TC-office News

Silvia Dalla Torre, Prakhar Garg,
Oskar Hartbrich, Matt Posik

ePIC General Meeting, November 1st, 2024

The most recent TIC meetings

October 2024

- 28 Oct TIC meeting - preTDR news; nHCal update; DSCs and project contact, highlights - pfRICH
- 21 Oct TIC meeting - progress (tracking); nHCal update; Project-DSC bilateral meetings, highlights
- 14 Oct TIC meeting - progress (FF); radiation maps, an update
- 07 Oct TIC meeting - integration and mechanics update; TDR effort, progress (Calorimeters); BIC

Brookhaven National Laboratory | Jefferson Lab | U.S. Department of Energy

Integration, Installation and Infrastructure (Triple I Group)

TIC Update

Roland Wimmer

Electron-Ion Collider

Detector Model Updates

- Inner Tracker Model Updates
- Services
  - VTRX+
  - Cable Trays
  - AC-LGAD
- Flux Return
  - New Simulations
  - RCS
- Barrel EMCAL
- Subgroup Meetings

Related to the review on "Final Design Review of the Mechanical Design for the Endcaps of ePIC", October 16, 2024

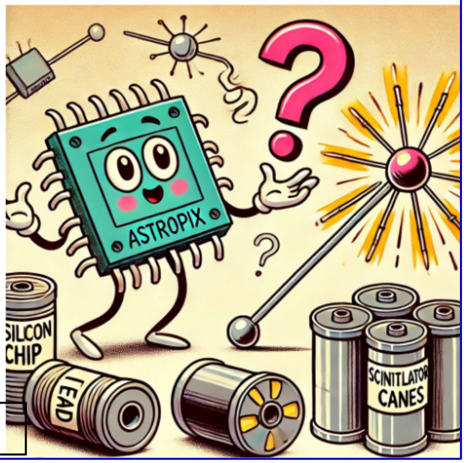
The report included:

- Highlights of the BIC review (September 19, 2024)
- AstroPix Layer Placement (next slide)

Final thoughts on the BIC PDR2

ePIC

- The BIC design is maturing rapidly
- The reviewer comments did not include any surprises, boiling down to encouraging us to execute our PED program as planned
  - Looking forward to the final Findings and Recommendations - *Just got notification this morning that the final report is ready!*
- I am proud of the performance of our team preparing for the review!



S. Joosten, 10/7/2024

BIC: AstroPix Layer Placement

Thoughts on Layer Placement Optimization

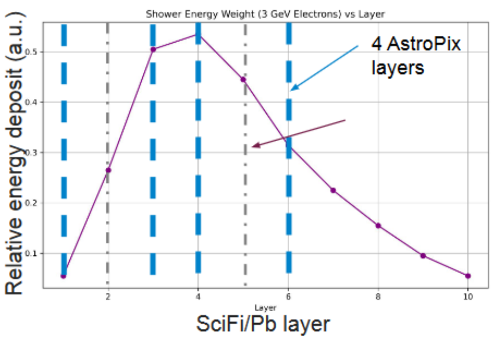
The baseline configuration (1-3-4-6) is a compromise:

- Layer 1 is purely there to support the DIRC, negligible impact on calorimeter performance
- Other layers placed to maximize electron-pion separation: sample shower maximum and shower tail
- Not instrumenting layer 2 misses the shower onset for most electromagnetic showers:
  - Large impact on neutral particle reconstruction and π^0-photon separation (strongly degrades neutral particle performance)
  - Moderate impact on precision of energy separation of overlapping showers in ScFi

If Layer 1 is not needed for the DIRC:

- Can move to 2-3-4-6 or 2-3-5-6 configuration
- Alternate 4-layer configurations will boost all performance metrics
- Greatly reduce risk of underperformance in neutral particle reconstruction

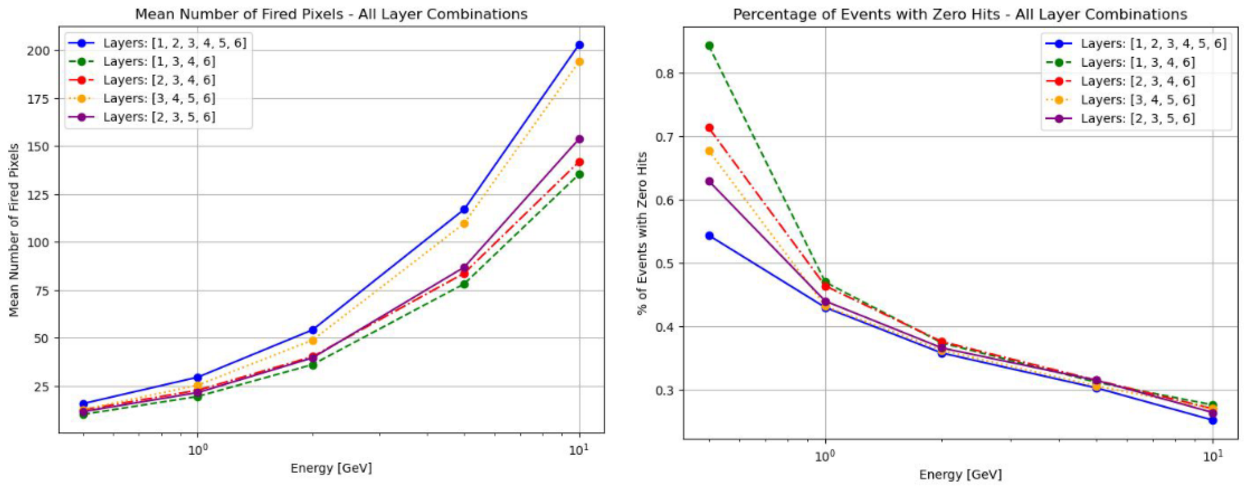
3 GeV electron shower profile at η = 0



Studies to prepare detailed impact metrics ongoing

Mean hit multiplicity and % of zero hits in all AstroPix layers

Different layer configurations



Note that this is for photons at η=0, different η will differ

The Collaboration as a whole has a responsibility here:

- *AstroPix layer 1 is almost only a one more tracking layer*
  - *Which contribution to tracking (also helping hpDIRC)*
  - *Adopting layer 1, which price would be paid in term of BIC performance as ECAL ?*

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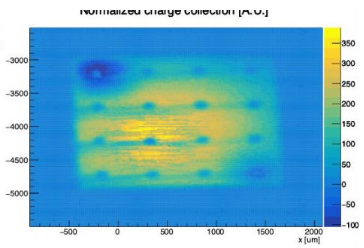
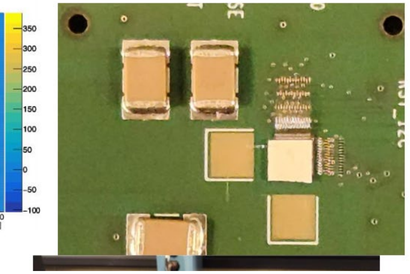
Radiation studies

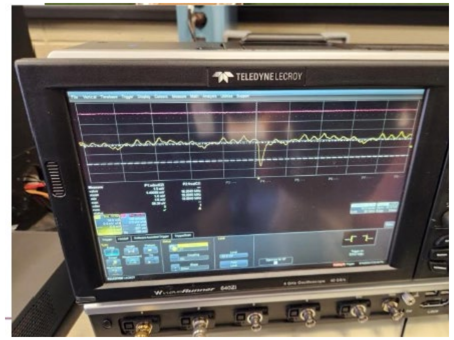
- simulation sensitivity to cuts and the need for specialized plugins to access Geant4 step information
- The current setup agrees within 30% with STAR Hall measurements.
- *IMPORTANT: instructions to correctly use the maps*
- Updated in wiki

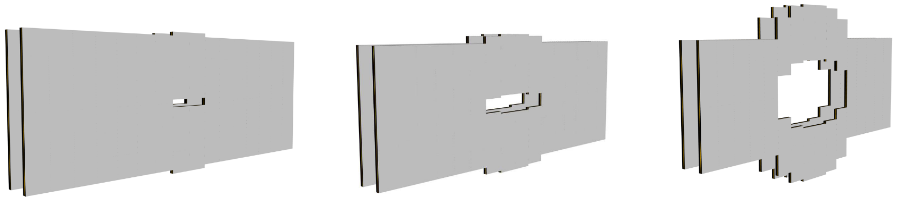
FF progress report, highlights

- Successful test at BNL of AC-LAG and EICROC
  - Both sensor and FEE are key for FF detectors and other subsystems in ePIC → a through step forward
- Roman pots geometry updated to enable changing geometry with magnet configuration choice.









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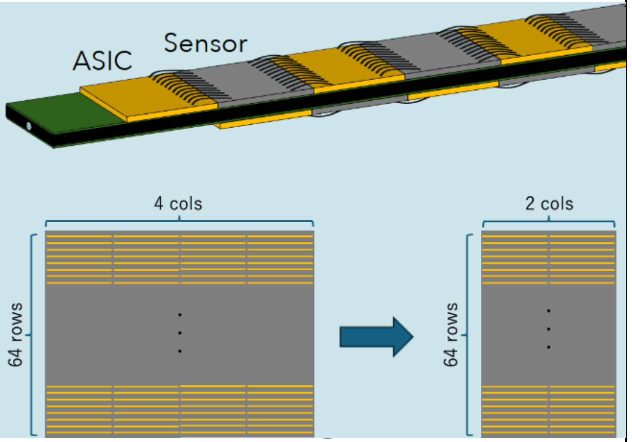
nHCAL update

- important progress in the physics motivation studies:
  - Vector meson reconstruction in dimuon channel, Vector meson reconstruction in KK channel, Diffractive dijets with nHCal, Par�cle distribu�ons in nHCal, Jets with neutrals, Veto for dRICH
- New architecture: FLHCAL technology

On-going bilateral meeting Project-DSC

- Reported so far: dRICH TOF SVT pfRICH
- In evidence, BTOF, new design

- The baseline of BTOF design has been changed
  - Stave design
    - Previous: Single side has sensors and ASICs
    - New: Double sides have sensors and ASICs
      - No acceptance gap between sensors and no direct contact between ASIC and sensor
  - Sensor
    - Previous: 3.2x4 cm^2 with 64x4=256 strip-type electrodes
    - New: 3.2x2 cm^2 with 64x2=128 strip-type electrodes

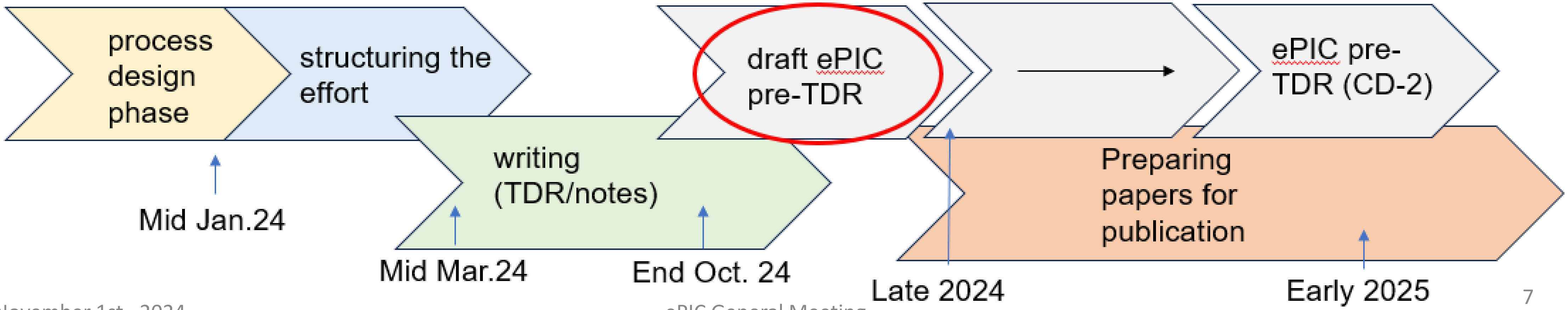


preTDR draft

ePIC engagement in EIC pre-TDR

REMINDER, 1/2

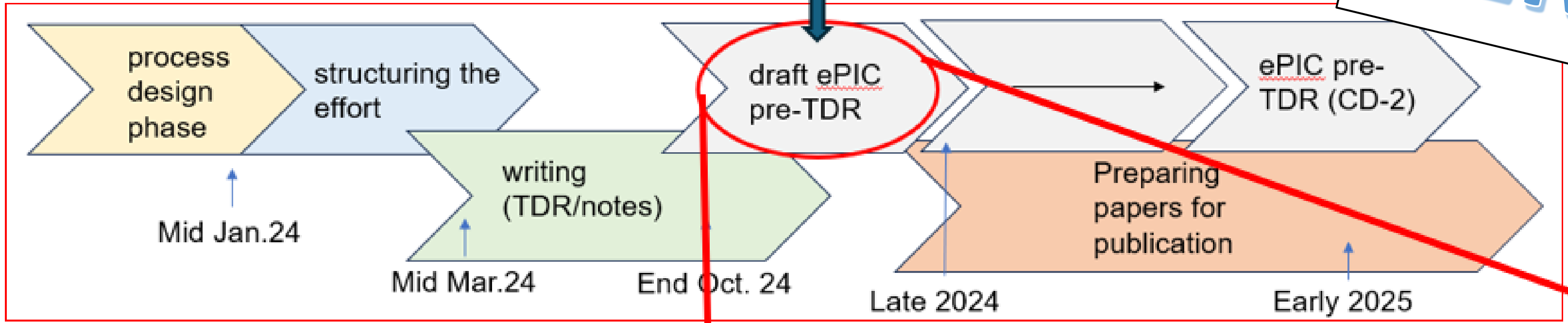
- Domain of ePIC contributions:
  - *Chapter 2 “Physics Goals and Requirements”*
  - *Chapter 8 “Experimental Systems”*
- ePIC planning: with priority to preTDR, prepare in parallel 3 publications on high-rank scientific journals, reshaping the preTDR material and focusing on
  - The ePIC Detector *(from chapter 8)*
  - The ePIC detector performance for EIC physics scope *(from chapter 2)*
  - The ePIC software and computing model *(from dedicated subsection in chapter 8)*
- *PROCESS TIMELINES:*



ePIC engagement in EIC pre-TDR - STATUS

REMINDER, 2/2

We are here



ZOOMING

2 preTDR draft versions in 2024

- **Version0** by **September 29**
  - ✓ **ACHIEVED** (~ all subsystem texts inserted in the overleaf support tool)
- During October 2024, internal review process!
  - Recommendations to be integrated in Version1
- **Version1 by December 1**
  - material for the Jan. 2025 DOE OPA review

NEW !!!

ePIC engagement in EIC pre-TDR - STATUS

In detail, chapter 2 “Physics Goals and Requirements”

		chapter	section	subsection	sub-subsection	sub-sub-subsection	title	text inserted
		2					**Physics Goals and Requirements**	
			2.1				EIC Context and History	Y
ePIC			2.2				The Science Goals of the EIC and the Machine Parameters	N
responsibility				2.3			Reconstruction Tools and Special Probes	
					2.3.1		Kinematic reconstruction	Y
Project					2.3.2		Electron identification and event selection	Y
responsibility					2.3.3		Jets: a versatile probe	Y
				2.4			The EIC Science (ePIC performance for key observables)	Y
Joint					2.4.1		Origin of Nucleon Mass	Y
responsibility						2.4.1.1	Inclusive neutral current cross sections	Y
						2.4.1.2	Upsilon production	Y
					2.4.2		Origin of Nucleon Spin	Y
					2.4.3		Multi-Dimensional Imaging of the Nucleon	Y
						2.4.3.1	Imaging in Momentum Space	Y
						2.4.3.2	Imaging in Transverse Position Space	Y
					2.4.4		Properties of Nuclear Matter	Y
						2.4.4.1	Gluon Saturation	Y
						2.4.4.2	Nuclear Modifications of Parton Distribution Functions	N
						2.4.4.3	Passage of Color Charge Through Cold QCD Matter	N

It requires the rest of chapter 2 to be in place and inputs from Project

Clever addition by AC’s

Late in simulation; can it be there for pre-TDR ?

ePIC engagement in EIC pre-TDR - STATUS

In detail, chapter 8 “Experimental Systems”

		chapter	section	subsection	subsection	title	test inserted
ePIC		8				Experimental Systems	
responsibility			8.1			Experimental Equipment Requirements Summary	N
			8.2			General Detector Considerations and Operations Challenges	
Project				8.2.1		General Design Considerations	N
responsibility				8.2.2		Backgrounds and Rates	N
				8.2.3		Radiation Level	N
Joint			8.3			The ePIC Detector	
responsibility				8.3.1		Itroduction	Y
				8.3.2		Magnet	N
				8.3.3		Tracking	N
					8.3.3.1	The silicon trackers	Y
					8.3.3.2	The MPGD trackers	Y
				8.3.4		Particle identification	Y
					8.3.4.1	The time-of-flight layers	Y
					8.3.4.2	The proximity focusing RICH	Y
					8.3.4.3	The high performance DIRC	Y
					8.3.4.4	The dual radiator RICH	Y
				8.3.5		Electromagnetic Calorimetry	N
					8.3.5.1	The backward endcap electromagnetic calorimeter	
					8.3.5.2	The barrel electromagnetic calorimeter	
					8.3.5.3	The forward endcap electromagnetic calorimeter	
				8.3.6		Hadronic Calorimetry	N
					8.3.6.1	The backward endcap hadronic calorimeter	Y
					8.3.6.2	The barrel hadronic calorimeter	Y
					8.3.6.3	The forward endcap hadronic calorimeter	Y
				8.3.7		Far forward detectors	Y
					8.3.7.1	The detectors in the B0 bending magnet	Y
					8.3.7.2	The roman pots and the off-momentum detectors	Y
					8.3.7.3	The zero degree calorimeter	Y
				8.3.8		Far backward detectors	Y
					8.3.8.1	The luminosity system	Y
					8.3.8.2	The low Q2 taggers	Y
				8.3.9		Polarimeters	N
					8.3.9.1	The electron polarimeters	N
					8.3.9.2	The proton polarimeters	N
				8.3.10		Readout Electronics and Data Acquisition	Y
				8.3.11		Software and Computing	N
			8.4			Detector Integration	N
				8.4.1		Installation and Maintenance	N
			8.5			Detector Commissioning and Pre-Operations	N

It requires ACs-TC-office coordination and chapter 2 in place

It requires 8.1, 8.2.2, 8.2.3

Project driven

On the way, also requiring that the sub-subsections are in place (ready, even if not yet inserted, for PID)

Extended version available as a separate document

preTDR draft, Version0.1 status of the text

Reviewing process

- October 20th → October 27th

Chapter 2 - Physics Goals and Requirements

- No reviewers appointed
- **6** feedback received

Chapter 8 - Experimental Systems

- Individual reminders, when needed to the appointed reviewers on October 25th
  - Feedback from reviewers : **25** (over 27)
  - Feedback from other collaborators : **11**

- The address of the google sheets where the reports are collected have been distributed to text editors

preTDR draft, NEXT STEPS

Next draft version due on December 1st → Version1

Integrating the review inputs

- Each subsystem is requesting to analyze the inputs, to engage exchanges with reviewers, when needed, to integrate the recommendations in the text in preparation for Version1
- **At TIC meeting on November 18th , DSCs will be request to shortly report on relevant inputs received (high-level, no details)**

Strategy

- As much as possible, please go on **updating the texts directly in the official overleaf project** to let us directly follow the progress