Report from the EIC Project detector technical review of the e/m and hadronic calorimetry

Alexander Kiselev & Alexander Bazilevsky (BNL)

ePIC General Meeting, December 8, 2022

The review panel

Lars Schmitt (GSI)

Rainer Novotny (Giessen)

Felix Sefkow (DESY)

Roman Pöschl (Orsay)

The agenda

Tuesday, December 6

8:00 AM → 8:30 AM **Executive Session** — 30m

Closed Session ECal / HCAL EIC Project TR

Join ZoomGov Meeting
https://bnl.zoomgov.com/j/1612342243?pwd=ZVhFMVBqNDRPMWpFKzNwazY2VmtiZz09

Meeting ID: 161 234 2243
Passcode: 079651

Speaker: Committee and Project

8:30 AM → 9:00 AM **Welcome and Introduction to EIC Project** — 30m

Speakers: E. C. Aschenauer (BNL), Rolf Ent (Jefferson Lab)

eca.CaloReview.pptx

9:00 AM → 9:30 AM **Electromagnetic Calorimetry Overview and Requirements** ¶ — 30m

Speaker: Alexander Bazilevsky (BNL)

EMCal_Review_Dec...

9:30 AM → 10:00 AM **Hadronic Calorimetry Overview and Requirements** — 30m

Speaker: Alexander Kiselev (BNL)

ayk-2022-12-06-hcal...

10:00 AM → 10:30 AM **Overall Detector Integration Status and CAD Design** — 30m

Speakers: Rahul Sharma (BNL), Roland Wimmer

Final_EIC_TR_EMCA...

10:50 AM → 11:10 AM **Backward Hadron Calorimetry detector upgrade** — 20m

Speaker: Leszek Kosarzewski (Czech Technical Univeristy in Prague)

FinalUpdated_nHCa...

11:10 AM → 11:50 AM **Backward Electromagnetic Calorimetry detector and integration** — 40m

Speakers: Carlos Munoz Camacho (IJCLab, CNRS/IN2P3), Julien Bettane (IJCLab)

Backward_ECAL_fin...

11:50 AM → 12:30 PM **SciGlass-Based Barrel Electromagnetic Calorimetry detector and integration** — 40m

Speakers: Joshua Crafts (affiliate@jlab.org;member@jlab.org), Tanja Horn (Cath)

Final BEMCal DR Pr...

12:30 PM → 1:00 PM **Imaging-Calorimeter Barrel Electromagnetic Calorimetry alternate option** — 30m

Speaker: Maria Zurek (Argonne National Laboratory)

Imaging-Calo-Zurek...

1:00 PM → 2:00 PM **Executive Session – Discussion** — 1h

Wednesday, December 7

8:00 AM → 8:30 AM **Barrel Hadronic Calorimetry detector and upgrades** — 30m

Speaker: John Lajoie (Iowa State University)

FINAL Barrel Hadro...

8:30 AM → 9:10 AM **Forward Electromagnetic Calorimetry detector and integration** — 40m

Speaker: oleg tsai (ucla)

EIC_fECal_final.pdf

9:10 AM → 9:50 AM **Forward Hadronic Calorimetry detector and integration** — 40m

Speaker: Friederike Bock (ORNL)

LFHCAL_Status_No...

9:50 AM → 10:10 AM **Calorimetry Electronics Overview** — 20m

Speaker: Fernando Barbosa (JLab)

Electronics Overvie...

10:10 AM → 10:25 AM **Forward Electromagnetic Calorimetry electronics** — 15m

Speaker: Gerard Visser (Indiana University)

hadron_endcap_EC...

10:25 AM → 10:40 AM **Forward Hadronic Calorimetry electronics** — 15m

Speaker: Norbert Novitzky (ORNL)

20221201CaloElecR...

11:00 AM → 2:00 PM **Executive Session** — 3h

Closed Session ECal / HCAL EIC Project TR

Join ZoomGov Meeting
https://bnl.zoomgov.com/j/1612342243?pwd=ZVhFMVBqNDRPMWpFKzNwazY2VmtiZz09

Meeting ID: 161 234 2243
Passcode: 079651

Speaker: Committee

2:00 PM → 2:30 PM **Closeout** — 30m

Several questions & answers -> ran over time badly on both days -> Closeout moved to Thursday

The topics

- Introduction
  - Elke
- Overview talks
  - AK, Sasha
- Integration
  - Roland

- Electromagnetic Calorimetry subsystems
  - Carlos & Julien, Joshua / Maria, Oleg
- Hadronic Calorimetry subsystems
  - Leszek, John, Friederike

- Electronics
  - Fernando, Gerard, Norbert

The charge and the digest of the closeout

Review Charge Questions (1)

1. Are the technical performance requirements appropriately defined and complete for this stage of the project?

- Requirements are not fully clear for all systems

2. Are the plans for achieving detector performance and construction sufficiently developed and documented for the present phase of the project?

- Some steps are missing in plans of new systems to ensure performance - see recommendations

3. Are the current designs and plans for detector and electronics readout likely to achieve the performance requirements with a low risk of cost increases, schedule delays, and technical problems?

- At the current phase the risks are not yet fully assessed, in particular for new systems - see recommendations

The charge and the digest of the closeout

Review Charge Questions (2)

4. Are the calorimeter fabrication and assembly plans consistent with the overall project and detector schedule?

- Time schedules contain float and match the overall project, but risks of manufacturing for new systems are not yet assessed, and QC plans are at an early stage.

5. Are the plans for detector integration in the EIC detector appropriately developed for the present phase of the project?

- Detector integration is mostly based on placeholders, as designs are not yet fixed.

6. Have ES&H and QA considerations been adequately incorporated into the designs at their present stage?

- Some systems consider ES&H and QA appropriately and should serve as examples to other systems.

General Conclusions

- Findings
  - Optimisation for particle flow still missing
  - Not all requirements for detector performance are clear
- Comments/Concerns
  - A unified readout scheme is helpful
  - Careful choice of SiPM: rad. hard (insensitive against neutrons!), correct pixel size for dyn. range. Characterise before final procurement, sample control (also rad hardness) as part of QA
  - Size of SiPMs to be optimised in view of dynamic range in front-end ASICs
- Recommendations
  - Carry out more simulation and reconstruction studies (particle flow)
  - Construct comprehensive engineering test articles for the detectors where possible, and validate simulations with beam tests
  - Perform risk assessment for new designs
  - Hold next review in person and schedule it sufficiently in advance

Final report expected before Christmas