Detector Advisory Committee Report:

Report on the DAC to the EIC Resources Review Board

- Introduction to DAC
- History of Activities
- New committee members

Edward Kinney, DAC Chair

Detector Advisory Committee (DAC)

- Formed in Fall 2020 to advise Laboratory and Project Management on issues related to the EIC detector design, EIC Users Group activities and associated R&D efforts

- Composed of 12 members, bringing technical expertise on Calorimetry, Tracking, Particle Identification, Readout Electronics, Data Acquisition, Detector Infrastructure, and EIC science.

- Meets once or twice a year to review project progress and evaluate R&D proposals and reports.

- After first two years, 1/3 of original members have rotated off and are being replaced. In the future, we will move to staggered 3 year terms.

Original DAC Members

Detector Advisory Committee – DAC 2020-2022		
Name	Institution	Expertise
Edward Kinney	Boulder CO	EIC Science, general
Ewa Rondio	Warsaw	EIC Science, general
Werner Riegler	CERN	Integration
Greg Rakness	FNAL	Integration
Peter Krizan	U Ljubljana	Particle Identification
Ana Amelia Machado	University of Campinas, Brazil	Particle Identification, Sensors
Heidi Schellman	Oregon State	Computing
Brigitte Vachon	McGill	Electronics
Glenn Young	BNL	Calorimetry
Etiennette Auffray	CERN	Calorimetry
Andrew White	U. Texas Arlington	Tracking
Chi Yang	SDU China	Tracking

Typical Agenda/Charge to the DAC

EIC Detector Advisory Committee Meeting

Host: Jim Yeck

MARCH 24th-26th , 2021
Virtual Meeting

Wednesday

Wednesday, March 24, 2021			
Time	**Title**	**Speaker (Time)**	**Slides**
9:00	Committee: Closed Session		
10:00	Welcome and Overview	Thomas Ullrich (10)	--
10:10	eRD6/Tracking: Progress Report	TBD (40+15)	--
11:05	eRD22/GEM-TRD: Progress Report	TBD (20+10)	--
11:35	Break		
12:00	eRD25/Si-Tracking: Progress Report	TBD (40+15)	--
12:55	eRD14/DIRC: Progress Report	TBD (12+3)	--
13:10	eRD14/mRICH: Progress Report	TBD (12+3)	--
13:25	eRD14/dRICH: Progress Report	TBD (12+3)	--
13:40	eRD14/Electronics & Sensors: Progress Report	TBD (12+3)	--
14:00	Committee: Closed Session		

Thursday

Thursday, March 25, 2021			
Time	**Title**	**Speaker (Time)**	**Slides**
10:00	eRD24/Roman Pots: Progress Report	TBD (20+10)	--
10:30	eRD17/BeAGLE: Progress Report	TBD (20+10)	--
11:00	eRD23/Streaming Readout: Progress Report	TBD (20+10)	--
11:30	Break		
11:50	eRD21/Background Studies: Progress Report	Charles Hyde (20+10)	--
12:20	eRD1/Calorimetry: Progress Report	TBD (40+15)	--
13:15	Committee: Closed Session		

Friday

Friday, March 26, 2021			
Time	**Title**	**Speaker (Time)**	**Slides**
10:00	eRD27/ZDC: Progress Report	TBD (20+10)	--
10:30	eRD26/Polarimetry: Progress Report	TBD (20+10)	--
11:00	Break		
11:15	eRD29/ToF-LGAD: Progress Report	TBD (20+10)	--
11:45	eRD28/SC-Nanowire: Progress Report	TBD (20+15)	--
12:15	Committee: Closed Session		
15:15	Close-Out		

Typical Agenda/Charge to the DAC

Wednesday

BROOKHAVEN NATIONAL LABORATORY

managed by Brookhaven Science Associates for the U.S. Department of Energy

Charge to EIC Detector Advisory Committee – 3rd Meeting March 24-26, 2021

The EIC Detector Advisory Committee (DAC) is to provide advice to the EIC project, managed by BNL in partnership with Thomas Jefferson National Accelerator Facility (TJNAF), on the experimental equipment and the scientific collaboration. 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 complete detector proposals, on collaboration formation, on detector integration, detector-interaction region integration, and detector commissioning, and on EIC-related detector R&D.

Friday

Friday, March 26, 2021			
Time	Title	Speaker (Time)	Slides
10:00	eRD27/ZDC: Progress Report	TBD (20+10)	--
10:30	eRD26/Polarimetry: Progress Report	TBD (20+10)	--
11:00	Break		
11:15	eRD29/ToF-LGAD: Progress Report	TBD (20+10)	--
11:45	eRD28/SC-Nanowire: Progress Report	TBD (20+15)	--
12:15	Committee: Closed Session		
15:15	Close-Out		

Typical Agenda/Charge to the DAC

Wednesday

BROOKHAVEN NATIONAL LABORATORY

managed by Brookhaven Science Associates for the U.S. Department of Energy

Charge to EIC Detector Advisory Committee – 3rd Meeting March 24-26, 2021

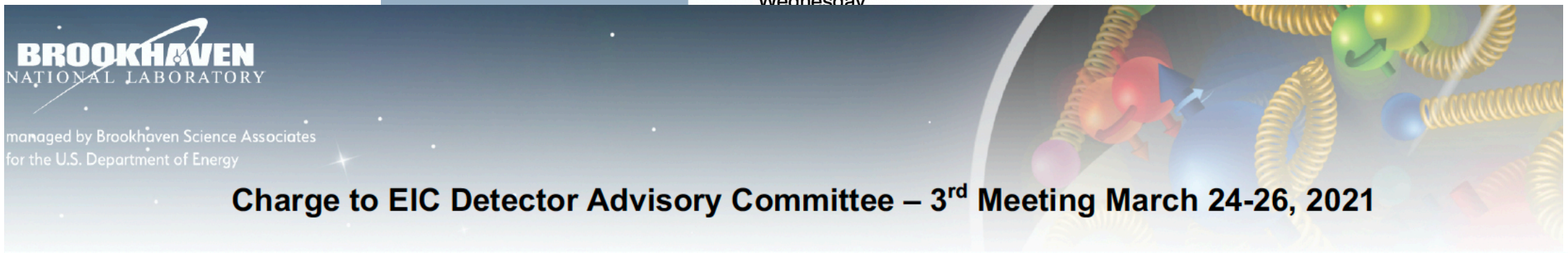
We welcome your guidance and advice on the following topics:

- The planning for the EIC-related Project detector R&D as documented in the "Assessment of R&D Needs for an EIC Detector" (EIC Detector R&D) document. Does it address the risk and does the proposed R&D timeline match the Project milestones?
- Are there any gaps in the proposed EIC-related Project detector R&D?
- What do you see as priorities for the proposed EIC-related Project detector R&D?
- Are there opportunities for generic EIC detector R&D to enhance the day-one and the longer-term EIC science program?
- What do you see as priorities for a generic EIC detector R&D program?

11:00	Break		
11:15	eRD29/ToF-LGAD: Progress Report	TBD (20+10)	--
11:45	eRD28/SC-Nanowire: Progress Report	TBD (20+15)	--
12:15	Committee: Closed Session		
15:15	Close-Out		

Typical Agenda/Charge to the DAC

Wednesday



We welcome your guidance and advice on the following topics:

- The planning for the EIC-related Project detector R&D as documented in the "Assessment

Reports are formally made to Project Management, but available to the public!

risk and does the proposed R&D timeline match the Project milestones?

- Are there any gaps in the proposed EIC-related Project detector R&D?
- What do you see as priorities for the proposed EIC-related Project detector R&D?
- Are there opportunities for generic EIC detector R&D to enhance the day-one and the longer-term EIC science program?
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Highlights from October 2022 Review

3.10 Photosensors for EIC Detectors

3.10.1 Findings

This recently initiated project is performing an in-depth evaluation of commercially available photo-sensors for use in the EIC, primarily LAPPDs, HRPPDs and SiPMs. The study of MCP PMTs was deferred. These sensors were investigated primarily for their use in Čerenkov light detectors. The focus of the LAPPD/HRPPD effort is to characterize the timing and spatial resolution and the performance in high magnetic field. Successful LAPPD studies have been performed in a high field facility at ANL and two in-beam tests at FNAL and CERN. A direct pixel readout design for an HRPPD tile has been developed, which is planned to be completed as a prototype for testing in high field and in-beam along with further studies of the LAPPDs. A focus of the timing studies is the determination of whether the timing precision of these sensors is sufficient for TOF measurements. The focus of the SiPM effort is to understand the effects of radiation damage from measured doses on the SiPM performance and to what the extent high temperature annealing can mitigate these effects, especially and over many cycles of dosing/annealing. Using a test stand at INFN preliminary results comparing in-situ vs over annealing have been obtained. In conjunction with eRD 102 (dRICH) and 109 (ALCOR) groups they recently performed in-beam tests at CERN.

Highlights from October 2022 Review

3.10.2 Comments

Photosensors are a critical component to overall EPIC realization, especially with respect to PID detectors, and is stongly coupled to the ASIC development program in eRD109. Good progress has been made to characterize the commercially available LAPPD in high field and in test beams. The proposed program addresses important open questions and appears to be on track with project timelines. It is important to investigate if alternate LAPPD vendor exist to mitigate risk. The annealing process seems promising for SiPMs; long time experience from STAR calorimeter annealing is also hopeful, however, single photon resolution requirements may be more stringent for RICH photon detection. It is also important to use conservative estimates of the expected fluences (10^{10}) and to explore what the impact of cooling/annealing/readout electronic infrastructure will have on global performance.

Highlights from October 2022 Review

3.10.3 Recommendation

1. We recommend continue aggressive study of both the LAPPD/HRPPD and SiPM performance in realistic operation environments.

Highlights from October 2022 Review

2. Status of ePIC Detector and Collaboration

The DAC applauds the rapid formation of the new ePIC collaboration from the members of the ATHENA and CORE collaborations and the ECCE proto-collaboration. Although the complete formation of the collaboration is still in process, they have clearly formed a strong working group to carry on the final design of the detector including many technological design choices. The excellent presentation highlighted not only the progress, but also the critical path decisions upon which the collaboration is now focused. Enormous progress has been made in developing a coherent design for a detector to carry out the EIC research goals, with well-defined open critical questions. Additional impressive achievements are the critical creation of common simulation environment with the "October Simulation Campaign," and important progress in integration of the readout software/framework at this early stage. As the project progresses on this tight timeline we recommend close monitoring of manpower and commitment to EIC as groups are also involved in outside projects both in the US and at international laboratories. The collaboration appears working strongly to keep on-track with the project timelines.

Highlights from October 2022 Review

4. General EIC and ePIC Comments and Recommendations

Again, congratulations to all on the enormous progress, in so many areas, in such a short time! We applaud the use of topical workshops to ensure good communication between overlapping development efforts and to build community. We strongly recommend their continued scheduling. We noted that many projects are at the stage of planning tests with particle beams; overall coordination might be very useful especially where common test infrastructure could reduce the duplication of effort and also to reduce test beam scheduling complications. Under the new ECFA R&D Roadmap the RDxx collaborations (and others) are being reorganized into DRDx collaborations. For instance, RD51 for MPGDs is becoming part of DRD1 and is being merged with other gas detectors (drift chambers, TPCs,...). These transitions will take place during 2023 and the new DRDs will start 1/24. There is concern about this distracting from R&D progress while the transitions occur and any delay that this might cause to EIC/ePIC (which is already on an aggressive schedule and is relying on connections to CERN/European R&D.) We also urge the collaboration to work to expand the manpower resources as soon as possible in order to keep progress on track, as there is little time between the periods of R&D and final design activities and the EIC detector production, installation and commissioning activities. We know you are aware of the tight constraints of the project timeline!

Past Meetings/Tasks of DAC

- September 28-29, 2020. Bring the DAC up to speed and prepare them for upcoming charges, e.g., related to input on assessment of the call for Expressions of Interest (EoI).
- December 18, 2020. Update DAC on the EIC Project and Yellow Report status, the EoI assessment, international engagement, and planning for call for detector proposals.
- March 24-26, 2021. Transition from the generic EIC detector R&D to the Project detector R&D.
- December 2021 – January 2022. Evaluation of detector technologies, cost and schedule as input to the Detector Proposal Advisory Panel.
- October 19-21, 2022. Review the ongoing project detector R&D. Advise for the FY23 detector R&D.

Role in Detector Proposal Review

- December 2021 – January 2022. Evaluation of detector technologies, cost and schedule as input to the Detector Proposal Advisory Panel.
- Two members of DAC served on DPAP to coordinate communication of results of DAC evaluation

Detector Proposal Advisory Panel (DPAP)

Patty McBride, co-chair	FNAL
Rolf Heuer, co-chair	Former CERN Director General
Sergio Bertolucci	University of Bologna and INFN
Daniela Bortoletto	Oxford
Markus Diehl	DESY
Ed Kinney	U. Colorado
Fabienne Kunne	Paris-Saclay
Andy Lankford	UC Irvine
Naohito Saito	KEK
Brigitte Vachon	McGill
Tom Ludlam, Scientific Secretary	BNL

New 2023 DAC Membership

Detector Advisory Committee 2023		
Name	**Institition**	**Expertise**
Edward Kinney	Boulder CO	EIC Science, general
Ken Wyllie	CERN	ASICs/electronics
Petra Merkel	FNAL	R&D, Integration
Antonis Papanestis	Rutherford Appleton Laboratory	Particle Identification
Peter Krizan	U Ljubljana	Particle Identification
Ana Amelia Machado	University of Campinas, Brazil	Particle Identification, Sensors
Heidi Schellman	Oregon State	Computing
Brigitte Vachon	McGill	Electronics
Stefano Miscetti	INFN Frascati	Calorimetry
Etiennette Auffray	CERN	Calorimetry
Andrew White	U. Texas Arlington	Tracking
Chi Yang	SDU China	Tracking

Summary and Outlook

- DAC formed to bring additional outside expertise and advice to the project during the critical and rapid early phases of the project.
- New committee members have joined in 2023
- Plans for this year: Review the ePIC detector and in-kind engagement, and the next phase of Project Detector R&D