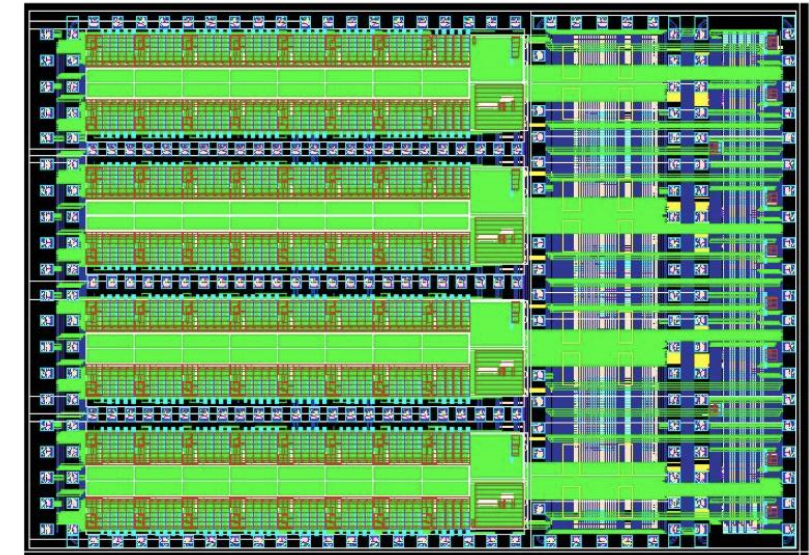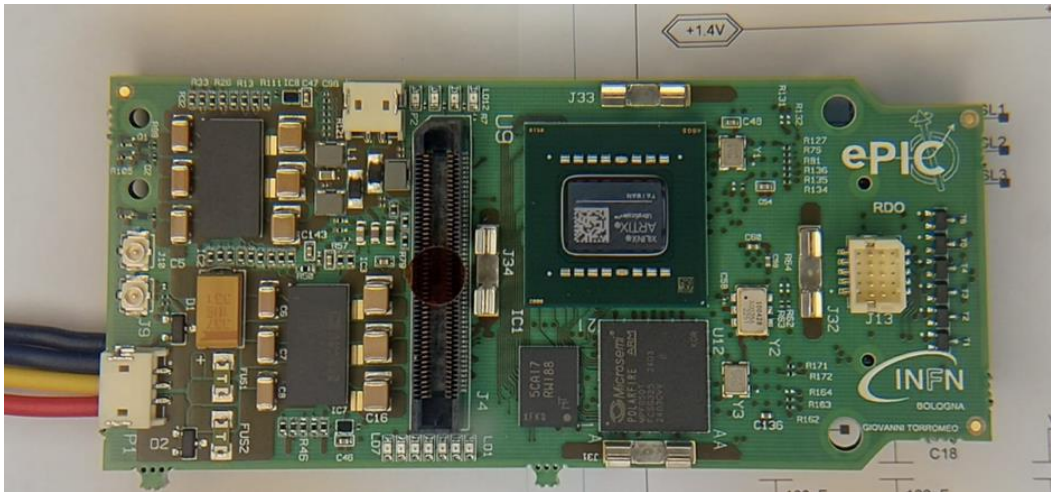# dRICH highlights from the Closeout Report of the Incremental Preliminary Design Review for Electronics & DAQ (3-4 September 2025)

P. Antonioli (INFN Bologna), F. Cossio (INFN Torino)

dRICH meeting
Zoom, 10 September 2025

PDR Electronics & DAQ: agenda

These general talks are available in the Indico page of dRICH DAQ meeting (5 September)

https://agenda.infn.it/event/48276/

"sub-systems" agenda

11:30 → 11:45 **Discrete Readout (Waveform digitizer)**

Speaker: Gerard Visser (Indiana University)

📄 calorimeter_wavefo...   📄 calorimeter_wavefo...

11:50 → 12:05 **RDO - Readout Board - General**

Speaker: Norbert Novitzky (ORNL)

📄 20250825RDO.pdf
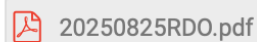
12:10 → 12:25 **Fiber RDO (SVT)**

Speaker: Dr Joachim Schambach (ORNL)

📄 20250903_DAQRevi...   📄 20250903_DAQRevi...

12:30 → 12:45 **Astropix RDO**

Speaker: Jessica Metcalfe (ANL)

📄 ETC_DAQ_PDR_202...

slides available in this Indico entry
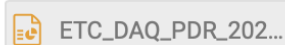
08:30 → 08:45 **Timepix RDO**

Speaker: Kenneth Livingston (University of Glasgow)

📄 Sept2025 PDR3 DA...   📄 Sept2025 PDR3 DA...

08:50 → 09:05 **ALCOR ASIC (dRICH)**

Speaker: Fabio Cossio (INFN Torino)

📄 [20250904] ALCOR_...   📄 [20250904] ALCOR_...

09:10 → 09:30 **dRICH RDO**

Speaker: Pietro Antonioli (INFN - sezione di Bologna)

📄 20250904-IPDR-dRI...   🔗 PDR 2024 - dRICH R...   🔗 PID Review 2025 - d...   🔗 PID Review Apr 202...
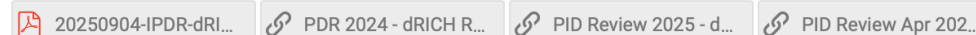
09:40 → 09:55 **EICROC ASIC**

Speaker: Christophe de la Taille (OMEGA CNRS/IN2P3-Ecole Polytechnique (FR))

📄 CdLT_EICROC_4sep...

10:00 → 10:15 **CALOROC ASIC**

Speaker: Frederic Dulucq (OMEGA - Ecole Polytechnique - CNRS/IN2P3)

📄 FD_MEB_20250904...   📄 FD_MEB_20250904...

10:20 → 10:35 **FCFD ASIC**

Speaker: Artur Apresyan (FNAL)

📄 FCFD-Status-Apresy...   📄 FCFD-Status-Apresy...

10:40 → 10:55 **SALSA ASIC**

Speaker: Damien Neyret (CEA Saclay IRFU/DPhN)

📄 SALSA_PDR_EIC_D...

Closeout report --> dRICH highlights

Closeout Report

Matt Noy (CERN), Mitch Newcomer (UPenn),
Prashansa Mukim (BNL), Filippo Costa (CERN)

Incremental Preliminary Design and Safety Review
of the EIC Detector DAQ and Electronics

Matt Noy	CERN
Mitch Newcomer	Unv Penn
Prashansa Mukim	BNL
Filippo Costa	CERN

Charge

Charge Questions

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

2. Are the plans for the various detector electronics and data acquisition systems appropriately documented and complete for this stage of the project?

3. Are the current plans from front-end electronics to data acquisition for the detector likely to achieve the technical performance requirements, with a low risk for cost increases, schedule delays, and technical problems?

4. Are the schedule assumptions for the fabrication of the various electronics and data acquisition systems and assembly plans reasonable and consistent with the overall detector schedule?

5. Have ES&H and QA considerations been adequately incorporated into the plans at their present stage?

6. Have the recommendations from previous reviews been adequately addressed?

"standard"

for dRICH they were:

- shutter implementation & simulation
- ALCOR packaging
- DAQ backend

General comments

Comments

- Yes, the plans for the detector electronics are appropriately documented and complete for this stage of the project. However, we feel that for the data acquisition (DAQ) systems, some information is still missing. Further clarification and detail will help ensure full alignment and readiness as the project advances.

- Clarify Protocol Between RDO and DAM
The communication protocol between the RDO and DAM should be clearly specified. From the current slides, it is unclear whether GBT, lpGBT, or a custom protocol is being used.

- Manpower, Software, and Firmware Development Progress
While a time schedule for deliverables was presented, more clarity is needed on the current progress of component integration, as well as the status of software and firmware development. This includes the tools and frameworks needed to support data-taking operations—both for lab tests and future experiment deployment. A more detailed roadmap and progress tracking would help assess readiness and identify potential bottlenecks.

Here main target is ePIC central DAQ not dRICH

The RDO-DAM protocol remains an outstanding issue.

dRICH is (together with SVT) the most advanced but the lack of central guidance might (and already had IMHO) an impact.

Recommendations (I)

Recommendations

- FELIX Server Compatibility for MiniDAQ (2027)
  In preparation for the MiniDAQ expected in early 2027, additional information should be provided regarding the server requirements and compatibility with the FELIX card.

- GTU Firmware Maintenance and Clock Stability
  Potential challenges in maintaining a single, large GTU firmware for both standalone and global runs should be evaluated. Additionally, issues related to clock stability—especially when the machine clock is unstable—need to be addressed and mitigated.

- Firmware Versioning and Compatibility Across RDOs
  The use of different firmware versions across RDOs could pose challenges for system maintenance and consistency during operation. A version control and compatibility strategy should be defined to minimize operational risks.

- General recommendation for CD2 readiness.
  It is recommended that all subsystems submit a comprehensive time schedule plan clearly indicating the current status and major milestones, accompanied by a detailed account of the allocated manpower resources, either by individual names or expressed in full-time equivalents (FTEs). This will ensure transparency, facilitate effective coordination across subsystems, and support timely monitoring of progress against the overall project objectives.

For dRICH too, easy (and wise) to do.
Good they are asking for milestones

Recommendations (II)

- Yes, the schedule assumptions for the fabrication of the electronics, data acquisition systems, and assembly plans appear reasonable and consistent with the overall detector schedule.

- Power Budgeting
  Clearly define the expected total power consumption of the detector, including all subsystems, to support infrastructure planning and risk mitigation.

- Power Distribution Tree
  Provide a detailed power-tree diagram showing power flow from sources to endpoints, including estimated losses at each stage.

- Cooling Budget & Thermal Management
  Develop a comprehensive cooling strategy, including thermal budgets. Ensure critical components (e.g., bPol) operate within safe temperature limits and are appropriately monitored.

- Wire Gauges & IR Drops
  Specify wire gauge selections and analyze voltage drops (IR drops) across all power lines to ensure reliable operation under load.

- Power-Up/Down Sequences
  Document safe power-up and power-down sequences to protect sensitive electronics and maintain system integrity.

- I2C Pull-Up Resistor Locations
  Review and specify the physical location of I2C pull-up resistors to avoid communication issues and ensure signal integrity.

- Detector Safety System (DSS) Overview
  Ensure to provide information documenting the Detector Safety System design, scope, and current status to demonstrate integration with overall safety planning.

- Time between SALSA2 and SALSA3 doesn't show any contingency.
  The team should account for more time between SALSA2 and SALSA3

- Timepix RDO
  Additional technical documentation and more structured planning are required in order to provide a clearer and more comprehensive overview of the project's progress and future direction

- dRICH
  The team should provide detailed information on the detector's cooling system, particularly in view of the high power consumption.

- EICROC ASIC
  We advise against changing the technology at this stage of the project as there maybe unforeseen impacts that could take long time to resolve, unless there is a strong motivation that would justify it.

These are good and general recommendations and they apply to dRICH too (power, DCS, masterpanel, ...)

Only point where dRICH is singled out. Not a surprise, both Fabio and Pietro have been "grilled" on this issue.

Previous recommendations

6. Have the recommendations from previous reviews been adequately addressed?

- The recommendations from previous reviews have been appropriately addressed.

This is good because it means we have been convincing on our dRICH talks! (and work behind)

Conclusions

dRICH went well through the Electronics & DAQ PDR
Need to plan in a more detailed way, good suggestions
Cooling is the burning issue

(a special thanks to A. Lonardo who attended all the PDR, providing material and answers on the spot about dRICH DAQ backend and the many who provide input to draft slides)