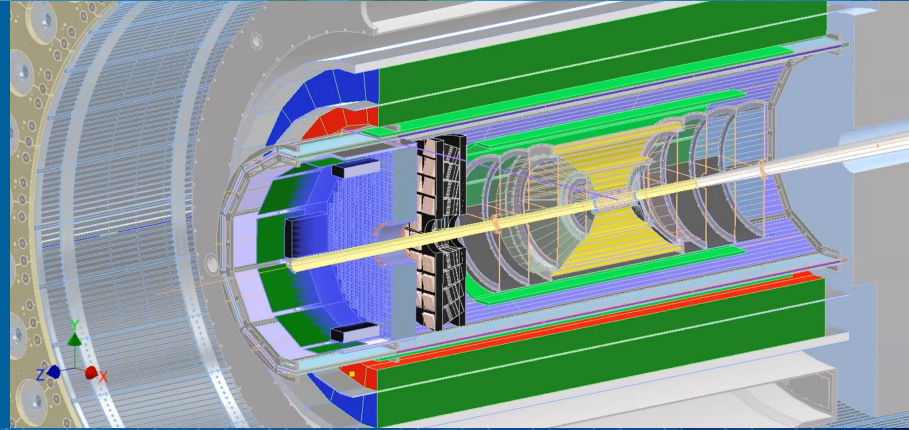


ePIC Calorimetry Meeting

Barrel Imaging Calorimeter ePIC TDR Planning (Draft)



04/10/2024



TDR Structure

- ✓ ready to write
- ⚠ partially ready to write
- ✗ lots of to do

Design

- Overview ✓
- Detector Requirements ✓

Performance

- Performance with *most up to date geometry/envelopes* ⚠
 - Energy resolution, Position resolution,
 - e/pi separation, gamma/pi0 separation
- Beam test benchmarking (e resolution) ⚠
- Literature benchmarking (pion response) ⚠
- Backgrounds ✗

Sector Design, Mechanics and Integration

- Sector design and construction ⚠
- Tracker mechanics ✗
- End-of-sector box mechanics ⚠
- Deflection studies ✗
- Barrel assembly and integration tooling ⚠

AstroPix Wafers & Modules

- AstroPix characteristics and readiness ✓/⚠
- Automated wafer testing ⚠
- Module & stave design ⚠
- Stave bus design ✗
- Module assembly and scalability ✗

End-of-sector Box and Readout

- SiPMs characteristics ✓/⚠
- SiPM boards and FEB ⚠/✗
- LED system ✓/⚠
- Tracker End-of-tray card (RDO) ✗
- Slow controls (temperature, humidity) ⚠

Cooling

- Cooling system design ⚠
- Global heat load simulations ✗

System Testing

- System Calibration ✗
- System QC ✗
- System Demonstration ⚠/✗

LAST MONTH'S MEETINGS

Meeting schedule:

1.ESB (End-of-Sector Box): Monday 2/19@4:30pm - Box Interfaces

- Objective: Freeze interfaces at this meeting (or define path to freeze interfaces by 3/15)
- <https://indico.bnl.gov/event/22370/>

2.Modules: Monday 2/26@5:00pm - Module Design

- Objective: determine the general geometry & path to finalize the mechanical design by 3/11
- <https://indico.bnl.gov/event/22371/>

3.General Meeting: Friday 3/1@8:00am

- <https://indico.bnl.gov/event/22372/>

4. Chips & Wafers: Friday 3/8@8:00am Wafer Testing

- Objective: Preliminary production QC wafer testing plan
- <https://indico.bnl.gov/event/22373/>

5. Modules/Mechanical: Monday 3/11@5:00pm Tray Mechanical Design

- Objective: Finalize module mechanical specifications
- <https://indico.bnl.gov/event/22376/>

6. ESB: Friday 3/15@8:00am SiPM Topical Meeting

- Objective: Review design concepts and freeze interface specifications
- <https://indico.bnl.gov/event/22377/>

7. Mechanical: Friday 3/22@8:00am Global Design

- Objective: Discuss strategies for rigidity and deformation. Decide on needed test articles and plan priorities
- <https://indico.bnl.gov/event/22378/>

UPCOMING WORKSHOPS

8. Mini-Workshop @Virtual Friday 3/29@8am-12pm Central

- General meeting
- Review all interface specifications
- Review CAD interface drawings and specification documents
 - Global BIC mechanics
 - EOSB (end of sector box)
 - Module
 - Wafer QC
- Updates
 - AstroPix
 - Coverage physics simulation
 - Discuss near-term PED phase plans
 - **Objective: Freeze specifications for Revision 1**
 - Review designs at the May workshop
 - <https://indico.bnl.gov/event/22516/>

In-person Workshop @ANL → May 14-17 (Tu-Fr (noon))

- <https://indico.bnl.gov/event/22517/>
- Objective: preliminary designs of all major components for review
 - Discuss any needed changes in specification (Rev2)

Performance

Performance

1. Performance with *most up to date geometry/envelopes* 🚧
 - a. Energy resolution, Position resolution,
 - b. e/pi separation, gamma/pi0 separation
2. Beam test benchmarking (e resolution) 🚧
3. Literature benchmarking (pion response) 🚧
4. Backgrounds ✖







Tasks	Time	Missing Workforce/Resources
1a and 1b	June 2024 (repeated depending on implementation of design)	FTEs on reconstruction algorithms implementation and validation.
2	August 2024	
3	October 2024 (depending on beam test success)	
4	November 2024	Requires input from background task-force and work on reconstruction algorithms.

Sector Design, Mechanics and Integration

1. Sector design and construction 🚧
2. Tracker mechanics ✖
3. End-of-sector box mechanics 🚧
4. Deflection studies ✖
5. Barrel assembly and integration tooling 🚧










Tasks	Time	Missing Workforce/Resources
1,2,3	July 2024 Internal preliminary design Sep 2024 Preliminary design review Jan 2025 Internal final design review	
4	July 2024 Sector-scale FEA Dec 2024 Full system FEA	
5	May 2024 Assembly Strategy Decision (w/ Project) Dec 2024 Assembly and tooling design	

AstroPix Wafers & Modules

1. AstroPix characteristics and readiness  
2. Automated wafer testing 
3. Module & stave design 
4. Stave bus design 
5. Module assembly and scalability 

Tasks	Time	Missing Workforce/Resources
1	Nov 2024 AstroPix v5 characterization June 2025 AstroPix v6 characterization (production chip)	
2	Jul 2024 chip-level QC testing for AstroPix v3 Nov 2024 chip-level QC testing for AstroPix v5 Jan 2025 transition from chip to wafer-level QC testing	
3,4,5	July 2024 Internal preliminary design Sep 2024 Preliminary design review Apr 2025 Internal final design review	

End-of-sector Box and Readout

1. SiPMs characteristics  
2. SiPM boards and FEB   
3. LED system  
4. Tracker End-of-tray card (RDO) 
5. Slow controls (temperature, humidity) 

Tasks	Time	Missing Workforce/Resources
1	July 2024 Irradiation Studies (FBTF tests) Sep 2024 Start Bidding/Procurement	
2, 3, 4, 5	July 2024 Internal preliminary design Sep 2024 Preliminary design review Mar 2025 Internal final design review	Formal FEB expert (Norbert has been helping us)

Cooling

1. Cooling system design 🚧
2. Global heat load simulations ✖

Tasks	Time	Missing Workforce/Resources
1, 2	July 2024 Internal preliminary design Sep 2024 Preliminary design review Jan 2025 Internal final design review	TBD: FEA expert to conduct simulations (can recruit from BIC DSC or maybe get help from Project)

System Testing

1. System Calibration ✘
2. System QC ✘
3. System Demonstration 🚧✘

Tasks	Time	Missing Workforce/Resources
1, 2	July 2024 Internal preliminary design review Sep 2024 Preliminary design review May 2025 Internal final design review	
3	May 2024 FTBF Beamtest (Commissioning, e/pion response) September 2024 First Integrated Mechanical Test Article Nov/Dec 2024 FTBF Beamtest (Integrations, e/pion response) July 2025 Large Integrated Test Article	

SUMMARY OF WEEKLY MEETINGS

Summary of new BIC meeting times:

- **Mondays 5 pm CT: Topical meetings**

- Tuesdays 8 am CT: Weekly simulation meeting and ad-hoc topical meetings

- Tuesdays 2 pm CT: Weekly simulation meeting

- Wednesday 8 am CT: Weekly AstroPix meeting [non-BIC]

- **Fridays 8 am CT: General meeting or topical meetings**

- Fridays 4 pm CT: Weekly Argonne mechanical engineering meeting

- You can add all current and future BIC meetings to your calendar through the top level indico by clicking on the calendar icon in the top right: <https://indico.bnl.gov/category/485/>

- You can also sign up for any EIC email list at lists.bnl.gov

 - BIC: Epic-bemcal-l

- If you would like to join the AstroPix meetings, please send a request to Regina Caputo: regina.caputo@nasa.gov