



PID Update in ePIC

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Disclaimers/Outline:

- If you find something missing or misunderstood please let us (TC Office) know.
- I have tried to sort issues in Short/Medium and Long term goals to achieve the preTDR/TDR requirements.
- Covers: **pfRICH, hpDIRC, dRICH and ToF**
- ePIC's critical item list can be found [here](#) [in John's "ePIC collaboration status" slides]

- Ongoing progress towards a ~realistic detector model in DD4hep simulation and a reconstruction algorithm in EICrecon (see Talk by Alexander)

But Detailed Performance studies have to be done for full evaluation in the EIC software stack with IRT₂.

- The single photon **time resolution requirement of ~30-40 ps** may be aggressive once the full readout chain is implemented. We suggest to consider if the single photon time resolution requirement can be relaxed, given the complementary information on the t_0 provided by the accelerator and primary vertex location.
- What's the t_0 requirements for pfRICH's own ToF feature.
- What's the t_0 requirements from pfRICH's for ToF detectors.
- What's the minimum momentum reach? Physics requirement study?

Medium Term

pfRICH (cont'd)

- **Document the comprehensive test plan for two candidate MCP-PMT photosensors**, which are planned to be performed by multiple groups at different locations. This document should evaluate if the complete performance requirements can be met for the pfRICH and hpDIRC, and how to make the final choice
- Spell out the requirements for the FCFD version and its successful evaluation
- Results of the first engineering test article of **HRPPDs** are promising. A second engineering run is encouraged to mitigate risk:
 - ▶ What drives the second run ? Mechanical/Fluence rate capabilities/ photon Aging /Neutron dose etc...

Long term

- Motivation, possible performance gain, challenges in reconstruction, and installation overheads of **funneling mirrors** should be carefully examined.
- No looming possibility to demonstrate particle separation in test beam for once

hpDIRC

Short Term

- ⦿ Ongoing progress towards a ~realistic detector model in DD4hep simulation and a reconstruction algorithm in ElCrecon. (see Talk by Greg)

But detailed Performance studies have to be done for full evaluation in the EIC software stack.

- ⦿ Requirements from other tracking detectors.
- ⦿ Current status/Success rate of bar-box removal?
- ⦿ Spell out the requirements for the FCFD version and its successful evaluation

Medium Term

- ⦿ Simulation and validation should be performed on the potentially relaxed performance requirements for the additional light guide bars, relative to the refurbished BaBar bars

Long term

- ⦿ **Document the comprehensive test plan for two candidate MCP-PMT photosensors,** which are planned to be performed by multiple groups at different locations. This document should evaluate if the complete performance requirements can be met for the pfRICH and hpDIRC, and how to make the final choice.

dRICH

Short Term

- Ongoing progress towards a ~realistic detector model in DD4hep simulation and a reconstruction algorithm in ElCrecon (see Talk by Chandra)

But Detailed Performance studies have to be done for full evaluation in the EIC software stack with IRT2.

- “The chromatic error is dominating the overall performance of the aerogel. It is recommended to study the optimization between (a) loss of photon yield and (b) reduction in chromatic error, using a possible optical filter installed after the aerogel tiles.”
 - ▶ Compatibility between choice of filters and UV graded SiPM's.

Long term

- There is concern that by the time of physics operation a non-ecofriendly dRICH gas may be impossible to obtain or very expensive and we recommend that fall back solutions be investigated.

ToF

Short Term

- Excellent progress in digitization implementation, work is actively ongoing on reconstruction side (see talk by Chun)
Detailed Performance studies have to be done for full evaluation in the EIC software stack.
- What is the ultimate timing resolution needed for Physics?
- Does the forward ToF contribute to the tracking, and if yes what requirements does this set?
- What is the allowed material budget not impacting the performance of the other detectors.
- What is the acceptance needed for the physics, do small acceptance gaps between modules have a negative impact
- Contribution of the barrel ToF layer in the tracking for the precise determination of the particle angle in the hpDIRC.
- Spell out the requirements for the FCFD version and its successful evaluation

Medium term

- Finalize the mechanics for forward ToF (cooling, support etc.)

Common Items

Detailed Performance studies have to be done for full evaluation in the EIC software stack.

- ⦿ Top priority to be placed on **Integrated simulations** and **Realistic Reconstruction** with the full detector to finalize optimizations between detector subsystems (Inclusion of Realistic Background and Tracking for performance evaluation)
- ⦿ Detailed **QA plans** in time, accompanied by protocols.

Thank you!