

ELC visit to Incom Inc.

Alexander Kiselev (BNL)

ePIC Cherenkov PID WG Meeting, January 20, 2023

Attendance & agenda topics

- EIC: Elke Aschenauer (remotely), Silvia Dalla Torre, Thomas Ullrich, Craig Woody, AK
- Incom Inc.: management team including Michael Detarando (CEO), LAPPD research team led by Michael Minot

EIC Leadership - Incom Inc., Site Visit

1. **Guests & Schedule:** - Thursday January 12th (12:30 PM to 5:30 PM) -
 - a. **Arrival:** 12:30 PM at Incom - BNL visitors plan to take a 9am ferry on their way to Charlton, and
 - b. **Departure** – 5:30 PM to be in time for an 8pm ferry on their way back to Long Island.

Agenda topics

2. Meet & Greet Guests – Arriving at about 12:30 Noon

- a. Incom personnel introduce themselves
- b. Guests get settled in the conference room
- c. Guests are directed to the Show & Tell / Edinburgh & PittCon displays Set up outside of Conference Room
 - i. Samples of 8" MCPs and other, smaller sizes for display
 - ii. Need HRPPD – both styles, LAPPDs – both styles

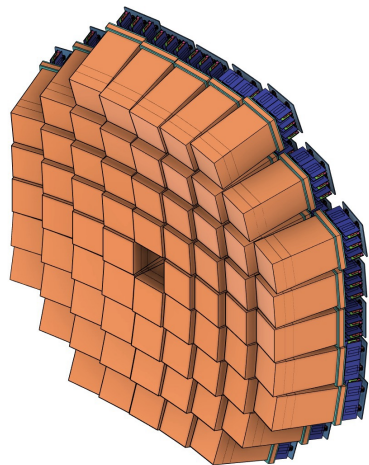
3. Formal Meeting Called to Order, RT 20 Conference Room (1:00 PM to 2:00 PM)

- a. Introduction/ Welcome - Incom Overview for EIC (Cole, 15 minutes)
- b. EIC project timelines, DOE Critical Decision (CD) process, for photosensors – (Dr. Elke-Caroline Aschenauer, 15 min)
- c. HRPPD Updated Fabrication Overview (MRF, 15 minutes)
 - i. Current Phase II & Pending Ph IIA plans
 - ii. New DC-anode for max active area (~80%) and tile-ability
 - iii. Vendor Collaborations including Techtra
- d. Plans & BNL Support for updating the footprint for max OAR / close tiling, electronic readout, etc. – Alexander 15 min

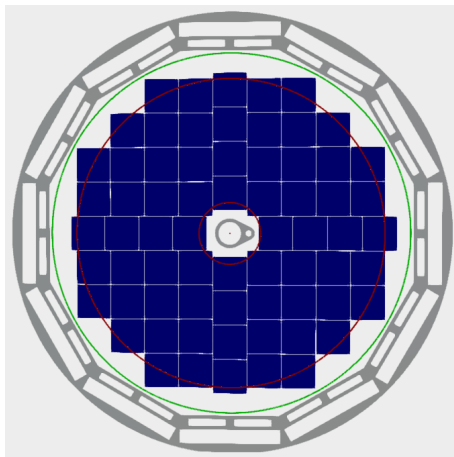
Possible LAPPD applications for the EIC

- mRICH / pfRICH: low dark noise, ToF capability (vs SiPMs)
- DIRC: expected to be more cost-efficient (vs other MCP-PMTs)
- dRICH: problematic, because of the magnetic field orientation

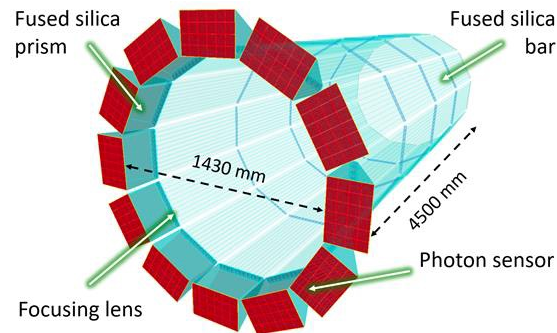
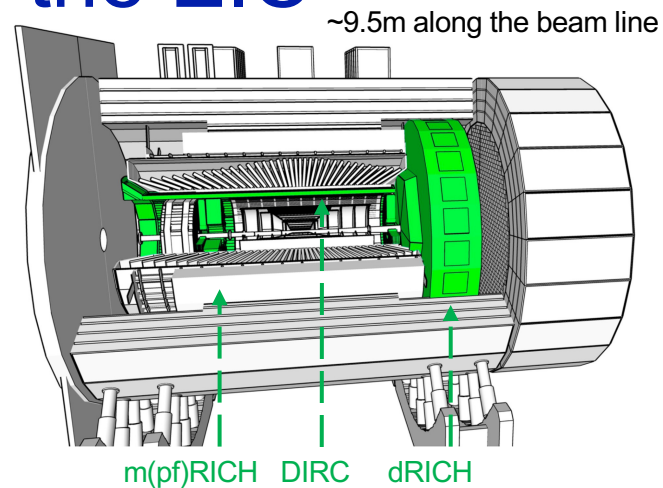
mRICH / pfRICH	either DC-coupled or Gen II, 10cm formfactor
DIRC	DC-coupled, 10cm



mRICH: 68 HRPPDs total



pfRICH sensor plane: 68 HRPPDs total



DIRC: $12 \times 3 \times 2 = 72$ HRPPDs total

Agenda topics

3 **Route 20 Facility Tour- 2:00 PM TO 3:20 PM (80 min)**

- a. Overview of LAPPD Manufacturing Process (MRF) (10 min)
- b. Detector Fabrication Tour:
 - i. Wire Saw (10 min) , General / Wet Chemistry Lab (10 min) as an entire group, then
 - ii. Divide into two Groups, then switch
 - 1. Group 1; Dark Box Room (30 min) then switch (MJM, MAD, JBS to be available in Dark Box Room for Q&A)
 - 2. Group 2; Cleanroom room, (30 min) then switch
 - a. focusing on three key process steps, rather than every step in the process:
 - i. ALD - 10 min
 - ii. MCP M&T – 10 min
 - iii. Integration & Sealing – 10 min

Agenda topics

5. Reassemble for Discussion - EIC guests discussing their thoughts and concerns (3:30 PM TO 5:00 PM)

- a. **Incom's Challenge** - Continue to support expanding demand for EIC support, product redesign, and prototype samples, without further exasperating financial losses. Bridging the funding gap between now and EIC Product Decisions and Purchases.
 - i. Grant funding
 - ii. Sale or rental of prototypes
 - iii. Future funding support for production scale-up
- b. **EIC Funding** - eRD110 FY23 budget request was funded in full in its LAPPD part (\$203k), including work on HRPPD interface, tile rentals by BNL and INFN, beam test travel and magnetic field measurement program continuation at Argonne.
- c. **Addressing the "gap"** - between now and EIC CD-3 in early 2025
 - i. Conditional upon the outcome of the R&D effort over the next half a year
 - ii. Purchase / In Kind Phase IIA Collaboration - 4-5 HRPPDs → end of 2023,
 - iii. Testing pfRICH "engineering prototype" at Fermilab → spring 2024,
 - iv. CD-3 → early 2025, green light to actually place Purchase Orders.

Agenda topics

d. **Options to formalize a relationship between Incom Inc. and EIC**

- i. PED contract between EIC and Incom, or
- ii. Memorandum of Understanding (MoU)

6. **Closing Remarks** – 5:00 to 5:30 PM

- a. Meeting Summary / Action Items
- b. Next Steps

7. **Departure** – 5:30 PM to be in time for an 8pm ferry on their way back to Long Island.

Next steps

- Prepare a “staged” EIC / Incom contract for the next ~18 months:
 - Phase I: finalize remaining R&D to the extent needed
 - Will be critical for the rest of the contract
 - Will partly depend on the outcome of the March e-endcap RICH review
 - Will to a large extent depend on the success of the “configurable LTCC pixellation” exercise
 - Phase II: procure 4-5 HRPPDs
 - Phase III: perform bench tests and beam test evaluation well ahead of the CD-2 review
- Consolidate other funding sources (SBIR Phase IIA, eRD110, medical imaging) and ongoing efforts, including a downselection of LAPPD technological solutions for EIC