Brookhaven National Laboratory

Jefferson Lab

U.S. DEPARTMENT OF ENERGY

Barrel Outer Tracker / µRWELL-BOT

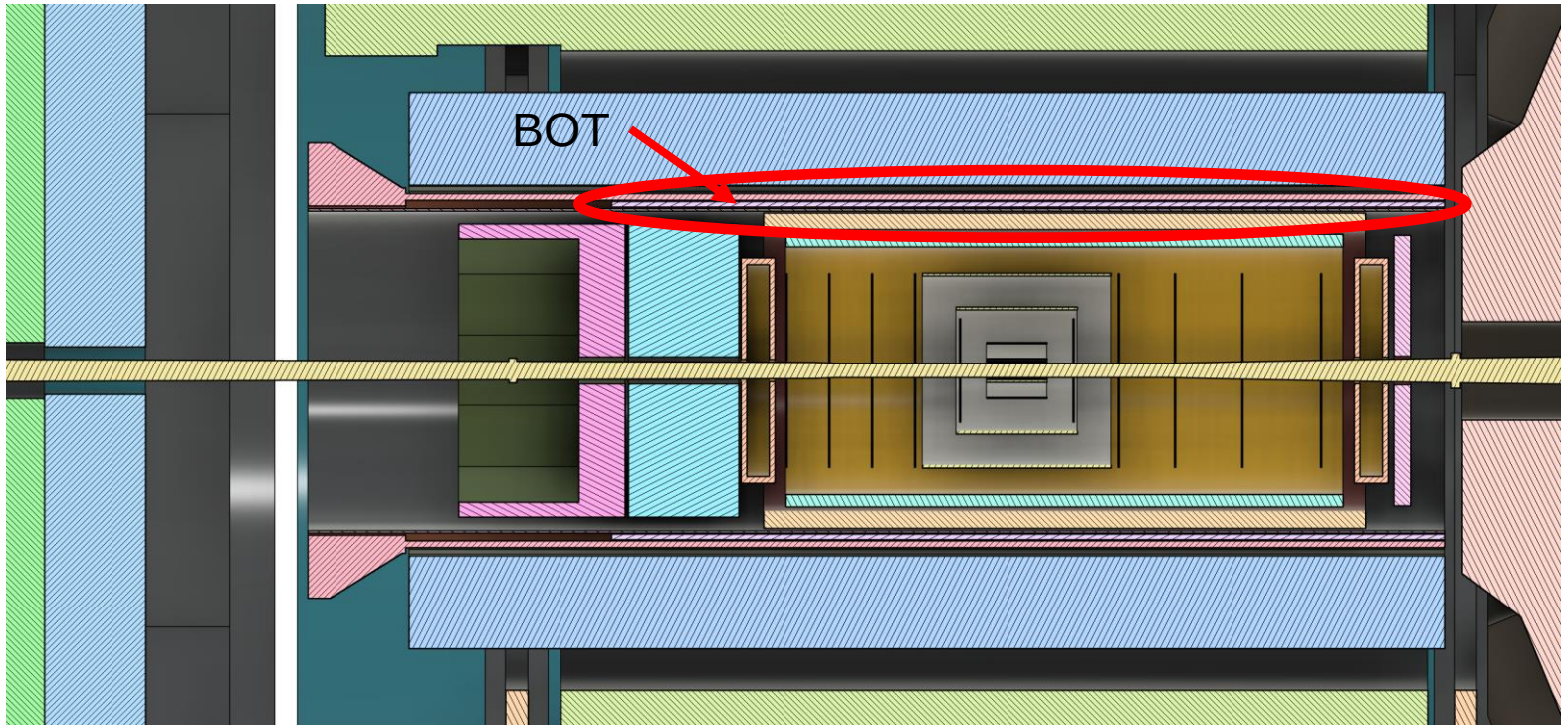
Triple I Engineering Meeting Update

Seungjoon Lee (JLab)

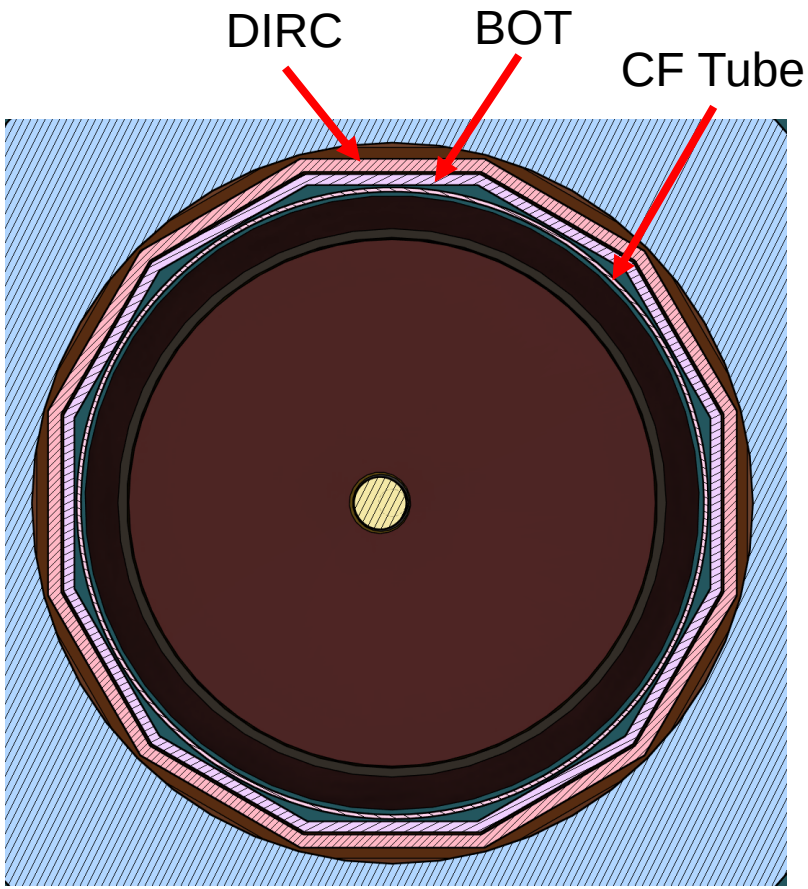
2/24/2025

Electron-Ion Collider

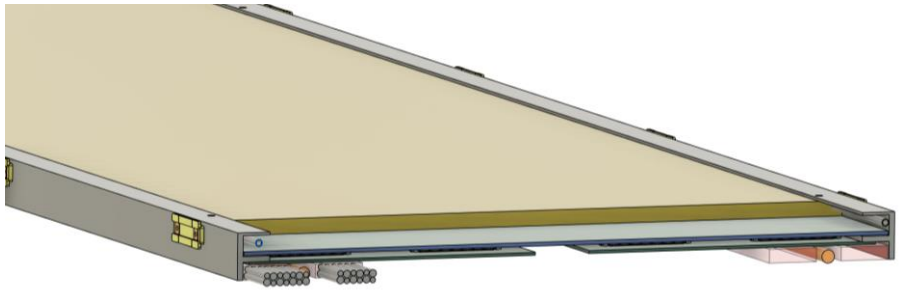
μRWELL Barrel Outer Tracker (BOT)

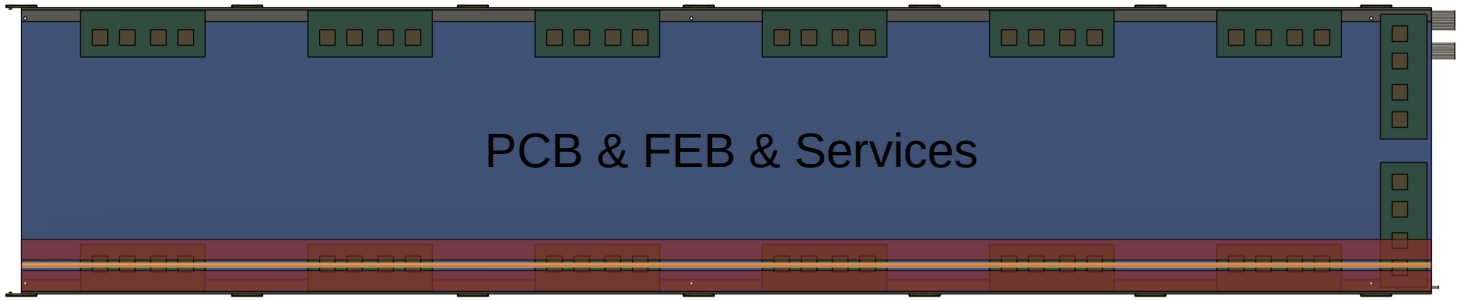


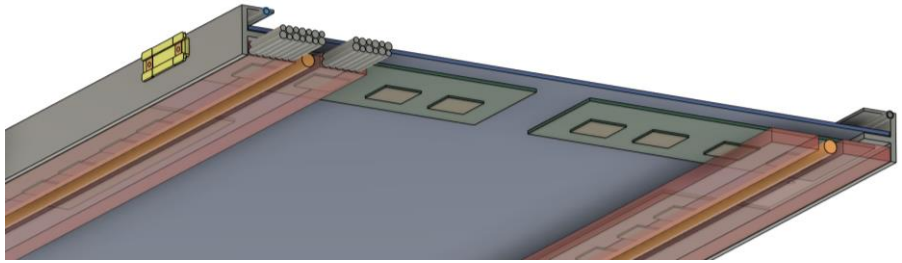
12 Sectors

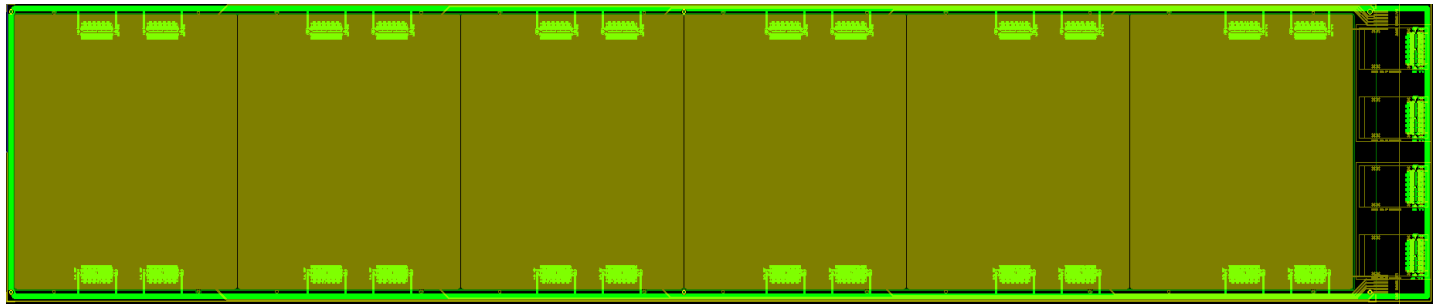


Detector Views

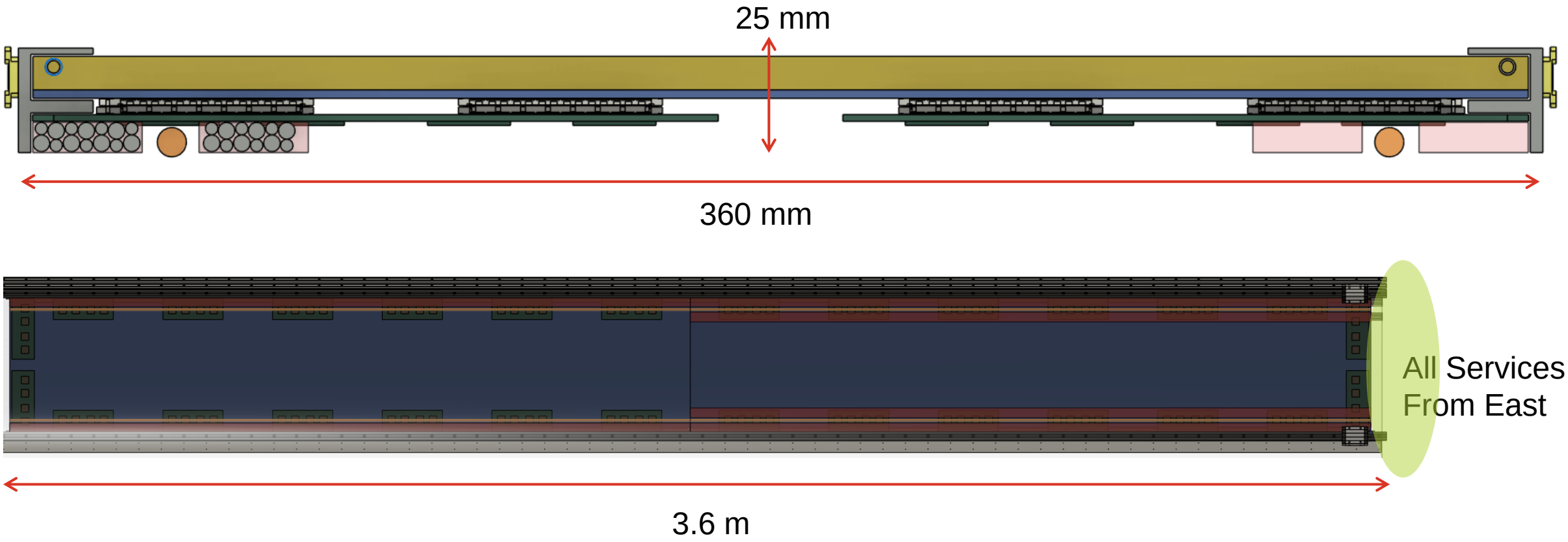








Detector Views



Detector Views

- Service Area is facing CF tube: To utilize extra space on CF tube side

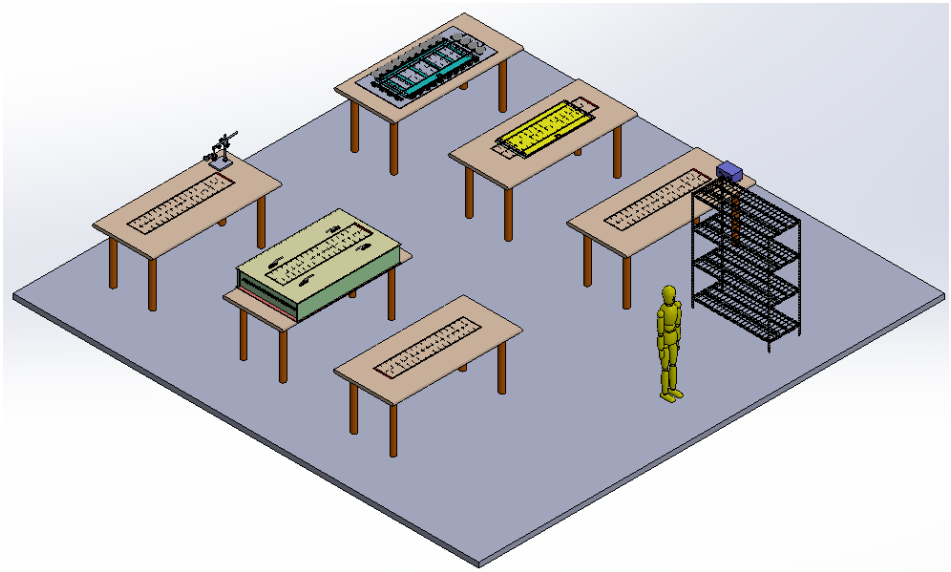
Status / Updates

From EPIC

- Recent change in DIRC/BOT/CF Tube spacing adjustment
- There are 1 ~ 1.5 cm extra space between CF tube and EM-Cal
- Move DIRC outward about 1-1.5 cm
- Moving DIRC & BOT outward: ~2% coverage loss
- Possible swap DIRC – BOT position
- Exact re-location will be determined later.

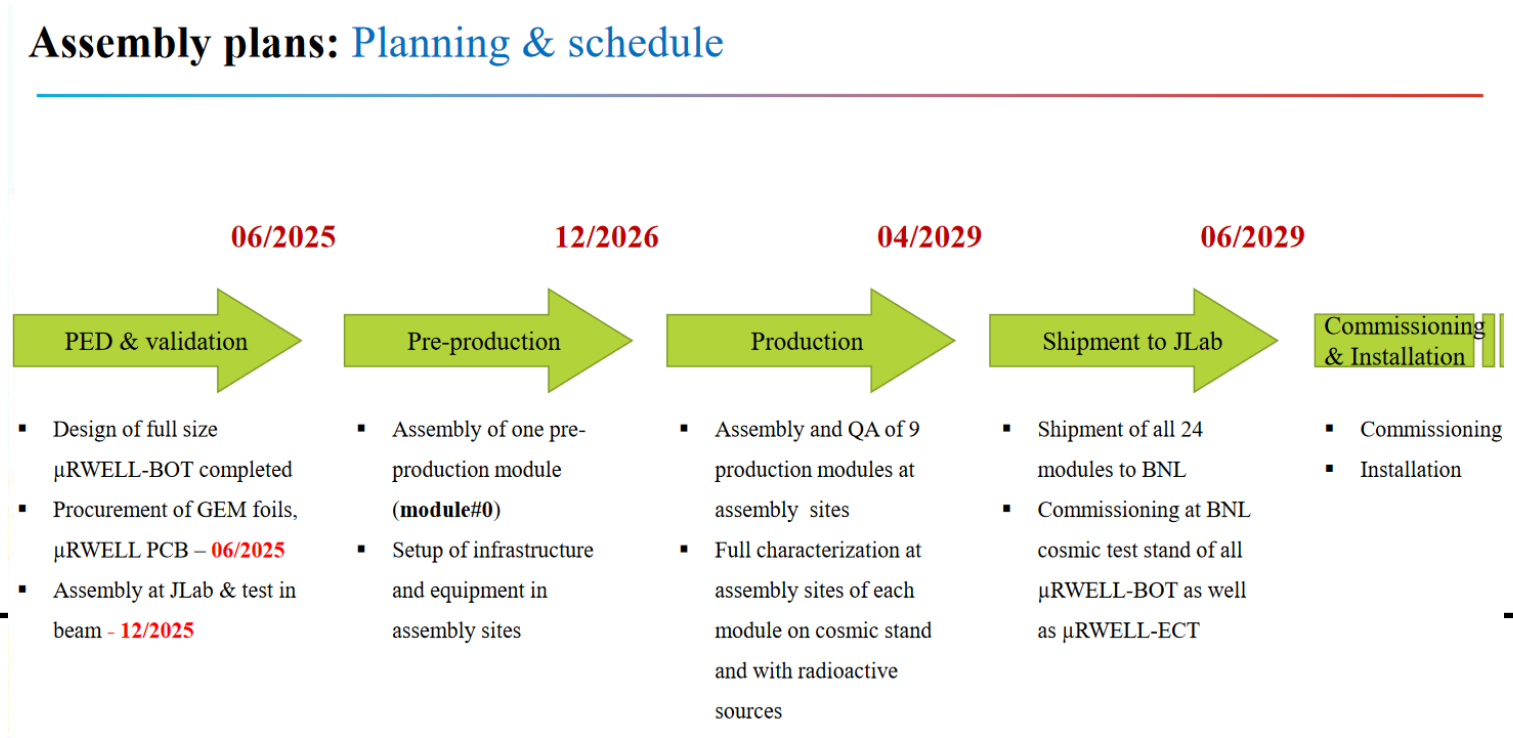
From BOT

- Working on building test article
- Chamber Frames are ordered (RESARM)
- GEM & uRWELL PCB are ordered (CERN)
- Design BOT assembly site at JLab (space reserved)
- Purchasing clean room equipment (cleaning bath, hood, etc)
- Designing special tools (foil stretcher, glueing machine, etc)

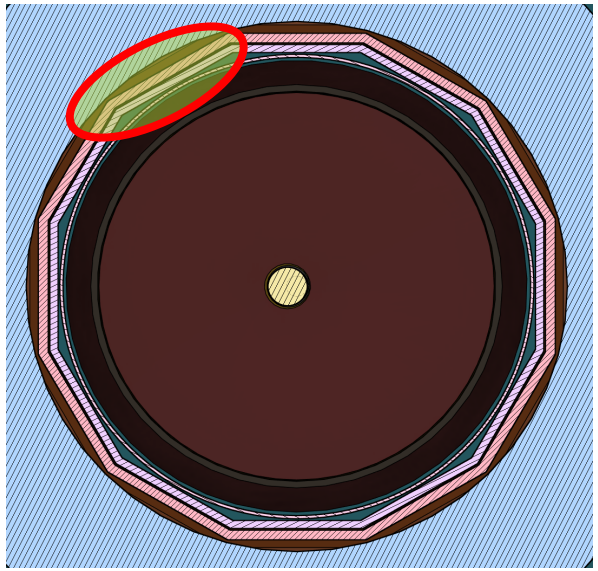


Plans Towards PDR

- ePIC Gaseous trackers (CyMBaL, µRWELL-BOT, µRWELL-ECT) PDR will most likely be in Summer 2025
- Plans on how our group is progressing towards 60% design completion for the PDR
  - The engineering test article is considered beyond 60% design completion (closer to 80% / 90%)
    - µRWELL + U-V-strips readout PCB, GEM foil expected delivery ➔ 06 / 2025
    - Assembly of the test article at JLab ➔ 09 / 2025
    - Final test in beam at CERN➔ 11 / 2025
  - SALSA readout electronics and DAQ 60% completion depends more on the DAQ & Electronics timeline
    - We expect to have first SALSA2 prototype in hand for test on real detector ➔ End of 2026



Services Estimates

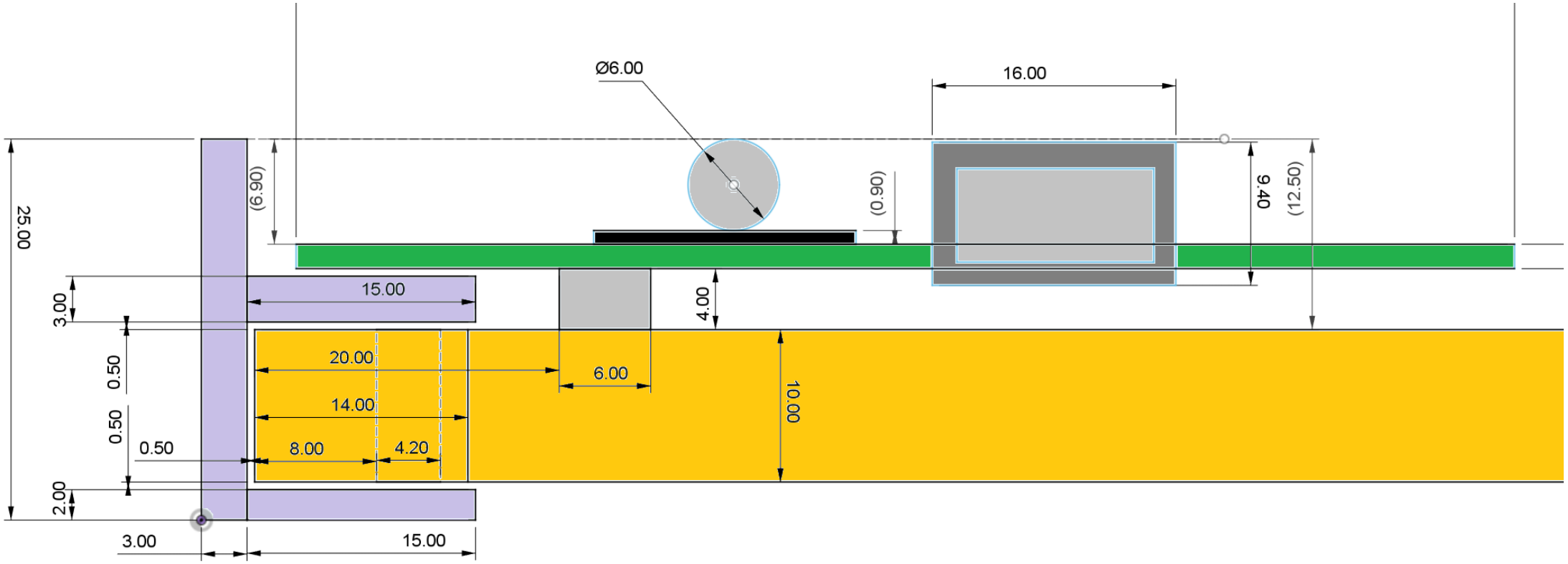


- **Per sector** (12 sectors total)
- All service from east side (west side blocked by DIRC)
- Total 28 FEBs, 2 MPGD Chambers
- 4 Gas lines (in&out) for chamber: ∅6 mm
- 1 Ground: copper braid
- 4 HV: ∅4 mm
- 28 Data: ∅3 mm (Optical Fiber)
- 56 LV (power supply): ∅2.4 mm or 28 LV: ∅2.8 mm (if supply power to 2 x DC/DC converters)
- 4 Cooling pipe: ∅6 mm (Stainless Steel)
- 4 Temperature & Humidity Sensors

- The main unknown: FEB power requirement => DC/DC converter spec. => cable/cooling specification

Question ?

Backup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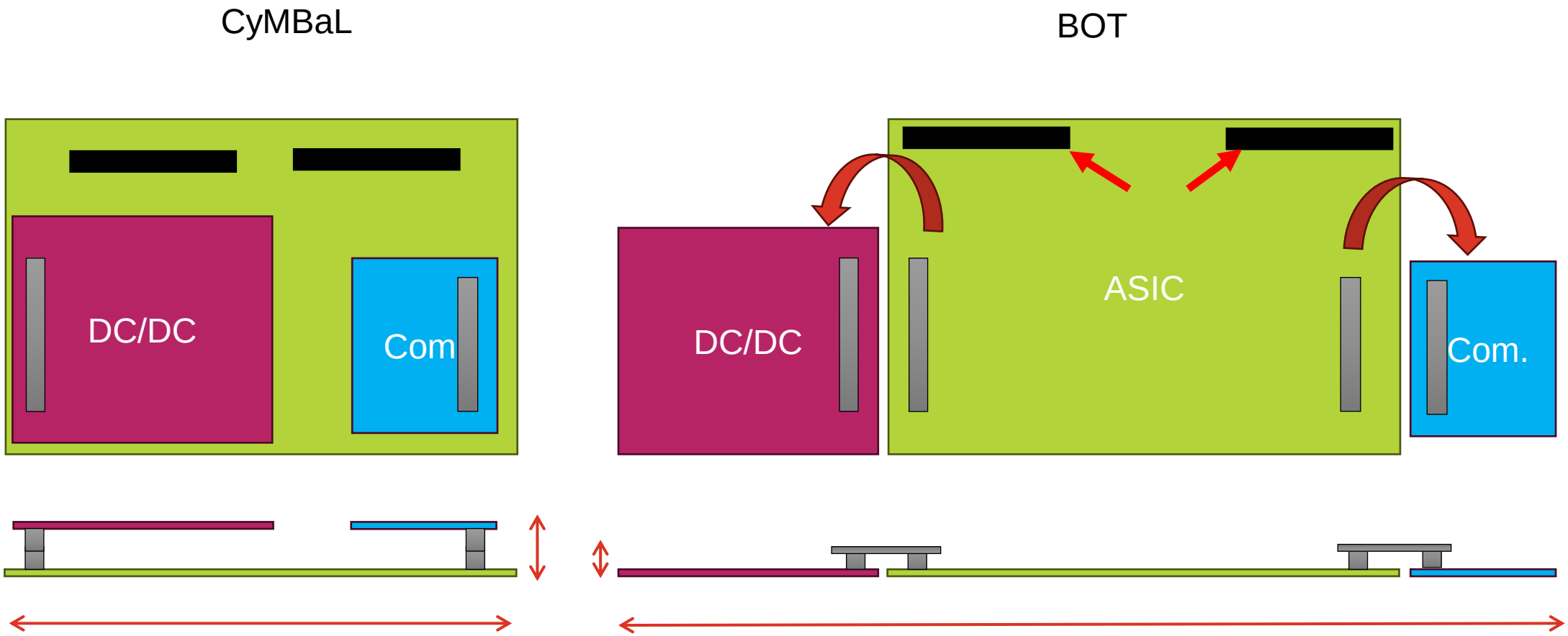
FEB Status / Updates

- FEB design

- Common factors (CymBAL, ECT, BOT) :
- 4 SALSA ASIC = 256 Ch
- Nearby DC/DC converter
- VTRX+ (LPGBT)

- It is nearly impossible to use single FEB for all three MPGD detectors.
- We will minimize variation

Example of common FEB design



The same board design with modification of connectors