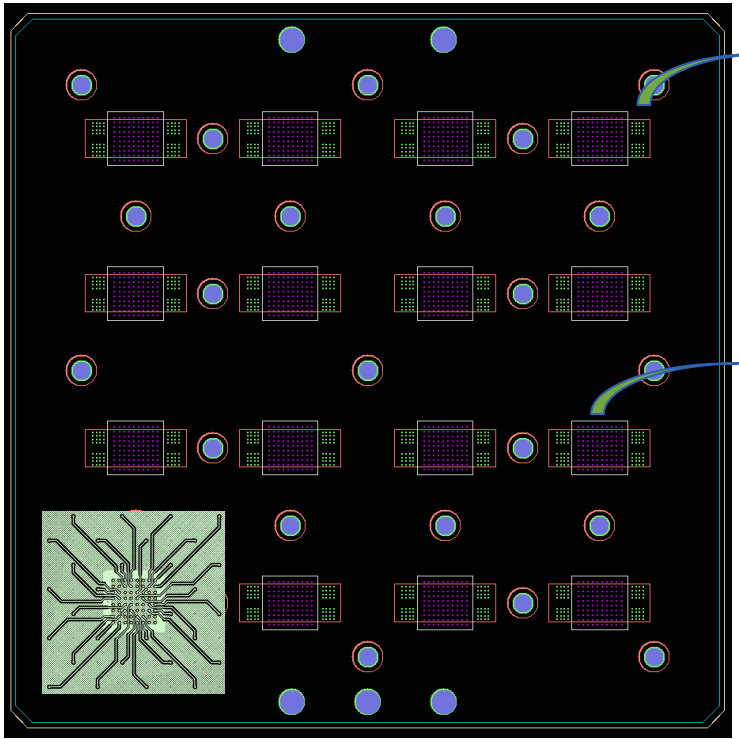


- Full size (120mm) anode plate with 1024 pads will be built and shipped to Incom by May
- A matching readout board with a “simple connectivity” will be built on the same timescale
- Assume that this design will be compatible with either 16x HGCROC (perhaps as early as beam test in spring 2024) or 4x EICROC (final) ASIC configuration

News from the HRPPD re-design front



Inner side of a 32x32 pad ceramic base plate



Outer side overlaid with a 16x HGCROC PCB template

HGCROC ASIC

Samtec interposer