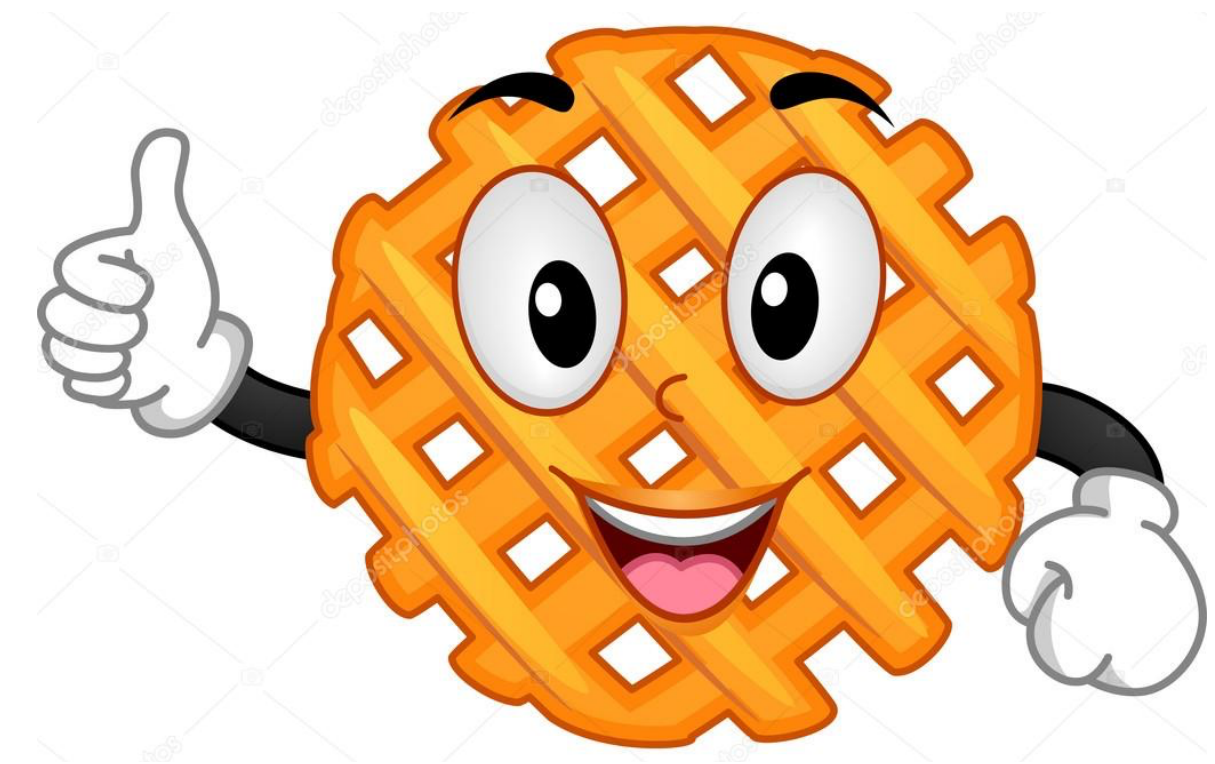


PID Cross-Cutting Working Group

Thomas Ullrich & Oskar Hartbrich
ePIC Collaboration Meeting
University of Warsaw
July 28, 2023



General Information

PID CC WG = dRICH + pfRICH + hpDIRC + ToF/AC-LGAD

Created April 2023

Conveners: Oskar Hartbrich (ORNL), Thomas Ullrich (BNL)

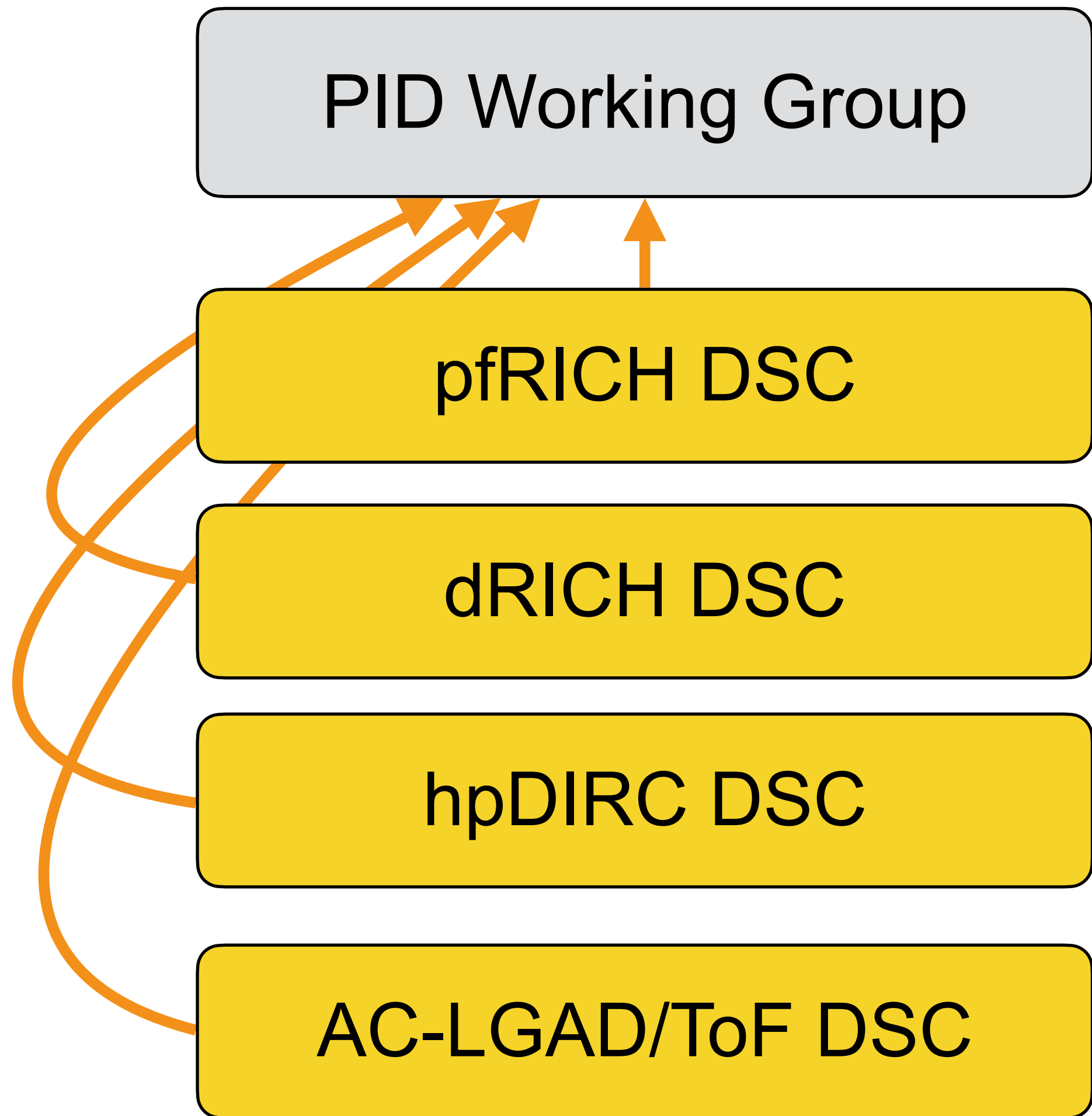
Indico: <https://indico.bnl.gov/category/486/>

Mailing List: eic-projdet-pid-l@lists.bnl.gov
(133 subscribers)

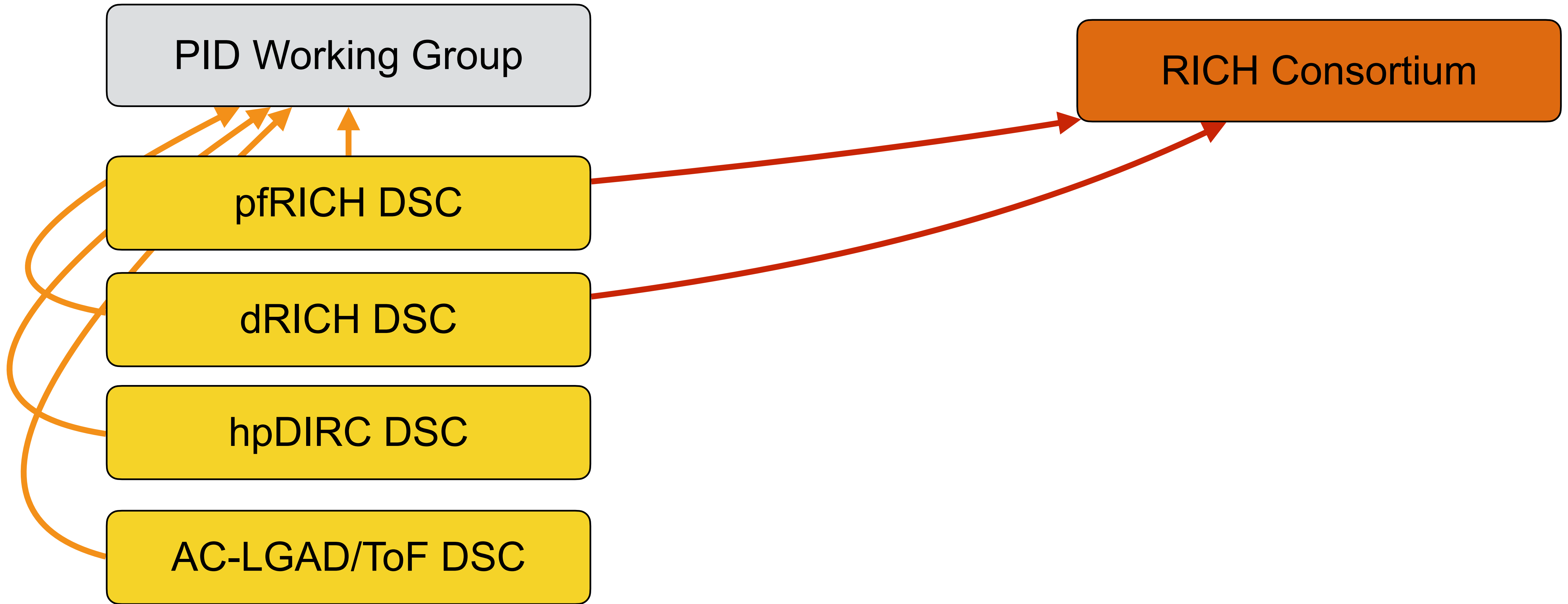
Meetings: biweekly, Fridays 8:30 (EST/EDT)



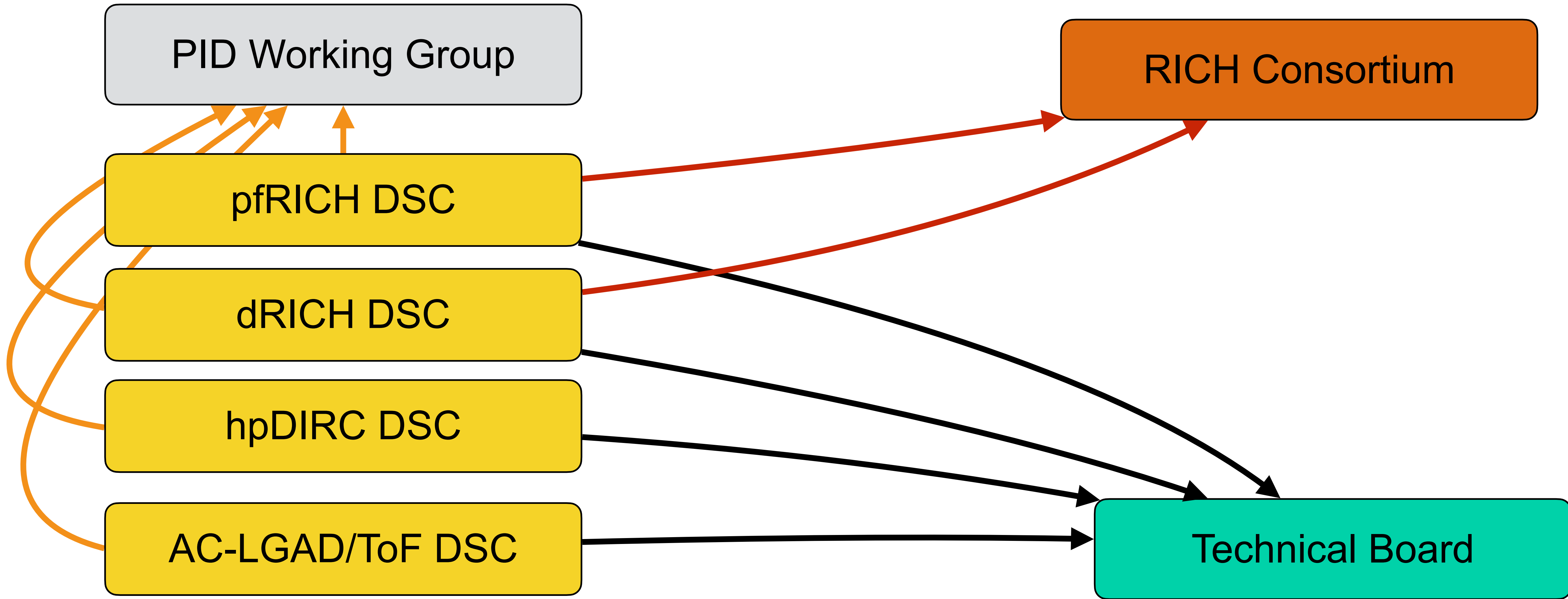
Context



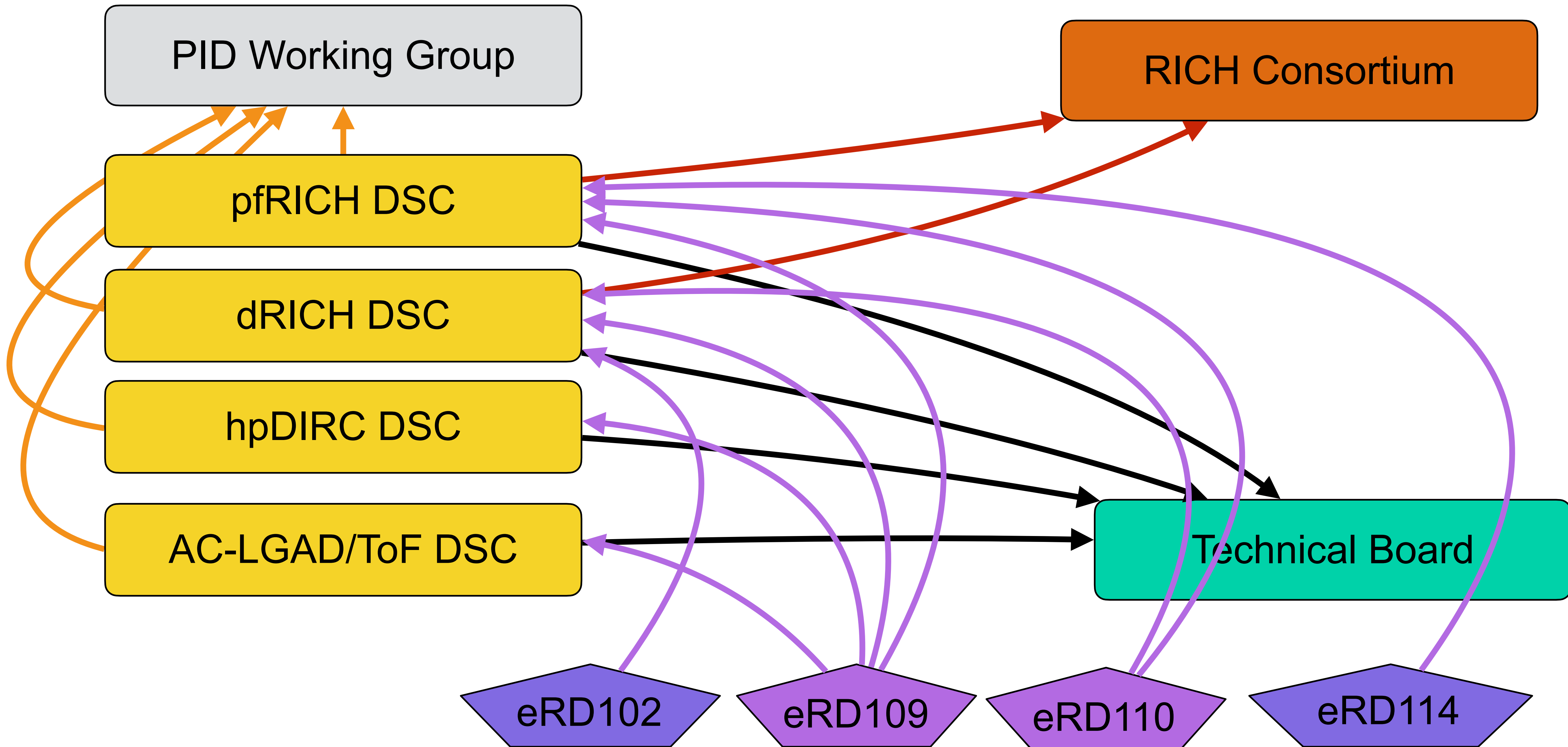
Context



Context



Context



The Role of the PID WG ?

- We have to be careful to **not duplicate efforts** and add too many meetings
- **RICH Consortium** will play a significant role on long term in the coordination and collaboration of pfRICH and dRICH
- R&D
 - ▶ R&D project == DSC for dRICH & pfRICH
 - ▶ R&D project = several PID DSCs (photosensors, ASICs/electronic)
- All PID DSCs are represented in the TB and taking part in TIC meeting

PIF WG will focus dominantly on

- DSC status reports to keep others informed (few/year)
- Help in preparation and closeout of PID Reviews (when needed)
- Focus mainly on global ePIC PID software (not individual subsystem)
 - ▶ Global PID interface independent of rapidity/subsystem
 - ▶ Combining PID info where overlap (e.g. dRICH+TOF, hpDIRC+ToF, tracking topology, etc)
- Interface between other subsystem (e.g. tracking) and all PID (e.g. angular resolution definitions)

Meetings

Cross-cutting working group including all PID projects, dRICH, pfRICH, DIRC, and AC-LGAD/ToF

July 2023

- Jul 14 Summary & Discussion of PID Review

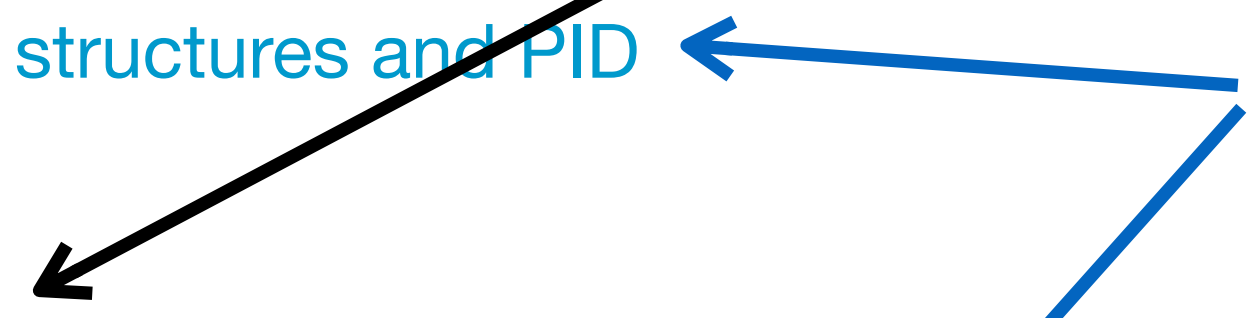
PID **Review** related



June 2023

- Jun 23 Joint PID Software: Common algorithms, data structures and PID combination
- Jun 09 Preparation Meeting for Upcoming Reviews

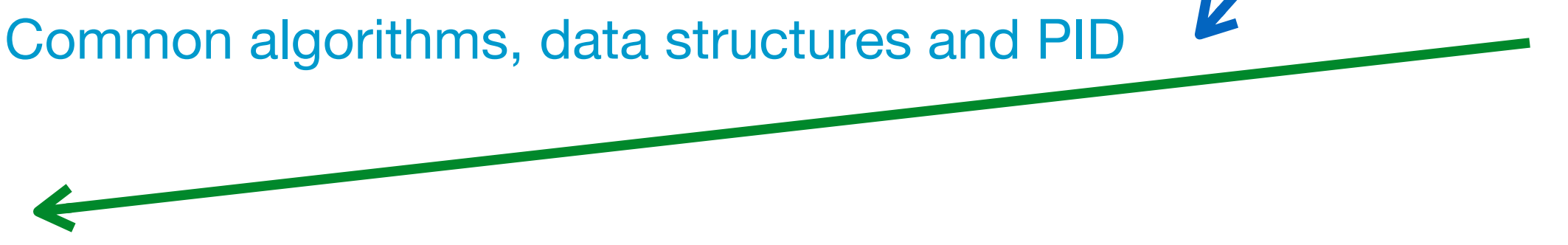
PID **Software** related



May 2023

- May 26 Joint PID Software: Common algorithms, data structures and PID combination
- May 12 Inaugural Meeting

PID **DSCs** related



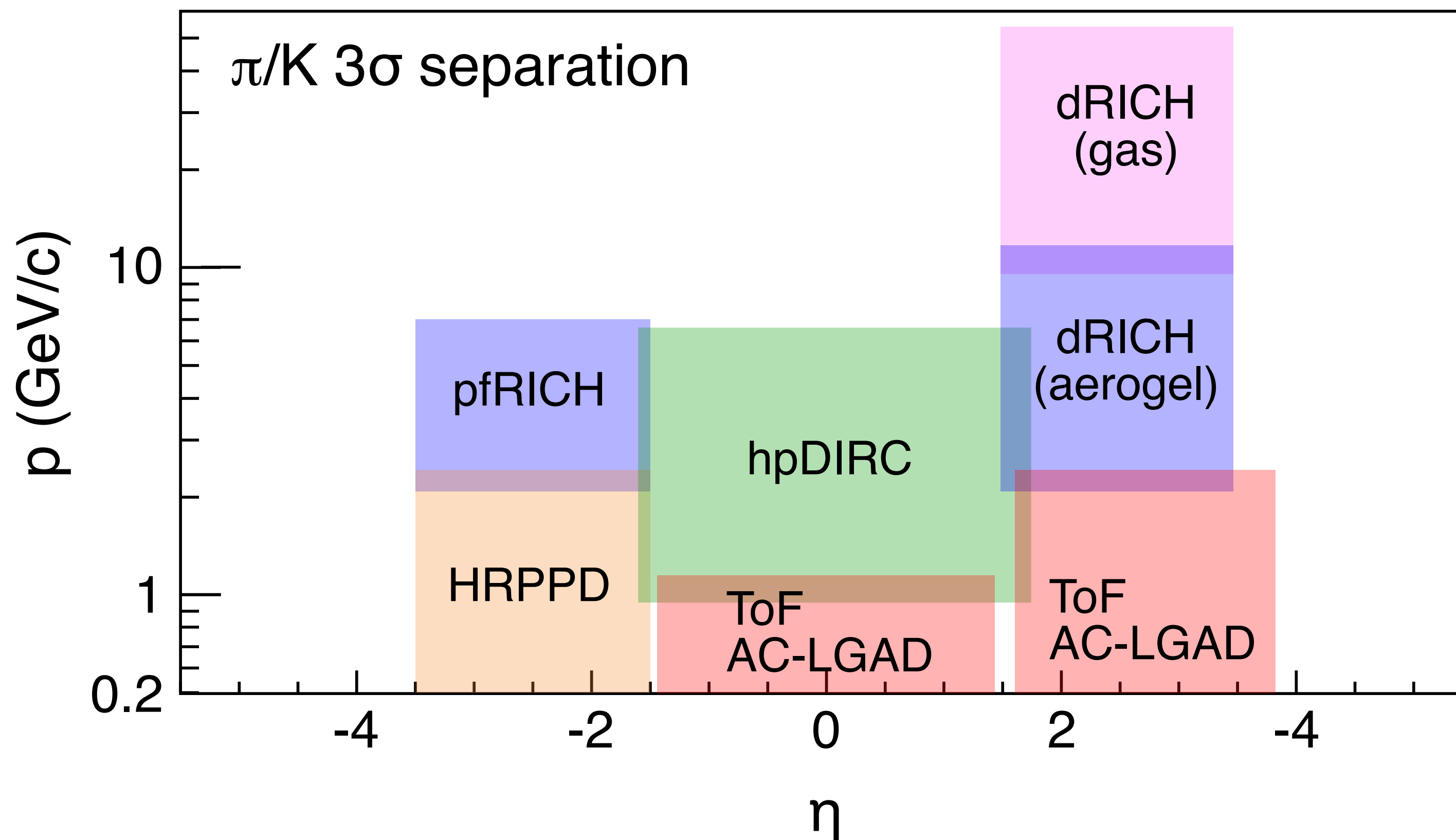
2nd July meeting skipped because of Warsaw meeting

Common PID Software: Intermediate Goal

Produce combined PID performance figures with full reconstruction

- Especially for systems in the same η region: bTOF + hpDIRC, fTOF + dRICH

We should be able to reproduce the often-shown ePIC PID coverage diagram with full simulation data:



PID Combination and Software

Discussion on PID combination approaches: <https://indico.bnl.gov/event/19554/>

- Bayesian Likelihood Combination: Used by ALICE, Belle II, HERMES
- Requires Likelihood/Weight for each track in each subdetector for each particle hypothesis
 - ▶ PID event data model is prepared for this, detector specific details can be added per subsystem
- Requires priors on particle abundances in given physics phase space
 - ▶ ... and an analyzer-friendly interface to obtain proper priors and feed them into the PID combination

Initial discussions on common algorithm usage between subsystems

- In reconstruction this seems to be largely the IRT core code useful to forward and backward RICHs:

PID implementations in EICrecon are progressing...

- ... but maybe not quite at the tempo everyone would prefer, including the PID review referees:
 - ▶ *“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.”*

Homework from Review

PID Review: Incremental Design and Safety Review of the Electron- Ion Collider (EIC) Particle Identification Detectors, July 5-6, 2023

1. Are the technical performance requirements appropriately defined and complete for this stage of the project?

Comments:

- 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 improve the tracking performance and how in the reconstruction algorithms this could be integrated.

→ Meeting between tracking and PID this week

Take-Away Message

- PID Cross-cutting WG has started their work
 - ▶ dRICH, hpDIRC, pfRICH, ToF/AC-LGAD
- Try hard not to duplicate (interfere with) the many PID related efforts (DSCs, R&D, TIB, RICH Consortia)
- Focus on
 - ▶ Common PID software
 - ▶ Aid in preparing reviews affecting two or more PID DCSs.