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, …

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
…

July PID detector review report

1. Executive Summary

The PID detector proponents provided excellent presentations and discussions during this review.

We are very happy to see the state of the project and the very interesting R&D for the PID community, and encourage a continuation of R&D and beam tests to complete the designs.

The PID detectors are fully on track for the CD2/3 review on the current project timeline.

- Many studies have been carried out with standalone simulation and reconstruction. However, additional support should be provided for integrating the latest designs and realistic PID performance into the full ePIC simulation.

- Recent progress has been made in ePIC's cross-cutting PID WG to understand tracking requirements for PID detectors. Requirements documents should capture the bi-directional interface between tracking and PID detectors: e.g., translation between extrapolated track impact point and angle resolution requirements for PID detectors. It could be evaluated where the PID subdetectors can contribute to improving the tracking performance and how in the reconstruction algorithms this could be integrated.

July PID detector review report

- Following the discussion, the integrated anode charge for the HRPPD over the experiment lifetime is understood to be only a few C/cm^2 in a worst-case estimate at 10^7 gain. Operating at a lower gain can increase the lifetime but should be balanced with reduced PDE. It would be good to have the integrated charge numbers available from the simulation, also for different quartz HRPPD window thicknesses.

- A charged particle timestamp with a resolution of ~20 ps is required. It was stated that an SPTR of ~50 ps is required to achieve this track resolution, based on the minimum of 6 photons per track and the requirement of ~100% geometric efficiency. However, it was also presented that the mean number of photoelectrons lies around 12 (in the aerogel) and >80 (in the entrance window). It, therefore, appears that for the majority of tracks, the requirement on SPTR could be relaxed. It would be good to see the results from simulation on how the overall pfRICH and ePIC performance behaves as a function of this SPTR.

- It would be good to evaluate the effect of the different photon angles of incidence on the quartz window across the detector plane on the number of detected photons and Cherenkov-angle resolution.

July PID detector review report

- The reviewers acknowledge that the EICROC will not be available before the design is finalized; thus, evaluation of the HRPPD performance will take place with the existing HGCROC under the assumption that similar performance will be achieved with the EICROC.

- It was mentioned that the 3.375 mm (or potentially smaller) pitch at the HRPPD backplane is dominated by requirements of the hpDIRC using the same photodetector, and the pfRICH could operate at larger pixel areas. It should be investigated whether a small change in layout would allow multiple pixels to be grouped into a single readout channel, in order to reduce the overall channel count and cost.