ePIC Collaboration Status and News

John Lajoie and Silvia Dalla Torre

ePIC General Meeting, August 18, 2023

TODAY AGENDA

45 **General Status and Updates**

Convenors: John Lajoie (Iowa State University), Silvia Dalla Torre (INFN, Trieste)

10:30 **ePIC Collaboration Status**

Speakers: John Lajoie (Iowa State University), Silvia Dalla Torre (INFN, Trieste)

Including also Projects news, slides kindly provided by Elke

10:55 **Committee Chair/Vic-Chair Elections**

Speaker: John Arrington (Lawrence Berkeley National Laboratory)

11:15 **Discussion**

Speakers: John Lajoie (Iowa State University), Silvia Dalla Torre (INFN, Trieste)

- **Not a dense agenda:**
  - Deep status review at the end of July in Warsaw
  - Vacation period (with some, even if limited, impact on the activity)
- **Nevertheless, INFORMATION MUST CONSTANTLY FLOW WITHIN ePIC**
  - this results in the today meeting

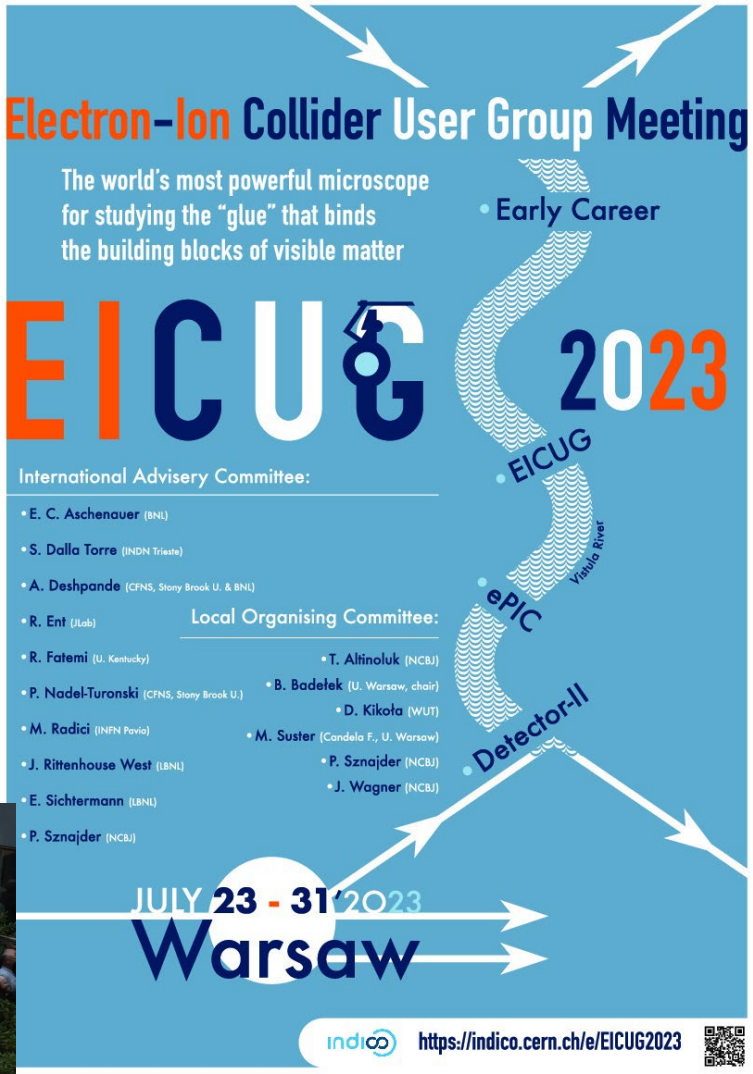
ePIC Collaboration meeting (Warsaw, July 2023)

The meeting in main figures:

- 110 participants in person
- 59 participants from remote
- 3 fully days
- 48 reports (37 in presence) + the CC meeting

(https://indico.cern.ch/event/1238718/)

Please, note: Here summarizing only about the ePIC meeting



Next ePIC Collaboration meetings

Collaboration meeting format

- The Collaboration is increasing in its level of integration
  → reconsider a format of only plenary sessions
  - Comments and suggestions about received in the context of the July meeting
  - Format discussed also with the Coordinators
- The new format resulting from these considerations
  - Duration: from 2.5-3 days → ~ 5 days
  - First days: a set of parallel sessions (still to be finalized: How many ? Duration ?)
  - Final days: plenary sessions including reports summarizing the parallel sessions

The next ePIC Collaboration meeting

- **Presently, ePIC plans two Collaboration meetings per year** (typically July and January)

- A call for proposal to host the January 2024 meeting was issued on July 20 with dead-line on August 4
- 4 proposals received:
  - A sign of vitality, interest and engagement!
  - e-mail interactions with the proponents to learn more details, some exchanges still ongoing
  - Thank you to all proponents:
    - **ANL**
    - **OTK/ORNL**
    - **Temple**
    - **Yale**
  - *Tentative dates* (also taking into account the academic calendars):
    - **January 9 (Tuesday)- January 13 (Saturday), 2024**
    - The hosting site will be selected soon (~ 1w) and promptly communicated

ePIC Collaboration, more opportunities for working together

advertised during the Warsaw meeting: **Workfests**

A "workfest" is a gathering of a small subset of people for a short, intense period of time to address specific issues.

- Emphasis is on making progress, not information exchange
- Several examples in 2023:
  - ORNL Clustering Workshop (April 11-14)
  - Imaging Barrel EMCal Workshop (June 12-16)
  - hpDIRC Annual Meeting (JLab, May 31-June 4)

- A coming example:

  ePIC Software & Computing, UIC, September 20–22

  (https://indico.bnl.gov/event/20159)

- **IMPORTANT** (partially missing in the past):
  - **prompt and wide advertisement** so that whoever within ePIC is interested can attend

ePIC Streaming Computing Model

An update on the **computing model requested at the next RRB** (Dec. 7-8, 2023)

- The design of the computing model is the responsibility of ePIC and its international partners, in concurrence with the host labs

- The ePIC Streaming Computing WG with the SCC team is coordinating the **discussion to develop the computing model**
  - Streaming Computing WG kickoff Tuesday, July 11th (https://indico.bnl.gov/event/19974/)
  - Next appointment: **UIC, September 20–22 (https://indico.bnl.gov/event/20159)**

- Working with EIC Computing and Software Joint Institute (ECSJI)
  - Amber Boehnlein (JLab) and Eric Lancon (BNL), co-directors
  - Emphasis on a partnership with ECSJI and ePIC
  - On-going regular meetings w/ePIC leadership
  - **A review of computing model prior to RRB**: October 19-20, 2023 @ GWU (as much as possible *in presence*)
  - Draft charge under discussion
- *Please, note: the ePIC Streaming Computing Model WG regularly meets on Tuesday at 9:00am ET (next meeting will be on August 22)*

NEWS from TIC

- two TIC meetings so far in August
  - *August 7 –* ***HGCROC & EICROC*** *(https://indico.bnl.gov/event/19415/)*
  - *August 14 –* ***MPGD trackers*** *(https://indico.bnl.gov/event/19416/)*

- *Coming meetings*

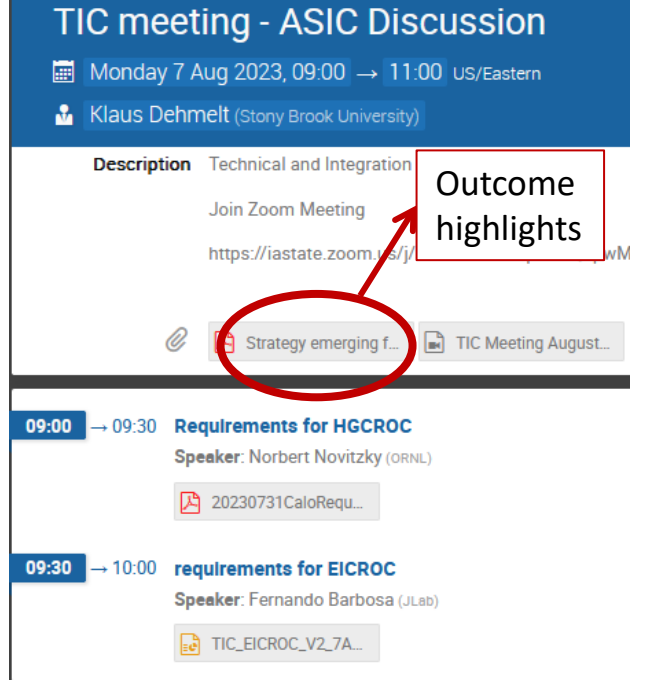
- **8/21** - Far backward, status and integration aspects

- **9/4**
  - FEE (others than EGCROC and EICROC), coupling with sensors and ASIC architectures
  - Cooling, a global approach

No TIC meeting on 8/28 *(overlap with the DAC review of Detector R&D)*

NEWS from TIC

*August 7 – **HGCROC & EICROC** (https://indico.bnl.gov/event/19415/)*



- ***Goal:*** *summarizing HGCROC and EICROC requirements → to identify where a common ASIC may be appropriate, and to provide a set of requirements to the Omega Group for the HGCROC, H2GCROC and EICROC.*
- ***Inputs:***
  - *TIC mtg.s on July 10 (HGCROC) and on July 17 (EICROC)*
  - *Norbert's and Fernando's reports*

- ***Emerging strategy, <u>calorimetry</u>***
  - *the **Forward HCal + insert, Barrel HCal, Barrel EMCal, and Backward HCAL** are very similar: a single ASIC (**H2GCROC**) can meet the requirements for these systems; a superset of requirements should be developed from the most demanding detector system in this category*
  - *The **backwards and forward EMCal** aim at very fine performance, with a very small constant term. Reachable with a dedicated ASIC (multiple SiPMs ganged together)? Also: a very large dynamic range of shower energies for the forward EMCal. They should **explore two options**: namely the usage of **H2GCROC** with the parameters dictated by the subset of the calorimeter subsystems in ePIC (described above) and a read-out chain based on discrete elements (**COTS**) following the developments in eRD109.*

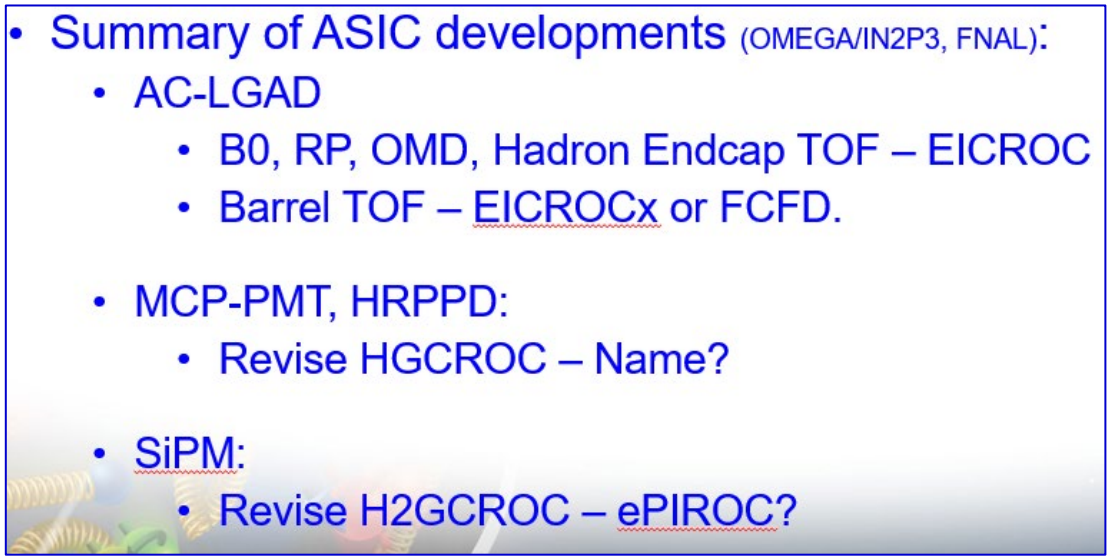
Overview of Calorimeters – SiPM

	Insert Calorimeter	Forward HCal	Forward ECal	Barrel HCal	Barrel ECal	Backward ECal	Backward HCal (TBD)
SiPM Size	1.3x1.3 mm Or 3x3 mm	1.3x1.3 mm And 3x3 mm	6x6 mm2	3x3 mm	3x3 mm	6x6 mm2	1.3x1.3 mm Or 3x3 mm
Voltage	38-45 V	50-53 V	33-47 V	38 V	38-42 V	40-46 V	38-45 V
Array of SiPM (summing)	-	5 or 10	2x2 Parallel	-	4x4 (Assembled)	2x2	-
Capacitance/ channel	320pF or 1280 pF	1.6-3.2 nF And 6.4-12.8 nF	10 nF	320 pF	500pF	2.5 nF	320pF or 1280 pF
Pixel/channel	7.3k Or 38k	13k-26k And 72k-144k	638k	40k	50k	160-360k	7.3k Or 38k
simulation Dynamic range	0.2 pC - 300 pC (TBD)	0.2 - 100 pC And 0.5 - 500 pC (TBD)	0.29pC-5.8 nC	1-52 pC	0.27pC - 400 pC	10-10,000pC (TBD)	0.1pC-320 pC (TBD)

NEWS from TIC

*August 7 – **HGCROC & EICROC** (https://indico.bnl.gov/event/19415/), cont.*

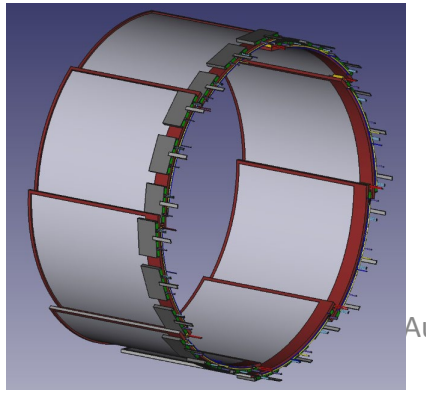
- ***Emerging strategy, AC-LGADs***
  - ***AC-LGAD Pixel sensors***
    - *similar characteristics and requirements in the Roman Pots, Off-Momentum Detectors, B0 trackers and forward ToF layer have similar characteristics → EICROC*
  - ***AC-LGAD Strip sensors***
    - *a different version of the EICROC, where the mean difference has been identified in the layout and implementation of the input electrodes: EICROCx ? Interesting alternative: the ASIC FCFDv2 (eRD109) → additional work required to determine the optimal approach*
- ***Emerging strategy, HRPPDs/MCP-PMT***
  - *A dedicated version of the current HGCROC (the existing HGCROC, not the SiPM-focused H2GCROC); the FCFDv2 is also a potential option → additional work required to determine the optimal approach*

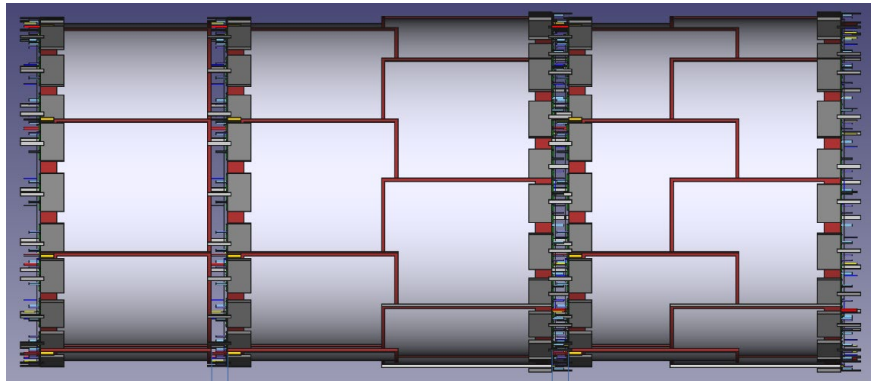


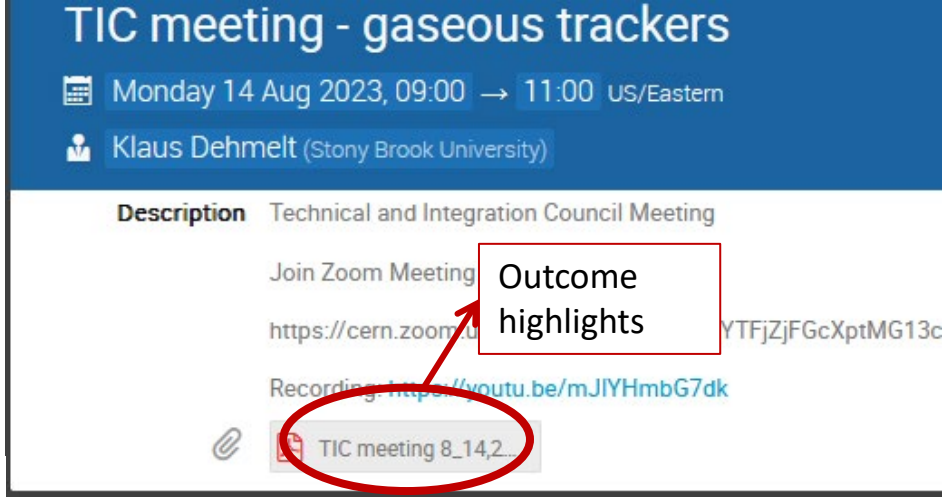
NEWS from TIC

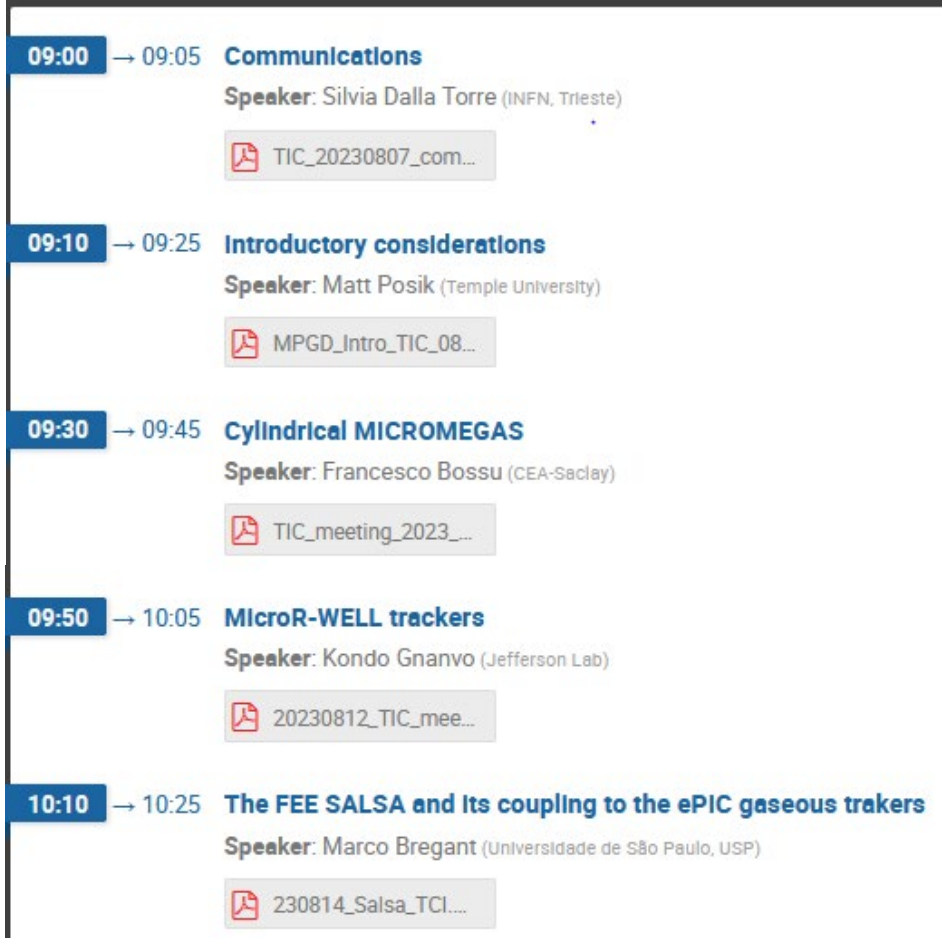
*August 14 – **MPGD trackers** (https://indico.bnl.gov/event/19416/)*

- ***Goal:** understand MPGD status and plans to identify points requiring specific attention and close follow-up*
- ***Inputs:** The rich and careful reports at the mtg*
- ***The layout of the three cylindrical MICROMEGAS (inner MPGD)***
  - *The important progress following the principle scheme defined only in June is greatly appreciated. The concept of a tiled approach to the modular MPGDs of medium size has been appreciated.*
  - *Remaining open questions:*
    - *How large is the overlaps between adjacent tiles related space requirement?*
    - *The tile services seem to consume all the clearance space between the cylinders, also needed by the services of the more inner subsystems.*
    - *Understanding the routing to the FEE of the signals from the coordinate different from z (parasitic capacitance, etc.)*
  - The open questions will be addressed among the MICROMEGAS groups, the tracking CC-WG conveners and the Project.





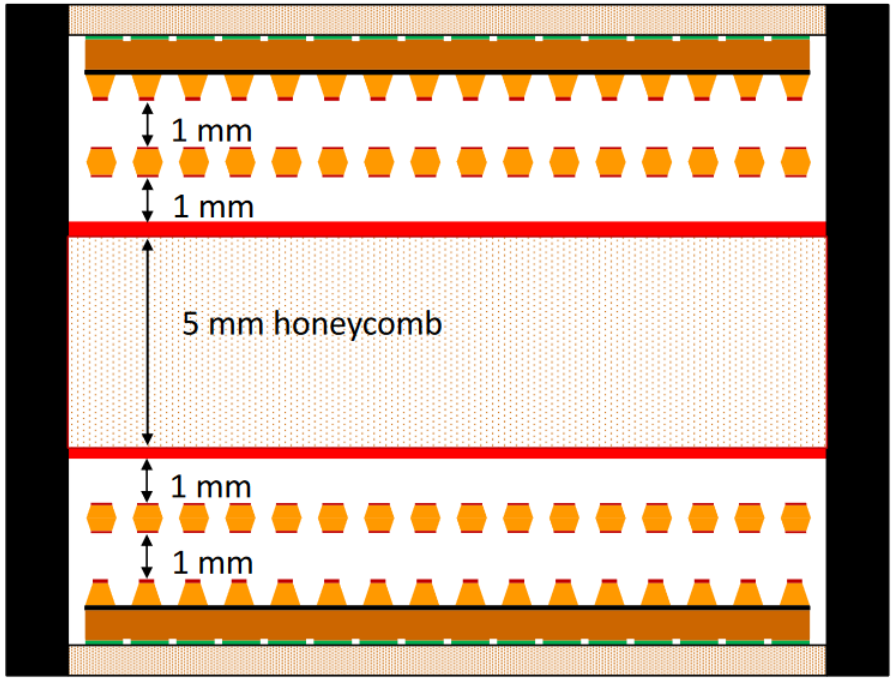




NEWS from TIC

*August 14 – **MPGD trackers** (https://indico.bnl.gov/event/19416/). cont.*

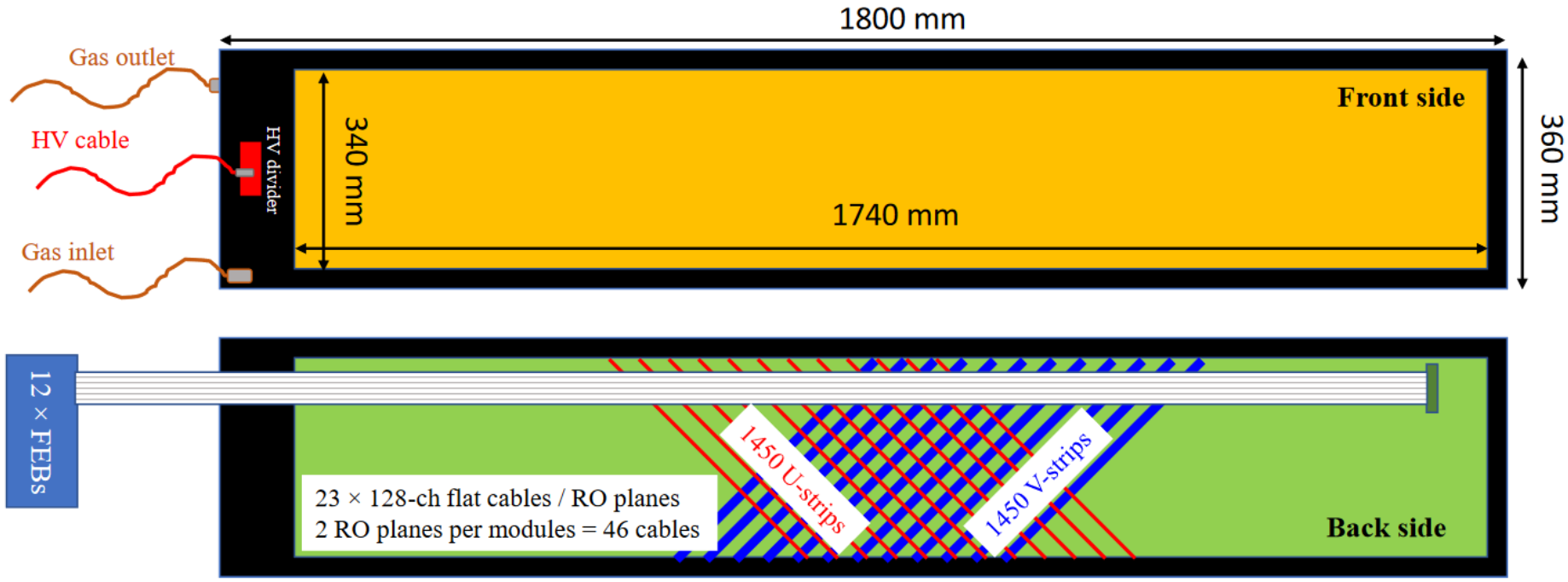
- ***microR-WELL and thin-gap approach (outer MPGD)***
  - *The thin-gap approach to improve the space resolution for inclined trajectories, which is driven by the pointing requirements of the PID detectors (further simulations needed).*
  - *A single thin-gap amplification can provide good efficiency if gas mixtures with heavy gasses (Xe, Kr) as main component are used. The recent shortage of these gasses raises the issue of risk regarding future procurement.*
  - *Therefore, a hybrid thin-gap option is considered: GEM + microR-WELL. This option is problematic: long R&D needed (3y estimated by the proponents), the opposite mechanical requirements by microR-WELL and GEM foils.*
- *It has been suggested:*
  - *To progress as soon as possible to quantify the needed space resolution via simulation studies (Matt Posik has taken responsibility to follow)*
  - *Is the present shortage temporary ?*
  - *Are less pure heavy gasses available? Can a more refined gas system overcome the purity limitations? Contact the LHC experiments to investigate their strategy to deal with this issue.*
- *Progress in accessing and overcoming this critical aspect should come from the contributions of the microR-WELL groups, the tracking CC-WG conveners, the Project and SP-Office.*



NEWS from TIC

*August 14 – **MPGD trackers** (https://indico.bnl.gov/event/19416/), cont.*

- ***Readout of the long trackers forming the outer layer.***
  - *It has been proposed to read-out from one single end of the tracker by coupling the FEE with the strip edges far from the readout electronics via long coaxial cables.*
  - *Concerns about this approach were put forward in the talk dedicated to the FEE ASIC SALSA, specifically the substantial capacitance due to cables. Fernando Barbosa has kindly agreed to further investigate this potential problem.*



EIC Project Update

Elke Aschenauer and Rolf Ent

Co-Associate Directors for the Experimental Program

ePIC General Meeting

August 18th 2023

Electron-Ion Collider

BROOKHAVEN NATIONAL LABORATORY

Jefferson Lab

U.S. DEPARTMENT OF ENERGY | Office of Science

Upcoming in your EIC Detector Arena

- July 5 + 6: Particle Id Detectors Interim Design Review ✓
  - Reviewers: Peter Krizan (U Ljubljana), Floris Keizer (CERN), Ana Amelia Machado (UniCamp), Koji Nakumura (KEK), Justin Stevens (W&M)
- July 21: Final Design Review of the PbWO4 Crystals for the ePIC Backward EM Calorimeter ✓
  - Reviewers: Eugene Chudakov (JLab), Dipangkar Dutta (MSU)
- August 28 + August 31: DAC Review of Detector R&D – had to split in two separate days to make it work with DAC
  - FY23 progress
  - FY24 continuation requests
- August 29 + 30: DOE CD-3A Design Review by DAC
- September 13 Final Design Review of the SciFi for cECal & fECal
- September 14 Final Design Review of the SiPMs for ECals, HCals & dRICH
- October 5 + 6: Final Design Review of Magnet (MARCO)
- October 10-12: DOE CD-3A Director's Review
- November 14-16: DOE CD-3A Independent Project Review
- December 7 + 8: 2nd Resource Review Board meeting @ GWU
- December (TBD): Preliminary Design Review of Far-Forward/Far-Backward Detectors

PbWO4 Crystals FDR

Final Design Review of the PbWO4 Crystals for the ePIC Backward EM Calorimeter

The Electron-Ion Collider (EIC) is a major facility, fully international in character, being designed and built at the U.S. Department of Energy's (DOE) Brookhaven National Laboratory (BNL) in partnership with the Thomas Jefferson National Accelerator Facility (Jefferson Lab). The accelerator and one general purpose detector will be constructed over the next 10 years as a DOE construction project augmented with non-DOE in-kind contributions. The ePIC collaboration in cooperation with the EIC project is designing the detector systems to meet the goals as outlined in the 2015 NSAC Long Range Plan. The detector design work is currently in full swing.

The Backward EM Calorimeter (EEEMCAL) will provide high-precision detection of the scattered electron that is critical to determine event kinematics at the EIC in the range of particle energies of hundreds of MeV to 18 GeV. The EEEMCAL is designed to be in the electron endcap of the EIC detector, at a distance of 175 cm from the EIC interaction point. It is installed around the EIC beamlines in a roughly cylindrical geometry. The particles of interest impinge on the front face of the detector and pass through a PbWO4 radiator with adapted geometrical dimensions to contain the major part of the electromagnetic shower. The produced scintillation photons are detected at the back of the radiator using an array of Silicon Photomultipliers (SiPMs) and readout with back- and front-end electronics. The detector is enclosed in a mechanical frame that provides services like thermal cooling, light, and thermal monitoring.

The EEEMCAL radiator consists of ~3000 PbWO4 crystals. These will be the base of a procurement based on the ongoing EIC EEEMCAL design that includes requirements, specifications, and control drawings. We are ready to proceed with the Final Design Review of the PbWO4 crystals for this ePIC detector subsystem.

EST	Topic	Presenter	Duration (Min)
8:00-8:20 AM	Introduction: Backward EMCal physics goals, requirements, expected physics performance with PbWO4	Alexander Bazilevsky	20
8:20-8:40 AM	Mechanical Design	Carlos Munoz	20
8:40-9:00 AM	PbWO4 Specs and QA	Tanja Horn	20
9:00-9:20 AM	Discussion	All	20
9:20-9:50 AM	Executive Session	Review Committee	30
9:50-10:00 AM	Close-out		10
10:00 AM			

Passed – planning in place, design sufficiently mature

Two recommendations are to improve overall design

Other LLP reviews will be very very similar

Committee: Eugene Chudakov (JLab), Dipangkar Dutta (M

Charge to the Committee:

The scope of this review is a
asked to respond to the follo

1. Are the EEMCAL tec

Findings: The requirements a

Comments: The PWO crystals

Recommendations: The project
procurement.

2. Are the plans for achiev
performance and construction sufficiently developed and documented for the present phase of the project? (I.e., are they commensurate with the initiation of the PbWO4 procurement?)

Findings: Yes, plans for the crystals are in place and well documented.

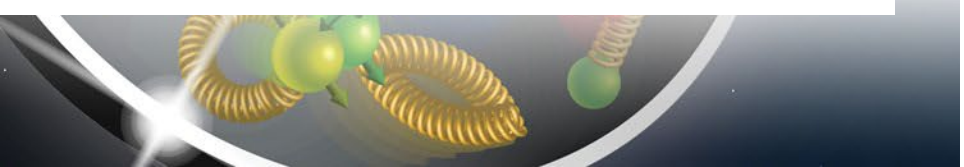
Comments: A) Non-pointing (flat) geometry may cause performance degradation at the edges

B) Although the current solutions seem to be the best available at this time, direct in-beam measurements of pi/e suppression would be beneficial for the whole project.

Recommendations: The following recommendations do not apply to the LLP and are only for the benefit of the final design optimization.

A) Calculations of the impact of the thermal gradients on detector performance caused by shower fluctuations should be performed.

B) The carbon-fiber mesh (or something similar to the final design) should be used in the prototype being tested for temperature stabilization.



...mendations: None

5. Are the plans for detector integration in the EIC detector appropriately developed to initiate the PbWO4 procurement?

Findings: Yes

Comments: None

Recommendations: The project should proceed with the PWO long lead procurement.

6. Have previous review recommendations been adequately addressed to initiate the PbWO4 procurement?

Findings:

Comments: not applicable

Recommendations: None

7. Have ES&H and QA considerations been adequately incorporated in the PbWO4 procurement planning? (This includes a quality assurance plan for receipt of material meeting specifications.)

Findings: QA has been developed

Comments: No comments about ES&H

Recommendations: None

8. Is the procurement approach sound and the procurement schedule credible?

Findings: Yes

Comments: No comments

Recommendations: None

We would appreciate receiving the committee's report within 14 days of the review's conclusion.

You will be supplied with the report from the earlier calorimetry preliminary design review, with the EEMCAL PbWO4 specifications table, with a copy of ongoing similar PbWO4 crystal procurements, and the crystal performance spreadsheet illustrating the quality assurance process of those crystals.

EIC Project Detector R&D

2024 https://wiki.bnl.gov/conferences/index.php/ProjectRandDFY24

Project:	eRD101	eRD102	eRD103	eRD104	eRD105	eRD106	eRD107	eRD108	eRD109	eRD110	eRD111	eRD112	eRD113	eRD114	eRD115
Title:	mRICH	dRICH	hpDIRC	Silicon Service reduction	SciGlass	Forward ECal	Forward HCal	Cylindrical MPGD	ASIC/Electronics	Photosensors	Si-Vertex	AC-LGAD	Si-Sensor Development and Characterization	pfRICH	Imaging Cal
Contact:	X. He (GSU)	E. Cisbani (INFN-RM1), M.Contalbrigo (U. Ferrara), A. Vossen (Duke)	G. Kalicy (CUA), J. Schwiening (GSI)	L. Gonella (B'ham)	T. Horn and .L. Pegg (CUA)	H.Z. Huang (UCLA), O. Tsai (UCLA)	Friederike Bock (ORNL)	K. Gnanvo (UVA)	Fernando Barbosa (JLab)	Y. Ilieva (SC), C. Zorn (JLab), J. Xie (ANL), A. Kiselev (BNL), Pietro Antonioli (INFN)	Nicole Apadula (LBNL)	Zh. Ye (UIC)	Grzegorz Deptuch (BNL)	A. Kiselev (BNL)	Maria Zurek (ANL), Sylvester Joosten (ANL), Zisis Papandreou (ANL)
Proposal/ Progress Report:	v1 (pdf)	v1 (pdf)	v1 (pdf)	v1 (pdf)	-	v1 (pdf)	v1 (pdf),	v1 (pdf)	v1 (pdf)	v1 (pdf)	v1 (pdf)	v1 (pdf)	v1 (pdf)	v1 (pdf)	v1 (pdf)

Review by DAC:

Monday August 28 and Thursday August 31.

Preliminary agenda: https://indico.bnl.gov/event/20113/

DAC Membership:

Edward Kinney (Chair)	Boulder CO
Ken Wyllie	CERN
Petra Merkel	FNAL
Antonis Papanestis	Rutherford Appleton Laboratory
Peter Krizan	U Ljubljana
Ana Amelia Machado	University of Campinas, Brazil
Heidi Schellman	Oregon State
Brigitte Vachon	McGill
Stefano Miscetti	INFN Frascati
Etiennette Auffray	CERN
Andrew White	U. Texas Arlington
Chi Yang	SDU China

new members

Remember:

exchange 1/3 of the committee every year

DOE CD-3A Design Review

Reviewers: DAC

EIC Detector Comprehensive Design Review – 6th DAC meeting

August 29-30, 2023

Charge

The EIC Detector Advisory Committee (DAC) provides advice to the EIC project managed by BNL in partnership with Thomas Jefferson National Accelerator Facility (TJNAF) on the experimental equipment and on overall matters with respect to the scientific collaboration, ePIC. This includes advice on the suitability of the experimental equipment for the EIC science, on cost, schedule and technical risk of detector components and design choices, and relative importance of technical tasks, on evaluation of complementary EIC detector technologies and the sub-detector integration, detector-interaction region integration, and detector commissioning, and on the EIC-related detector R&D.

Critical Decision-One (CD-1) for the EIC was awarded on June 29 2021 and allowed for release of Project Engineering and Design (PED) funds. This initiated the next phases of design of accelerator and detector. The 2022 EIC funding from the Inflation Reduction Act allowed the EIC project to stay on pace, with the EIC project aiming to receive CD-3A (start of long-lead procurements) early 2024 and CD-2/CD-3 (baseline approval and start of construction) roughly one year later.

The 6th and 7th DAC meeting will occur in the same week, where two days will be dedicated to a comprehensive design review of the ePIC detector where you will also hear the overall progress and status of the EIC Project, and two days dedicated to the review of the ongoing EIC project detector R&D and possible continuations.

For the 6th DAC meeting that serves as comprehensive EIC detector design review, the DAC is asked to answer the following charge questions:

- Given the detector progress over the last two years and the status of the ePIC detector, are the projected timelines of the Electron-Ion Collider detector feasible? Do there remain significant open detector technology questions?
- Are the requirements for the detector and their flow down sufficiently comprehensive for this stage of the project to complete the design of the various detector technologies?
- Are the interfaces between the elements of the design adequately defined for this stage of the project and to proceed with the detector long-lead procurement items?
- Is the design of these long-lead procurement items sufficiently advanced and mature to start procurement in 2024? Are the technical specifications complete?
- Is the projected design maturity of the further detector components likely to be accomplished by the end of 2024 for CD-2 and CD-3?
- Is the overall schedule for completion of the design, production, and installation of detector components realistic?

We welcome any other suggestions you can make for additions and changes that will improve the quality of the EIC detector design. Note that there is no dedicated charge element related to detector R&D and their risk mitigation as the DAC will separately review and advice on this.

The committee is requested to organize their assessment in terms of findings, comments, and recommendations and provide a written report by September 30, 2023.

ET	WBS	Topic	Presenter	Duration (Min)
9:30-10:00		Project Overview	Jim Yeck	30
10:00-10:45	6.10.01	Detector Overview and Requirements	Elke Aschenauer/ Rolf Ent	45
10:45-11:00	6.10.01	Requirements and Interfaces Flow	Walt Akers	15
11:00-11:45	6.10.01/6.10.10	CAD status & Infrastructure, Integration and Installation	Roland Wimmer/ Rahul Sharma	30
11:45-12:00	6.10.02	Detector R&D Status and Milestones	Thomas Ullrich	15
12:00-12:30	6.10.07	Magnet	Renuka Rajput-Ghoshal	30
12:00 – 13:00		*Break*		30
13:00-13:30	6.10.03	Tracking Detectors	Brian Eng	30
13:30-14:00	6.10.04	Particle Identification Detectors	Benedikt Zihlmann	30
14:00-14:30	6.10.05	Electromagnetic Calorimetry	Alexander Bazilevsky	30
14:30-15:30		Executive Session	DAC members	60
15:30		*Adjourn*		

ET	WBS	Topic	Presenter	Duration (Min)
9:00-9:30	6.10.06	Hadronic Calorimetry	Alexander Kiselev	30
9:30-10:00		Vacuum, Backgrounds, Machine-Detector Interface	Elke Aschenauer	30
10:00-10:30	6.10.11	Interaction Region integration and Ancillary Detectors	Yulia Furletova	30
10:30-11:00	6.10.14	Polarimetry	Oleg Eyser/ Dave Gaskell	30
11:00-11:30	6.10.08	Electronics	Fernando Barbosa	30
11:30-12:00	6.10.09	DAQ and Scientific Computing	David Abbot/ Jeff Landgraf	30
12:00-12:15	6.10.12	Pre-Ops planning	Elke Aschenauer/ Rolf Ent	15
12:15-12:45		*Break*		30
12:45-15:00		Executive Session		135
15:00-15:30		Closeout		30
15:30		*Adjourn*		

Follow up on recent ePIC technology choices

The path to integrate the recent technology changes, Barrel Ecal and backward RICH, by ePIC into the EIC Project baseline

Remember: five-step change control process

1. The detector collaboration initiates a possible change in baseline scope
2. The collaboration technical board or equivalent ensures the change is consistent with the NAS science requirements and initiates the change request

→ prepare input for the TCCB
detailed changes in cost, schedule and risk → implement in P6
science and technical justification for the change ← input from ePIC
started with backward RICH as it is a less complex case

3. The detector TCCB collects wide input, discusses, and gives advise
4. The Project Technical Director gives approval
5. The EIC Management Team needs to approve the formal baseline change control

→ process for both detectors needs to be complete by the DAC technical design review

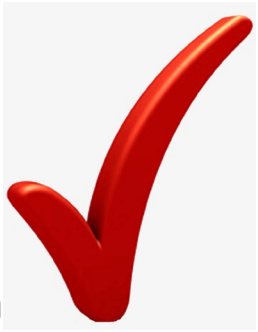
Follow up on recent ePIC technology choices

backward RICH:

- fully integrated in P6 (changes to WBS 6.10.03 and 6.10.08)
  - ➢ no changes in either cost, schedule or risk

→ no change request needed

→ documented change in detector technology through filing a record of decision



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Electron-Ion Collider
Record of Decision

TITLE	pfRICH for backward PID in ePIC
PREPARER	Beni Zihlmann
NUMBER (Supplied by SEG)	EIC-ROD-011
DATE	August 7, 2023
AFFECTED WBS/PROJECT AREA	06.10.04.03 mRICH/pfRICH, 06.10.08 Electronics
STATEMENT OF DECISION (Summary, 1-2 sentences):	
The request by the ePIC collaboration to switch from mRICH to pfRICH as solution for the backward PID is found to have minimal impact on cost and schedule for the project.	

Description/Purpose:

The ePIC collaboration selected a proximity-focusing Ring Imaging Cherenkov detector (pfRICH) detector as base line detector technology to provide the required particle identification (PID) in the backward region. A review panel was assembled by the ePIC collaboration to guide the detector technology choice. The review report can be found at:

https://indico.bnl.gov/event/18499/attachments/46114/79362/ePIC_bRICH_Report.pdf.

Subsequently, the ePIC leadership (the spokespersons and a proto-Executive Board) provided a recommendation to the Institutional Board of the ePIC collaboration, as outlined here:

https://indico.bnl.gov/event/19156/contributions/75760/attachments/47144/79965/detector_recommendations.v1.pdf.

The ePIC collaboration adopted this detector technology choice. This process serves as the first two steps of a detector change process, in that the detector collaboration initiates a possible change in baseline scope and a collaboration technical board or equivalent ensures the change is consistent with the NAS science requirements and initiates the change request. It then moves to the EIC project for further consideration.

The pfRICH replaces the current modular RICH (mRICH) PID detector choice that was earlier assumed in the WBS and P6 of 06.10.04.03. This detector technology change has impact on both the backward particle identification detector scope itself (06.10.04.03) and on the Electronics (06.10.08) scope due to the change in readout channels. There was no impact identified on Data Acquisition and Computing scope (6.10.09) and Detector Infrastructure scope

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Electron-Ion Collider
Record of Decision

(6.10.10) due to the close similarities of the two pfRICH and mRICH choices. P6 was used to estimate the cost and schedule impact to establish a direct cost and schedule comparison.

It is found that the detector costs (06.10.04.03) for the new system will lead to an overall cost decrease of 3.6% or $153,760 while the electronics part (06.10.08) will lead to an overall cost increase of 9.2% or $223,278 due to the increase in detector readout sensors. This leads to a total cost increase for the detector including electronics of $69,518, or 1% of the present 6.10.04.03 P6 cost. There is no impact on schedule as the design maturity of both detector choices is similar, and the estimated construction and assembly times for both detectors are similar. Either can be constructed well in advance of their scheduled required installation dates into the full 06.10 detector. The pfRICH and mRICH detector technologies are similar in many areas, including their photon-sensor readout choices. Therefore there is no new risk introduced and there is no change to the risk registry.

Given the minimal change to P6, it is decided to adopt the pfRICH detector technology choice.

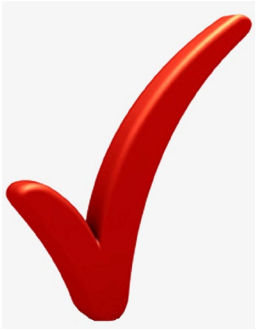
WBS Detector delta: 06.10.04

WBS Electronics delta: 06.10.08

APPROVALS:

	NAME	TITLE	DIGITAL SIGNATURE
Preparer	Beni Zihlmann	6.10.04 CAM	DocuSigned by: Benedikt Zihlmann D0F44B58B52F46C... 8/14/2023
Reviewer	Fernando Barbosa	6.10.08 CAM	DocuSigned by: Fernando Barbosa D7B91FE2076C470... 8/15/2023
Reviewer	Elke Aschenauer	EIC Co-Associate Director for the Experimental Program	DocuSigned by: Elke Aschenauer F78CBAC47DA141D... 8/14/2023
Reviewer	Rolf Ent	EIC Co-Associate Director for the Experimental Program	DocuSigned by: Rolf Ent BE94565C108F4F3... 8/15/2023
Approver	Ferdinand Willeke	Deputy Project Director / Technical Director	DocuSigned by: Ferdinand Willeke 44DC15F43EAA4F7... 8/15/2023

Follow up on recent ePIC technology choices



Barrel ECal:

- fully integrated in P6 (changes to WBS 6.10.05 and 6.10.08)
  - WBS 6.10.05 = P6 cost ($19.483M) + $2.447M
  - WBS 6.10.00 = P6 cost reduced by $0.358M

→ Expect imaging calorimeter costs to be P6 + $2.089M

→ Sci-Glass based calorimeter due to geometry change would also require P6 + $4.980M
($4.980M was already added to 11/28/22 in EIC scope cost changes list)

→ Discussed in EMT and it was decided we can do here also a Record of Decision

→ Submitted for signatures this week

Where to find Information

- Wiki-page: https://wiki.bnl.gov/EPIC/index.php?title=Project_Information
- Public Sharepoint: ePIC
- Detector Requirements: https://eic.jlab.org/Requirements/
- Geometry Database: https://eic.jlab.org/Geometry/Detector/Detector-20230108185912.html
- Updated ePIC figures: Updated ePIC Figures