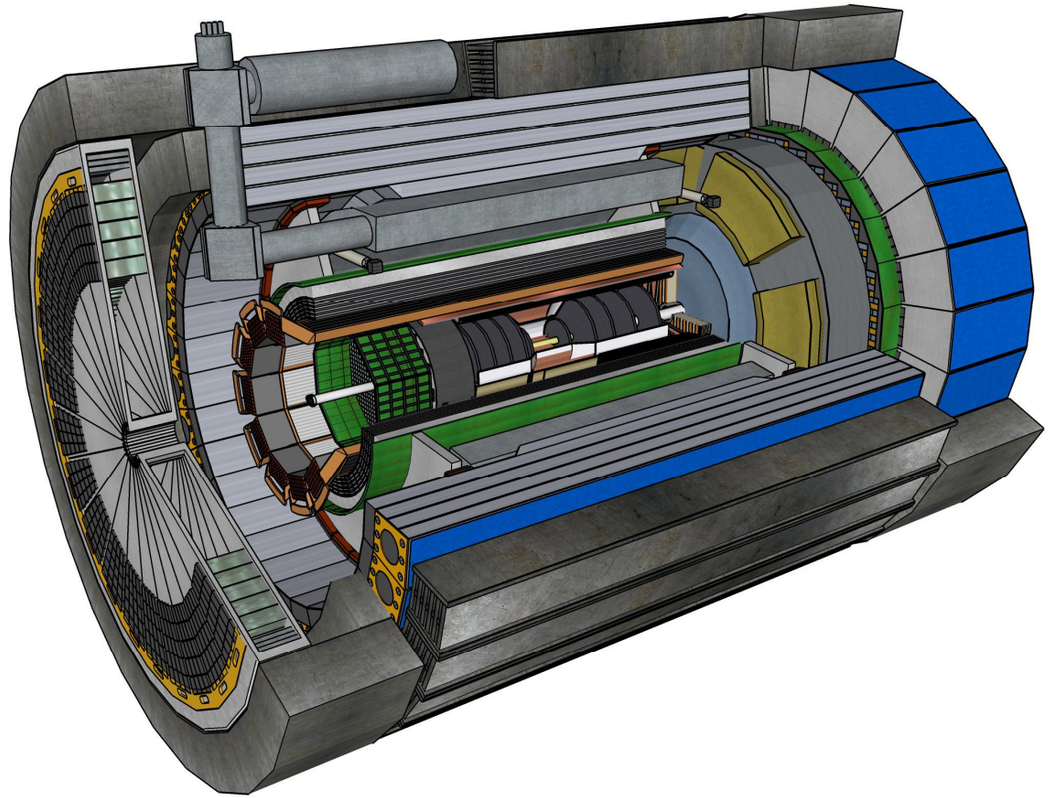
Report from the ePIC Collaboration Spokesperson



John Lajoie

Oak Ridge National Laboratory

OAK RIDGE National Laboratory

U.S. DEPARTMENT OF ENERGY

Office of Science

What is ePIC

What is ePIC

JLab, Jan. 2023

Warsaw, July 2023

ANL,
Jan. 2024

ePIC is a community of scientists dedicated to realizing the EIC science mission.

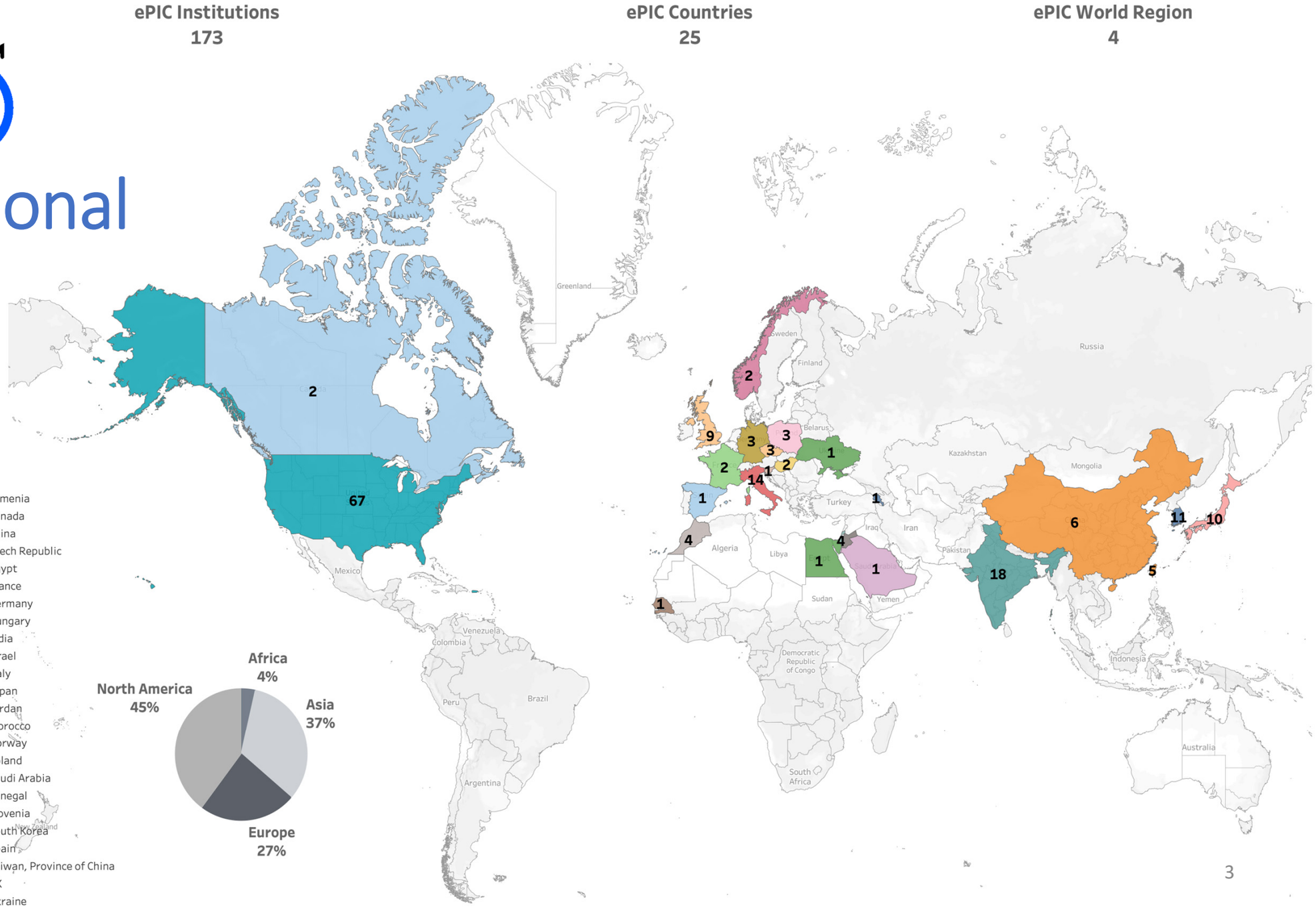
The ePIC Collaboration is as unique as the ePIC detector.

International

ePIC Initiated in July 2022

Currently:
>850 collaborators (from 2024 Institutional Survey)

>650 members active in ePIC activities



ePIC Institutions
173

ePIC Countries
25

ePIC World Region
4

Internati

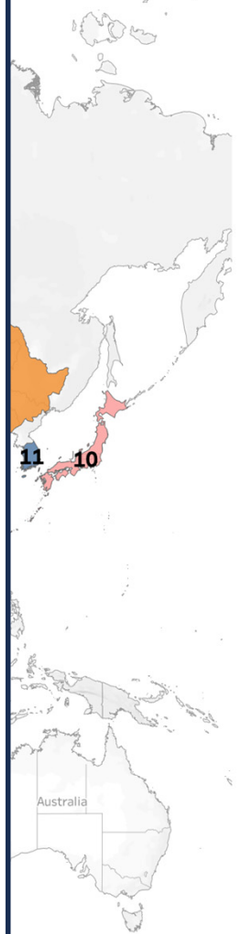
ePIC Initiated in July 2022

Currently:
>850 collaborators (from 2024 Institutional Survey)

>650 members active in ePIC activities

New Institutions Joining ePIC in 2024:

- University of Texas at Austin
- University Mohammed V in Rabat
- University Ibn Tofail in Kénitra
- University Mohammed Premier in Oujda
- University Mohammed VI in Bengurir
- Kent State University



ePIC Institutions
173

ePIC Countries
25

ePIC World Region
4

Internati

eP
Jul

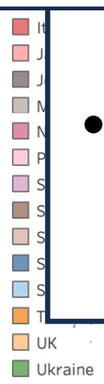
Cu
>8
(fr
Ins
Su

>6
active in ePIC activities

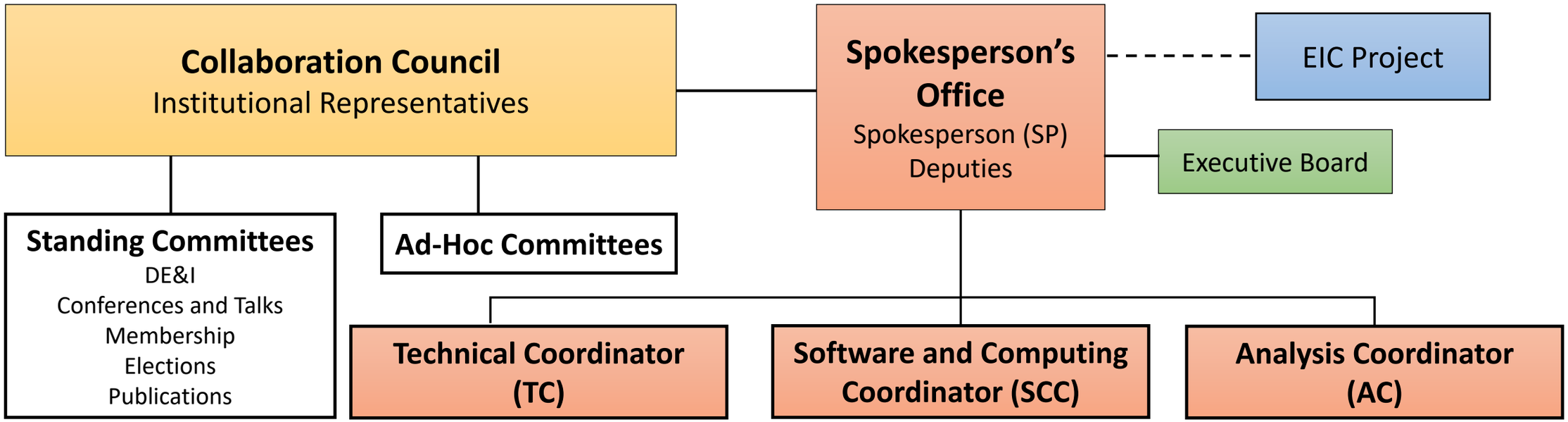
New Institutions Joining ePIC in 2024:

New Proposals for ePIC Membership:

- Laboratoire Leprince-Ringuet (LLR)
- American University in Cairo
- Central University of Haryana
- Indian Institute of Technology Mandi
- Kent State University



ePIC Collaboration Structure



ePIC Collaboration Structure

Collaboration Council
Institutional Representatives

Spokesperson's Office
Spokesperson (SP)
Deputies

EIC Project

Executive Board

Standing Committees
DE&I
Conferences and Talks
Membership
Elections
Publications

Ad-Hoc Committees

Te rdinator

Software and Computing Coordinator (SCC)

Analysis Coordinator (AC)

Technical Coordinator (Acting)
- Silvia Dalla Torre (INFN)

Deputy TC's:
Prakhar Garg (Yale)
Oskar Hartbrich (ORNL)
Matt Posik (Temple)

ePIC Collaboration Structure

Collaboration Council
Institutional Representatives

Spokesperson's Office
Spokesperson (SP)
Deputies

EIC Project

Executive Board

Standing Committees
DE&I
Conferences and Talks
Membership
Elections
Publications

Ad-Hoc Committees

Te  **rdinator**

Softwa Co  **nputing SCC)**

Analysis Coordinator (AC)

Technical Coordinator (Acting)
- Silvia Dalla Torre (INFN)

Deputy TC's:
Prakhar Garg (Yale)
Oskar Hartbrich (ORNL)
Matt Posik (Temple)

SCC Coordinator
- Markus Diefenthaler (JLab)

Dmitry Kalinkin
(Kentucky, Deputy SCC for Development)
Torre Wenaus
(BNL, Deputy SCC for Infrastructure)
Wouter Deconinck
(U. Manitoba, Deputy SCC for Operations)

ePIC Collaboration Structure

Collaboration Council
Institutional Representatives

Spokesperson's Office
Spokesperson (SP)
Deputies

EIC Project

Executive Board

Standing Committees
DE&I
Conferences and Talks
Membership
Elections
Publications

Ad-Hoc Committees

Te  **rdinator**

Softwa Co  **nputing SCC)**


s Coo (AC)  **r**

Technical Coordinator (Acting)
- Silvia Dalla Torre (INFN)

Deputy TC's:
Prakhar Garg (Yale)
Oskar Hartbrich (ORNL)
Matt Posik (Temple)

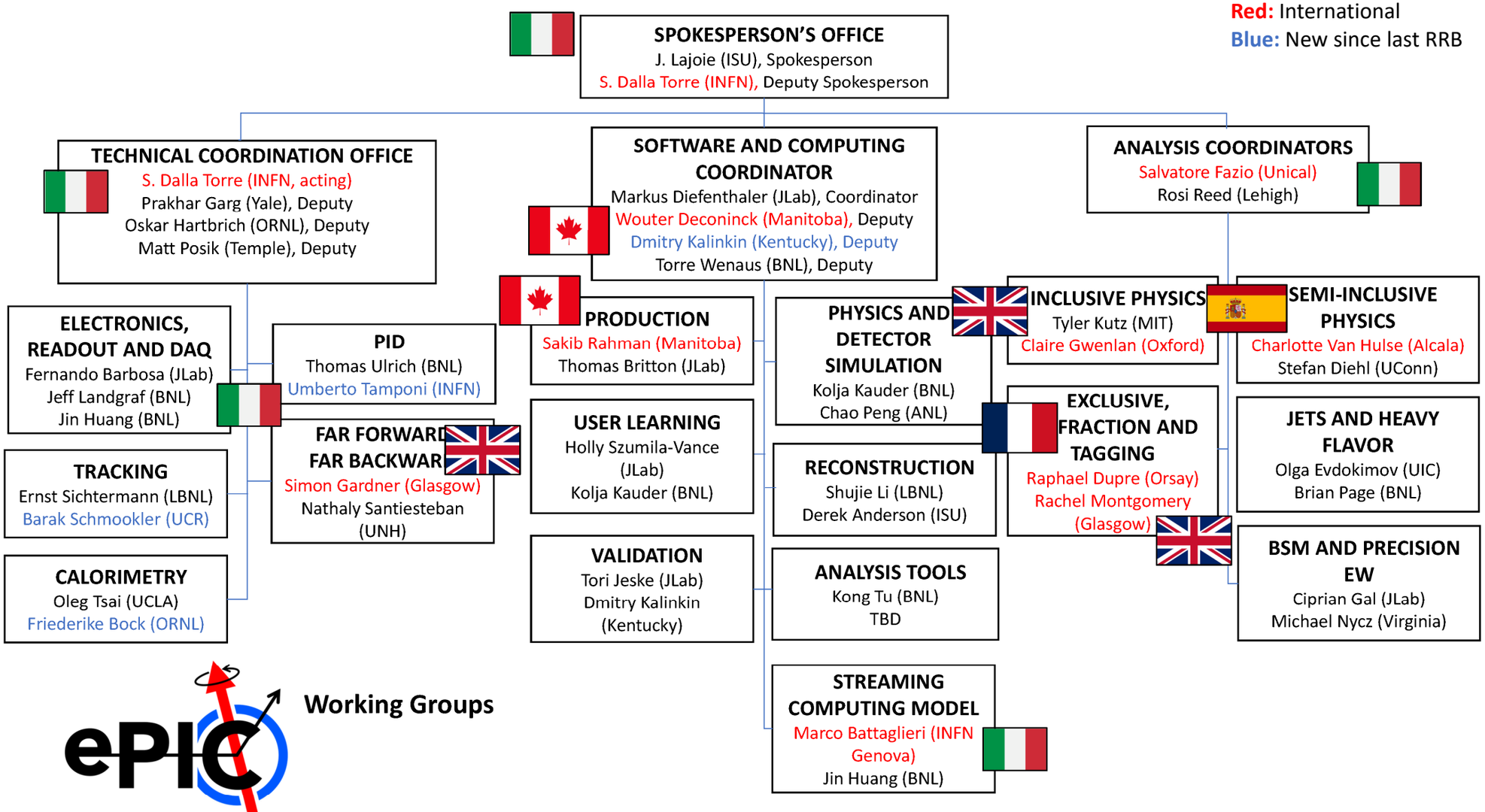
SCC Coordinator
- Markus Diefenthaler (JLab)

Dmitry Kalinkin
(Kentucky, Deputy SCC for Development)
Torre Wenaus
(BNL, Deputy SCC for Infrastructure)
Wouter Deconinck
(U. Manitoba, Deputy SCC for Operations)

Analysis Co-Coordinators
- Rosi Reed (Lehigh Univ.)
- Salvatore Fazio (Univ. Calabria)

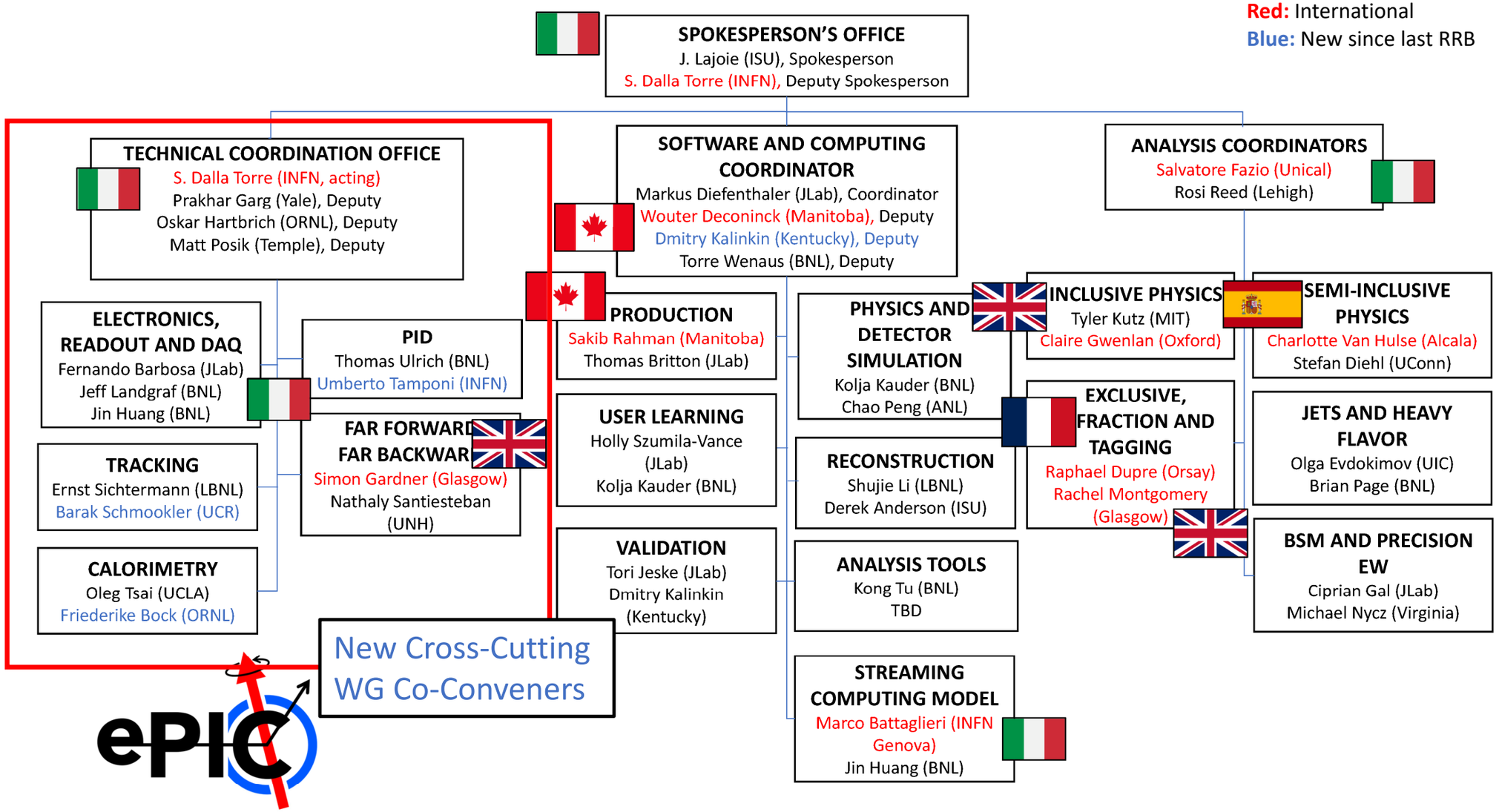
ePIC Working Group Structure

Red: International
Blue: New since last RRB

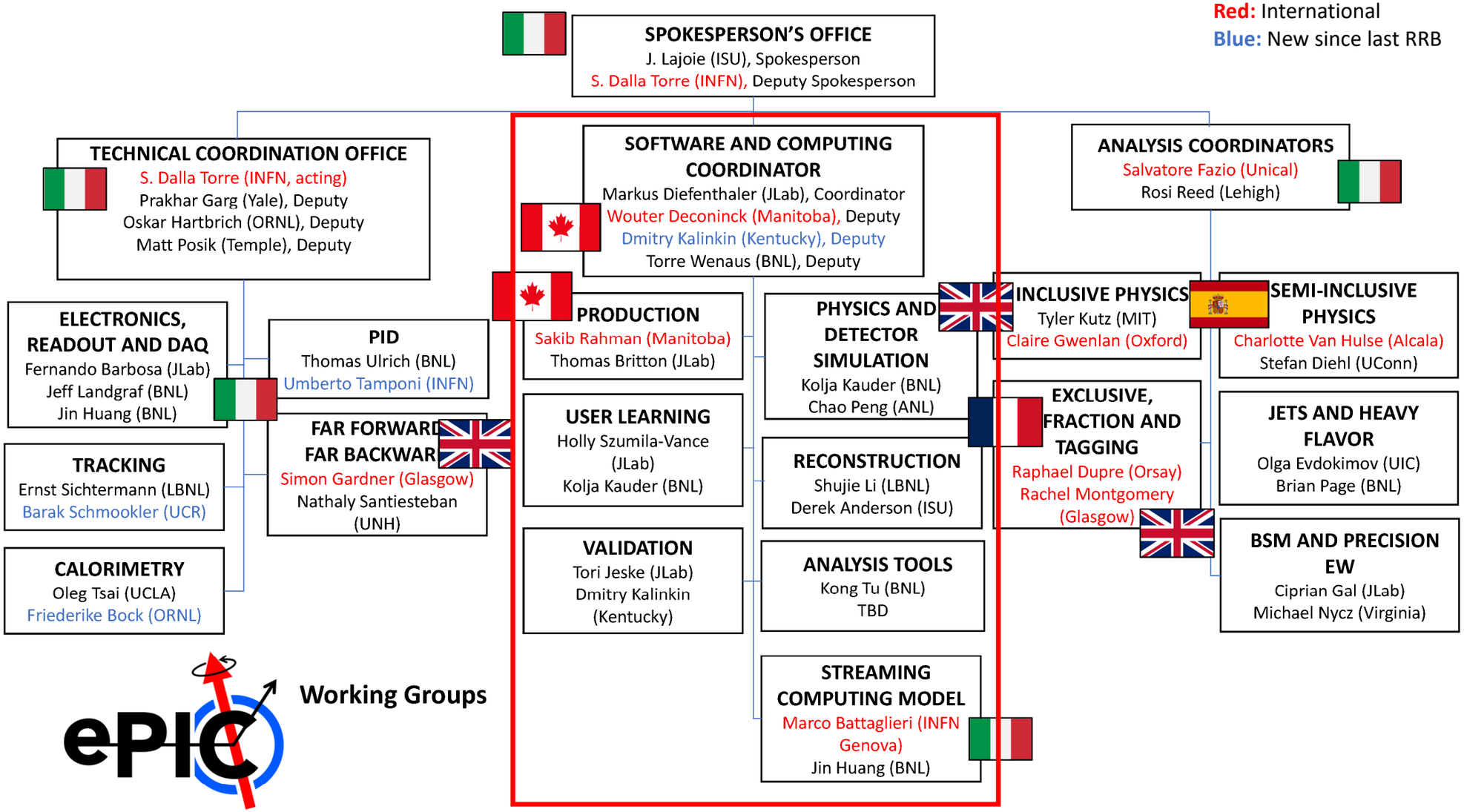


Working Groups

ePIC Working Group Structure

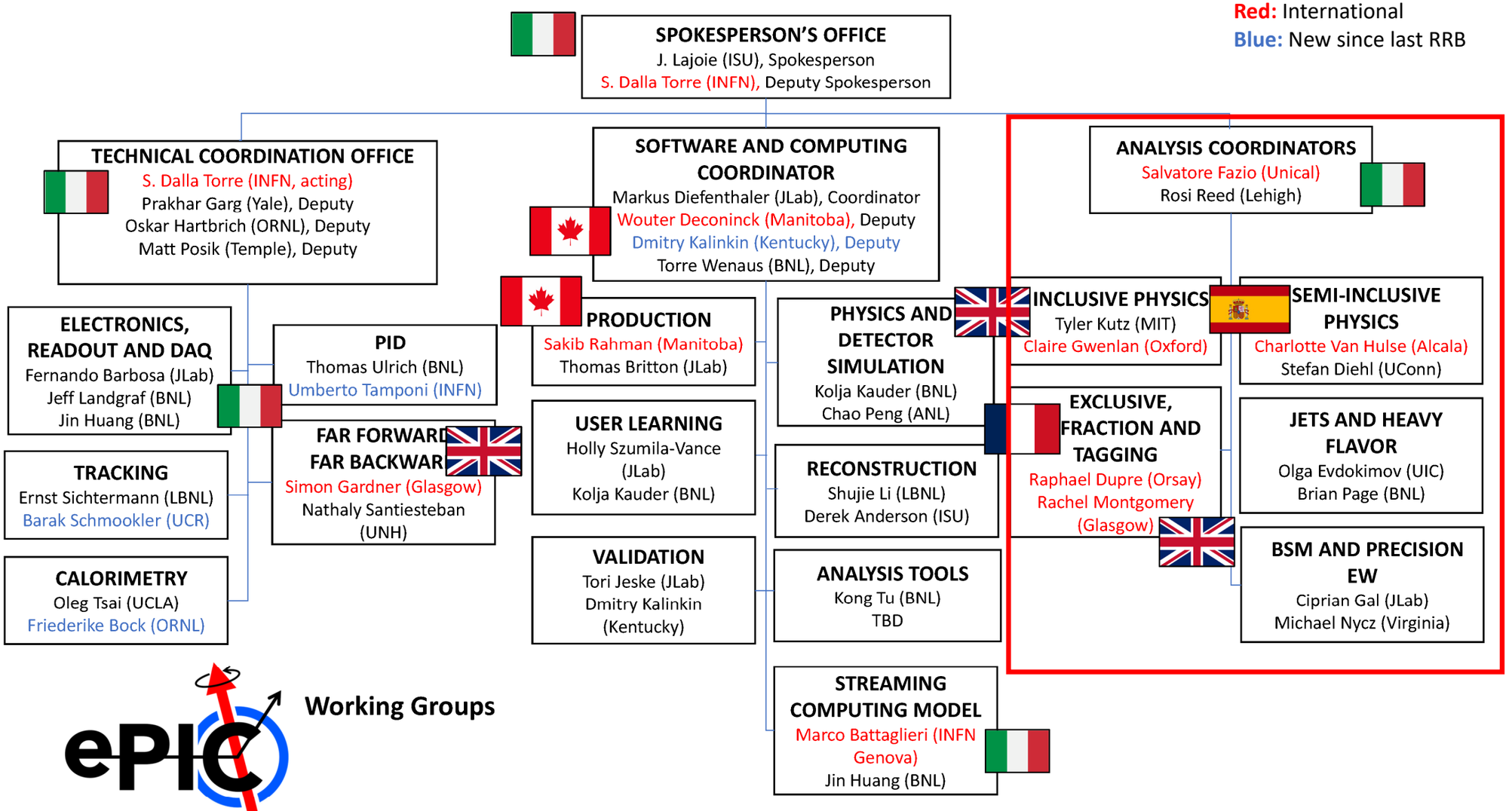


ePIC Working Group Structure



ePIC Working Group Structure

Red: International
Blue: New since last RRB



ePIC DSC Structure

Red: International
Blue: New since last RRB

SPOKESPERSON'S OFFICE
J. Lajoie (ORNL), Spokesperson
S. Dalla Torre (INFN), Deputy Spokesperson

TECHNICAL COORDINATION OFFICE
Silvia Dalla Torre (INFN, acting)
Prakhar Garg (Yale), Deputy
Oskar Hartbrich (ORNL), Deputy
Matt Posik (Temple), Deputy

Detector Subsystem Collaborations

Particle Identification

dRICH
DSL/DSTC: Marco Contalbrigo (INFN)

hpDIRC
DSL/DSTC: Greg Kalicy (CUA)

BACKWARD RICH
DSL/DSTC: Alexander Kiselev (BNL)
Deputy DSL: Brian Page (BNL)

AC-LGAD TOF
DSL: Zhangbu Xu (Kent State)
Deputy DSL: Satoshi Yano (Hiroshima)

Calorimetry

BARREL ECAL
Co-DSL: Sylvester Joosten (ANL)
Co-DSL: Hwidong Yoo (Yonsei)
Deputy DSL: Maria Zurek (ANL)
DSTC (Si): Jessica Metcalfe (ANL)
DSTC (SciFi/Pb): Zisis Papandreou (Regina)

BARREL HCAL
Co-DSL: Stefan Bathe (Baruch)
Co-DSL: Megan Connors (GSU)

FORWARD ECAL
Co-DSL/DSTC: Oleg Tsai (UCLA)
Co-DSL: Huan Huang (UCLA)

BACKWARDS HCAL
DSL/DSTC: Leszek Kosarzewski (OSU)

FORWARD HCAL
DSL/DSTC: Friederike Bock (ORNL)
Deputy DSL/DSTC: Miguel Arratia (UCR)

BACKWARDS ECAL
DSL: Tanja Horn (CUA)
DSTC: Carlos Munhoz Camacho (IJCLab)

Far-Forward Far-Backward

FAR FORWARD
DSL: Alex Jentsch (BNL)
DSTC (B0): Zvi Citron (Ben-Gurion)
DSTC (Roman Pots/OMD): Alex Jentsch (BNL)
Co-DSTC (ZDC): Yuji Goto (RIKEN)
Co-DSTC (ZDC): Miguel Arratia (UCR)

FAR BACKWARD HIGH RATE TRACKER
DSL: Jaroslav Adam (CTU)
DSTC: Simon Gardner (Glasgow)

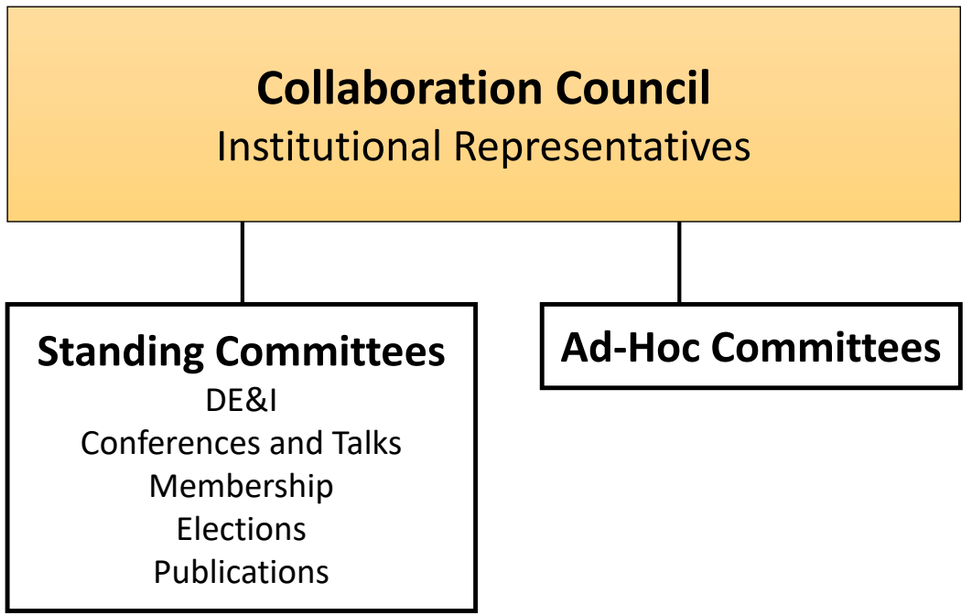
LUMINOSITY
Co-DSL: Nick Zachariou (York)
Co-DSL: Krzysztof Piotrzkowski (AGH Krakow)
DSTC (Pair Spectr.): Dhevan Gangadharan (Houston)

Tracking

Si TRACKERS
DSL: Ernst Sichtermann (LBL)
DSTC: Laura Gonella (Birmingham)

GASEOUS TRACKERS
DSL: Kondo Gnanvo (JLab)
DSTC: Maxence Vendenbroucke (Saclay)

ePIC Committees



ePIC Committees

Collaboration Council
Institutional Representatives

Standing Committees
DE&I
Conferences and Talks
Membership
Elections
Publications

Ad-Hoc Committees

DE&I Committee:
Chair: Megan Connors (GSU)
Vice-Chair: Christine Nattrass (UTK)
Francesco Bossù (CEA-Saclay), Wouter Deconinck (University of Manitoba), Narbe Kalantarians (Virginia Union University) , Iris Ponce Pinto (Yale University) , Maya Shimomura (Nara Women's University) , Allison Zec (University of New Hampshire)

ePIC Committees

Collaboration Council
Institutional Representatives

Standing Committees
DE&I
Conferences and Talks
Membership
Elections
Publications

Ad-Hoc Committees

DE&I Committee:
Chair: Megan Connors (GSU)
Vice-Chair: Christine Nattrass (UTK)
Francesco Bossù (CEA-Saclay), Wouter Deconinck (University of Manitoba), Narbe Kalantarians (Virginia Union
Maya
(Unive

Conferences and Talks:
Chair: Maria Zurek (ANL)
Vice-Chair: Brian Page (BNL)
Barbara Jacak (Berkeley), Daniel Brandenburg (OSU), Dmitry Kalinkin (Kentucky), Nick Zachariou (York), Xuan Li (LANL), Nicola Rubini (Bologna), Wouter Deconinck (Manitoba)

ePIC Committees

Collaboration Council
Institutional Representatives

Standing Committees
DE&I
Conferences and Talks
Membership
Elections
Publications

Ad-Hoc Committees

DE&I Committee:
Chair: Megan Connors (GSU)
Vice-Chair: Christine Nattrass (UTK)
Francesco Bossù (CEA-Saclay), Wouter Deconinck (University of Manitoba), Narbe Kalantarians (Virginia Union
Maya
(Unive

Conferences and Talks:
Chair: Maria Zurek (ANL)
Vice-Chair: Brian Page (BNL)
Barba
Kalink
Nicola

Membership Committee:
Chair: Peter Steinberg (BNL)
Vice-Chair: Pietro Anontioli (INFN-Bologna)
Friederike Bock (ORNL), Helen Caines (Yale), Doug Higinbotham (JLab), Bedhangas Moharty (NISER), Silvia Niccolai (IJCLAB), Marzia Rosati (ISU)

ePIC Committees

Collaboration Council
Institutional Representatives

Standing Committees
DE&I
Conferences and Talks
Membership
Elections
Publications

Ad-Hoc Committees

DE&I Committee:
Chair: Megan Connors (GSU)
Vice-Chair: Christine Nattrass (UTK)
Francesco Bossù (CEA-Saclay), Wouter Deconinck (University of Manitoba), Narbe Kalantarians (Virginia Union

Conferences and Talks:
Chair: Maria Zurek (ANL)
Vice-Chair: Brian Page (BNL)

Membership Committee:
Chair: Peter Steinberg (BNL)
Vice-Chair: Pietro Anontioli (INFN-Bologna)
Friederike Bock (ORNL), Helen Caines (Yale), Doug

Elections Committee:
Chair: Helen Caines (Yale)
Vice-Chair: Ken Barish (UCR)
Past-Chair: John Arrington (LBNL)
Maria Stefaniak (OSU), Domenico Elia (INFN)

ePIC Committees

Collaboration Council
Institutional Representatives

Standing Committees
DE&I
Conferences and Talks
Membership
Elections
Publications

Ad-Hoc Committees

DE&I Committee:
Chair: Megan Connors (GSU)
Vice-Chair: Christine Nattrass (UTK)
Francesco Bossù (CEA-Saclay), Wouter Deconinck (University of Manitoba), Narbe Kalantarians (Virginia Union

Conferences and Talks:
Chair: Maria Zurek (ANL)
Vice-Chair: Brian Page (BNL)

Membership Committee:
Chair: Peter Steinberg (BNL)
Vice-Chair: Pietro Anontioli (INFN-Bologna)
Friederike Bock (ORNL), Helen Caines (Yale), Doug

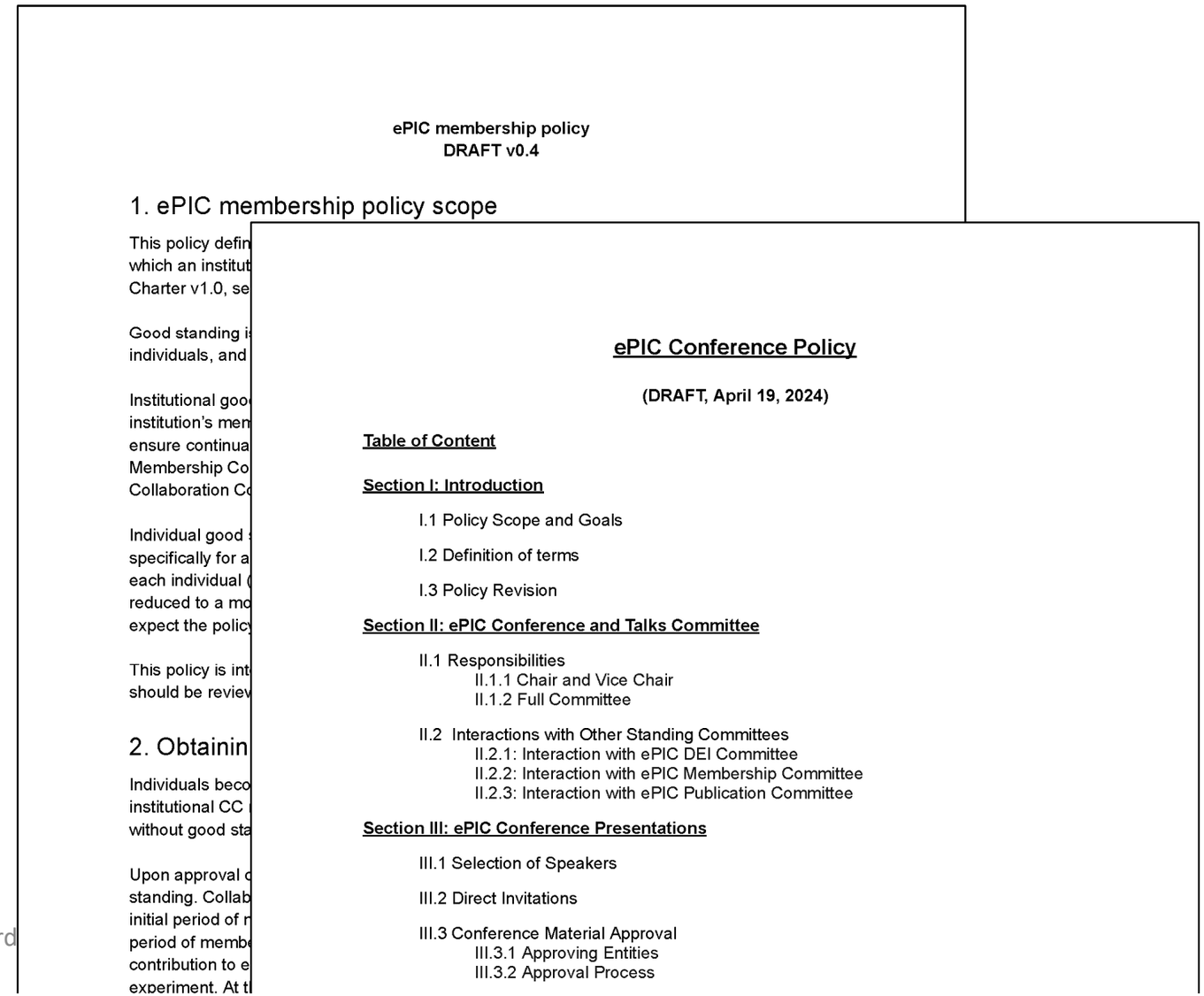
Elections Committee:
Chair: Helen Caines (Yale)

Publications Committee:
Chair: Rene Bellwied (U. Houston)
Vice –Chair: Annalisa Mastroserio (INFN Bari)
Lokesh Kumar (Panjab U.), Michela Chiosso (Torino), Prithwish Tribedy (BNL), Markus Diefenthaler (JLab), Sevil Salur (Rutgers),
ex-officio w. Conferences and Talks Committee:
Daniel Brandenburg (OSU)

All ePIC Standing Committees now formed and at work.

Formation of ePIC Policies

Latest drafts of Membership and Conference and Talks Policies presentated to Collaboration Council on April 26th.



ePIC membership policy
DRAFT v0.4

1. ePIC membership policy scope

This policy defin
which an institut
Charter v1.0, se

Good standing i
individuals, and

Institutional goo
institution's men
ensure continua
Membership Co
Collaboration Co

Individual good
specifically for a
each individual (
reduced to a mo
expect the policy

This policy is int
should be reviev

2. Obtainin

Individuals beco
institutional CC
without good sta

Upon approval o
standing. Collab
initial period of r
period of membe
contribution to e
experiment. At t

ePIC Conference Policy

(DRAFT, April 19, 2024)

Table of Content

Section I: Introduction

I.1 Policy Scope and Goals

I.2 Definition of terms

I.3 Policy Revision

Section II: ePIC Conference and Talks Committee

II.1 Responsibilities
II.1.1 Chair and Vice Chair
II.1.2 Full Committee

II.2 Interactions with Other Standing Committees
II.2.1: Interaction with ePIC DEI Committee
II.2.2: Interaction with ePIC Membership Committee
II.2.3: Interaction with ePIC Publication Committee

Section III: ePIC Conference Presentations

III.1 Selection of Speakers

III.2 Direct Invitations

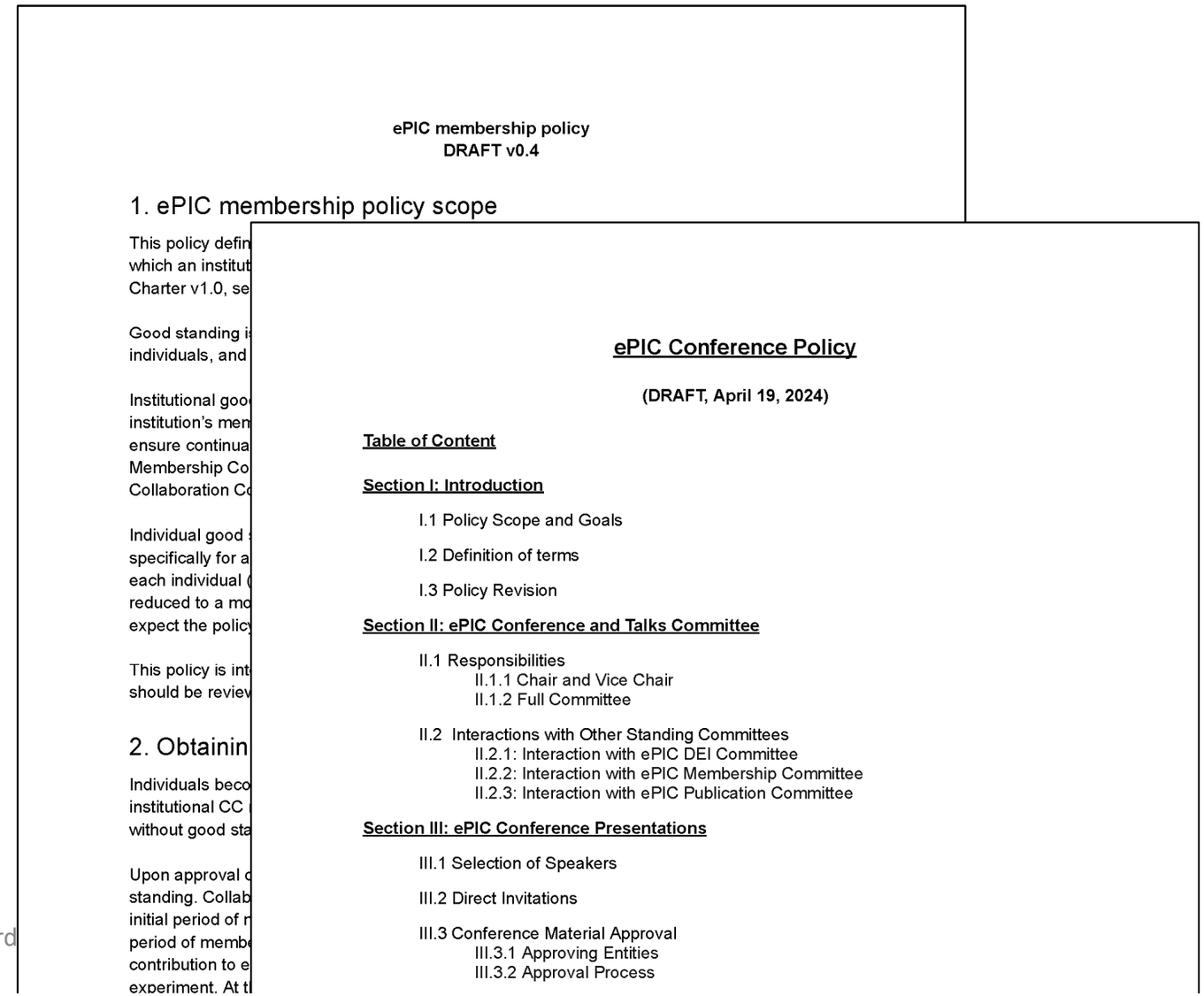
III.3 Conference Material Approval
III.3.1 Approving Entities
III.3.2 Approval Process

Formation of ePIC Policies

Latest drafts of Membership and Conference and Talks Policies presentated to Collaboration Council on April 26th.

The Membership Policy defines the process by which individuals and institutions establish "good standing" – from the current draft:

- Individual "good standing" requires a one-time identifiable contribution to ePIC
- Institutional "good standing" requires an annual "Statement of Service"
    - Threshold for combined service to ePIC



ePIC membership policy
DRAFT v0.4

1. ePIC membership policy scope

This policy defin
which an institut
Charter v1.0, se

Good standing i
individuals, and

Institutional goo
institution's men
ensure continua
Membership Co
Collaboration Co

Individual good
specifically for a
each individual (
reduced to a mo
expect the policy

This policy is int
should be reviev

2. Obtainin

Individuals beco
institutional CC
without good sta

Upon approval o
standing. Collab
initial period of r
period of membe
contribution to e
experiment. At t

ePIC Conference Policy

(DRAFT, April 19, 2024)

Table of Content

Section I: Introduction

I.1 Policy Scope and Goals

I.2 Definition of terms

I.3 Policy Revision

Section II: ePIC Conference and Talks Committee

II.1 Responsibilities
II.1.1 Chair and Vice Chair
II.1.2 Full Committee

II.2 Interactions with Other Standing Committees
II.2.1: Interaction with ePIC DEI Committee
II.2.2: Interaction with ePIC Membership Committee
II.2.3: Interaction with ePIC Publication Committee

Section III: ePIC Conference Presentations

III.1 Selection of Speakers

III.2 Direct Invitations

III.3 Conference Material Approval
III.3.1 Approving Entities
III.3.2 Approval Process

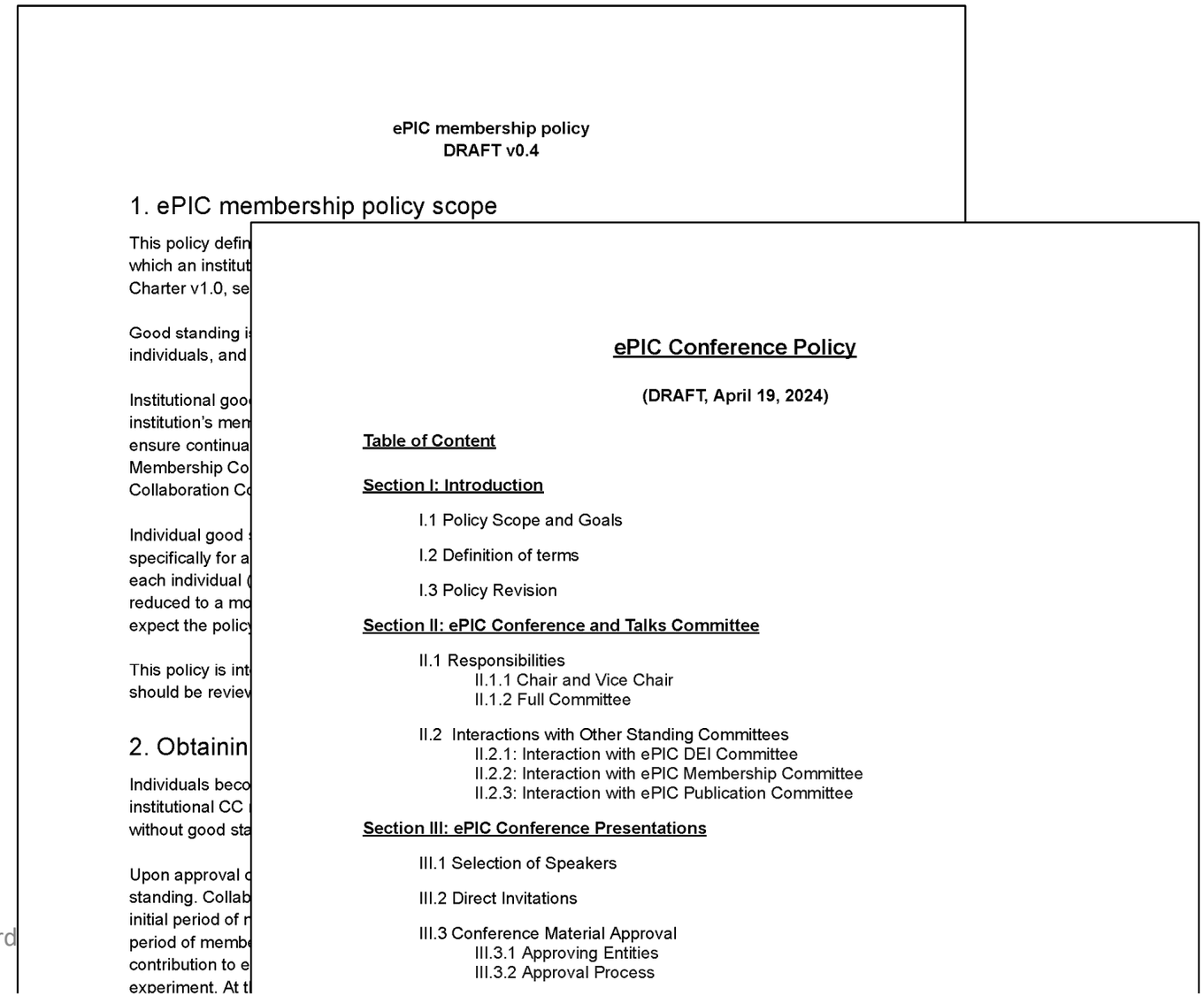
Formation of ePIC Policies

Latest drafts of Membership and Conference and Talks Policies presentated to Collaboration Council on April 26th.

The Membership Policy defines the process by which individuals and institutions establish "good standing" – from the current draft:

- Individual "good standing" requires a one-time identifiable contribution to ePIC
- Institutional "good standing" requires an annual "Statement of Service"
    - Threshold for combined service to ePIC

The Conference and Talks Policy defines the processes governing the speaker selection, quality assurance, approval, and archiving of conference abstracts and oral and poster presentations delivered at scientific conferences, workshops, etc.



ePIC membership policy
DRAFT v0.4

1. ePIC membership policy scope

This policy defin
which an institut
Charter v1.0, se

Good standing i
individuals, and

Institutional goo
institution's men
ensure continua
Membership Co
Collaboration Cc

Individual good
specifically for a
each individual (
reduced to a mo
expect the policy

This policy is int
should be reviev

2. Obtainin

Individuals beco
institutional CC
without good sta

Upon approval c
standing. Collab
initial period of r
period of membe
contribution to e
experiment. At t

ePIC Conference Policy

(DRAFT, April 19, 2024)

Table of Content

Section I: Introduction

I.1 Policy Scope and Goals

I.2 Definition of terms

I.3 Policy Revision

Section II: ePIC Conference and Talks Committee

II.1 Responsibilities
II.1.1 Chair and Vice Chair
II.1.2 Full Committee

II.2 Interactions with Other Standing Committees
II.2.1: Interaction with ePIC DEI Committee
II.2.2: Interaction with ePIC Membership Committee
II.2.3: Interaction with ePIC Publication Committee

Section III: ePIC Conference Presentations

III.1 Selection of Speakers

III.2 Direct Invitations

III.3 Conference Material Approval
III.3.1 Approving Entities
III.3.2 Approval Process

Formation of ePIC Policies

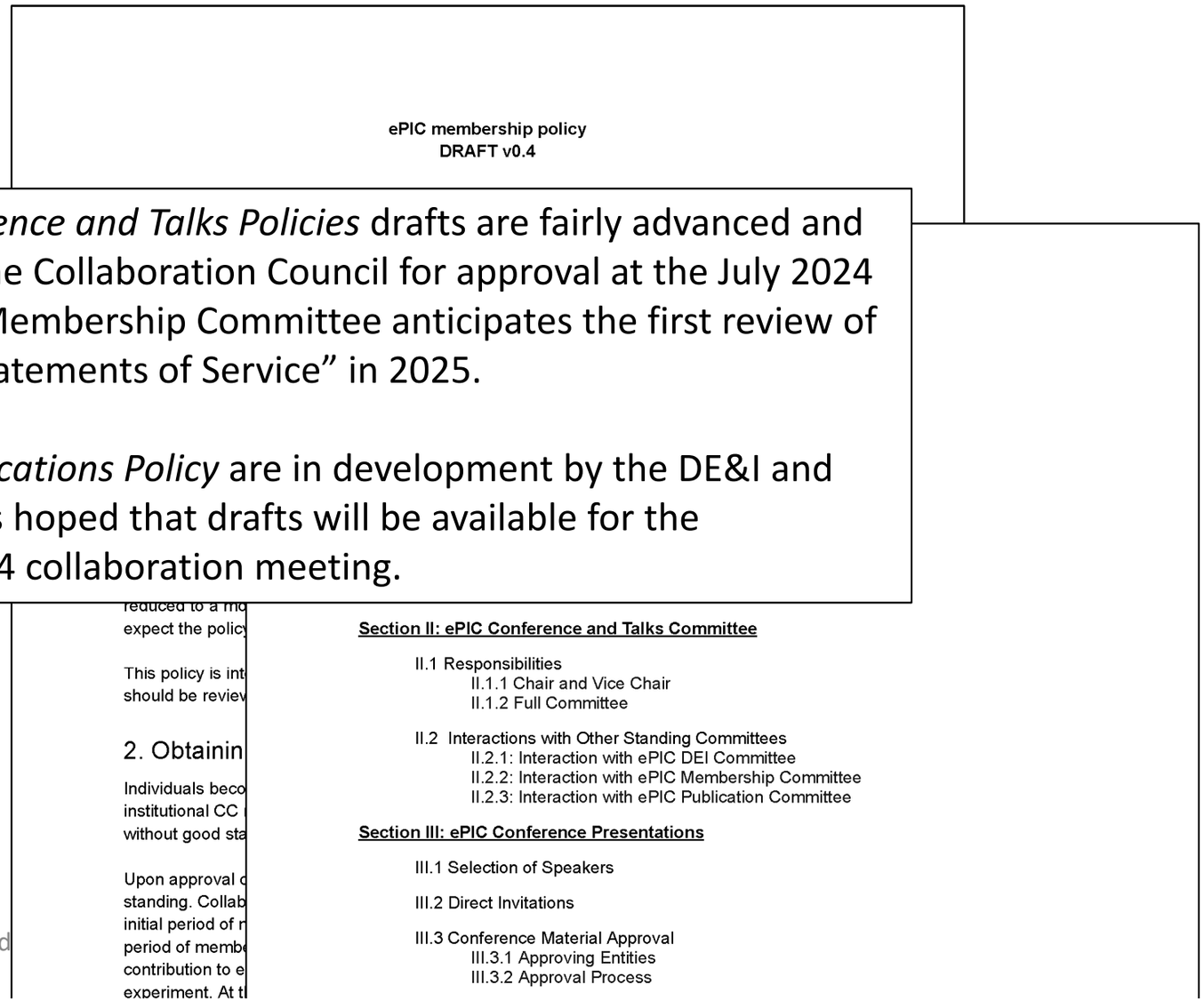
Latest drafts of Membership and Conference and Talks Policies presentated to Collaboration Council on April 26th.

The Membership Polic defines the process by which individuals and
"good standing" – fro
- Individual "good st
  time identifiable c
- Institutional "gooc
  annual "Statemen
  - Threshold for

The Conference and Talks Policy defines the processes governing the speaker selection, quality assurance, approval, and archiving of conference abstracts and oral and poster presentations delivered at scientific conferences, workshops, etc.

The *Membership* and *Conference and Talks Policies* drafts are fairly advanced and potentially could be put to the Collaboration Council for approval at the July 2024 collaboration meeting. The Membership Committee anticipates the first review of collaboration institutions "Statements of Service" in 2025.

A *Code of Conduct* and *Publications Policy* are in development by the DE&I and Publications committees. It is hoped that drafts will be available for the collaboration by the July 2024 collaboration meeting.


ePIC membership policy
DRAFT v0.4

reduced to a mo
expect the policy

This policy is int
should be reviev

2. Obtainin

Individuals beco
institutional CC
without good sta

Upon approval c
standing. Collab
initial period of r
period of membe
contribution to e
experiment. At t

Section II: ePIC Conference and Talks Committee

II.1 Responsibilities
II.1.1 Chair and Vice Chair
II.1.2 Full Committee

II.2 Interactions with Other Standing Committees
II.2.1: Interaction with ePIC DEI Committee
II.2.2: Interaction with ePIC Membership Committee
II.2.3: Interaction with ePIC Publication Committee

Section III: ePIC Conference Presentations

III.1 Selection of Speakers

III.2 Direct Invitations

III.3 Conference Material Approval
III.3.1 Approving Entities
III.3.2 Approval Process

Regular Cadence of the Collaboration

- New CC WG co-convenors submitted for Collaboration Council for endorsement
- New DSC Leaders and Technical Coordinators

Regular Cadence of the Collaboration

- New CC WG co-convenors submitted for Collaboration Council for endorsement
- New DSC Leaders and Technical Coordinators
- Collaboration Council Vice-Chair Elections:
  - Candidates: Ken Barish (UCR), Olga Evdokimov (UIC), Peter Steinberg (BNL) Thomas Ullrich (BNL)
    - Candidate statements at the April 26th Collab. Council Meeting, election coming soon

Regular Cadence of the Collaboration

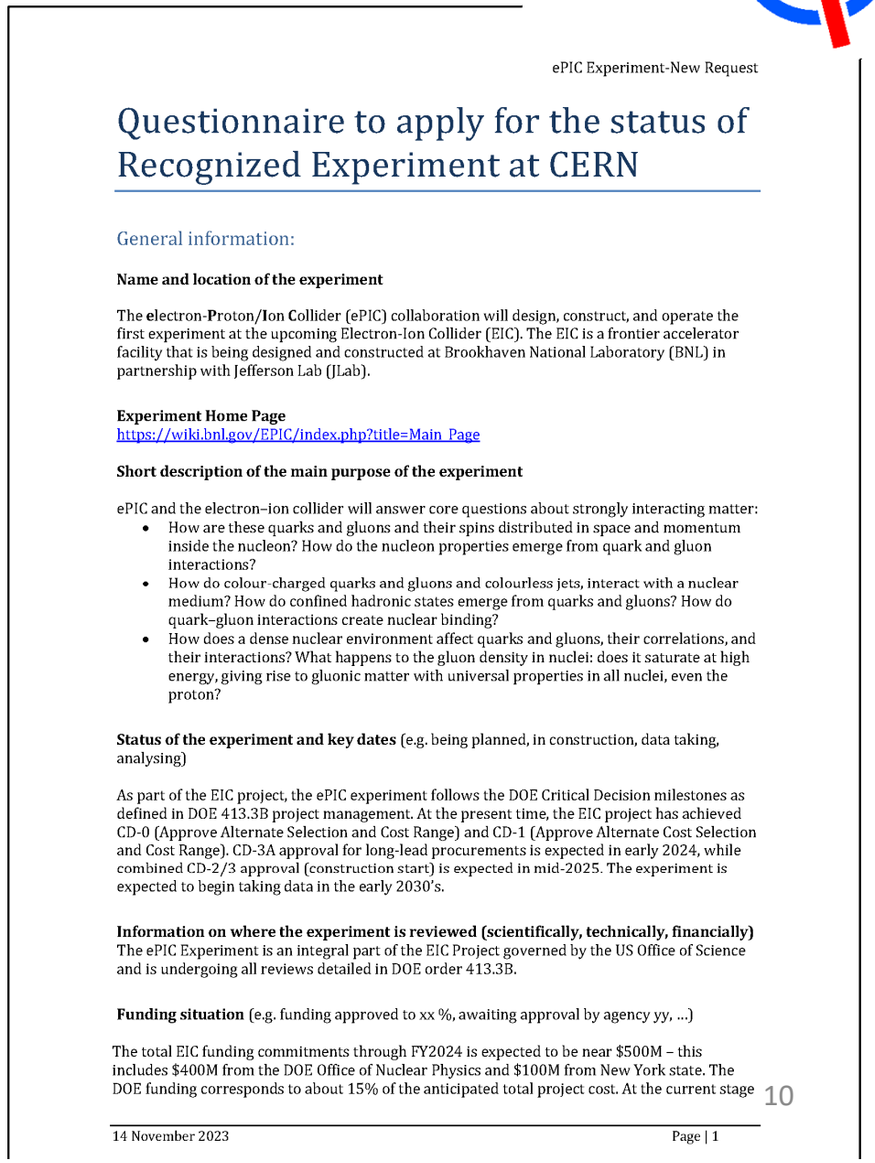
- New CC WG co-convenors submitted for Collaboration Council for endorsement
- New DSC Leaders and Technical Coordinators
- Collaboration Council Vice-Chair Elections:
  - Candidates: Ken Barish (UCR), Olga Evdokimov (UIC), Peter Steinberg (BNL) Thomas Ullrich (BNL)
    - Candidate statements at the April 26th Collab. Council Meeting, election coming soon
- Physics Working Group Convener Rotations
  - PWG Co-conveners serve staggered two-year terms
  - SP Office will submit new PWG conveners for CC endorsement at July collaboration meeting

Regular Cadence of the Collaboration

- New CC WG co-convenors submitted for Collaboration Council for endorsement
- New DSC Leaders and Technical Coordinators
- Collaboration Council Vice-Chair Elections:
  - Candidates: Ken Barish (UCR), Olga Evdokimov (UIC), Peter Steinberg (BNL) Thomas Ullrich (BNL)
    - Candidate statements at the April 26th Collab. Council Meeting, election coming soon
- Physics Working Group Convener Rotations
  - PWG Co-conveners serve staggered two-year terms
  - SP Office will submit new PWG conveners for CC endorsement at July collaboration meeting
- Spokesperson election in February 2025

CERN Recognized Experiment

- ePIC Application for CERN Recognized Experiment:
  - ePIC leadership has submitted an application to become a CERN Recognized Experiment
  - Strong synergies between CERN and EIC
  - Important for access to CERN resources (test beams, …)
  - Increase visibility in the European community
- ePIC presentation to CERN Recognized Experiments Committee (REC) Feb 8th
- Research Board confirmed the positive REC recommendation at CERN Council Meeting March 21-22nd
- Working with Helge Meinhard on next steps



ePIC Experiment-New Request

Questionnaire to apply for the status of Recognized Experiment at CERN

General information:

Name and location of the experiment

The **e**lectron-**P**roton/**I**on **C**ollider (ePIC) collaboration will design, construct, and operate the first experiment at the upcoming Electron-Ion Collider (EIC). The EIC is a frontier accelerator facility that is being designed and constructed at Brookhaven National Laboratory (BNL) in partnership with Jefferson Lab (JLab).

Experiment Home Page
https://wiki.bnl.gov/EPIC/index.php?title=Main_Page

Short description of the main purpose of the experiment

ePIC and the electron–ion collider will answer core questions about strongly interacting matter:

- How are these quarks and gluons and their spins distributed in space and momentum inside the nucleon? How do the nucleon properties emerge from quark and gluon interactions?
- How do colour-charged quarks and gluons and colourless jets, interact with a nuclear medium? How do confined hadronic states emerge from quarks and gluons? How do quark–gluon interactions create nuclear binding?
- How does a dense nuclear environment affect quarks and gluons, their correlations, and their interactions? What happens to the gluon density in nuclei: does it saturate at high energy, giving rise to gluonic matter with universal properties in all nuclei, even the proton?

Status of the experiment and key dates (e.g. being planned, in construction, data taking, analysing)

As part of the EIC project, the ePIC experiment follows the DOE Critical Decision milestones as defined in DOE 413.3B project management. At the present time, the EIC project has achieved CD-0 (Approve Alternate Selection and Cost Range) and CD-1 (Approve Alternate Cost Selection and Cost Range). CD-3A approval for long-lead procurements is expected in early 2024, while combined CD-2/3 approval (construction start) is expected in mid-2025. The experiment is expected to begin taking data in the early 2030's.

Information on where the experiment is reviewed (scientifically, technically, financially)
The ePIC Experiment is an integral part of the EIC Project governed by the US Office of Science and is undergoing all reviews detailed in DOE order 413.3B.

Funding situation (e.g. funding approved to xx %, awaiting approval by agency yy, …)

The total EIC funding commitments through FY2024 is expected to be near $500M – this includes $400M from the DOE Office of Nuclear Physics and $100M from New York state. The DOE funding corresponds to about 15% of the anticipated total project cost. At the current stage

14 November 2023 Page | 1

ePIC Conference Presentations

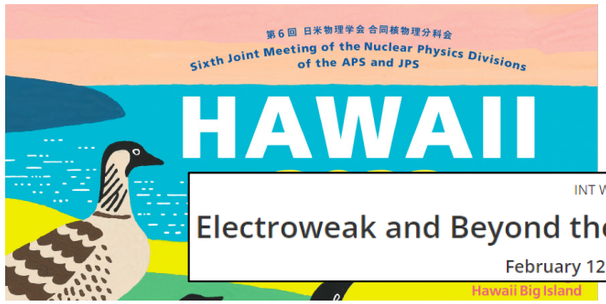
A selection of ePIC presentations at conferences in the past year:

APS Southeastern Section SESAPS

SESAPS 2023: invited talk

Three invited talks

2nd workshop on advancing the understanding of non-perturbative QCD using energy flow



Six contributed talks

apctp asia pacific center for theoretical physics

2nd APCTP Workshop on the Physics of Electron Ion Collider: ePIC Physics and Detectors

Invited talk

Two invited talks

Joint ECFA-NuPECC-APPEC Activity Workshop "Synergies between the EIC and the LHC"

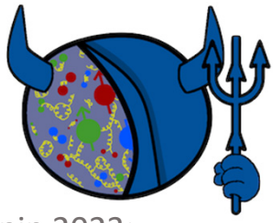
Two invited talks

INT WORKSHOP INT-24-87W

Electroweak and Beyond the Standard Model Physics at the EIC

February 12, 2024 - February 16, 2024

Hawaii Big Island



Spin 2023: two invited talks

MENU 2023

Invited talk

Six contributed talks

EINN2023

Two invited, two contributed

Forward Physics and QCD at the LHC and the EIC - 798 WE-Heraeus Seminar

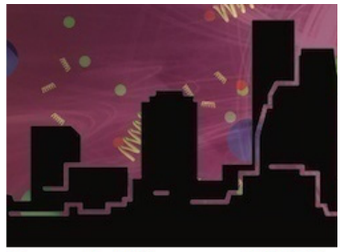
invited talk

EPIPHANY 2024: invited talk

APS The 2023 Fall Meeting of the Division of Nuclear Physics of the American Physical Society and the Physical Society of Japan

AI4EIC: four talks

Multiple contributed, posters



Quark Matter 2023

HADRON 2023

Invited talk

Invited talk

23rd Zimanyi School Winter Workshop

invited talk

Invited talk

UPC 2023: International workshop on the physics of Ultra Peripheral Collisions

ePIC Talks @ DIS 2024

https://lpsc-indico.in2p3.fr/event/3268/

- Invited Talks:
  - *ePIC Detector Overview* - Shujie Li
- Contributed Talks:
  - *Overview of the ePIC Calorimetry* – Henry Klest
  - *Silicon Vertex Tracker for the ePIC experiment at the Electron-Ion Collider* – Gian Michele Innocenti
  - *Particle Identification with the ePIC detector at the EIC* – Chandradoy Chatterjee
  - *Physics Perspectives with the ePIC Far-Forward and Far-Backward detectors* - Michael Pitt

Jan 2024 ePIC Collaboration Meeting

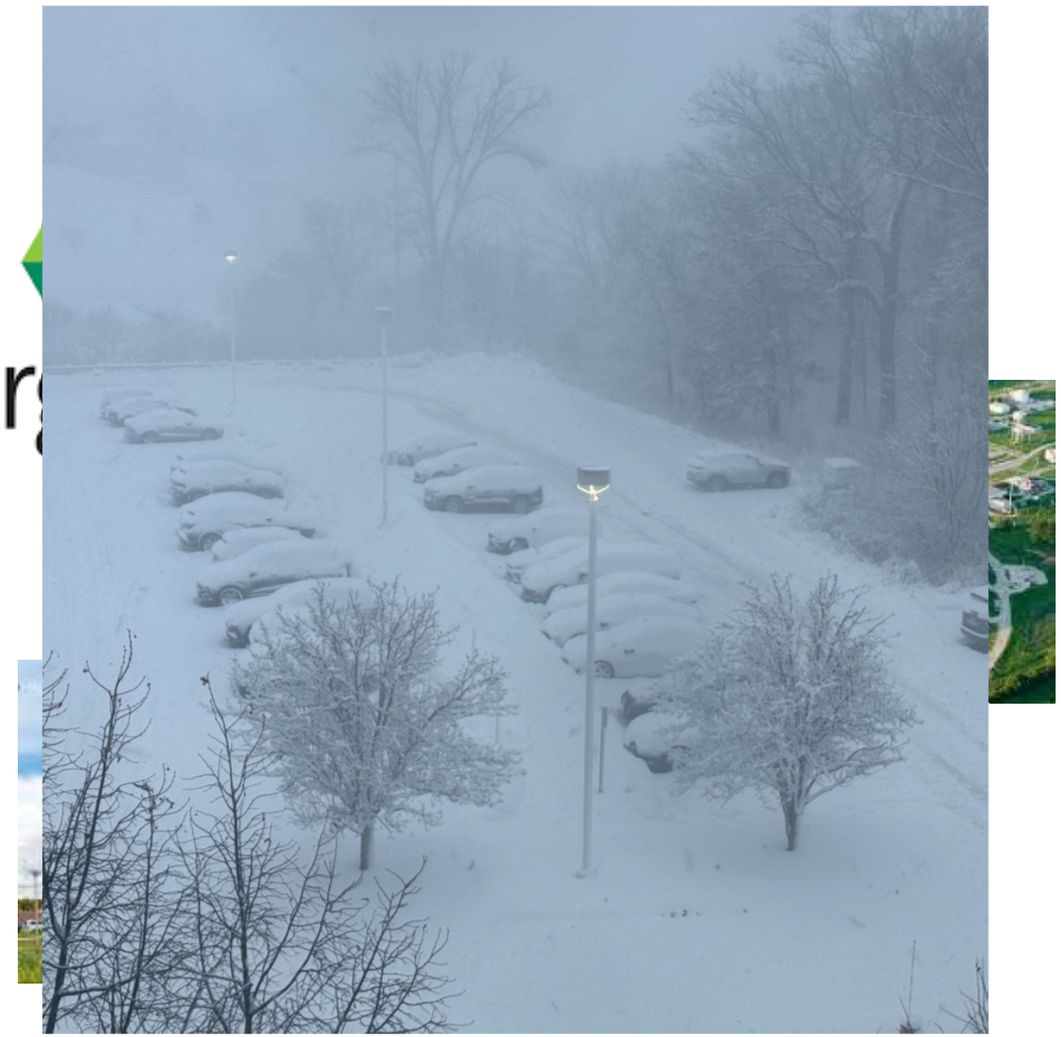
- Jan 9-13th, 2024 @ ANL
- Three days of parallel workfests followed by two days of plenary sessions:
  - https://indico.bnl.gov/event/20473/

Jan 2024 ePIC Collaboration Meeting

- Jan 9-13th, 2024 @ ANL
- Three days of parallel workfests followed by two days of plenary sessions:
  - https://indico.bnl.gov/event/20473/
- 175 in-person participants

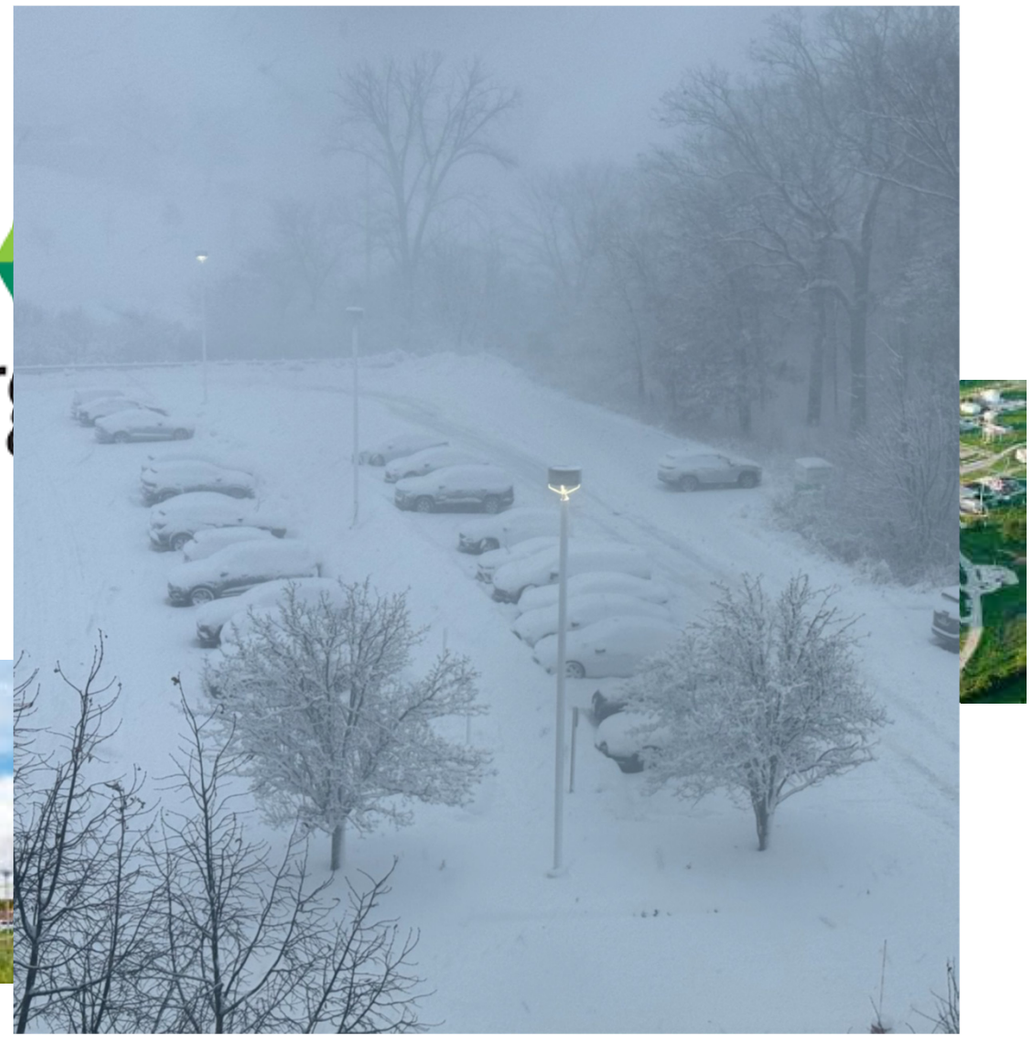
Jan 2024 ePIC Collaboration Meeting

- Jan 9-13th, 2024 @ ANL
- Three days of parallel workfests followed by two days of plenary sessions:
  - https://indico.bnl.gov/event/20473/
- 175 in-person participants

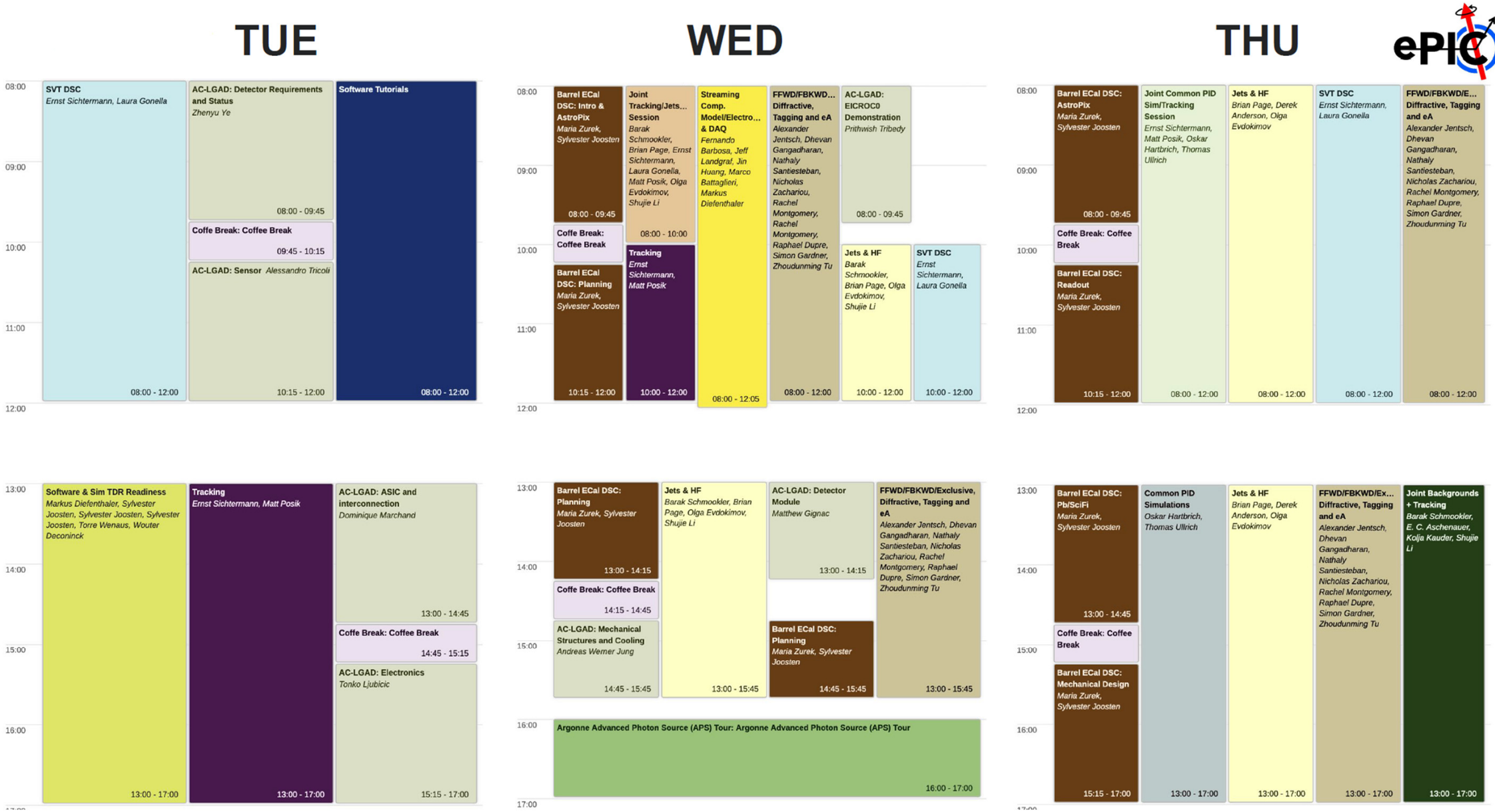


Jan 2024 ePIC Collaboration Meeting

- Jan 9-13th, 2024 @ ANL
- Three days of parallel workfests followed by two days of plenary sessions:
  - https://indico.bnl.gov/event/20473/
- 175 in-person participants
- Strong participation by early-career scientists:
  - Student support available
  - 29% of registered attendees early-career
- Updates and status reports
- Discussion of ePIC strategy for 2024

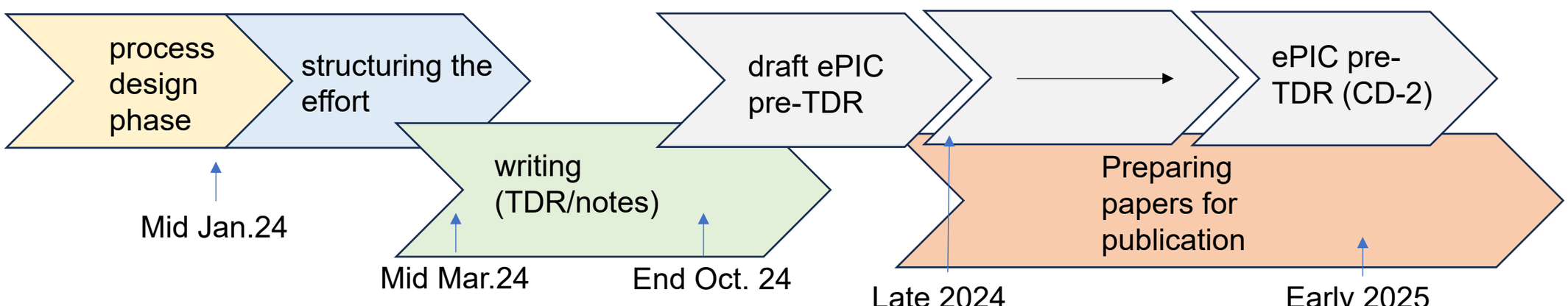


Workfests!


TUE
WED
THU
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
SVT DSC
Ernst Sichtermann, Laura Gonella
08:00 - 12:00
AC-LGAD: Detector Requirements and Status
Zhenyu Ye
08:00 - 09:45
Coffe Break: Coffee Break
09:45 - 10:15
AC-LGAD: Sensor Alessandro Tricoli
10:15 - 12:00
Software Tutorials
08:00 - 12:00
Barrel ECal DSC: Intro & AstroPix
Maria Zurek, Sylvester Joosten
08:00 - 09:45
Joint Tracking/Jets... Session
Barak Schmookler, Brian Page, Ernst Sichtermann, Laura Gonella, Matt Posik, Olga Evdokimov, Shujie Li
08:00 - 10:00
Streaming Comp. Model/Electro... & DAQ
Fernando Barbosa, Jeff Landgraf, Jin Huang, Marco Battaglieri, Markus Diefenthaler
08:00 - 12:05
FFWD/FBKWD... Diffractive, Tagging and eA
Alexander Jentsch, Dhevan Gangadharan, Nathaly Santiesteban, Nicholas Zachariou, Rachel Montgomery, Rachel Montgomery, Raphael Dupre, Simon Gardner, Zhoudunming Tu
08:00 - 12:00
AC-LGAD: EICROC0 Demonstration
Prithwish Tribedy
08:00 - 09:45
Coffe Break: Coffee Break
Barrel ECal DSC: Planning
Maria Zurek, Sylvester Joosten
10:15 - 12:00
Tracking
Ernst Sichtermann, Matt Posik
10:00 - 12:00
Jets & HF
Barak Schmookler, Brian Page, Olga Evdokimov, Shujie Li
10:00 - 12:00
SVT DSC
Ernst Sichtermann, Laura Gonella
10:00 - 12:00
Barrel ECal DSC: AstroPix
Maria Zurek, Sylvester Joosten
08:00 - 09:45
Joint Common PID Sim/Tracking Session
Ernst Sichtermann, Matt Posik, Oskar Hartbrich, Thomas Ullrich
08:00 - 12:00
Jets & HF
Brian Page, Derek Anderson, Olga Evdokimov
08:00 - 12:00
SVT DSC
Ernst Sichtermann, Laura Gonella
08:00 - 12:00
FFWD/FBKWD/E... Diffractive, Tagging and eA
Alexander Jentsch, Dhevan Gangadharan, Nathaly Santiesteban, Nicholas Zachariou, Rachel Montgomery, Raphael Dupre, Simon Gardner, Zhoudunming Tu
08:00 - 12:00
Coffe Break: Coffee Break
Barrel ECal DSC: Readout
Maria Zurek, Sylvester Joosten
10:15 - 12:00
Software & Sim TDR Readiness
Markus Diefenthaler, Sylvester Joosten, Sylvester Joosten, Sylvester Joosten, Torre Wenaus, Wouter Deconinck
13:00 - 17:00
Tracking
Ernst Sichtermann, Matt Posik
13:00 - 17:00
AC-LGAD: ASIC and interconnection
Dominique Marchand
13:00 - 14:45
Coffe Break: Coffee Break
14:45 - 15:15
AC-LGAD: Electronics
Tonko Ljubicic
15:15 - 17:00
Barrel ECal DSC: Planning
Maria Zurek, Sylvester Joosten
13:00 - 14:15
Jets & HF
Barak Schmookler, Brian Page, Olga Evdokimov, Shujie Li
13:00 - 15:45
AC-LGAD: Detector Module
Matthew Gignac
13:00 - 14:15
FFWD/FBKWD/Exclusive, Diffractive, Tagging and eA
Alexander Jentsch, Dhevan Gangadharan, Nathaly Santiesteban, Nicholas Zachariou, Rachel Montgomery, Raphael Dupre, Simon Gardner, Zhoudunming Tu
13:00 - 15:45
Coffe Break: Coffee Break
14:15 - 14:45
AC-LGAD: Mechanical Structures and Cooling
Andreas Werner Jung
14:45 - 15:45
Barrel ECal DSC: Planning
Maria Zurek, Sylvester Joosten
14:45 - 15:45
Argonne Advanced Photon Source (APS) Tour: Argonne Advanced Photon Source (APS) Tour
16:00 - 17:00
Barrel ECal DSC: Pb/SciFi
Maria Zurek, Sylvester Joosten
13:00 - 14:45
Common PID Simulations
Oskar Hartbrich, Thomas Ullrich
13:00 - 17:00
Jets & HF
Brian Page, Derek Anderson, Olga Evdokimov
13:00 - 17:00
FFWD/FBKWD/Ex... Diffractive, Tagging and eA
Alexander Jentsch, Dhevan Gangadharan, Nathaly Santiesteban, Nicholas Zachariou, Rachel Montgomery, Raphael Dupre, Simon Gardner, Zhoudunming Tu
13:00 - 17:00
Joint Backgrounds + Tracking
Barak Schmookler, E. C. Aschenauer, Kolja Kauder, Shujie Li
13:00 - 17:00
Coffe Break: Coffee Break
Barrel ECal DSC: Mechanical Design
Maria Zurek, Sylvester Joosten
15:15 - 17:00

TDR Strategy and Publications

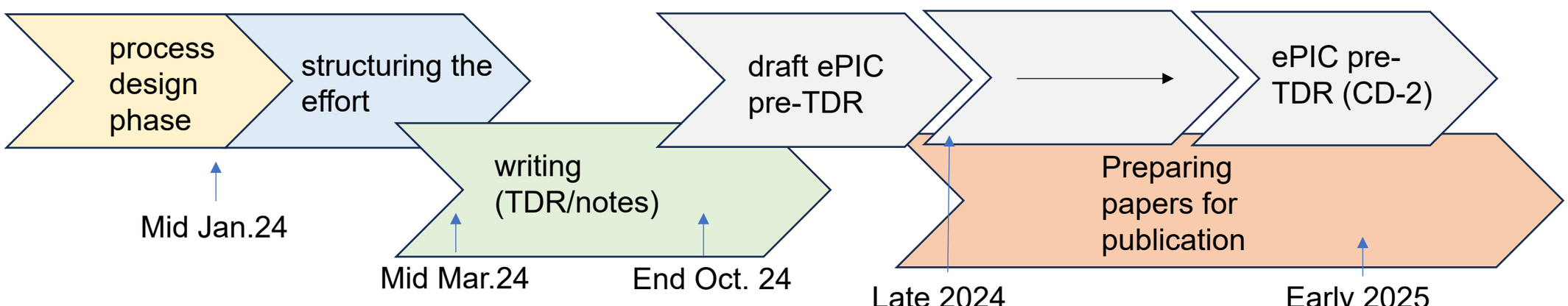
- In 2024 the ePIC collaboration will produce:
  - A draft of the ePIC contributions to the EIC TDR
    - The EIC TDR is the top priority
      - Chapters on *Physics Goals and Requirements* and *Experimental Systems*
      - Not just the document, but the simulations and detector R&D that form the basis
      - Requires close cooperation between the collaboration and the project!
- An ePIC Detector Design paper:
    - Derived and expanded from the *Experimental Systems* TDR chapter
- An ePIC Physics Performance paper:
    - Derived and expanded from the *Physics Goals and Requirements* TDR chapter
- Both to be published in a scientific journal (such as NIMA, JINST, or PRC)
- These publications will serve as a focus in developing the ePIC Membership and Publication policies.



TDR Strategy and Publications

- In 2024 the ePIC collaboration will produce:
  - A draft of the ePIC contributions to the EIC TDR
    - The EIC TDR is the top priority
      - Chapters on *Physics Goals and Requirements* and *Experimental Systems*
      - Not just the document, but the simulations and detector R&D that form the basis
      - Requires close cooperation between the collaboration and the project!
- An ePIC Detector Design paper:
    - Derived and expanded from the *Experimental Systems* TDR chapter
- An ePIC Physics Performance paper:
    - Derived and expanded from the *Physics Goals and Requirements* TDR chapter
- Both to be published in a scientific journal (such as NIMA, JINST, or PRC)
- These publications will serve as a focus in developing the ePIC Membership and Publication policies.

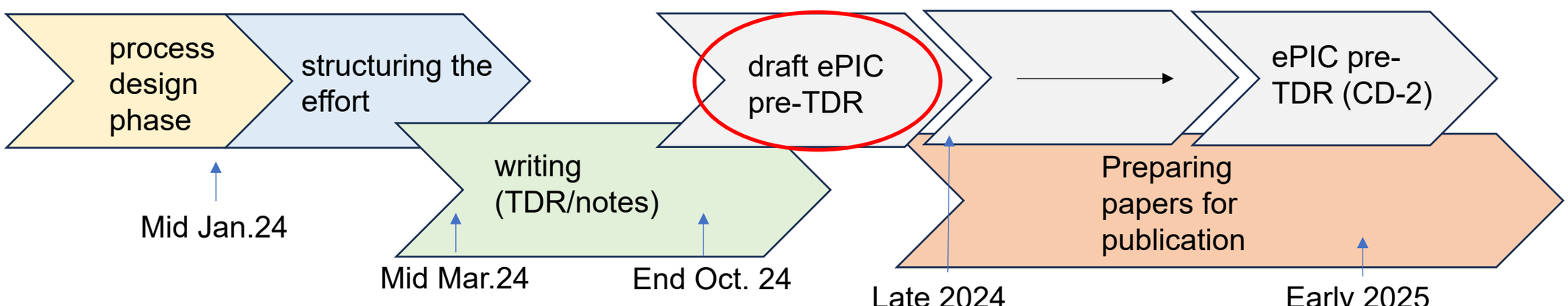
Focused activity in the **Technical and Integration Council**: Report by Silvia to follow



TDR Strategy and Publications

- In 2024 the ePIC collaboration will produce:
  - A draft of the ePIC contributions to the EIC TDR
    - The EIC TDR is the top priority
      - Chapters on *Physics Goals and Requirements* and *Experimental Systems*
      - Not just the document, but the simulations and detector R&D that form the basis
      - Requires close cooperation between the collaboration and the project!
- An ePIC Detector Design paper:
    - Derived and expanded from the *Experimental Systems* TDR chapter
- An ePIC Physics Performance paper:
    - Derived and expanded from the *Physics Goals and Requirements* TDR chapter
- Both to be published in a scientific journal (such as NIMA, JINST, or PRC)
- These publications will serve as a focus in developing the ePIC Membership and Publication policies.

Focused activity in the **Technical and Integration Council**: Report by Silvia to follow



Broadening Engagement in ePIC

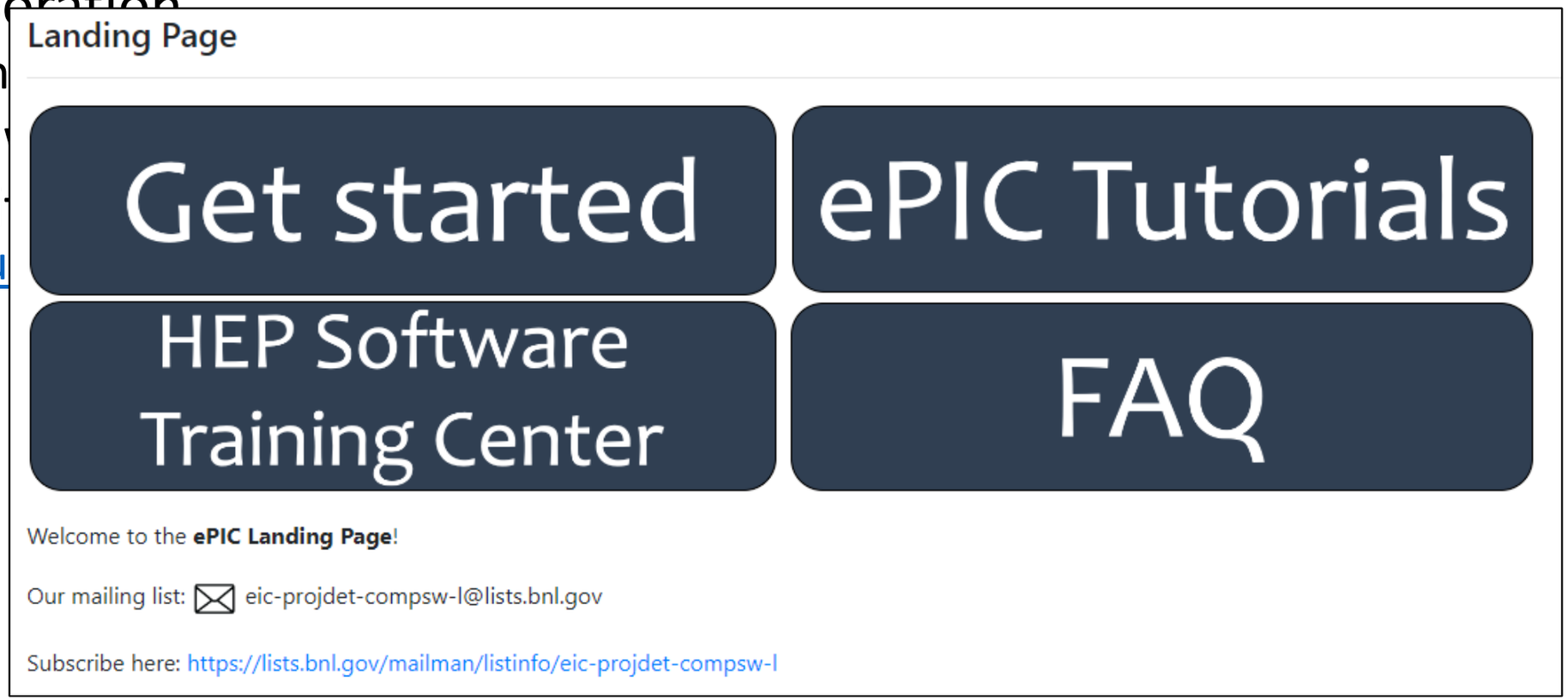
- The ePIC collaboration must be a welcoming environment for people to pursue their science
- Established procedures to welcome new institutions and integrate them into the collaboration
  - Meeting with SP Office and establish contacts within the collaboration

Broadening Engagement in ePIC

- The ePIC collaboration must be a welcoming environment for people to pursue their science
- Established procedures to welcome new institutions and integrate them into the collaboration
  - Meeting with SP Office and establish contacts within the collaboration
- User Learning WG established landing page as a one-stop location for onboarding with ePIC Software and Computing (https://eic.github.io/documentation/landingpage.html)

Broadening Engagement in ePIC

- The ePIC collaboration must be a welcoming environment for people to pursue their science
- Established procedures to welcome new institutions and integrate them into the collaboration
  - Meeting with
- User Learning
  onboarding wi
  (https://eic.githu



Broadening Engagement in ePIC

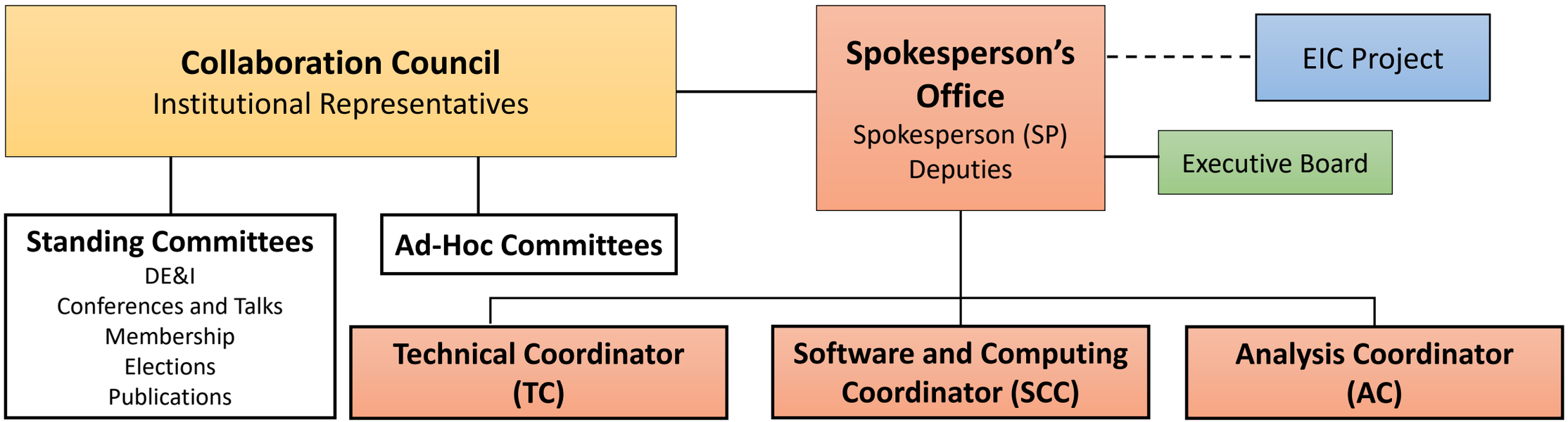
- The ePIC collaboration must be a welcoming environment for people to pursue their science
- Established procedures to welcome new institutions and integrate them into the collaboration
  - Meeting with SP Office and establish contacts within the collaboration
- User Learning WG established landing page as a one-stop location for onboarding with ePIC Software and Computing (https://eic.github.io/documentation/landingpage.html)
- Well-attended tutorials held at Jan. Collaboration Meeting and April. ePIC Software and Computing Meeting @ CERN
- AC's organized meeting to onboard EIC-India Institutions (Feb.)
- …

Next ePIC Collaboration Meeting

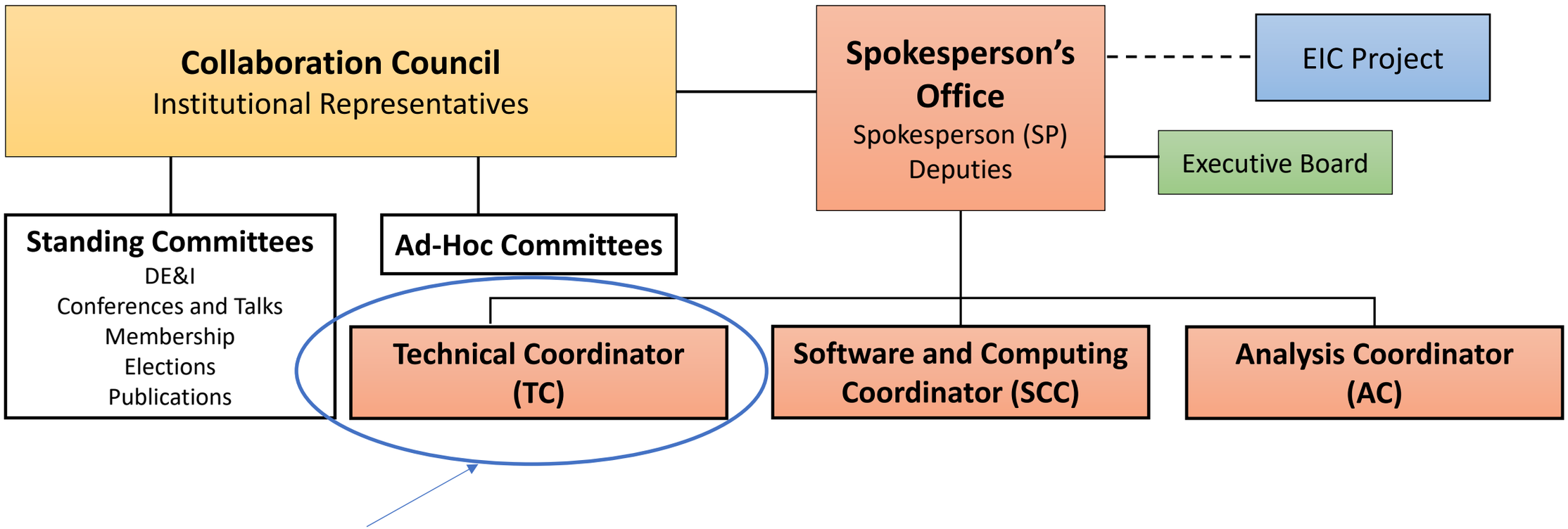
https://indico.bnl.gov/event/20727/

- Lehigh University Bethlehem, PA
  - July 22-28th
  - Hybrid format
- Jointly organized with the EICUG
- Joint EICUG/ePIC session with talks of common interest
- Mixed workfest and plenary sessions

What's Coming Next…

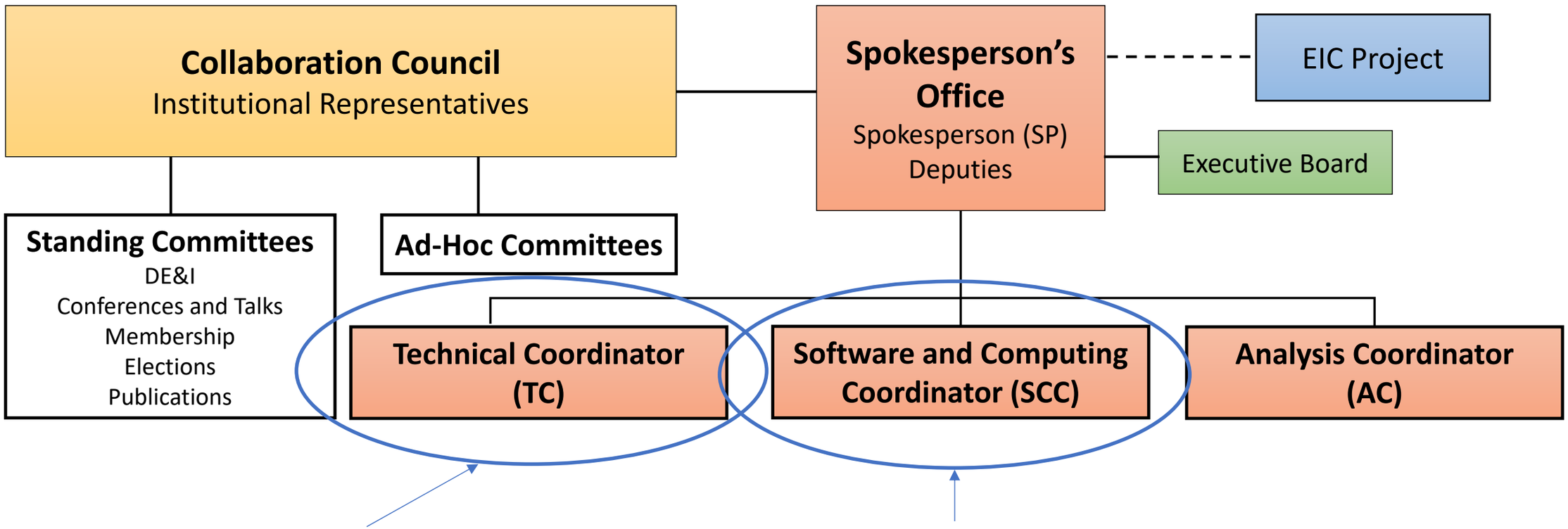


What's Coming Next…



More on technical coordination coming in Silvia's talk.

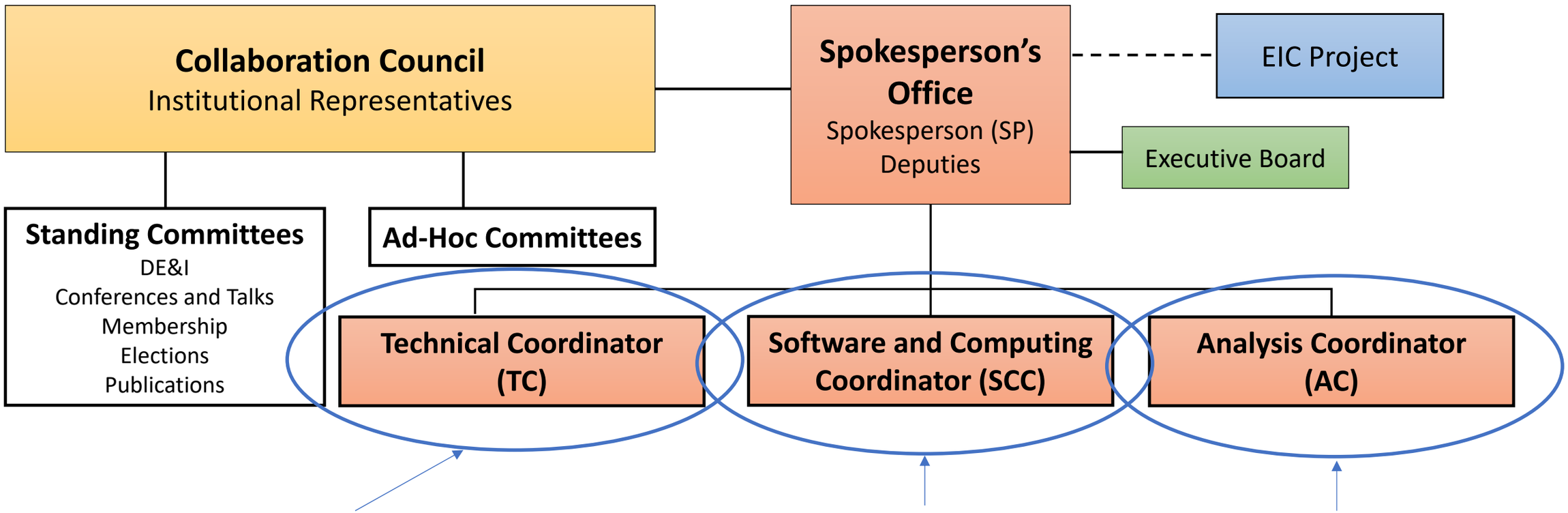
What's Coming Next…



More on technical coordination coming in Silvia's talk.

More on software and computing coming in the talk from Markus

What's Coming Next…



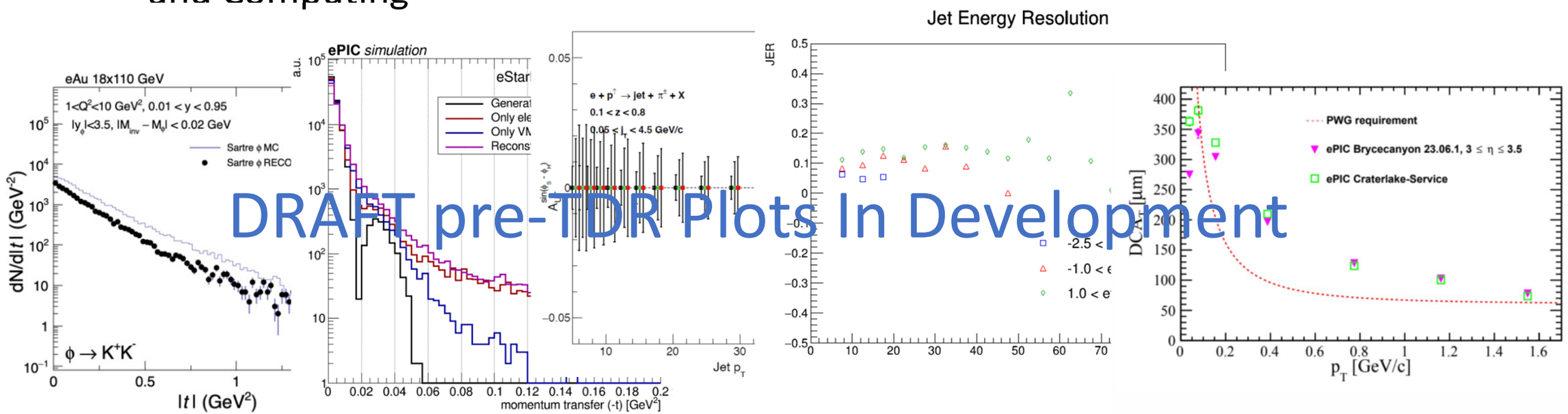
More on technical coordination coming in Silvia's talk.

More on software and computing coming in the talk from Markus

Just a few words on the next slide…

Analysis Coordination in ePIC

- Analysis Coordination is responsible for the simulations that demonstrate the ability of ePIC to do EIC science
  - A critical part of the TDR development process
  - Organizing physics “benchmark” plots for the TDR
  - Sets priorities for reconstruction development in conjunction with Software and Computing



DRAFT pre-TDR Plots In Development

Take-Away Message

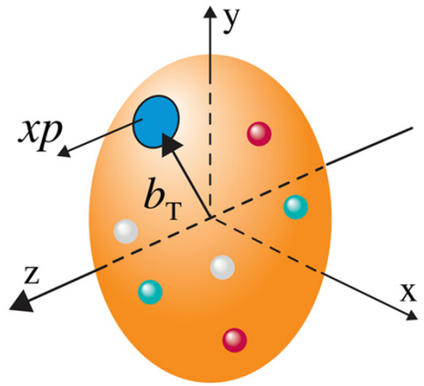
- The ePIC Collaboration is strong, active and growing!
  - New member institutions bring new strengths
  - International participation is key to the success of ePIC!
    - International collaborators play key roles in collaboration leadership
  - Collaboration committees are fully formed
  - ePIC policies for *Membership* and *Conferences and Talks* are in draft form, *Code of Conduct* and *Publication* policy drafts are expected soon
  - The collaboration is establishing a regular election schedule and convener rotation
  - ePIC members are active in promoting ePIC and EIC science to the worldwide Nuclear Physics community
  - ePIC leadership is focused on welcoming new institution and improving engagement in the collaboration

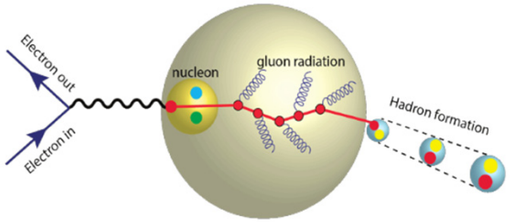

BACK UP

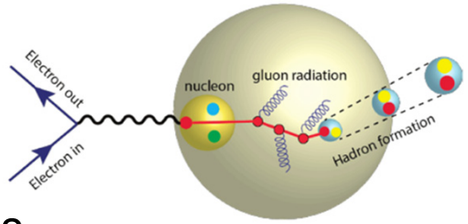
The Collaboration Pursues the Science

- How do the nucleon properties like mass and spin emerge from quarks and their interactions?

- How are the sea quarks and gluons distributed in space and momentum inside the nucleon? How is spin dynamically generated?





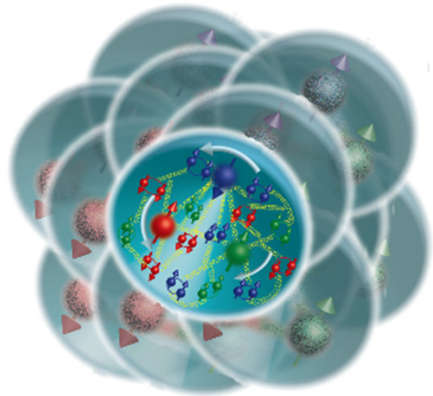


- In what manner do color-charged quarks and gluons, along with colorless jets, interact with the nuclear medium? And how do the confined hadronic states emerge from these quarks and gluons?

- What impact does a high-density nuclear environment have on the interactions, correlations, and behaviors of quarks and gluons?

s

- What is the mechanism through which quark-gluon interactions give rise to nuclear binding?



- Is there a saturation point for the density of gluons in nuclei at high energies, and does this lead to the formation of gluonic matter with universal properties across all nuclei, including the proton?

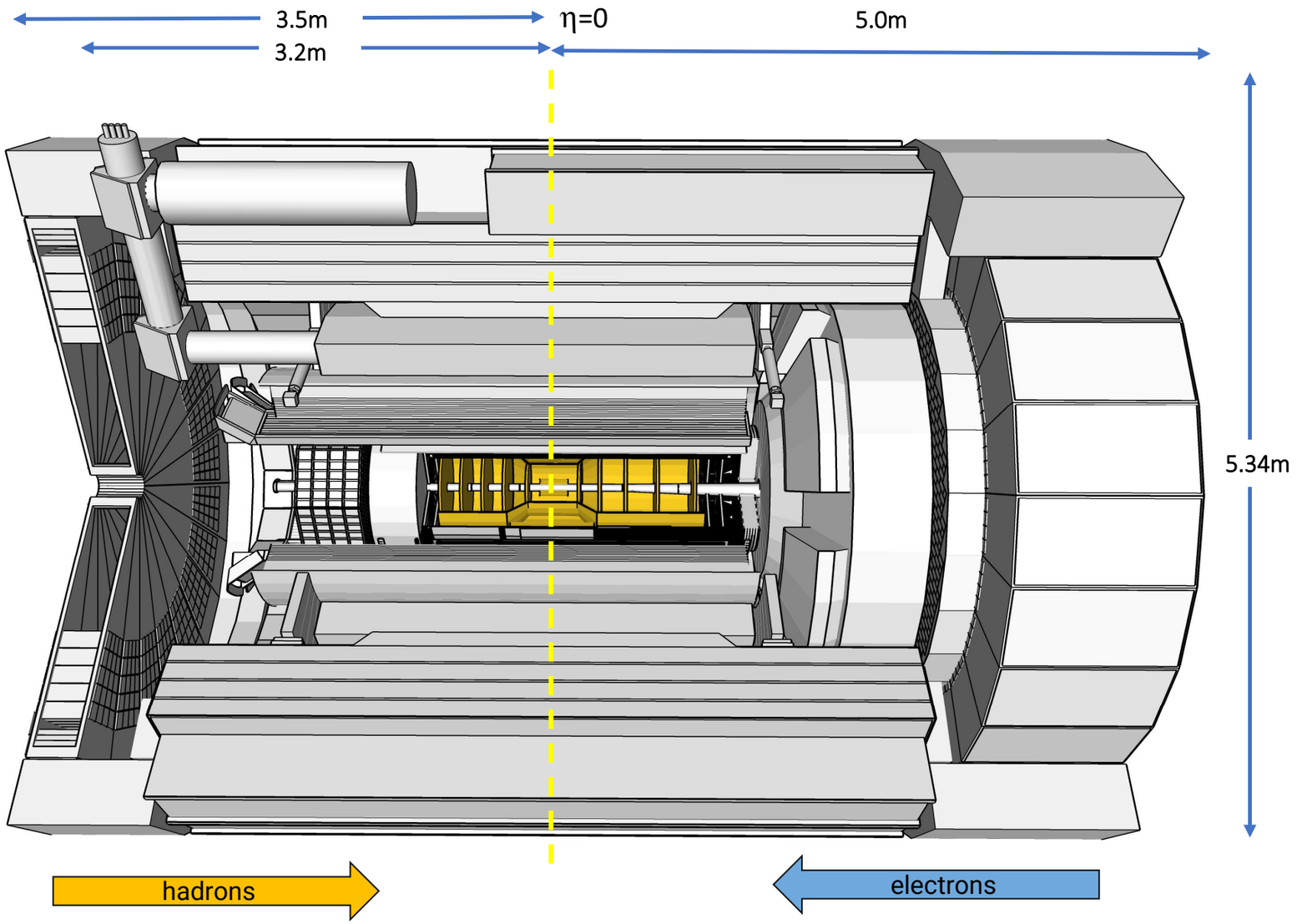
ePIC Meetings in 2024

- ePIC Collaboration Meeting (ANL)
  - Jan 9-13, 2024
- 3rd EIC-Asia Meeting (Taiwan)
  - Jan 29-31, 2024
- ePIC Software and Computing Meeting (CERN)
  - April 22nd-26th, 2024
- Joint EICUG/ePIC Collaboration Meeting (Lehigh)
  - July 22-28, 2024
- 4th EIC-Asia Meeting (China)
  - Aug. 12-16th, 2024

Jan 2024 ePIC Meeting Workfests

Workshop Title	Organizers
Barrel ECAL DSC	Maria Zurek, Sylvester Joosten
SVT DSC	Laura Gonella, Ernst Sichtermann
Tracking	Ernst Sichtermann, Matt Posik
Jets & HF (Particle Flow)	Brian Page, Olga Evdokimov, Derek Anderson
Jets & HF (Vertex)	Brian Page, Olga Evdokimov, Shujie Li, Barak Schmookler
Streaming Computing Model / Electronics & DAQ	Fernando Barbosa, Jin Huang, Jeff Landgraf, Marco Battaglieri, Markus Diefenthaler
FFWD, FBKWD & Exclusive, Diffractive and Tagging, eA	Raphael Dupre, Rachel Montgomery, Alex Jentsch, Kong Tu, Simon Gardner, Nathaly Santiesteban, Dhevan Gangadharan, Nick Zachariou
Backgrounds	Kolja Kauder, Elke-Caroline Aschenauer, Shujie Li, Barak Schmookler
AC-LGAD DSC	Alessandro Tricoli, Alex Jentcsh, Wei Li, Zhenyu Ye
Common PID	Thomas Ullrich, Oskar Hartbrich
Software & Sim TDR Readiness	Markus Diefenthaler, Sylvester Joosten, Wouter Deconinck, Torre Wenaus

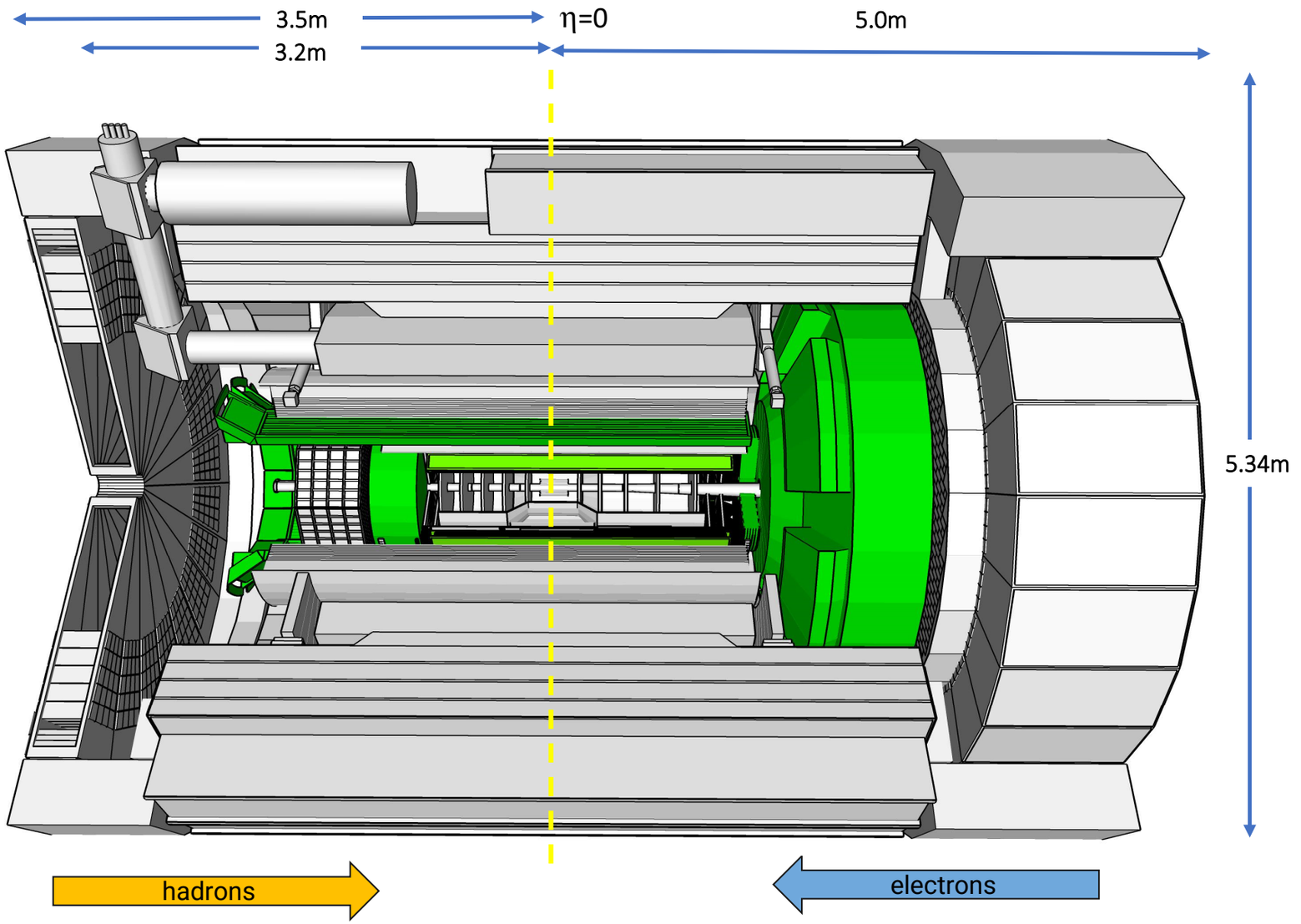
ePIC Detector Design



Tracking:

- New 1.7T solenoid
- Si MAPS Tracker
- MPGDs (µRWELL/µMegas)

ePIC Detector Design



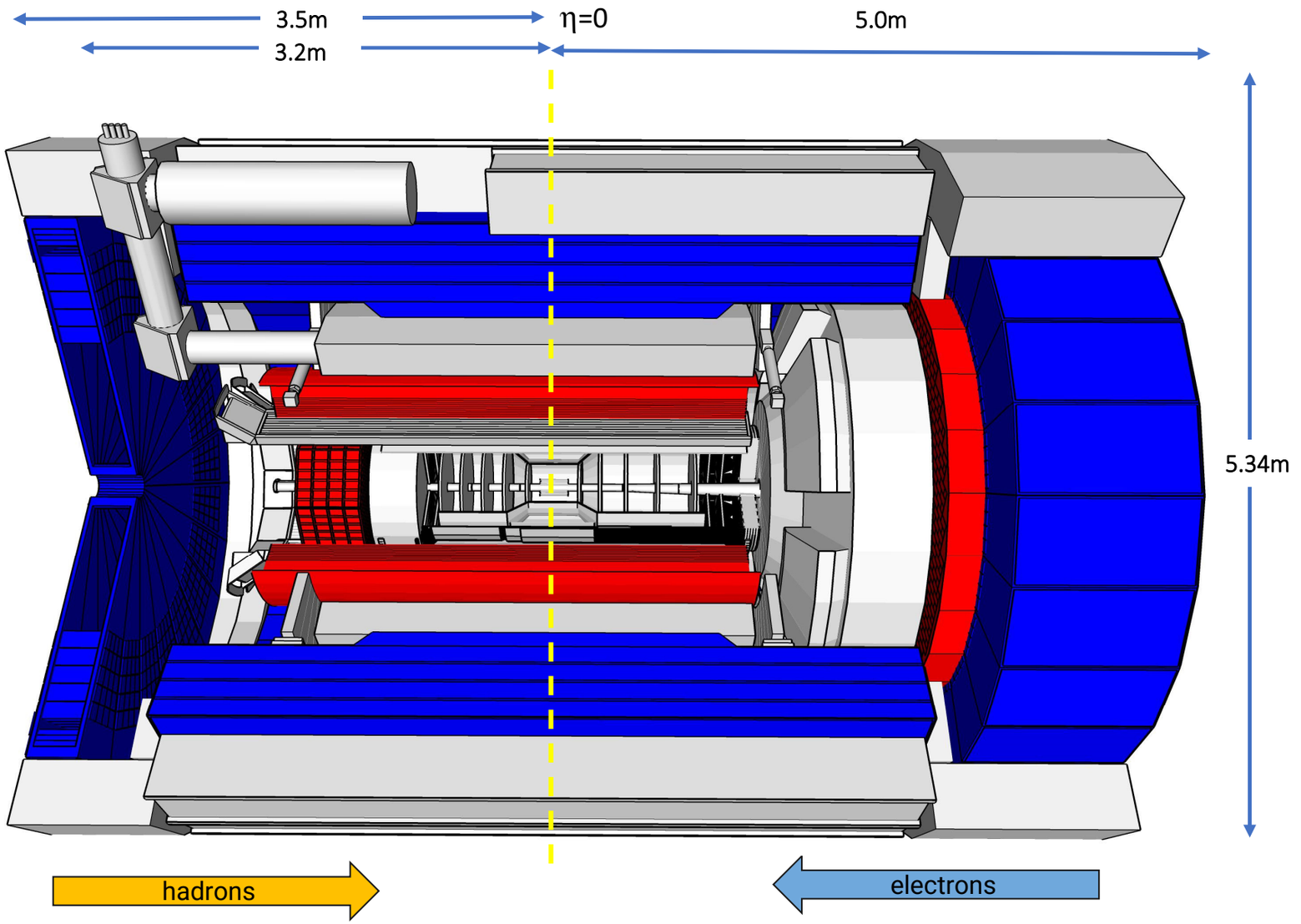
Tracking:

- New 1.7T solenoid
- Si MAPS Tracker
- MPGDs (µRWELL/µMegas)

PID:

- hpDIRC
- pfRICH
- dRICH
- AC-LGAD (~30ps TOF)

ePIC Detector Design



Tracking:

- New 1.7T solenoid
- Si MAPS Tracker
- MPGDs (µRWELL/µMegas)

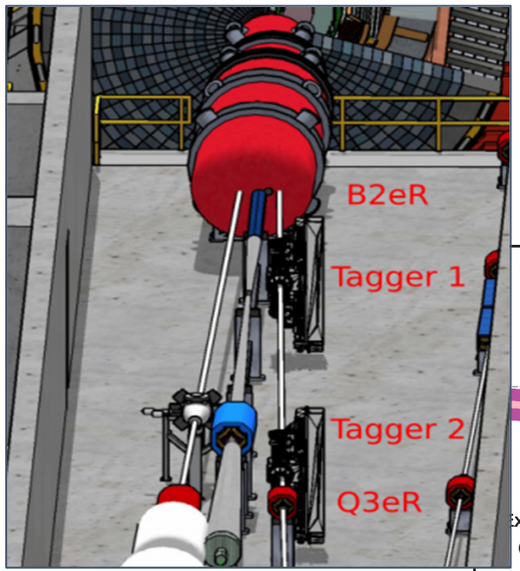
PID:

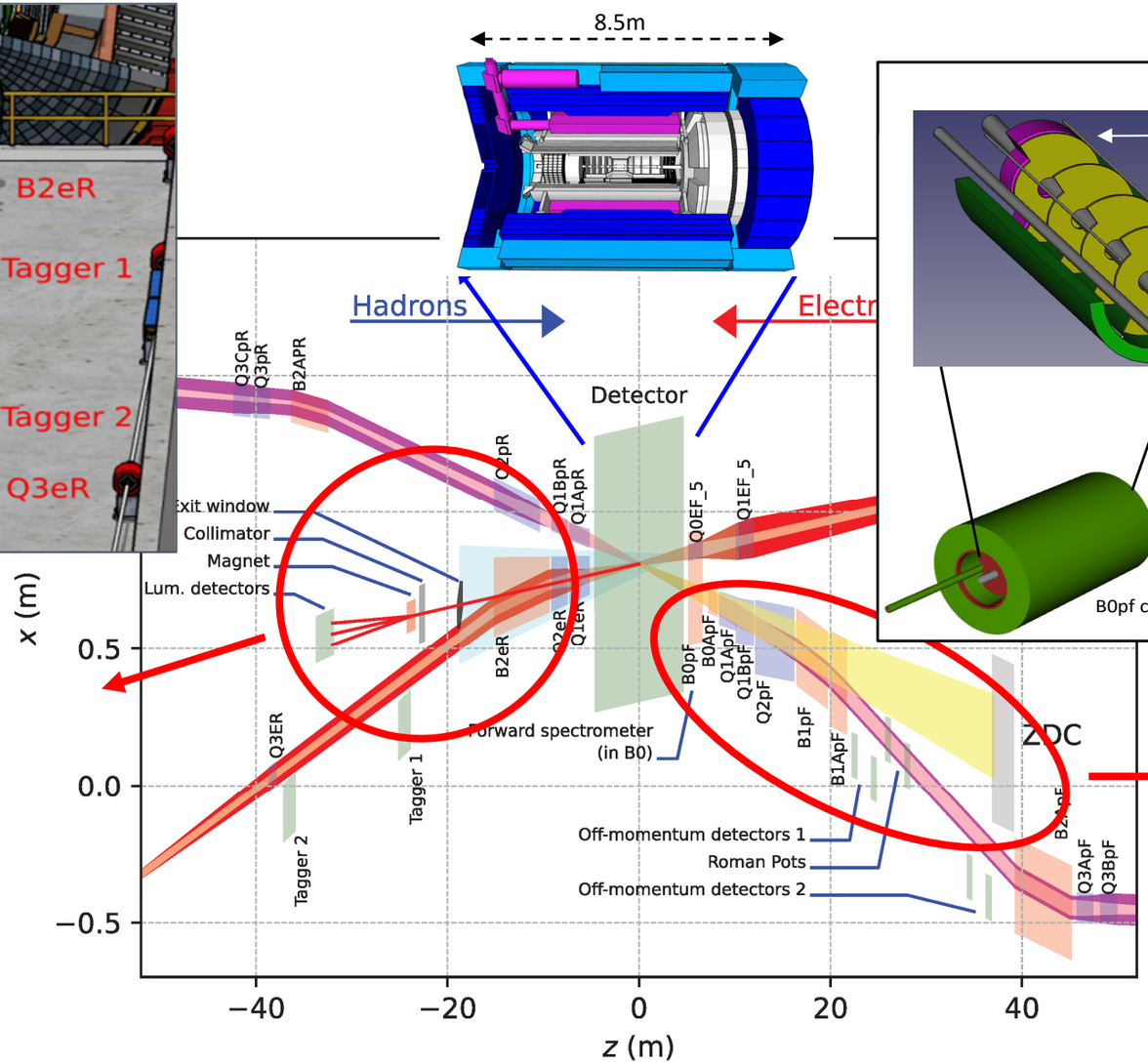
- hpDIRC
- pfRICH
- dRICH
- AC-LGAD (~30ps TOF)

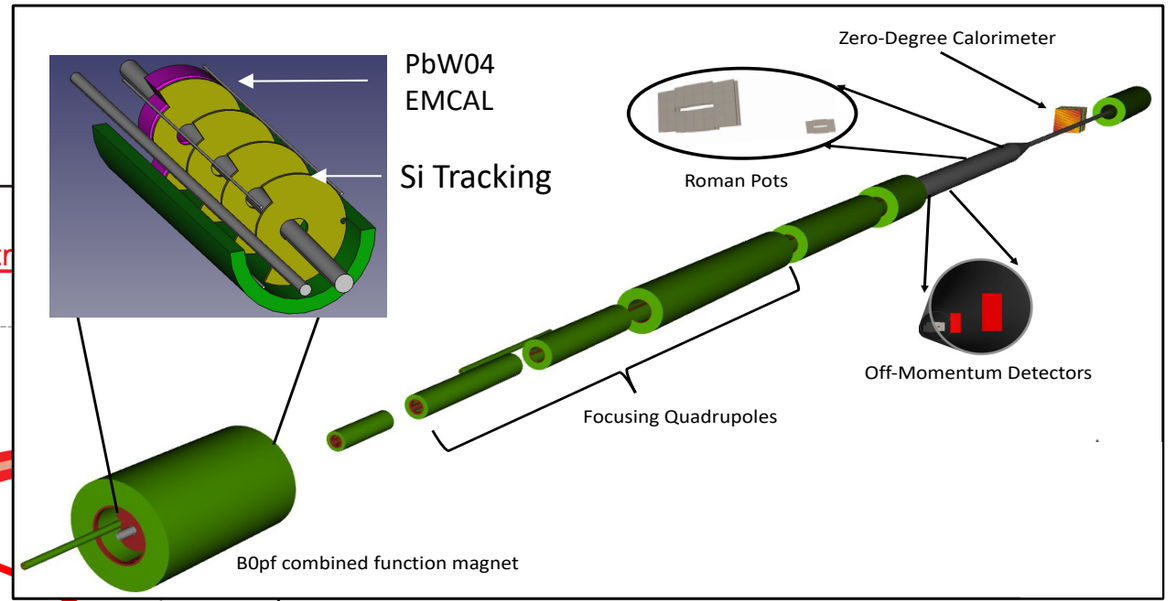
Calorimetry:

- Imaging Barrel EMCal
- PbWO4 EMCal in backward direction
- Finely segmented EMCal +HCal in forward direction
- Outer HCal (sPHENIX re-use)
- Backwards HCal (tail-catcher)

Far-Forward and Far-Backward Detectors







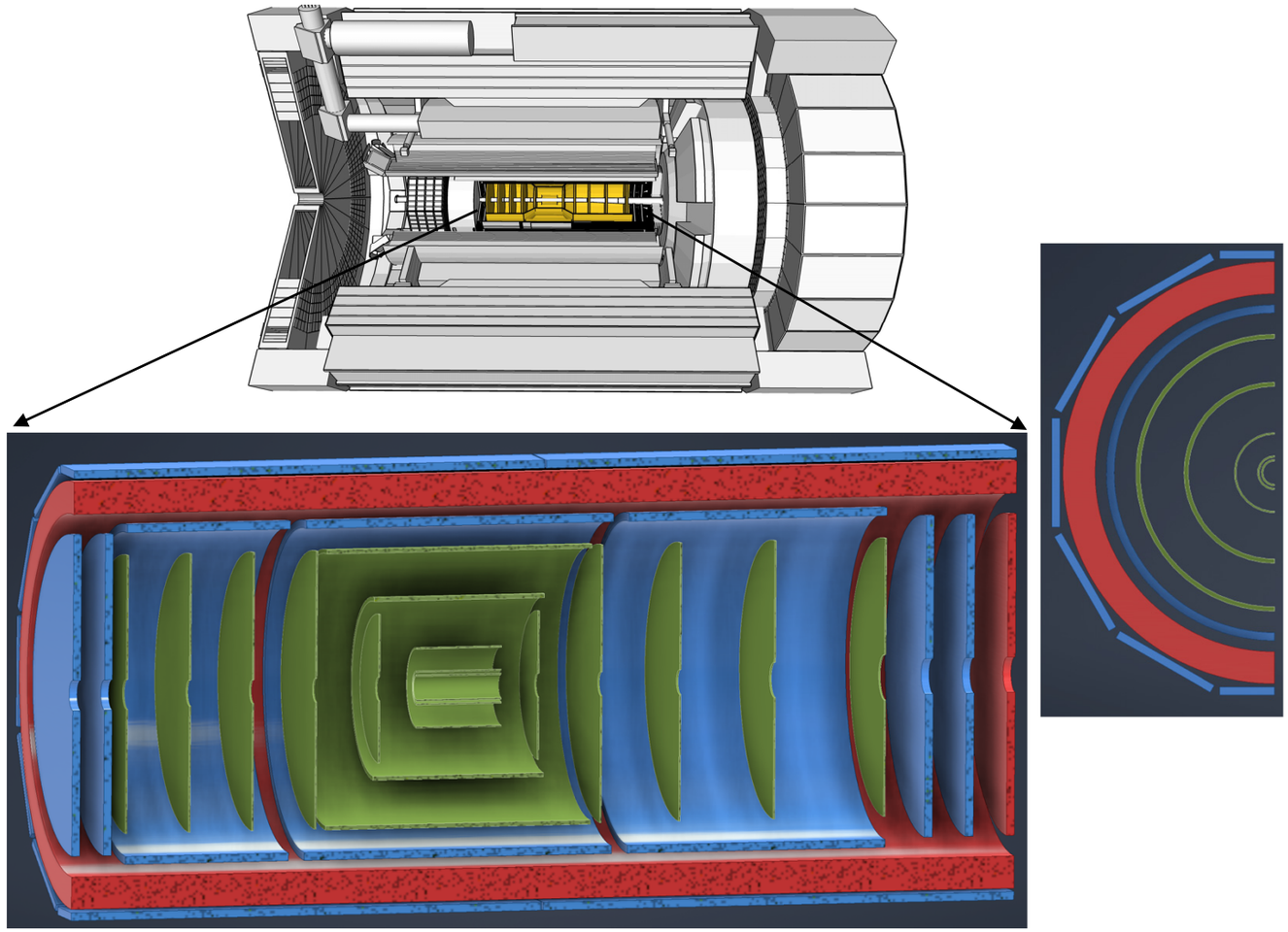
Far-Backward Detectors

- Luminosity monitor
- Low-Q^2 Tagging Detectors

Far-Forward Detectors

- B0 Tracking and Photon Detection
- Roman Pots and Off-Momentum Detectors
- Zero-Degree Calorimeter

ePIC Tracking Detectors



MAPS Barrel + Disks
MPGD Barrels + Disks
AC-LGAD based ToF

- **MAPS Tracker:**
  - Small pixels (20 μm), low power consumption (<20 mW/cm^2) and material budget (0.05% to 0.55% X/X$_0$) per layer
  - Based on ALICE ITS3 development
  - Vertex layers optimized for beam pipe bakeout and ITS-3 sensor size
  - Barrel layers based on EIC LAS development
  - Forward and backwards disks

world's first at ePIC

- **MPGD Layers:**
  - Provide timing and pattern recognition redundancy
  - Cylindrical μMEGAs
  - Planar μRWell's before hpDIRC
    - Impact point and direction for ring seeding

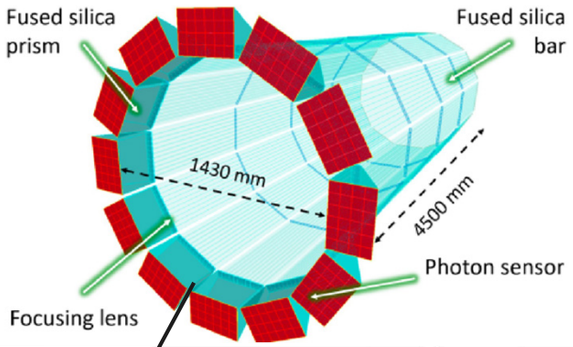
world's first at ePIC

- **AC-LGAD TOF and AstroPix (BECAL)**
  - Additional space point for pattern recognition / redundancy

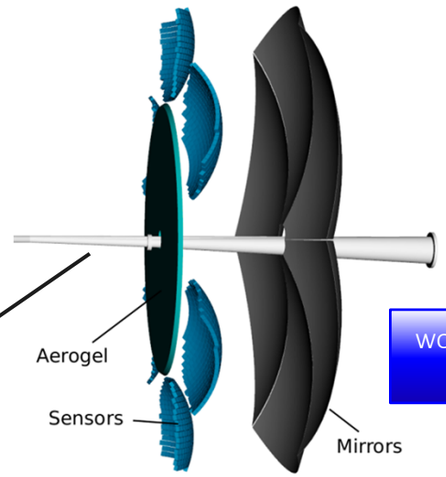
Particle ID

High-Performance DIRC

- Quartz bar radiator (BaBAR bars)
- light detection with MCP-PMTs
- Fully focused
- π/K 3σ separation at 6 GeV/c



Dual-Radiator RICH(dRICH)

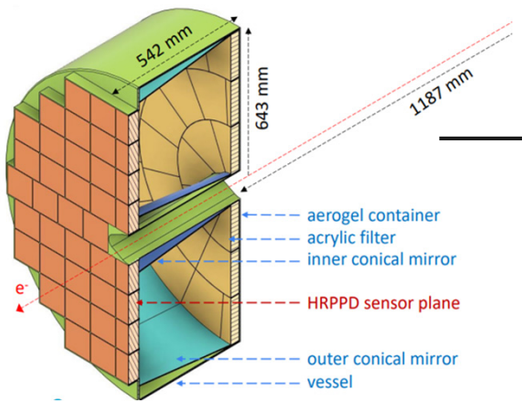


world's first at ePIC

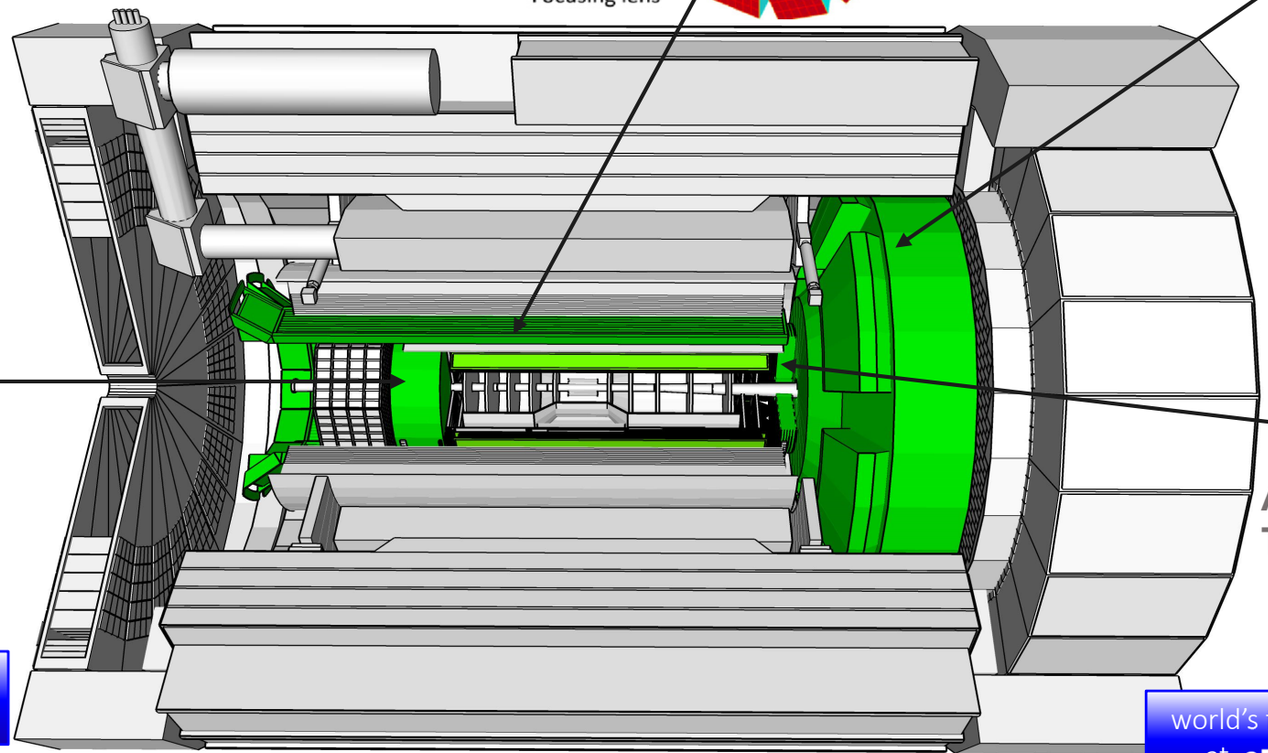
- C_2F_6 Gas Volume and Aerogel
- Sensors tiled on spheres (SiPMs)
- π/K 3σ sep. at 50 GeV/c

Proximity Focused (pfRICH)

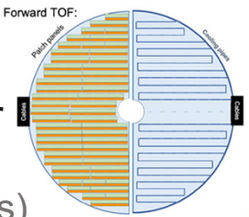
- Long proximity gap (~40 cm)
- Sensor: HRPPDs
- up to 9 GeV/c 3σ π/K sep.

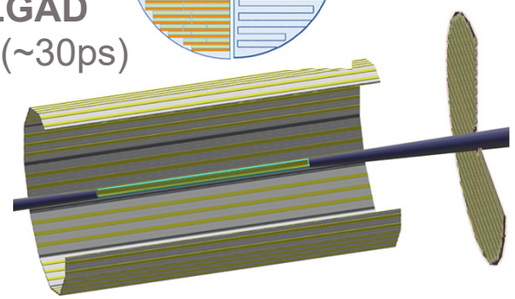


world's first at ePIC



AC-LGAD TOF (~30ps)





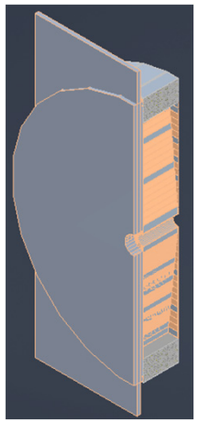
world's first at ePIC

- Accurate space point for tracking
- forward disk and central barrel

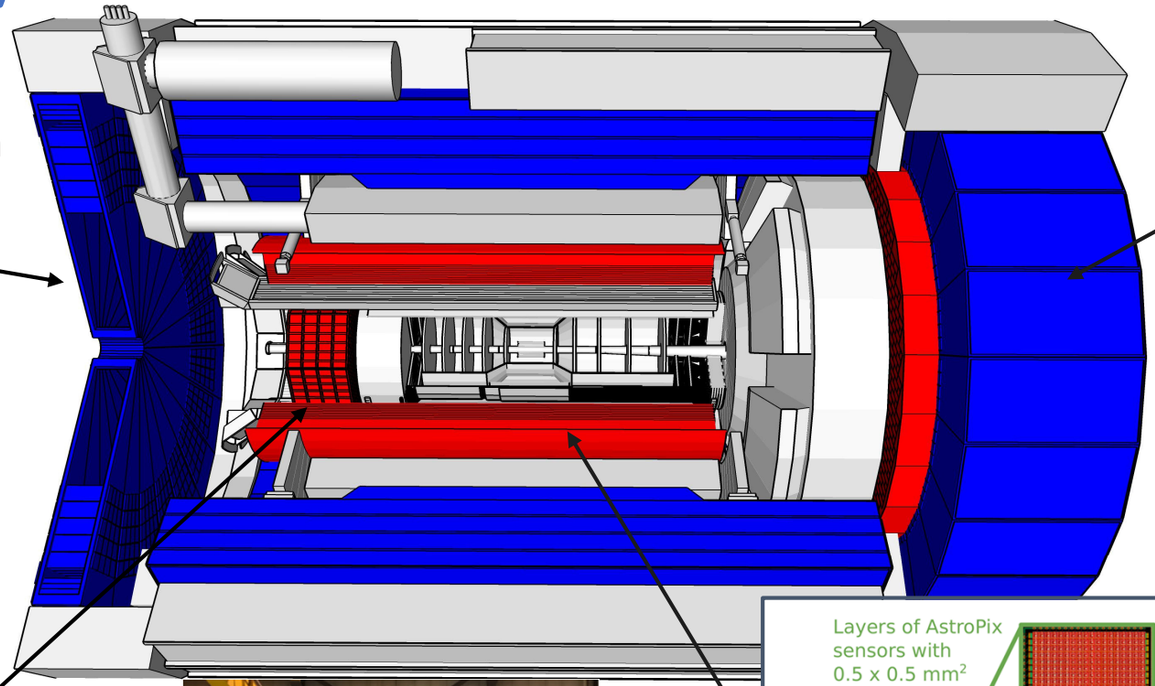
Calorimetry

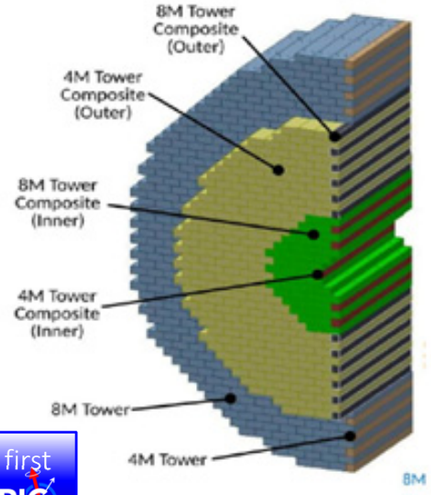
hadrons

electrons



Backwards HCal
Steel/Sc Sandwich
tail catcher

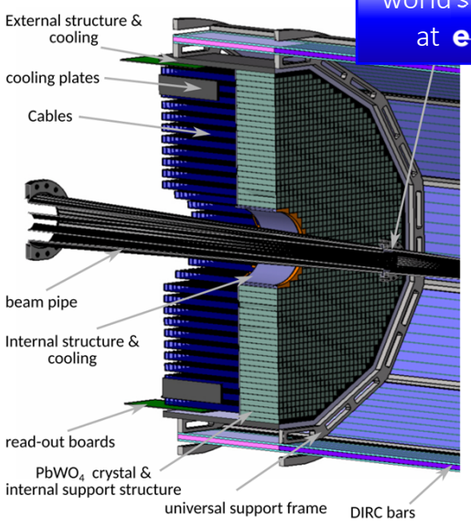




world's first at ePIC

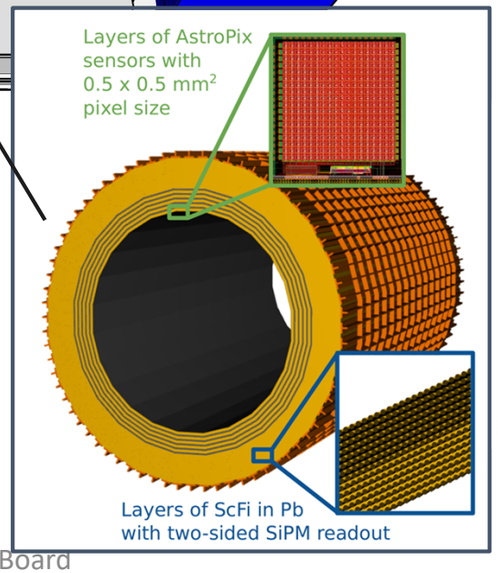
High granularity
W/SciFi EMCal
Longitudinally separated
HCAL with high-η insert

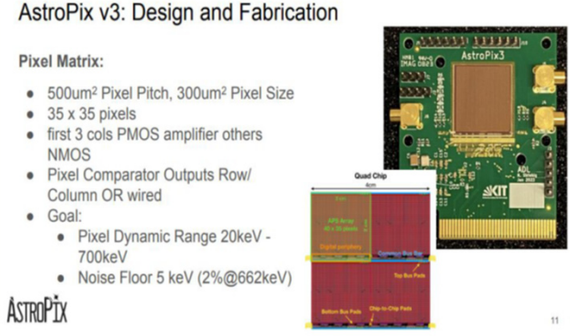
world's first at ePIC



Backwards EMCal
PbW04 crystals, SiPM
photosensor

Barrel HCAL
(sPHENIX re-use)

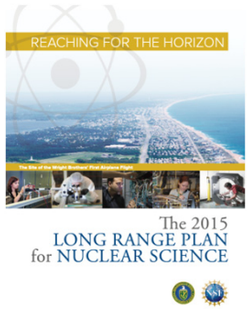




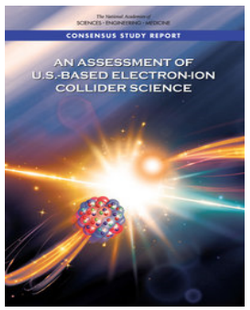
world's first at ePIC

Detector Design Process Timeline

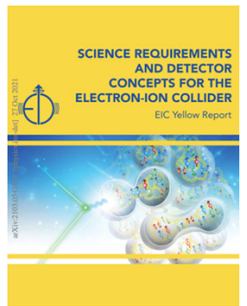
2012



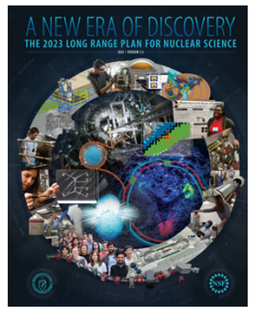
2015



2018



2020



2023

Detector and machine design parameters driven by physics objectives

- Call for proposals issued jointly by BNL and JLab in **March 2021** (Due Dec 2021)
  - ATHENA, CORE and ECCE proposals submitted
- DPAP review **Dec 2021 – Jan 2022**, closeout **March 2022**
  - ECCE proposal chosen as basis for first EIC detector reference design
- **Spring/Summer 2022** – ATHENA and ECCE form joint leadership team
  - Joint WG's formed and consolidation process undertaken
  - Coordination with EIC project on development of technical design
- Collaboration formation process started **July 2022**
- Charter ratified & elected ePIC Leadership Team **February 2023**
- **EIC/ePIC endorsed as highest priority for new facility construction in 2023 LRP.**
- **Working towards TDR and CD-3A (review Nov. 2023) and CD-2/3 (2025)**