# ePIC General Meeting
# October 6, 2022

Detector-1 Steering Committee

Silvia Dalla Torre, Or Hen, Tanja Horn, John Lajoie, and Bernd Surrow

# Today's Agenda

Usual introduction and update from the project.

Status report from Charter Committee

Simulation Campaign:
Reports from GD/I, Comp/SW and Sim/QA

## EPIC General Meeting

Thursday Oct 6, 2022, 8:30 PM → 10:30 PM US/Central

Description **Connection Information:**

Please click this URL to start or join. https://iastate.zoom.us/j/93468095976?pwd=ZFZyTDRwaUhuYXFJTllYVys3OWtxUT09
Or, go to https://iastate.zoom.us/join and enter meeting ID: 934 6809 5976 and password: 211496

**8:30 PM** → 9:30 PM **General Status and Updates**

**Conveners**: Bernd Surrow (Temple University), John Lajoie (Iowa State University), Or Hen (MIT), Silvia Dalla Torre (INFN. Trieste), Tanja Horn (Cath)

- 8:30 PM **SC Updates and Plans (15+5)** ¶ — 20m
  **Speaker**: John Lajoie (Iowa State University)
- 8:50 PM **EIC Project Update (15+5)** — 20m
  **Speakers**: E. C. Aschenauer (BNL), Rolf Ent (Jefferson Lab)
- 9:10 PM **News from the ePIC Charter Committee (15+5)** — 15m
  **Speakers**: Douglas Higinbotham (Jefferson Lab), Olga Evdokimov (UIC)

**9:30 PM** → 10:30 PM **Simulation Campaign Readiness**

- 9:30 PM **Report from GD/I (15+5)** — 20m
  **Speakers**: Carlos Munoz Camacho (IJCLab, CNRS/IN2P3), Jin Huang (Brookhaven National Lab), Joe Osborn (Brookhaven National Laboratory), Richard Milner (MIT), Silvia Dalla Torre (INFN. Trieste), Thomas Ullrich (BNL)
- 9:50 PM **First Simulation Campaign - Status and Next Steps (15+5)** — 20m
  **Speakers**: Andrea Bressan, Cristiano Fanelli (affiliate@jlab.org;member@jlab.org), David Lawrence (Jefferson Lab), Joe Osborn (Brookhaven National Laboratory), Sylvester Joosten (Argonne National Laboratory), Wenliang Li (Stony Brook University CFNS), Wouter Deconinck (University of Manitoba), Zhoudunming Tu (BNL)

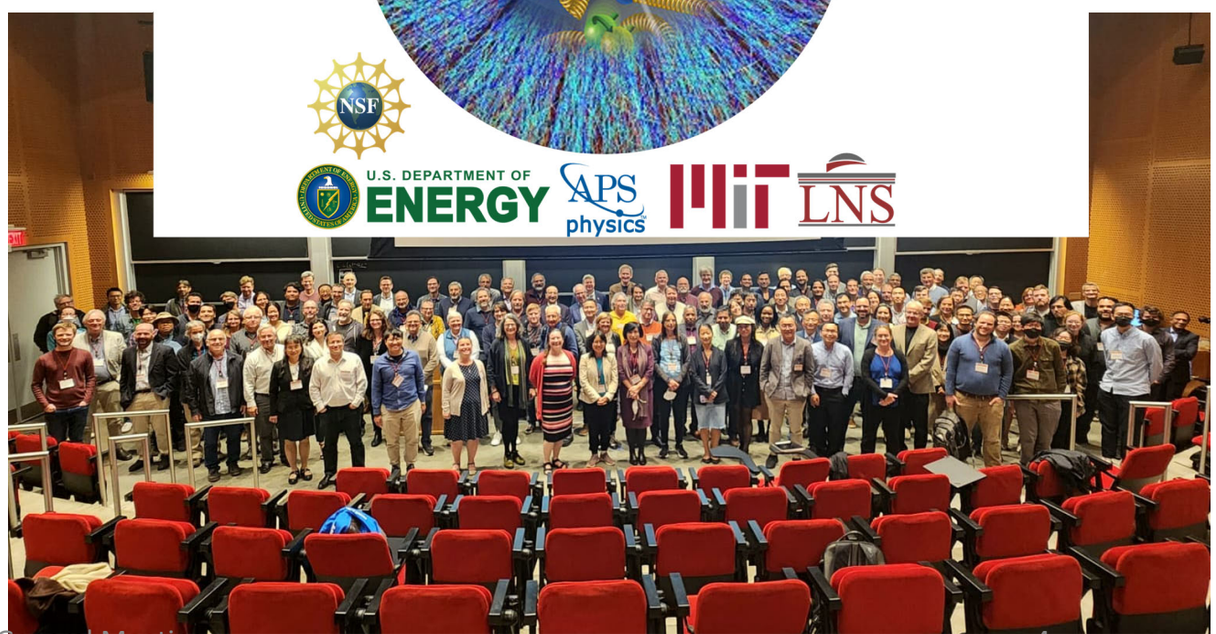
# Topics for this Introduction

- Hot and Cold QCD Town Hall
- Timeline for ePIC to CD-3
- Geometry Database
- Results of ePIC Logo First Round Voting
- Upcoming Meetings

# QCD Town Hall Meeting Sept. 23-25

- Excellent meeting with lots of participation from both the hot and cold QCD communities
  - Virtual participation a plus!
  - https://indico.mit.edu/event/538/
- EIC community was very well represented!
- 4 recommendations and 6 initiatives
- Final survey results with recommendations/initiatives:

https://indico.mit.edu/event/538/contributions/1254/



# Recommendation 2: EIC Project

**We recommend the expeditious completion of the EIC as the highest priority for facility construction.**

The Electron-Ion Collider (EIC) is a powerful and versatile new accelerator facility, capable of colliding high-energy beams ranging from heavy ions to polarized light ions and protons with high-energy polarized electron beams. In the 2015 Long Range Plan the EIC was put forward as the highest priority for new facility construction and the expeditious completion remains a top priority for the nuclear physics community. The EIC, accompanied by the general-purpose large-acceptance detector, ePIC, will be a discovery machine that addresses fundamental questions such as the origin of mass and spin of the proton as well as probing dense gluon systems in nuclei. It will allow for the exploration of new landscapes in QCD, permitting the "tomography", or high-resolution multidimensional mapping of the quark and gluon components inside of nucleons and nuclei. Realizing the EIC will keep the U.S. on the frontiers of nuclear physics and accelerator science and technology.

- Building on the recent EIC project CD-1 approval, the community-led Yellow-Report, and detector proposals, the QCD research community is committed to continue the development and timely realization of the EIC and its first detector, ePIC. We recommend supporting the growth of a diverse and active research workforce for the ePIC collaboration, in support of the expeditious realization of the first EIC detector.
- We recommend new investments to establish a national EIC theory alliance to enhance and broaden the theory community needed for advancing EIC science and the experimental program. This theory alliance will contribute to a diverse workforce through a competitive national EIC theory fellow program and tenure-track bridge positions, including appointments at minority serving institutions.

# Recommendation 3: Workforce and Conduct

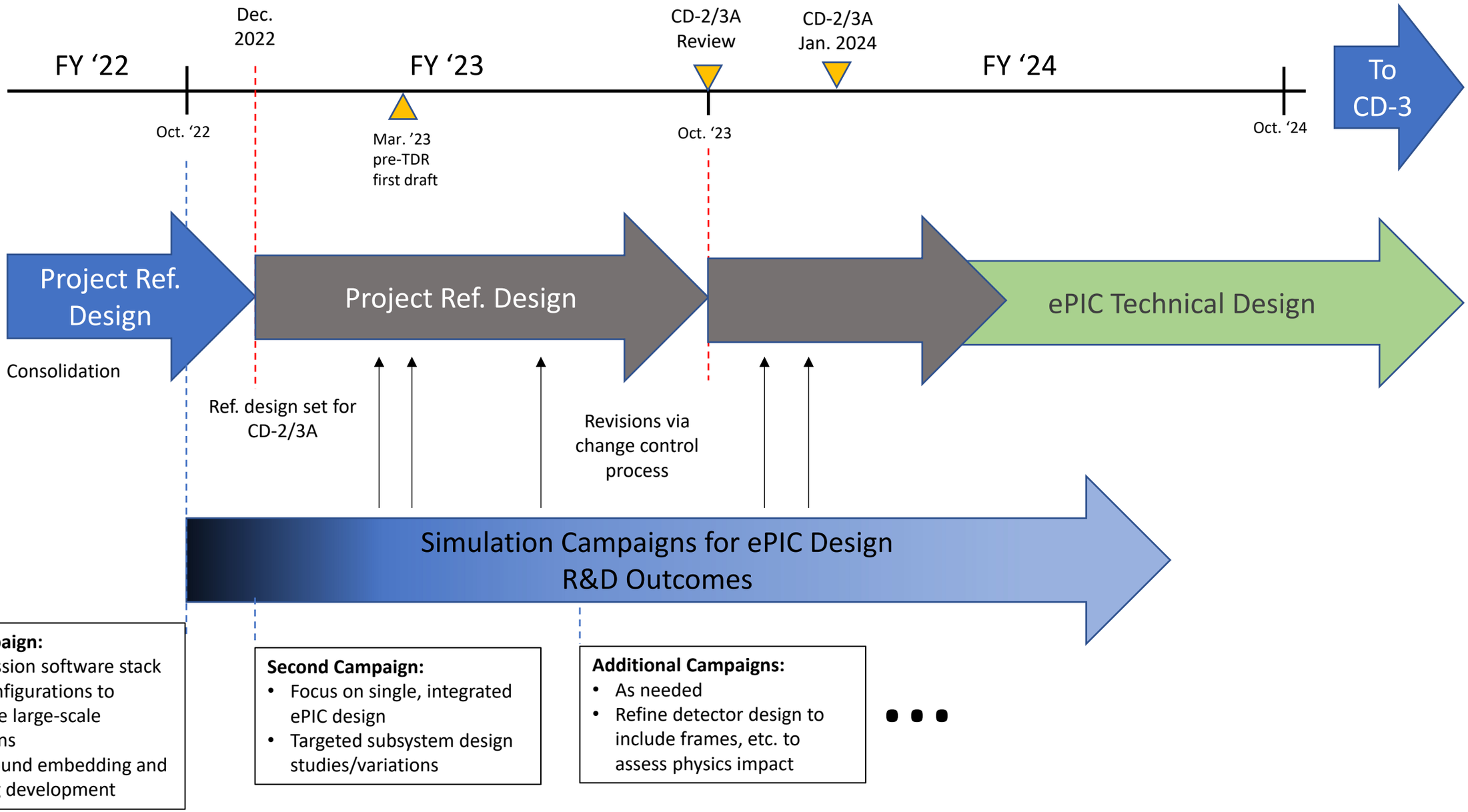
Increasing the U.S. QCD research workforce and participation of international collaborators is vital for the successful realization of the field's science mission. In addition, the nuclear physics research program serves an important role in developing a diverse STEM workforce for the critical needs of the nation. Creating and maintaining an equitable, productive working environment for all members of the community is a necessary part of this development.

**We recommend enhanced investment in the growth and development of a diverse, equitable workforce.**

- Part of recruiting and maintaining a diverse workforce requires treating all community members with respect and dignity. Supporting the recent initiatives by the APS and DNP to develop community-wide standards of conduct, we recommend that host labs and user facilities require the establishment and/or adoption of enforceable conduct standards by all of the experimental and theoretical collaborations they support. The enforcement of such standards is the combined responsibility of all laboratories, theoretical and experimental collaborations, conference organizers, and individual investigators supported by the nuclear physics research program.
- We recommend development and expansion of programs that enable participation in research by students from under-represented communities at National Labs and/or Research Universities, including extended support for researchers from minority-serving and non-PhD granting institutions.
- We recommend development and expansion of programs to recruit and retain diverse junior faculty and staff at universities and national laboratories through bridge positions, fellowships, traineeships, and other incentives.

# ePIC Design Towards CD-2/3A

- The Project must move forward with an ePIC reference design in order to prepare for CD-2/3A and allow for a ~60% design completion
- Nevertheless, ***the ePIC design optimization process will continue and is not expected to be completed by the end of 2022***
  - The ePIC design optimization process will proceed through a series of simulation campaigns.
  - The reference design will be updated through the project change control process
  - The change control process is important – changes must be justified by performance, cost and risk!
    - Changes should be the *exception*, not the rule.
    - Example: changing from SiPM readout to LAPPDs (technology change) or a change in detector acceptance (design change)
- This effort will result in an *ePIC Technical Design* going into CD-3


FY ‘22
Dec. 2022
FY ‘23
CD-2/3A Review
CD-2/3A Jan. 2024
FY ‘24
To CD-3
Oct. ‘22
Mar. ’23 pre-TDR first draft
Oct. ‘23
Oct. ‘24
Project Ref. Design
Project Ref. Design
ePIC Technical Design
Consolidation
Ref. design set for CD-2/3A
Revisions via change control process
Simulation Campaigns for ePIC Design
R&D Outcomes
First Campaign:
• Commission software stack
• Two configurations to compare large-scale variations
• Background embedding and tracking development
Second Campaign:
• Focus on single, integrated ePIC design
• Targeted subsystem design studies/variations
Additional Campaigns:
• As needed
• Refine detector design to include frames, etc. to assess physics impact

# Integration and Geometry Database

Slide from T. Horn, 9/30 Conveners Meeting.

## EIC Global Geometry Database

Detector envelope consistency is important for the simulation campaigns

to provide consistency of detector envelopes between:

- **Sketchup**: Integration and assembly, installation, and maintenance.
- **CAD**: Detailed engineering information for construction.
- **Simulation**: Physics and detector studies using detailed GEANT-based detector simulations.
- **Analysis:** Reconstruction in simulation and physics analysis

❑ **Gatekeeper**: Tanja Horn (for Detecfor-1 contacts; work together with system engineer Walt Akers for global changes and improvements)

- ➢ Keep some info on changes and why

❑ **Legs of input:**

- ➢ Global Detector/Integration Group:
  - Collects all information from working groups
  - Balances detector technology needs versus each other
- ➢ Detector-1 Sim/QA Working Group:
  - Collects all trade-offs of material budget versus science performance
  - Implements version control for simulations
- ➢ EIC Project Detector Leads:
  - Collect input from E&D process (Space needs for frames and supports, Space needs for service/cooling, Requirements of accelerator and vacuum integration)
  - Fold keep-in volumes into requirements/interface control document

Geometry Database – https://eic.jlab.org/Geometry/Detector/

**Please update bookmarks – latest version to be used is dated: 9/29/2022**

Adapted from 20 May Detector-1 WG Convener meeting

# Detector Matrix Example

## EIC Global Geometry: Detector Envelopes

*29 September 2022 Update: Detector envelopes from CAD Model (Initiated by EIC Project Leads)*

**EIC GEOMETRY** **THU, 29 SEP 2022 17:27:03**

| Region | Component | Sub-Component | WBS | Length (cm) | Inner Radius (cm) | Outer Radius (cm) | Offset from Center (cm) | Physical Start (cm) | Physical End (cm) | Volume ($m^3$) | Weight (kg) | Technology |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HADRON DIRECTION END CAP | Hadron Calorimeter | | 6.10.06 | 140 | 17.5 | 267 | 359.6 | 359.6 | 499.6 | 27.65 | 177,068 | FeSc, WSc last segment |
| | Electromagnetic Calorimeter | | 6.10.05 | 30 | 14.0 | 195 | 329.6 | 329.6 | 359.6 | 3.57 | 23,048 | Pb/Sc |
| | Service Gap | | | 9 | | | 320 | 320 | 329 | | | |
| | Dual RICH | | 6.10.04 | 120 | 15.0 | 185 | 180 | 195 | 315 | 11.43 | 2,123 | Aerogel/Gas |
| | | *Detector Section* | | *100* | 15.0 | *185* | *215* | *215* | *315* | *10.68* | | |
| | | *Aerogel Section* | | *20* | 15.0 | *110* | *195* | *195* | *215* | *0.75* | | |
| | HD Time of Flight/Tracker | | 6.10.03 | 15 | 8 | 67 | 180 | 180 | 195 | 0.21 | 42 | AC/LGAD |

Direct link to 29 Sept 2022 Detector Matrix:
https://eic.jlab.org/Geometry/Detector/Detector-20220929172703.html

**Please review and update simulation models as needed**

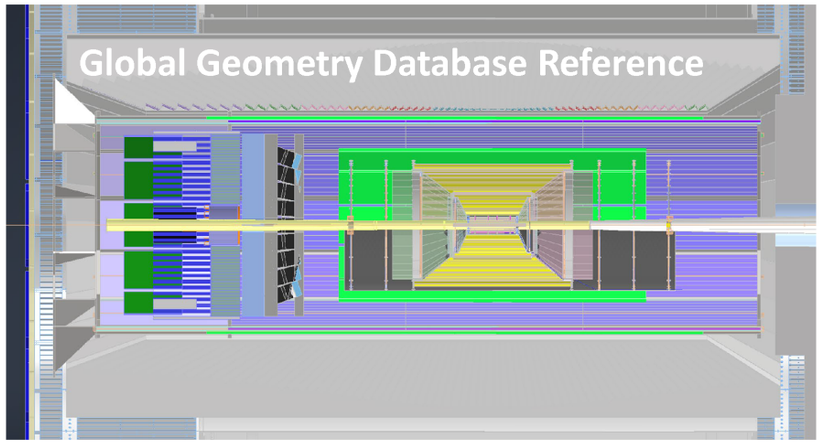
Slide from T. Horn, 9/30 Conveners Meeting.

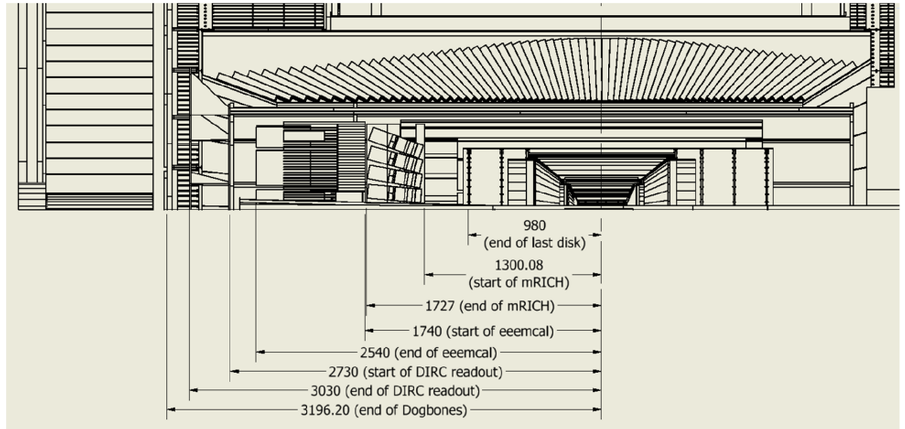
# Detector Envelopes

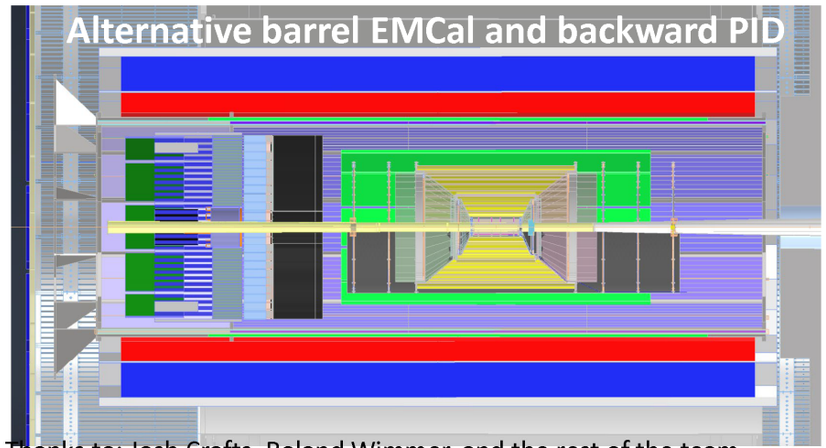
Slide from T. Horn, 9/30 Conveners Meeting.

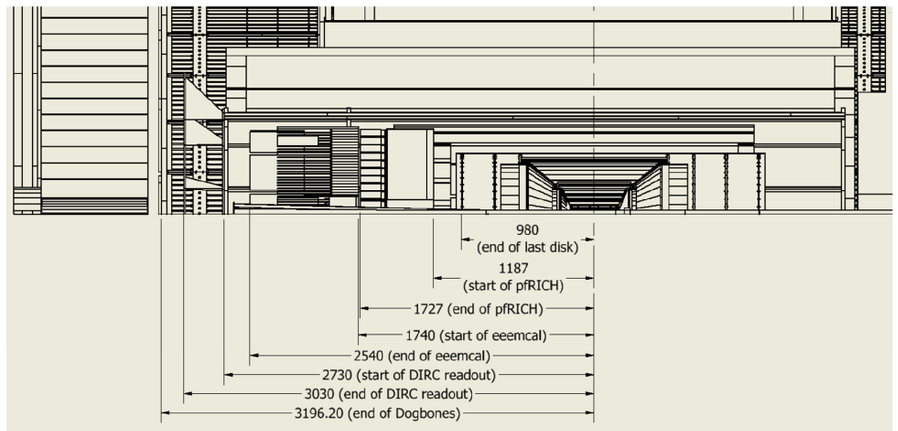
Understanding envelopes is ***critically important*** as DWG's work to define needs for electronics, cabling services…

## EIC Global Geometry: Detector Envelopes



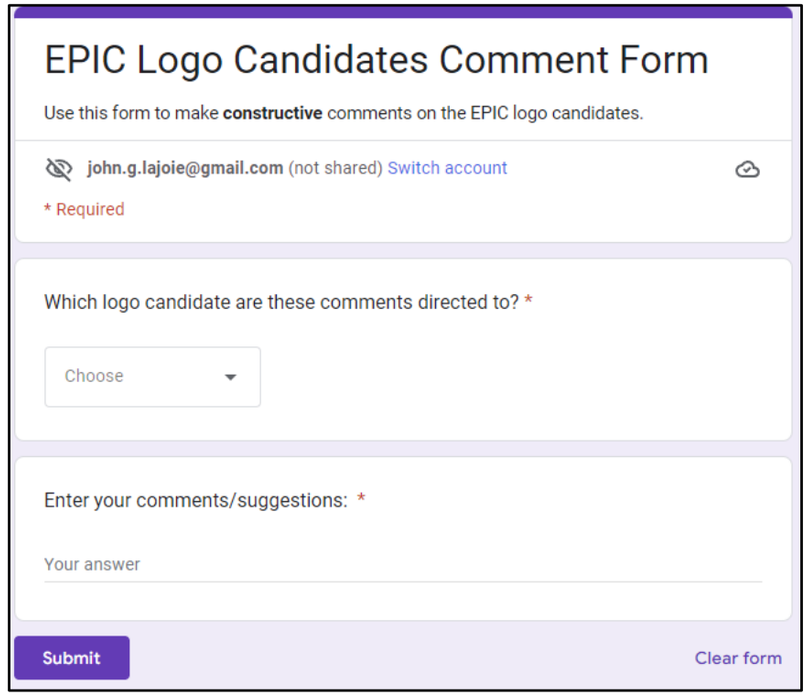




Thanks to: Josh Crafts, Roland Wimmer, and the rest of the team

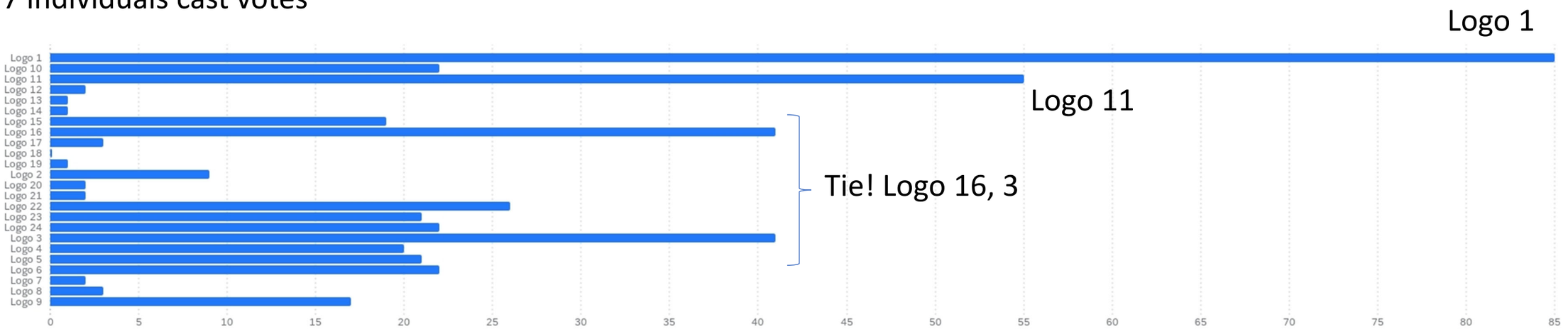
# ePIC Logo Competition

- Logo Submission opened on 8/3/22
  - Lots of interest, emails, questions…
  - Closed on 9/1
  - **22 submissions!** A testament to the creativity of our collaboration!
- Collected comments from the collaboration through Sept 16th
  - Comments distributed to artists; revised submissions accepted through Sept. 23rd
- Voting (by Qualtrics) Sept. 26 – Oct. 6th
  - Vote for up to three, top three advance
  - Many logs posted variations – voting for a concept to be evolved
- Logo candidates posted in wiki: https://wiki.bnl.gov/EPIC/index.php?title=Logos



# First Round Voting Results

177 individuals cast votes




Logo 1

Logo 11

Logo 16

Logo 3

Electron Proton-Ion Collider Experiment

# Path Forward

- Top ~~three~~ four logo candidate authors will be given opportunity to consult with graphic designer:
  - Refine logo for most professional look
  - Supported by JLab/BNL – Thanks Rolf and Elke!
- Final vote later in October (TBD)
  - Will requires a standard presentation from each logo (main, thumbnail, etc.)

# Upcoming Meetings


- 2nd Workshop on AI for the EIC
  - Oct 10-14, William and Mary
  - https://indico.bnl.gov/event/16586/
- APCTP Workshop on the Physics of Electron-Ion Collider
  - November 2-4, Songdo, South Korea
  - https://indico.knu.ac.kr/event/592/
- QCD With the Electron Collider II
  - December 18-20, Indian Institute of Technology, Delhi
  - https://indico.cern.ch/event/1196913/
- Second ePIC Collaboration Meeting
  - Jan 9-10, 2023, JLab
- Epiphany 2023
  - Jan 15-19, 2023, Cracow, Poland
  - Physics of the EIC and Future Facilities

Contact the SC with any conferences or meetings you think we should be aware of!


BACK UP

# Notes on ePIC Design Towards CD-2/3A

- The Project *must* freeze the ePIC reference design in order to prepare for CD-2/3A
  - The reference design will be determined from our best understanding at this point and allow for a ~60% design completion by CD-2/3A
- At the same time, the physics driven development of the ePIC technical design will proceed through a series of simulation campaigns.
  - This will be an ongoing process throughout 2023 to evaluate and refine the physics performance of ePIC
- The reference design will be updated through the project change control process:
  - The change control process is important – changes must be justified by performance, cost and risk!
    - Project also needs to demonstrate it has exercised change control at CD-2/3A
  - Changes should be the *exception*, not the rule.
  - Example: changing from SiPM readout to LAPPDs (technology change) or a change in detector acceptance (design change)
- This will result in a unified *ePIC Technical Design* going into CD-3

# 2022 NSAC Membership

## NSAC Members

DOE/NSF Nuclear Science Advisory Committee

## 2022 Membership List

NSAC Members for 2022 | 2020 - 2021 | 2019 | 2018 | 2017 | 2016 | 2015 | 2014 | 2013-12 | 2011 |2010 | 2009 | 2008 | 2007 | 2006 | 2004-5 | 2004 | 2003 | 2001-2 | 2000-1

| | |
|---|---|
| Sonia Bacca<br>Johannes Gutenberg- Universität Mainz<br>Mainz, Germany | Oliver Kester<br>TRIUMF<br>Vancouver, Canada |
| Paulo Bedaque<br>University of Maryland<br>College Park, Maryland 20742 | Joshua Klein<br>University of Pennsylvania<br>Philadelphia, Pennsylvania 19104 |
| Lee Bernstein<br>Lawrence Berkeley National Laboratory<br>Berkeley, California 94720 | Cecilia Lunardini<br>Arizona State University<br>Temple, Arizona 85287 |
| Romualdo deSouza<br>Indiana University<br>Bloomington, Indiana 47401 | Rosi Reed<br>Lehigh University<br>Bethlehem, Pennsylvania 18015 |
| Gail Dodge (Chair)<br>Old Dominion University<br>Norfolk, Virginia 23529 | Nathalie Wall (2022 ACS ex-Officio)<br>University of Florida<br>Gainesville, Florida 32611<br>Amherst, Massachusetts 01003 |
| Evangeline Downie<br>George Washington University<br>Washington, DC 20052 | Fred Wietfeldt<br>Tulane University<br>New Orleans, Louisiana 70118 |
| Senta Victoria Greene (2022 APS ex-Officio)<br>Vanderbilt University<br>Nashville, Tennessee 37235 | |

# LRP Writing Committee

Slide from Gail Dodge
Sept. 28, 2022, NSAC meeting

## LRP Writing Committee

Christine Aidala
Ani Aprahamian
Sonja Bacca
Paulo Bedaque
Lee Bernstein
Joe Carlson
Mike Carpenter
Kelly Chipps
Vincenzo Cirigliano
Ian Cloet
Andre de Gouvea
Romualdo DeSouza
Gail Dodge
Evie Downie
Renee Fatemi
Alexandre Gade
Haiyan Gao
Susan Gardner
Vicki Greeene
Auston Harton
Tanja Horn
Calvin Howell
Yordanka Illieva
Barbara Jacak
Thia Keppel
Oliver Kester
Josh Klein
Krishna Kumar
Kyle Leach
Dean Lee
Shelly Lesher
Marek Lewitowicz
Chen-Yu Liu
Jorge Lopez
Cecilia Lunardini
Richard Milner
Filomena Nunes
Dan Phillips
Jorge Piekarewicz
Dinko Pocanic
Jianwei Qiu
Sofia Quaglioni
David Radford
Rosi Reed
Lijuan Ruan
Martin Savage
Bjoern Schenke
Derek Teaney
Brent VanDevender
Ramona Vogt
Nathalie Wall
Fred Wietfeldt
John Wilkerson
Richard Wilson
Lindley Winslow
Sherry Yennello
Xiaochao Zheng