Report from the ePIC Technical Coordinator Office

by the TC-Office:
Silvia Dalla Torre, Prakhar Garg, John Haggerty,
Oskar Hartbrich, Matt Posik

ePIC meeting
BNL, January 20-23, 2026

TC-Office composition

- **Silvia Dalla Torre**, continuing
- **Prakhar Garg**, continuing
- **John Haggerty**
  - **John joined the TC-Office in May 2025**
  - Precious contribution to TC-Office thanks to his large experience in coordination of hardware activities and major effort for the preTDR progress

    thank you John for accepting to serve within the TC-Office !

- **Oskar Hartbrich**, continuing
- **Matt Posik**
  - Solid contribution, particularly following the tracking matters, till October 2025:

    thank you Matt for the long and fruitful serving within the TC-Office !
  - Matt not stepping back for a different scientific project: he more and more engaged in activities for ePIC

OUTLOOK of this report

- **TC-Office mission**
- **TC-Office activity highlights, last 6 months**
- **Detector Status in a global view**
- **TC-Office, 2026 planning**

TC-Office's mission

- CONTRIBUTING TO OPTIMIZE THE DETECTOR BASELINE
  - **By identifying challenges and supporting the DSCs/Collaboration in overcoming them**
  - **Promoting detector cross-cutting aspects**
  - **Recommendations in detector matter to SP-Office and the CC**
- DISSEMINATION OF COLLABORATION-RELATED INFORMATION
  - **Believing in the beneficial role of information dissemination, supporting it in the detector sector within the ePIC Collaboration**
- COOPERATING WITH PROJECT IN DETECTOR MATTER
- SUPPORTING DSC NEEDS
  - **The most relevant example: coordination of testbeam needs**
- SERVICE JOBS
  - **The most relevant example: serving for the preTDR** (preTDR will be discussed on Friday morning)

OUTLOOK of this report

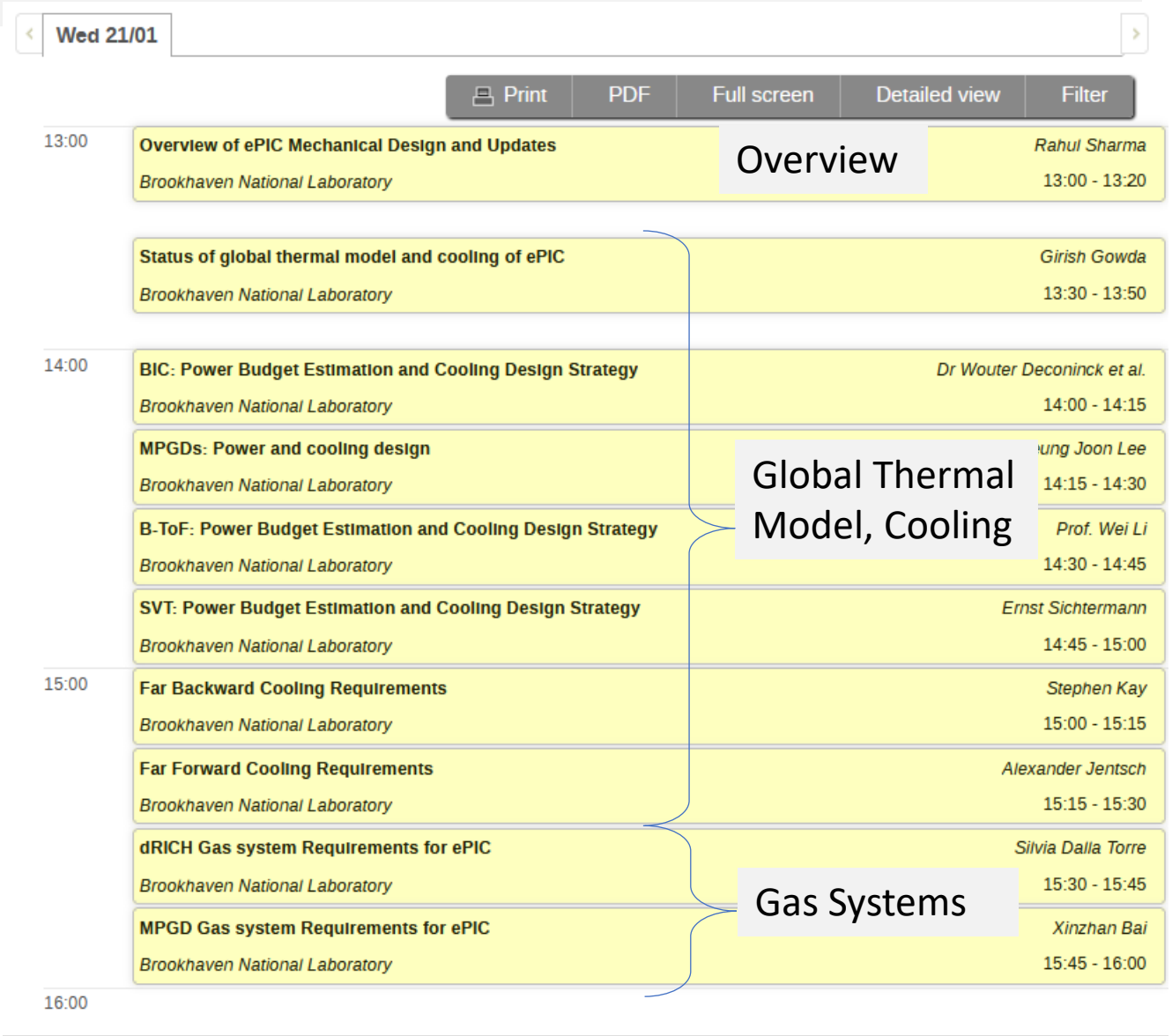
- **TC-Office mission**
- **TC-Office activity highlights, last 6 months**
- **Detector Status in a global view**
- **TC-Office, 2026 planning**

TC-Office for Mechanics and Integration

- ***Monthly updates at the TIC meetings***

  (Sep 8th, Oct 6th, Nov 5rd)

- ***Supporting the Engineer Team/DSCs synergies:***
  - *The coming **Mechanics and Integration Workfest**, tomorrow afternoon (Credit: Prakhar)*



TC-Office – Support the detector optimization

***REMINDER*: Decision flow**

1. Baseline Modifications for detector optimization initially **elaborated within DSCs**
   - Based on *simulation* on the physics impact and *technical studies*
2. Presented and discussed at **Technical and Integration Council (TIC) meetings** (iterating when improved proposal maturity may be beneficial) → **TIC RECOMMENDATION**
3. **Different paths** according to the modification entity:

- ***Modest modifications:***
  - Spokesperson Office approval, in consultation with the Project Management

- ***Substantial modifications:***
  - Spokesperson Office submits to Collaboration Council for decision
  - SP-office requests to Project management to start a **Change Control Process**

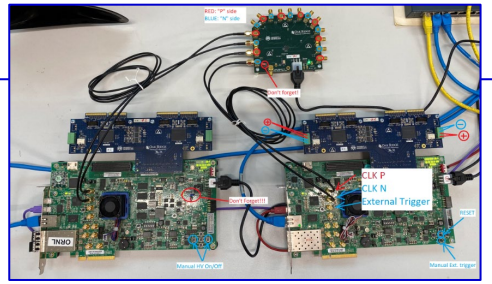
TC-Office – Support the detector optimization

Baseline Modifications, a recent case:

CALOROC layout

- CALOROC: the FEE ASIC for ePIC Calorimetry
- 36 ch.s instead of 72 ch.s
- Examined:
  - Technical merits;
  - Flexibility in PCB layout; Compatibility with the different Calorimeters;
  - Costs (not significant difference);
  - Risks

→ **TIC RECOMMENDATION : less dense version (36 ch.s) (Sep 29th, 2025)**



Electron-Ion Collider
Record of Decision

TITLE	36 Channel CALOROC ASIC
PREPARER	Fernando Barbosa
NUMBER	EIC-ROD-051
DATE	November 21, 2025
AFFECTED WBS/PROJECT AREA	6.03.01.07 Detector Electronics
STATEMENT OF DECISION:	

The number of readout channels of the CALOROC ASIC (Application Specific Integrated Circuit) for readout of calorimeters with SiPM sensors is 36 channels.

Description/Purpose:

This document summarizes the recommendation and rationale for selecting the optimal channel count of the CALOROC front-end ASIC. The current design can be implemented in two main configurations: a 36-channel version or a denser 64/72-channel variant. The latter would effectively consist of two nearly independent chips within the same BGA package, making the device physically more compact than the 36-channel version.

Each configuration impacts the integration with the LpGBT readout, as well as the overall board complexity, cost, and development schedule. In the FEC12 configuration, the LpGBT can accommodate up to six 1.26 Gbps data inputs. For the CALOROC architecture, each block of 18 channels is connected to one such 1.26 Gbps data line, defining the fundamental granularity of the readout interface. Consequently, the 36-channel chip would operate with two data lines, typically in a 3:1 ratio with the LpGBT chip. In contrast, the 72/64-channel version would establish a one-to-one correspondence with the LpGBT, as the individual Front-End Boards (FEBs) would be physically separated.

The increased complexity of the higher channel-count design implies that a full 72-channel implementation may not be feasible; therefore, the total must be reduced to 64 channels. While the 64-channel version would offer a more compact solution, the corresponding printed circuit board layout and testing procedures would become more challenging. Additionally, this configuration would require an extra engineering run.

Page 1

Electron-Ion Collider
Record of Decision

The following table summarizes the main quantitative and qualitative comparisons.

Aspect	36-Channel Version	64/72-Channel Version
Channel coverage per FEB	36 / 72 / 108 channels	64 (72) channels
LpGBT ratio	3 : 1	1 : 1
Physical layout	More space, less dense routing	More compact, higher trace density
PCB complexity	Simpler layout	More complex design
Output bandwidth	10 Gbps (same)	10 Gbps (same)
Power consumption	0.7 W / 1.4 W / 2.1 W	1.4 W
Estimated yield	~90%	~81%
Estimated part count	~6700 pcs	~3700 pcs
Total cost (relative)	108% (536k extra)	100% baseline
Engineering run	Ready sooner, no new mask	Needs new mask (+$250k)
Mechanical fit	Fits with margin	More compact, tighter fit
Development risk	Lower – proven design	Higher – may need shrink to 64ch
Schedule	Available sooner	Delayed by new run

Conclusion

While the 64/72-channel version offers higher compactness and modest cost savings, the **36-channel CALOROC represents a faster, lower-risk, and more versatile path** toward deployment. It builds upon the existing infrastructure and provides sufficient channel cover- age without introducing additional service requirements or engineering delays, making it the superior near-term choice for calorimeter readout system integration and testing.

Moreover, the available board area comfortably accommodates the 36-channel design, ensuring that there is virtually no drawback associated with the lower channel count in terms of space utilization or mechanical integration.

The ePIC Technical Coordination Committee (TIC) of the ePIC collaboration approved the recommendation of the Electronics & DAQ Working group on 29 September 2025 on the adoption of the 36-channel CALOROC as the baseline design for calorimeter systems.

Page 2

Electron-Ion Collider
Record of Decision

APPROVALS:

	NAME	TITLE	DIGITAL SIGNATURE
Preparer	Fernando Barbosa	Detector Systems, Chief Electronics Engineer	Signed by: Fernando Barbosa 11/22/2025
Reviewer	Silvia Dallatorre	Deputy ePIC Spokesperson	Signed by: Silvia Dalla Torre 12/9/2025
Reviewer	John Lajoie	ePIC Spokesperson	Signed by: John Lajoie 11/24/2025
Approver	Rolf Ent	EIC Co-Associate Director for the Experimental Program	Signed by: Rolf Ent 12/9/2025
Approver	Elke Aschenauer	EIC Co-Associate Director for the Experimental Program	Signed by: Elke Aschenauer 12/9/2025

Electron-Ion Collider
Record of Decision

TITLE	36 Channel CALOROC ASIC
PREPARER	Fernando Barbosa
NUMBER	EIC-ROD-051
DATE	November 21, 2025
AFFECTED WBS/PROJECT AREA	6.03.01.07 Detector Electronics
STATEMENT OF DECISION:	

The number of readout channels of the CALOROC ASIC (Application Specific Integrated C
readout of calorimeters with SiPM sensors is 36 channels.

APPROVALS:

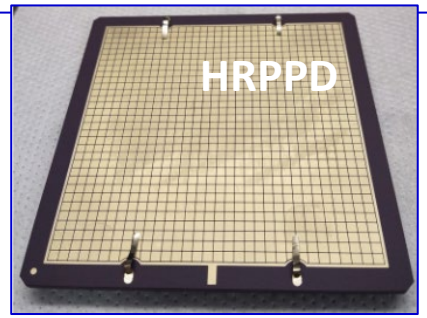
	NAME	TITLE	DIGITAL SIGNATURE
Preparer	Fernando Barbosa	Detector Systems, Chief Electronics Engineer	Signed by: Fernando Barbosa 11/22/2025
Reviewer	Silvia Dallatorre	Deputy ePIC Spokesperson	Signed by: Silvia Dalla Torre 12/9/2025
Reviewer	John Lajoie	ePIC Spokesperson	Signed by: John Lajoie 11/24/2025
Approver	Rolf Ent	EIC Co-Associate Director for the Experimental Program	Signed by: Rolf Ent 12/9/2025
Approver	Elke Aschenauer	EIC Co-Associate Director for the Experimental Program	Signed by: Elke Aschenauer 12/9/2025

TC-Office – Support the detector optimization

Baseline Modifications, present and coming cases:

Photosensors for hpDIRC

- Baseline: Photek MCP-PMT
- Alternative: HRPPD by INCOM, used in the pfRICH
- Being considered:
  - hpDIR performance
  - Costs
  - Production timelines
- **Process started on October 20th, on going**
- **HRPPD in magnetic field, TIC mtg Jan 12**



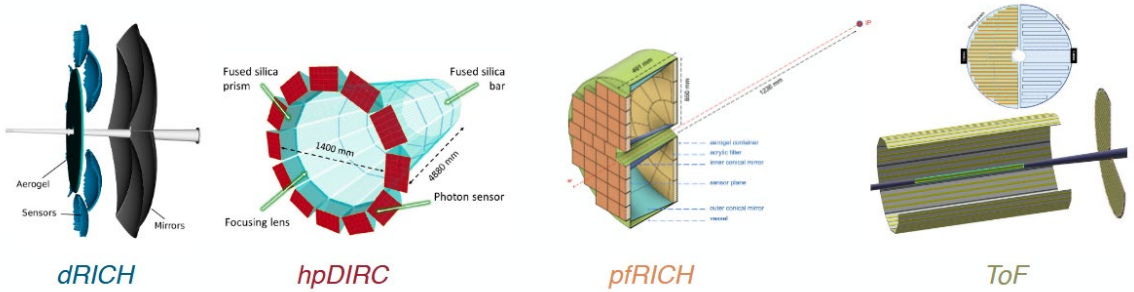
Coming soon:

EEEMCal read-out: COTS approach vs CALOROC

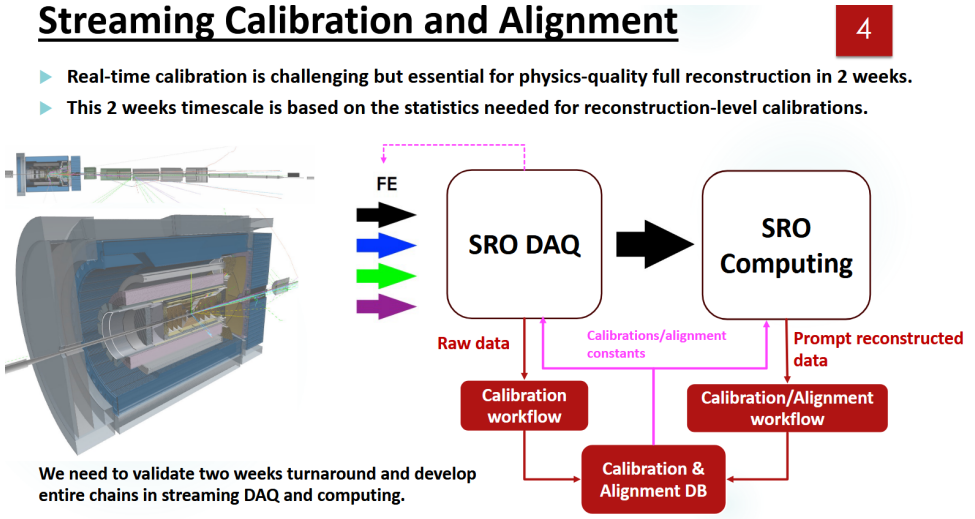
LFHCAL insert

Crosscutting activity: TC-Office / SCC

- ***TIC meeting - Joint SC-TC PID meeting (Sep 22)***
  - Status of PID systems for preTDR
  - Status and Plans for PID Reconstruction, all PID subsystems
  - Data Model



- ***SRO and subsystem alignment and calibration***
- ***First step on Dec 1:*** *The ePIC Computing Model and Calibrations 30m (Taku Gunji)*
- *Second step at the SRO workfest*
- *Third step: DSC feedback coming in March*



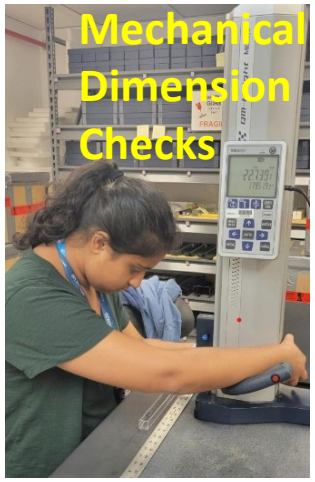
TC-Office – test beam coordination (credit to Oskar)

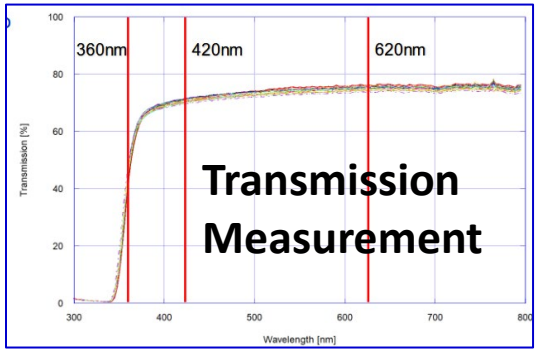
- ***Coordination started at the end of 2024 with some hesitation from DSCs***
- ***Consolidated over 2025***
- ***Including:***
    - Checking the planning and preparation status for testbeams (dRICH, MPGDs, LFHCAL)
    - Organizing reports from recent testbeam (dRICH, MPGDs, LFHCAL, AC-LGADs at Jlab)
    - **Coordinating the testbeam request to maximize synergies and outcome:**
        - **Particularly successful for 2026 testbeam planning at CERN**
        - **Accommodating : BIC, LFHCAL, dRICH, pfRICH, RPs + MPGD via DRD1**

TC-Office - dissemination of DSC highlights

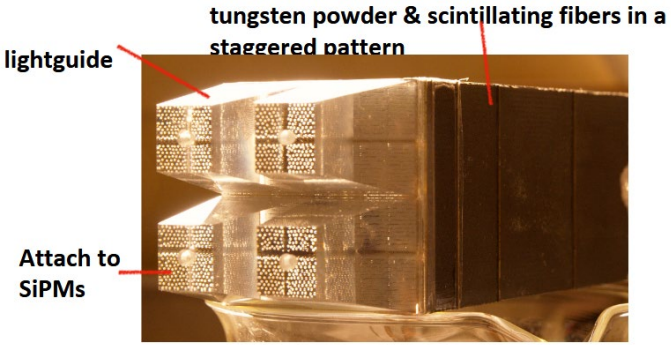
First QC of component deliverables (early procurement following CD3A approval) 1/2

- **First PbWO4 crystals (Jul 28)**



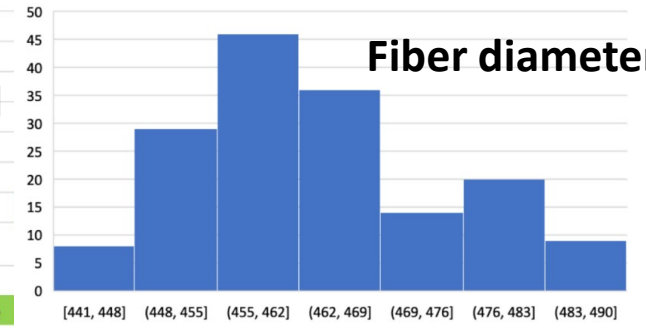


- **First SciFis for the FEMC (Jul 28)**



Preform ID	LY	% to Ref. Sample	
44776A	1.84	Reference Sample	
48706	1.68	91%	
48733	1.73	94%	
48924	1.96	107%	
48697	1.88	102%	
48727	1.8	98%	
48784	1.86	101%	
48700	1.84	100%	
48777	1.92	104%	
	Average LY	99.60%	with respect to Ref. sample

Light yield

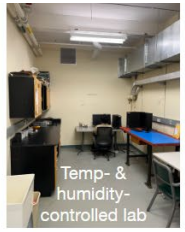


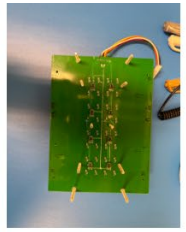
TC-Office - dissemination of DSC highlights

First QC of component deliverables (early procurement following CD3A approval) 2/2

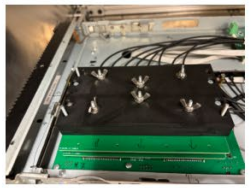
- **First SiPMs for LFHCal (Nov 3)**

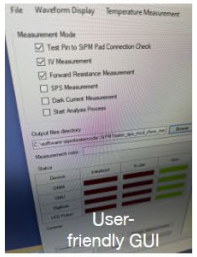
SiPM quality control





- Debrecen team contributed hardware and software for testing 32 SiPMs at once, ~45 mins



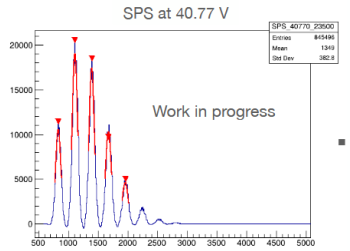


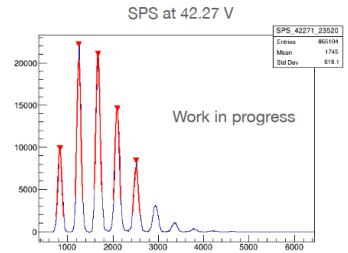
TIC Meeting, 11/3/2025

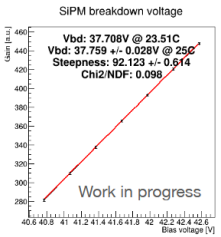
Isaac Mooney, Yale / BNL / CFNS

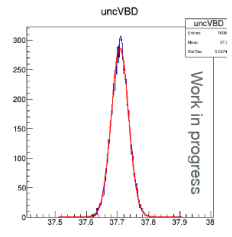
SiPM quality control: early results

$V_{bd} = 37.76 \pm 0.03$ V









TC-Office - dissemination of DSC highlights

As, usual reports about main DSC workshops (Aug 4)

- **SVT working meeting at SBU –**

  July 9–11,2025

SVT working meeting

9–11 Jul 2025
Department of Physics and Astronomy, Stony Brook University
US/Eastern timezone

Day 1: time-blocks related to sensor and ancillary asic; powering; cooling

Day 2: time-blocks related to electrical services; integration

Day 3: time-blocks related to inner barrel, outer barrel, disks; simulations

Dedicated time for discussions and action items every day,

- **10th DIRC@EIC Annual Meeting**

DIRC Annual Meeting

26 Jun 2025, 08:00 → 2 Jul 2025, 18:30 US/Eastern

Day	Date	Morning		Afternoon	
Thursday	June 26	TDR		Lens tests at ODU	hpDIRC ePIC simulation
Friday	June 27	Sensors	Machine Learning based Simulations	hpDIRC ePIC simulation	Generic R&D
Saturday	June 28	hpDIRC ePIC simulation	QA and Assembly	CRT	
Sunday	June 29	BaBar bar box		QA and Assembly	
Monday	June 30	NIM paper		Electronocs	BaBar bar box
Tuesday	July 1	ePIC Tracking	Mechanical Design	Papers and documentation	
Wednesday	July 2	miniDIRC		TDR	

OUTLOOK of this report

- **TC-Office mission**
- **TC-Office activity highlights, last 6 months**
- **Detector Status in a global view**
- **TC-Office, 2026 planning**

The ePIC detector, progress scrutinized

- June 11-13, 2025: **10th DAC meeting**

> The DAC has been impressed by the very substantial progress across many areas of the ePIC Detector. We see a real convergence towards the end of the R&D phase and the transition to the PED phase.

- **From the close-out of the 10th DAC meeting (**June 11-13, 2025):

> Charge question #5
>
> **Will the detector be ready for start of construction by late 2026?**
>
> YES for the 2026/2027 timeframe.

- **Next important verification appointment:**

  Director's Review of the EIC Detector (ePIC) Subproject to Assess Baseline Readiness

  February 3-5, 2026

  please, note:

  the preTDR Version 3.1 a relevant input to access the ePIC Detector readiness

The ePIC detector, progress implicitly recognized

DOE IPR Charge for April 28-May 1, 2026

IPR = Independent Project Review

Charge items 1-3, out of 6:

1. Is the project team effectively executing the work, including long-lead procurements? Is the project positioned to complete long-lead procurements within the established schedule and cost baseline? Are technical issues across all subprojects appropriately and proactively addressed?
2. **Is the project team on track to present performance baselines for the first two subprojects it has proposed, the Accelerator Storage Rings and Detector subprojects, by the end of 2026? Is the team making adequate progress developing the performance baseline for the other subprojects it has proposed? Is each subproject scope well and logically defined? Are the subprojects ordered and phased optimally? Are the schedules and cost estimates credible for the current stage of each subproject? Do plans include adequate scope, schedule, and cost contingency?**
3. Are the key performance parameters and scope for each subproject well documented, traceable, reasonable, and justifiable? Does the roll-up of subproject scope unambiguously and progressively elaborate a complete and responsive Electron-Ion Collider facility in an asset-oriented hierarchy? Are subproject interfaces understood and clearly delineated at this stage of design? Would attainment of the key performance parameters of all subprojects indicate delivery of the mission need?

The ePIC detector, progress implicitly recog

DOE IPR Charge for April 28-Ma

Charge items 1

3.

delivery of the mission

Electron-

ePIC biweekly meeting January 9th, 2026

Nevertheless, important challenges still in front of us towards CD2, addressing DSCs and cross-cutting all ePIC domains.

Mentioned in the following, reconsidered on Friday in the preTDR context.

Indications for 2026 Collaboration priorities

Subsystems

- **Design consolidation by *(real scale)* engineering articles operated in labs and test beams *(as much as possible with final FEE ASICs)***
  - Extract **sensor response parameters** in realistic conditions , including sensor/electronics noise
  - They also act as mockup exercises, which help in **identifying elements and details forgotten or requiring optimization**

- **Subsystem performance by simulation** extracted
  - Using more and more **realistic response parameters** (discussed above);
  - In the **context of the overall detector** (= within EICRecon);
    - Improving reconstruction software;
  - Using **physics events** (not only particle guns)
  - Including **background** (physics background and noise, when relevant)

Indications for 2026 Collaboration priorities

ePIC Detector

- **Detector holistic performance** studying key physics channels
  - Move the weight from studies without background complement by a preliminary exploration of the results obtained with background to **making the studies with background**
  - To this end**, continuing the coordination with the simulation campaigns** is needed
  - The improvement in the subsystem simulation will also support more and more realistic studies of the detector holistic performance

Indications for 2026 Collaboration priorities

Flexibility for quick exercises

- Need to **facilitate** specific simulation **studies beyond the main and robust official ePIC software**:
  - Test of algorithms;
  - Effect of layout modifications;
  - Performance using different sensor parameters.

- These exercises are needed for:
  - Detector optimization;
  - Decisions related to subsystems;
  - Requested by the project for accelerator development

- A **strategy** should be designed and implemented to move in this direction:
  - A crucial point is making **quick** testing possible
- A dedicated task force to design/implement this strategy?

OUTLOOK of this report

- **TC-Office mission**
- **TC-Office activity highlights, last 6 months**
- **Detector Status in a global view**
- **TC-Office, 2026 planning**

TC-Office 2026 planning

- In cooperation with the concerned DSCs and CC WGs, TC-Office will bring to maturity the cases where **baseline modifications** are suggested. To this end TC-Office organizes, according to needs, dedicated preparatory meetings followed by TIC meetings capable to provide **Recommendations** when the assessment reaches full maturity (cases presently foreseen: DIRC photosensors, EEEMCal electronics, LFHCal insert).

CONTINUATION OF AN ONGOING ACTIVITY

- In cooperation with the concerned DSCs and CC WGs, TC-Office promotes the **check of performance** (subsystems and subsystem components) by verifying whether subsystem **requirements** are met versus the official requirements as reported in the preTDR, chapter 2. Part of this activity also requires joint effort with physics/analysis coordinators and teams.

RELATED TO PATH TOWARS CD2

- Contribute to the **fast quasi-real-time implementation of the mechanical modifications in the simulation package** in full synergy with SCC.

NEW

TC-Office 2026 planning

- Establishing an informative link with the R&R activity starting at the beginning of 2026 and the ePIC Collaboration. This is particularly relevant for items like f.i. lab spaces that directly concern the DSC activities. Potential opportunities that ePIC DSCs cannot miss.

NEW

- Continuing in testbeam coordination, following a successful path.
- Facilitating the **bridge between DSCs and S&C/PACs** on all matters that will require cooperative effort.

CONTINUATION OF 2 ONGOING ACTIVITIES

- Offer support on critical/challenging technical items within the DSC by dedicated informal workshops also with external experts (when useful). They have to be co-organized with DSCs and CCWGs. An activity to help overcoming the DSC challenges.

NEW

Thank you