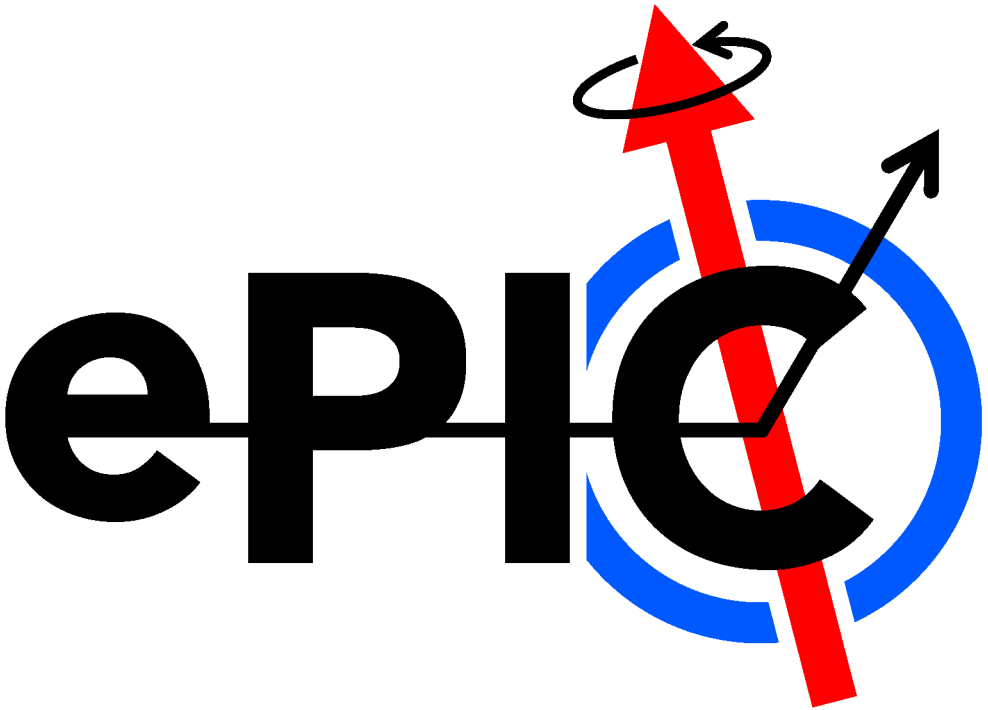
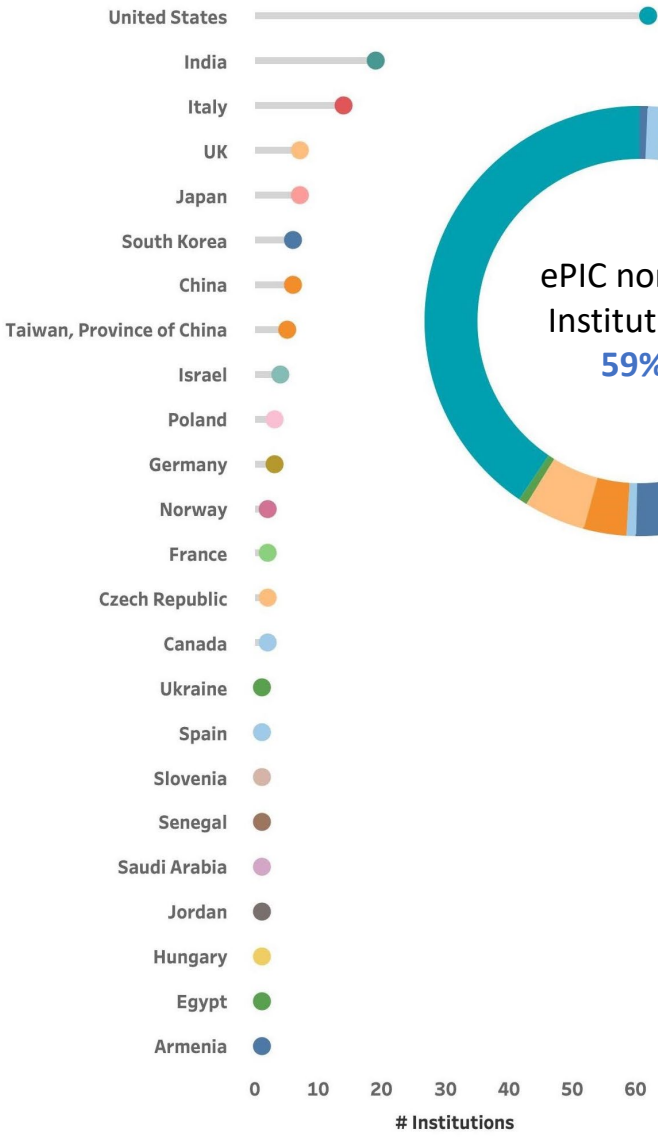
The ePIC Collaboration



John Lajoie

Iowa State University

The ePIC Collaboration

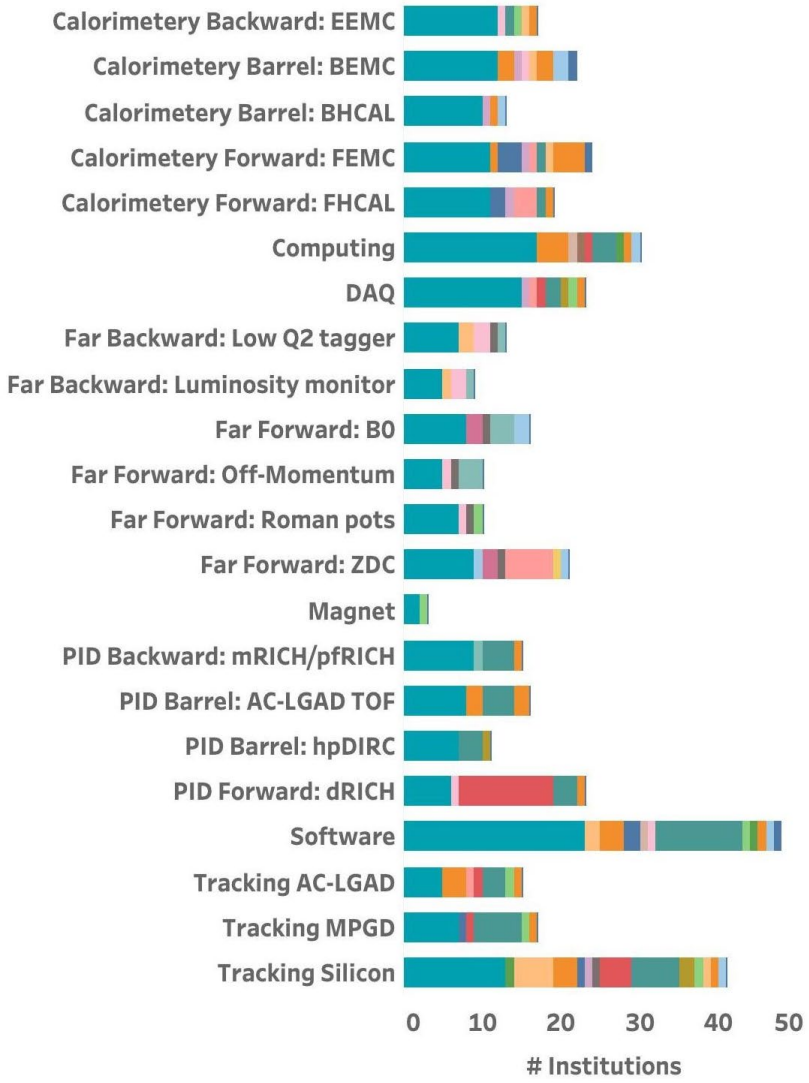


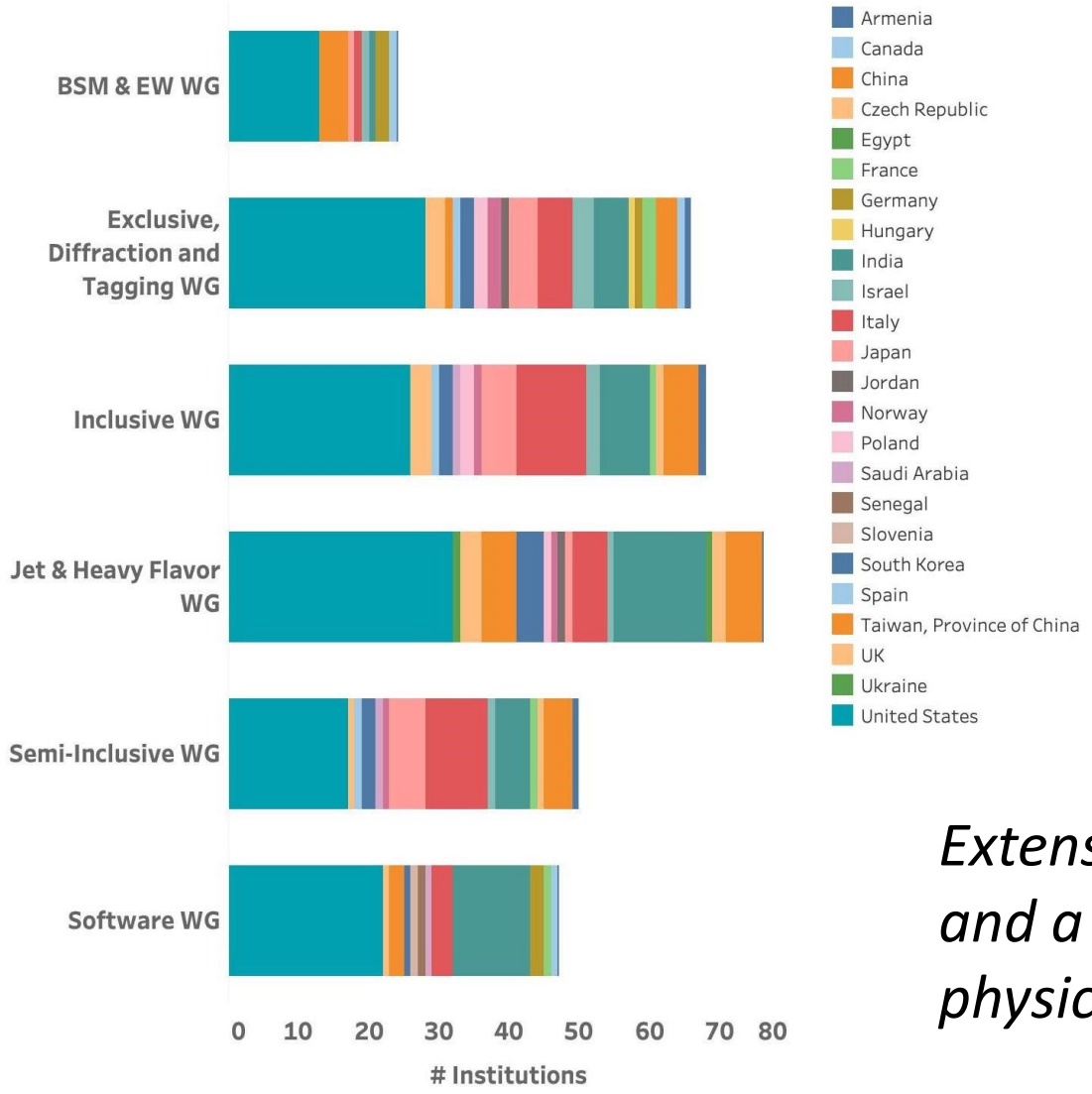
160+ institutions
24 countries

500+ participants

A truly global pursuit for a new experiment at the EIC!

The ePIC Collaboration

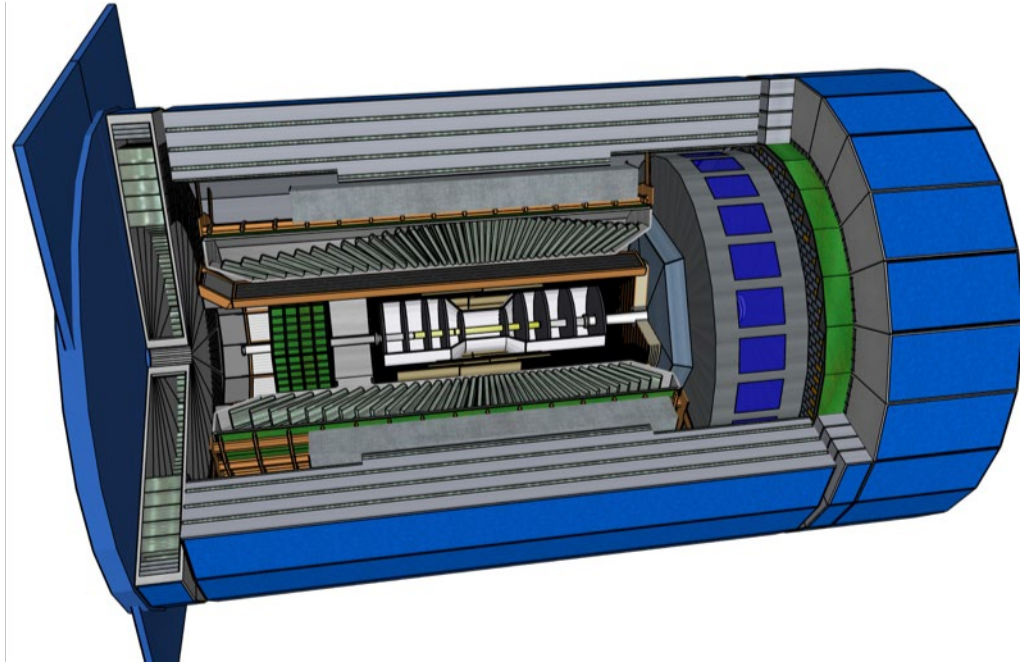




Extensive expertise and a wide array of physics interests.

A Brief Timeline

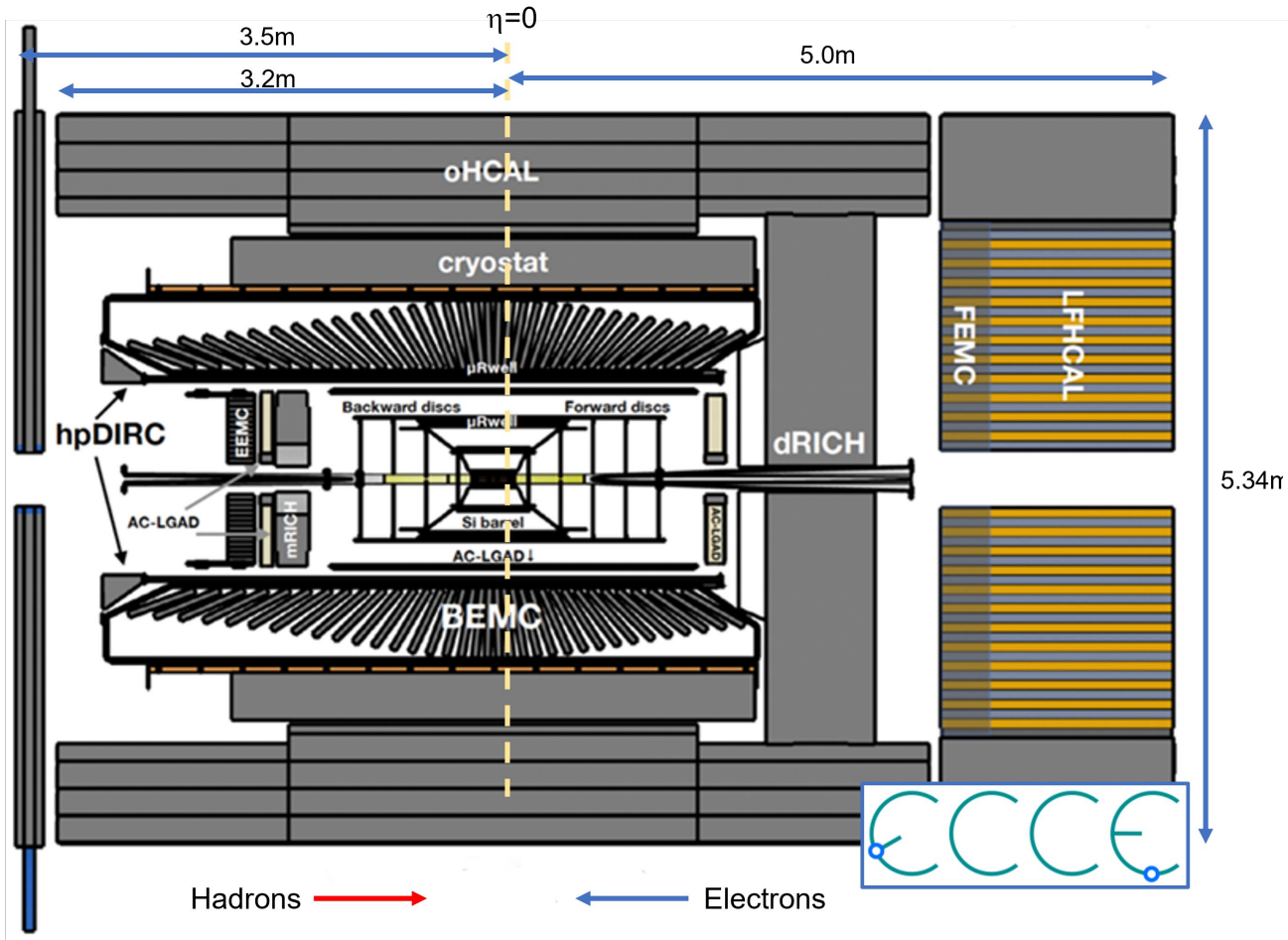
- EICUG Yellow Report (2020-21)
- Call for proposals issued jointly by BNL and JLab in March 2021
  - Proposals due Dec. 1, 2021
  - ATHENA, CORE and ECCE proposals submitted
- Public DPAP meetings Dec. 13-15, 2021
  - Presentations from proto-collaborations
  - Panel-assigned homework questions
- Second DPAP session Jan. 19-21, 2022
- DPAP closeout March 8th, 2022
  - Final report available March 21st, 2022
  - ECCE proposal chosen as basis for Detector-1 reference design
- Spring – Fall 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

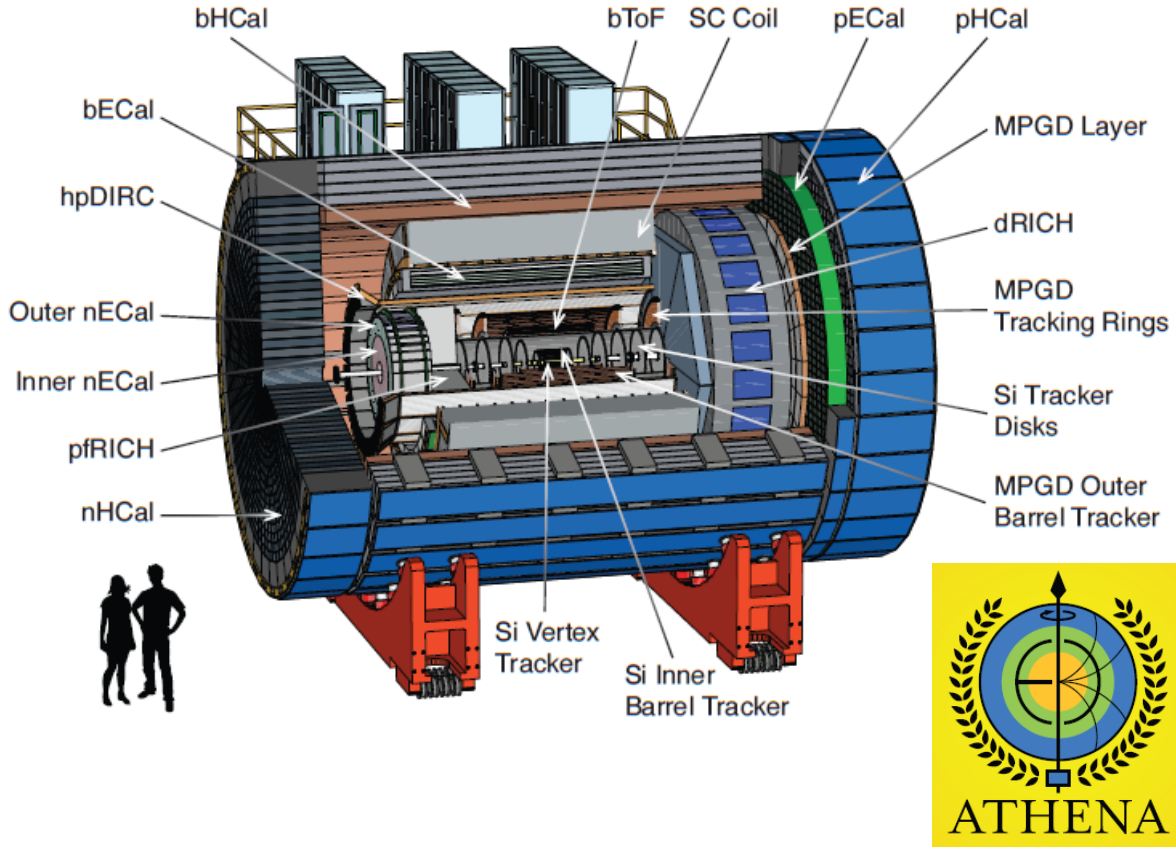


ePIC Detector

- To be sited at IP6 (25mr crossing angle)
- Addresses EIC science program as outlined in the EIC white paper and NAS report
- Must be ready for Day-1 EIC operations
- Working towards pre-TDR and CD-2/3A

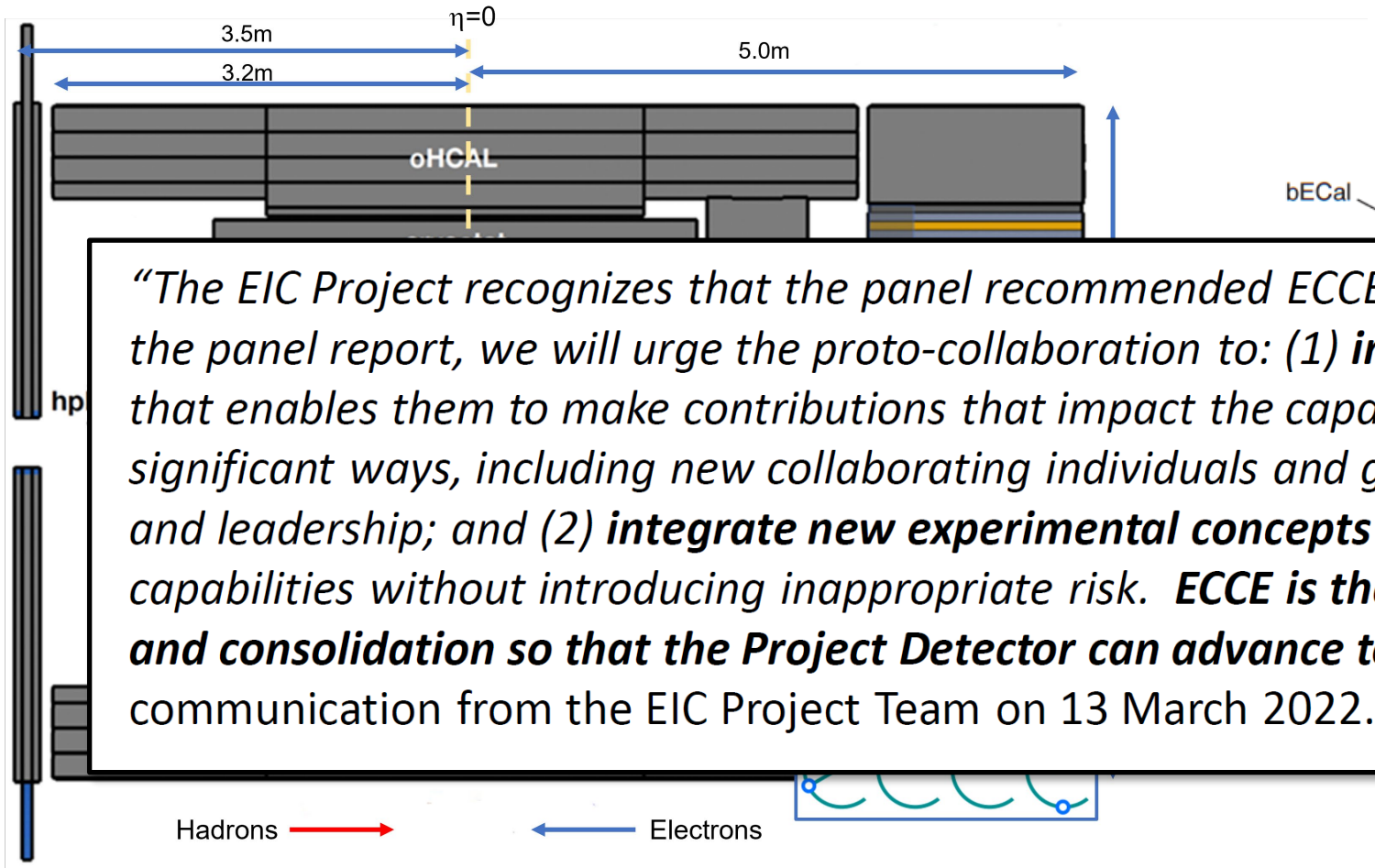
ECCE and ATHENA

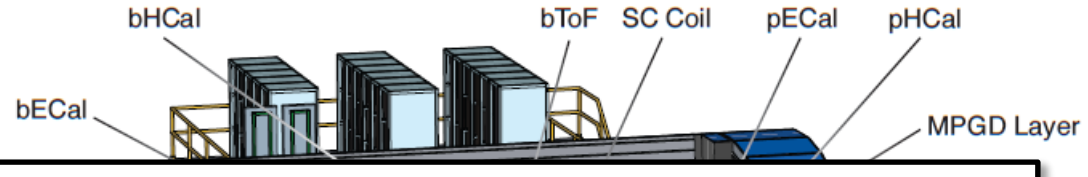




Key conceptual differences – bore size and magnetic field!

ECCE and ATHENA

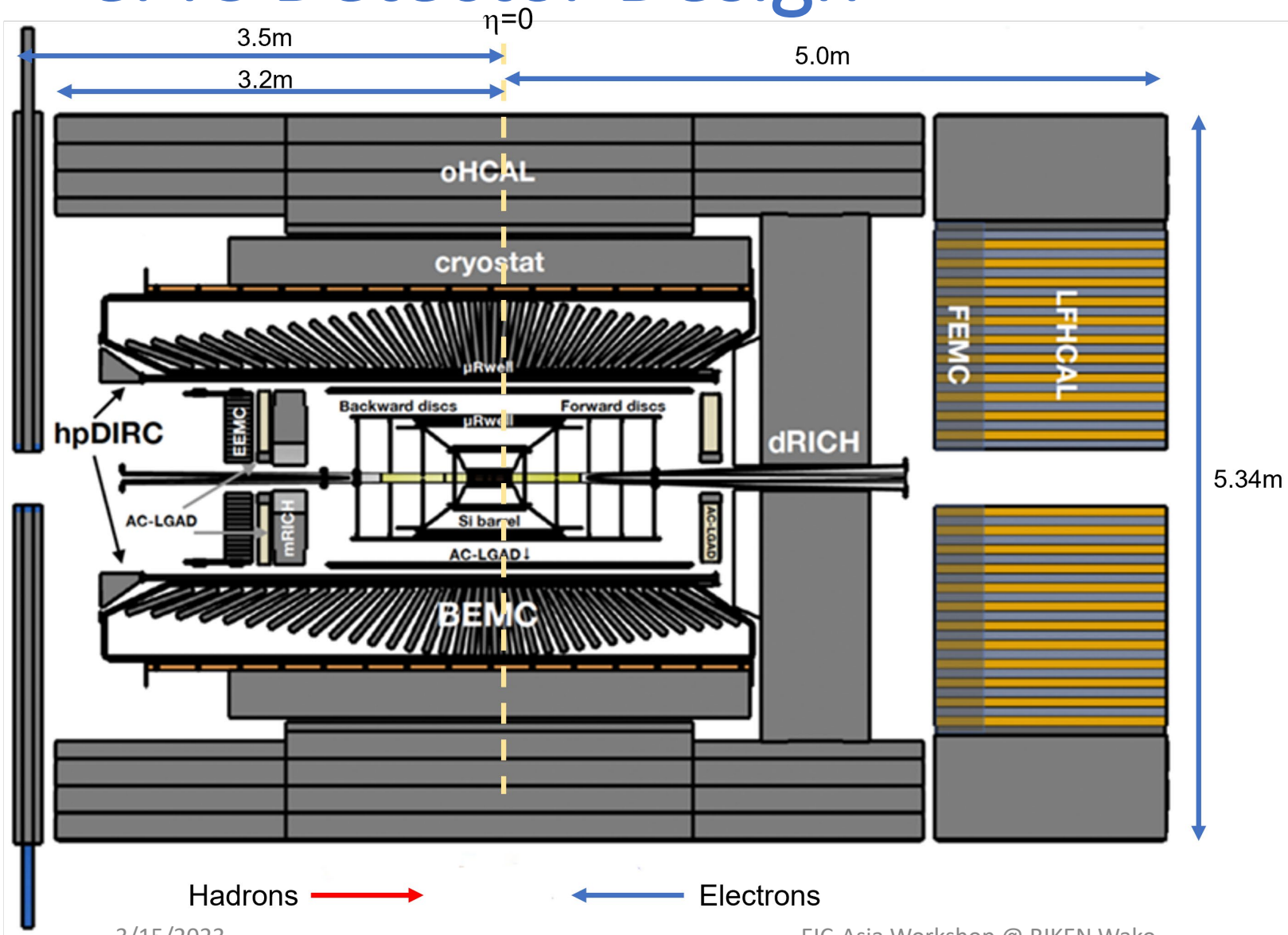




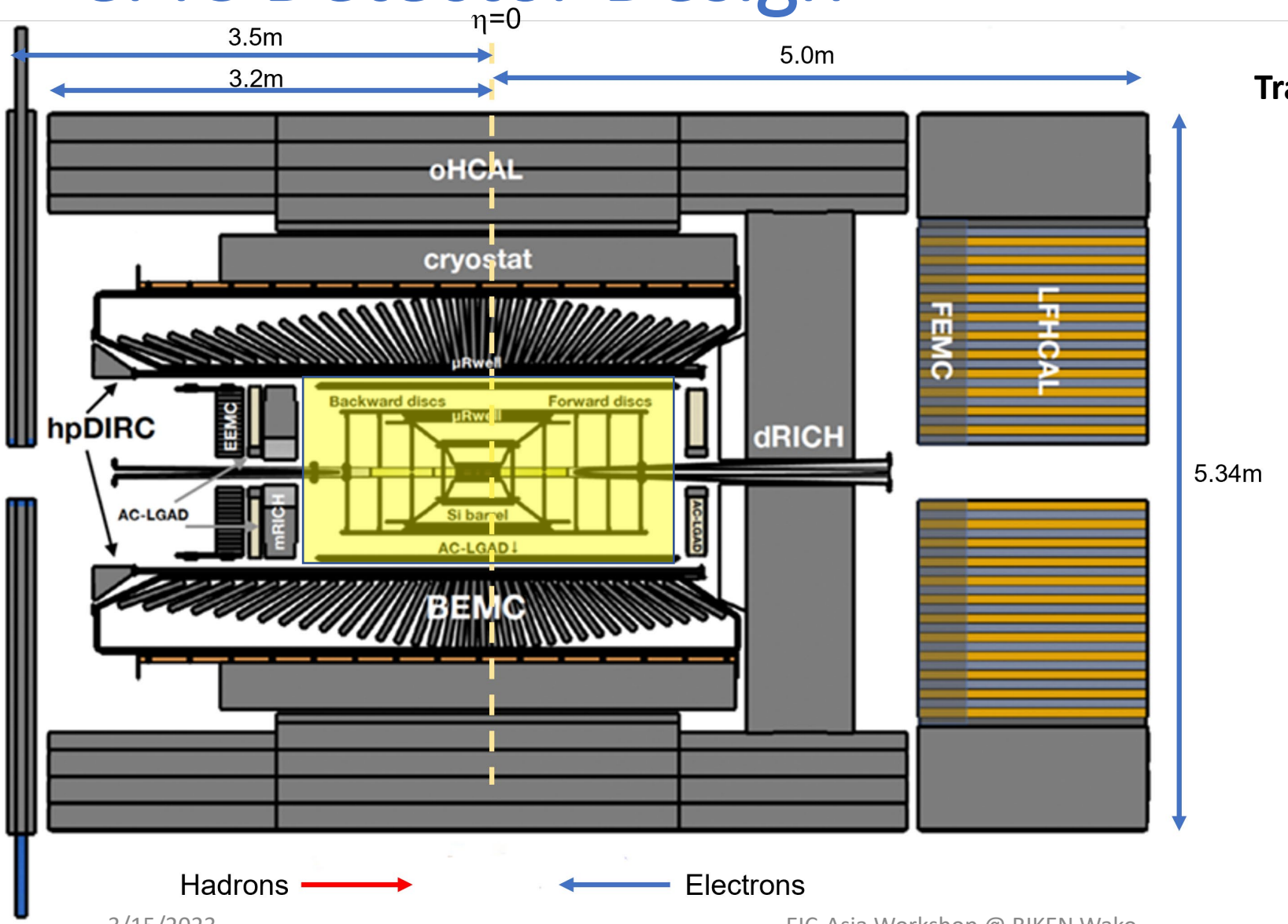
"The EIC Project recognizes that the panel recommended ECCE as the Project Detector. As described in the panel report, we will urge the proto-collaboration to: (1) ***integrate new collaborators*** *in a manner that enables them to make contributions that impact the capabilities and success of the experiment in significant ways, including new collaborating individuals and groups into positions of responsibility and leadership; and (2)* ***integrate new experimental concepts*** *and technologies that improve physics capabilities without introducing inappropriate risk.* ***ECCE is the reference design for this optimization and consolidation so that the Project Detector can advance to CD2/3a in a timely way"*** – email communication from the EIC Project Team on 13 March 2022.

Key conceptual differences – bore size and magnetic field!

ePIC Detector Design



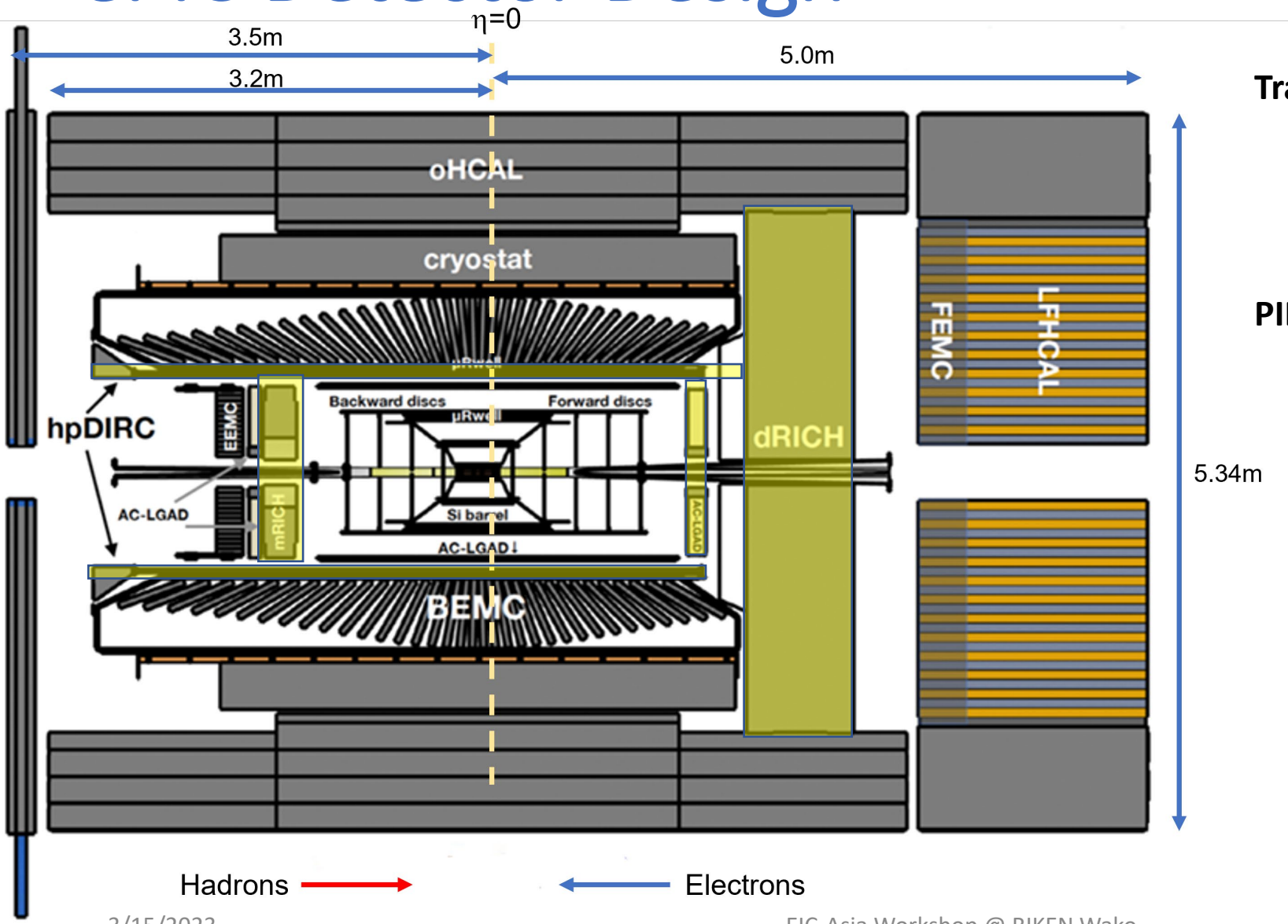
ePIC Detector Design



Tracking:

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

ePIC Detector Design



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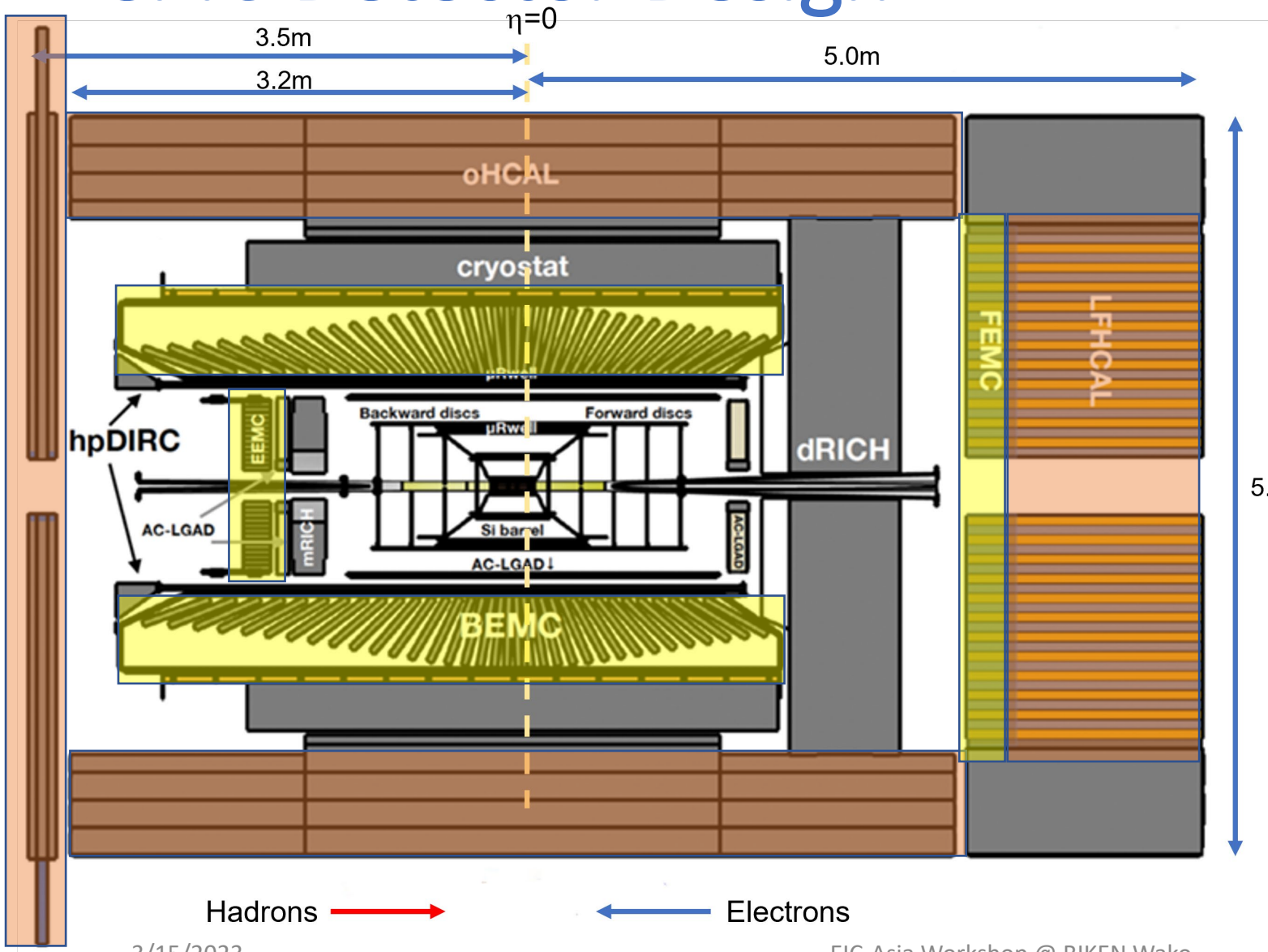
PID:

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

ePIC Detector Design



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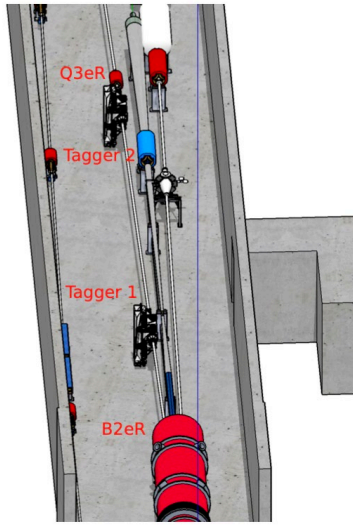
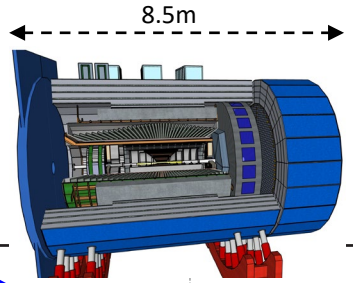
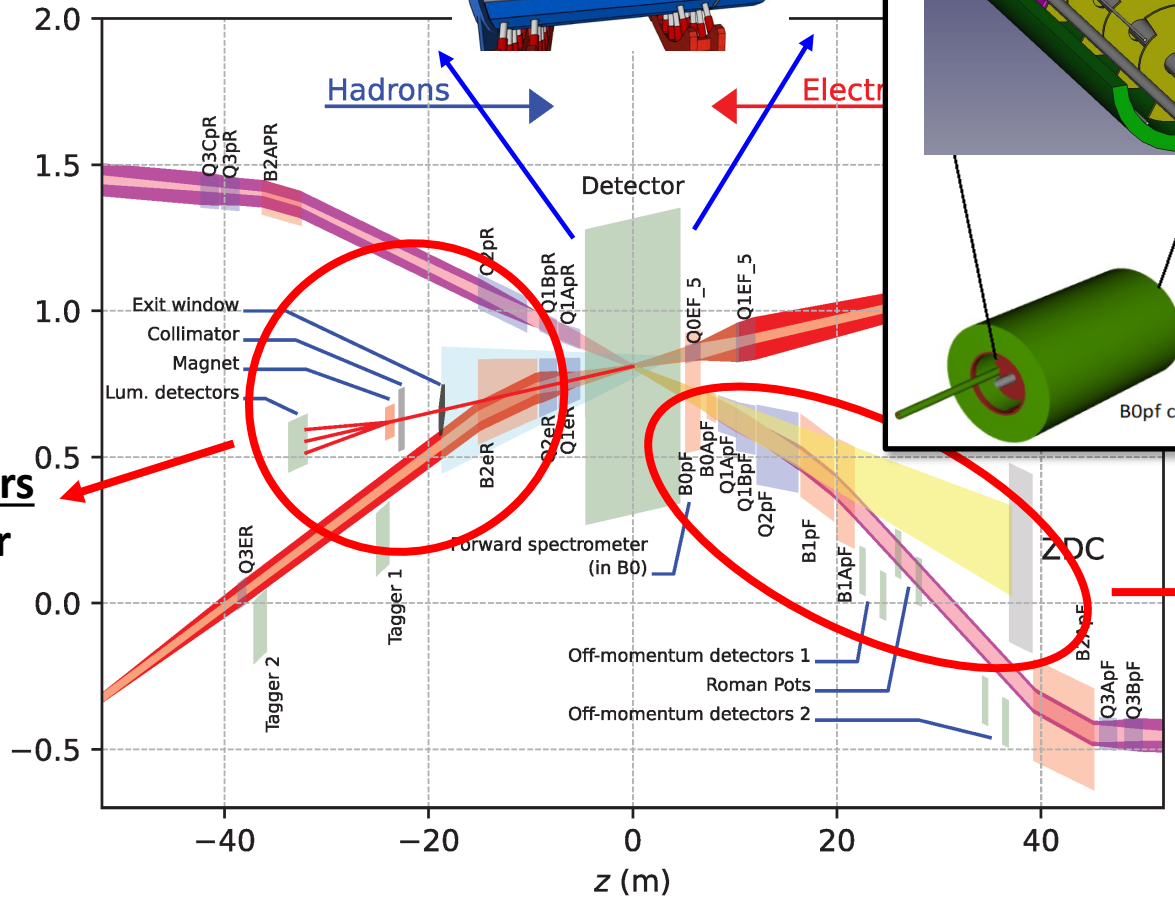
Calorimetry:

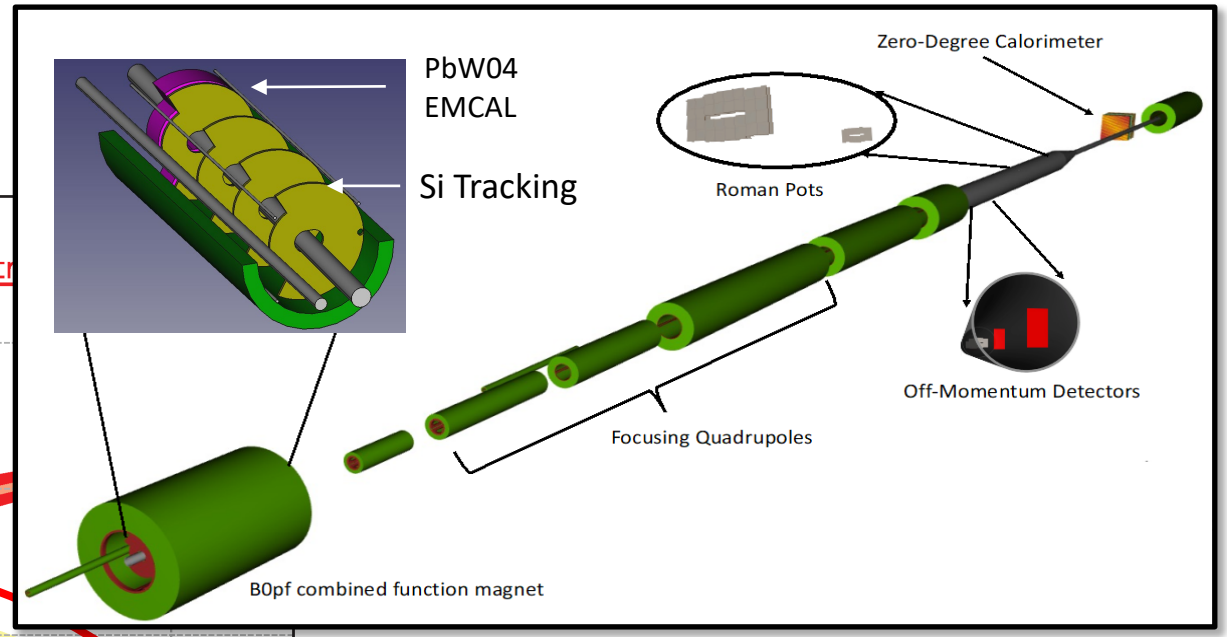
- SciGlass/Imaging Barrel EMCal
- PbWO4 EMCal in backward direction
- Finely segmented EMCal +HCal in forward direction
- Outer HCal (sPHENIX re-use)
- Backwards HCal (tail-catcher)

Far-Forward and Far-Backward Detectors









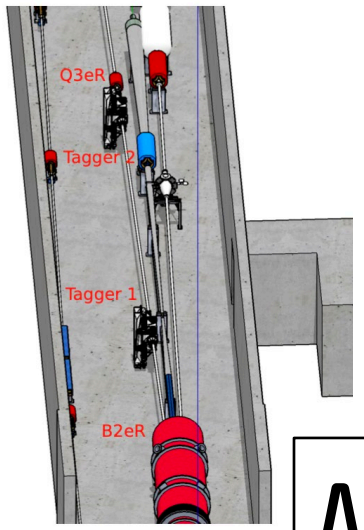
Far-Backward Detectors

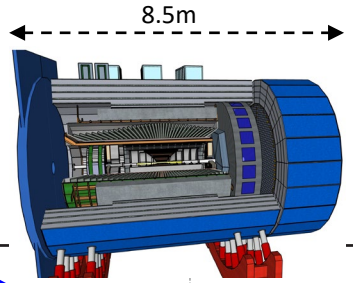
- **Luminosity monitor**
- **Low-Q^2 Tagging Detectors**

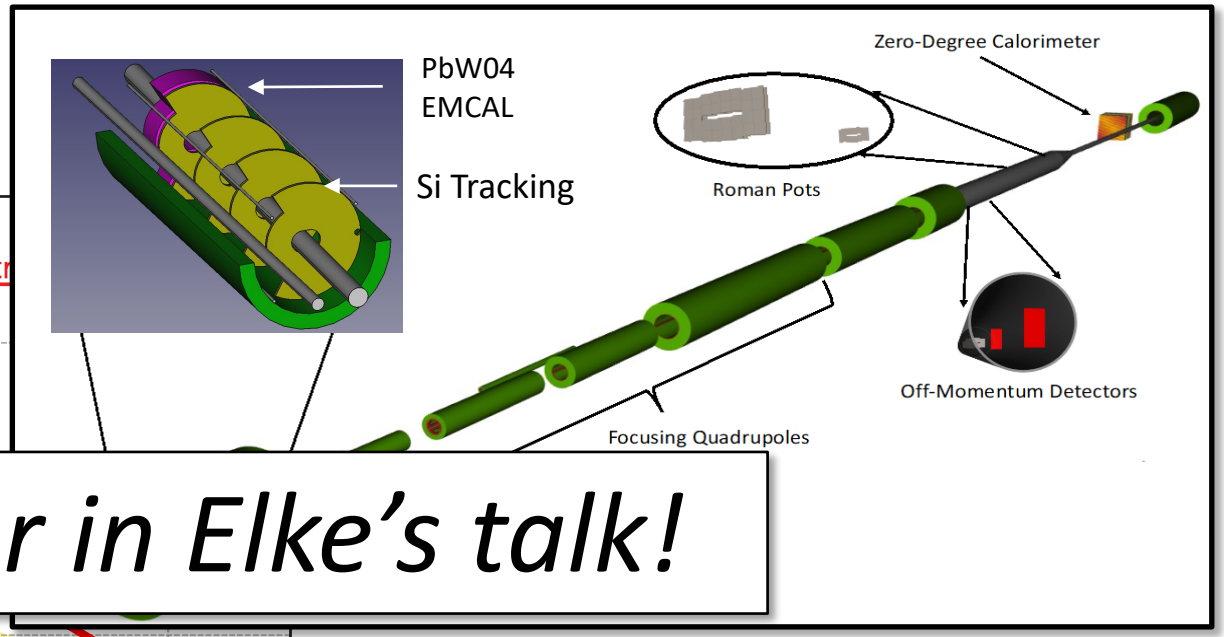
Far-Forward Detectors

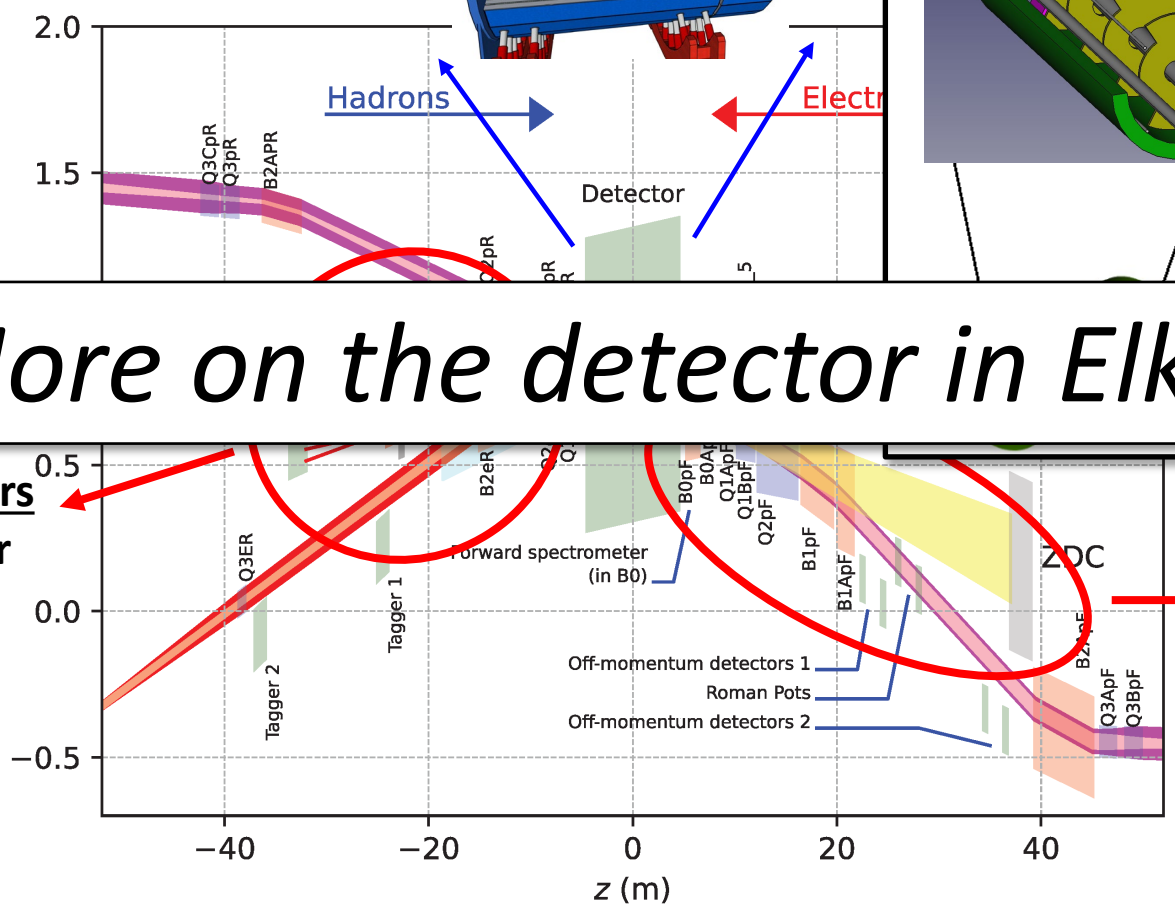
- **B0 Tracking and Photon Detection**
- **Roman Pots and Off-Momentum Detectors**
- **Zero-Degree Calorimeter**

Far-Forward and Far-Backward Detectors









More on the detector in Elke's talk!

Far-Backward Detectors

- **Luminosity monitor**
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Far-Forward Detectors

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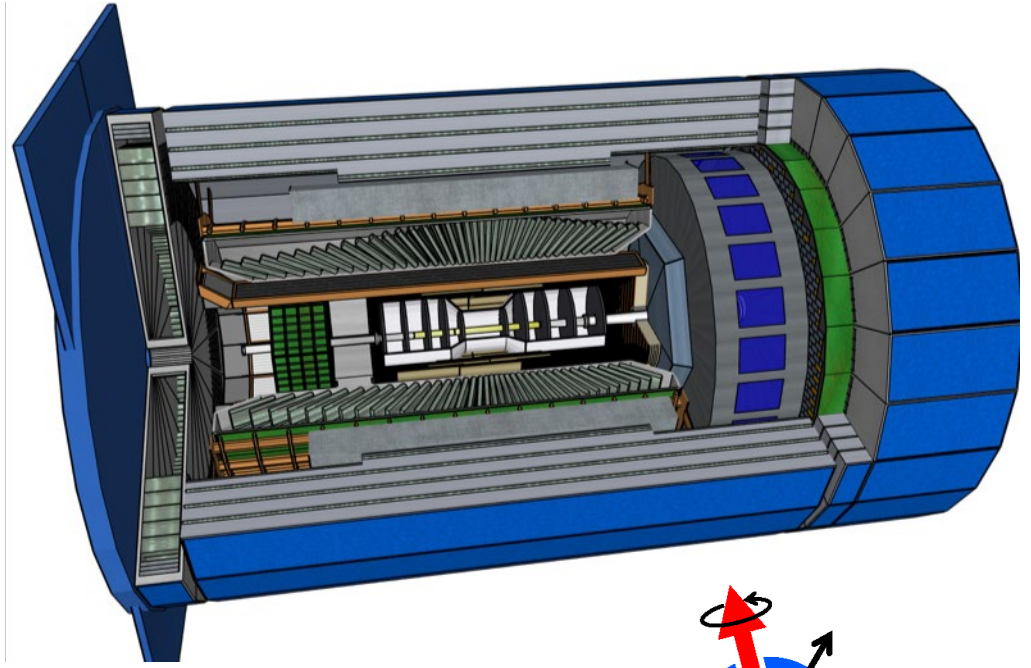
- **Roman Pots and Off-Momentum Detectors**
- **Zero-Degree Calorimeter**

ePIC Collaboration Formation

- Collaboration formation process started July, 2022:
  - First IB Meeting July 18th
    - Charter writing committee formed
  - First ePIC Collaboration meeting July 26-29, 2022
  - ePIC Charter approved by IB vote Dec. 14, 2022
  - Second ePIC Collaboration Meeting Jan. 9-11, 2023
    - ePIC leadership election process started
  - Spokesperson election completed Feb. 14, 2023
    - John Lajoie (Spokesperson),
      Silvia Dalla Torre (Deputy Spokesperson
  - Collaboration Council Chair and Vice-Chair election completed Feb 23, 2023:
    - Ernst Sichtermann (CC Chair) and
      Bernd Surrow (Vice Chair)
- Spokesperson's Office currently in process of implementing management plan



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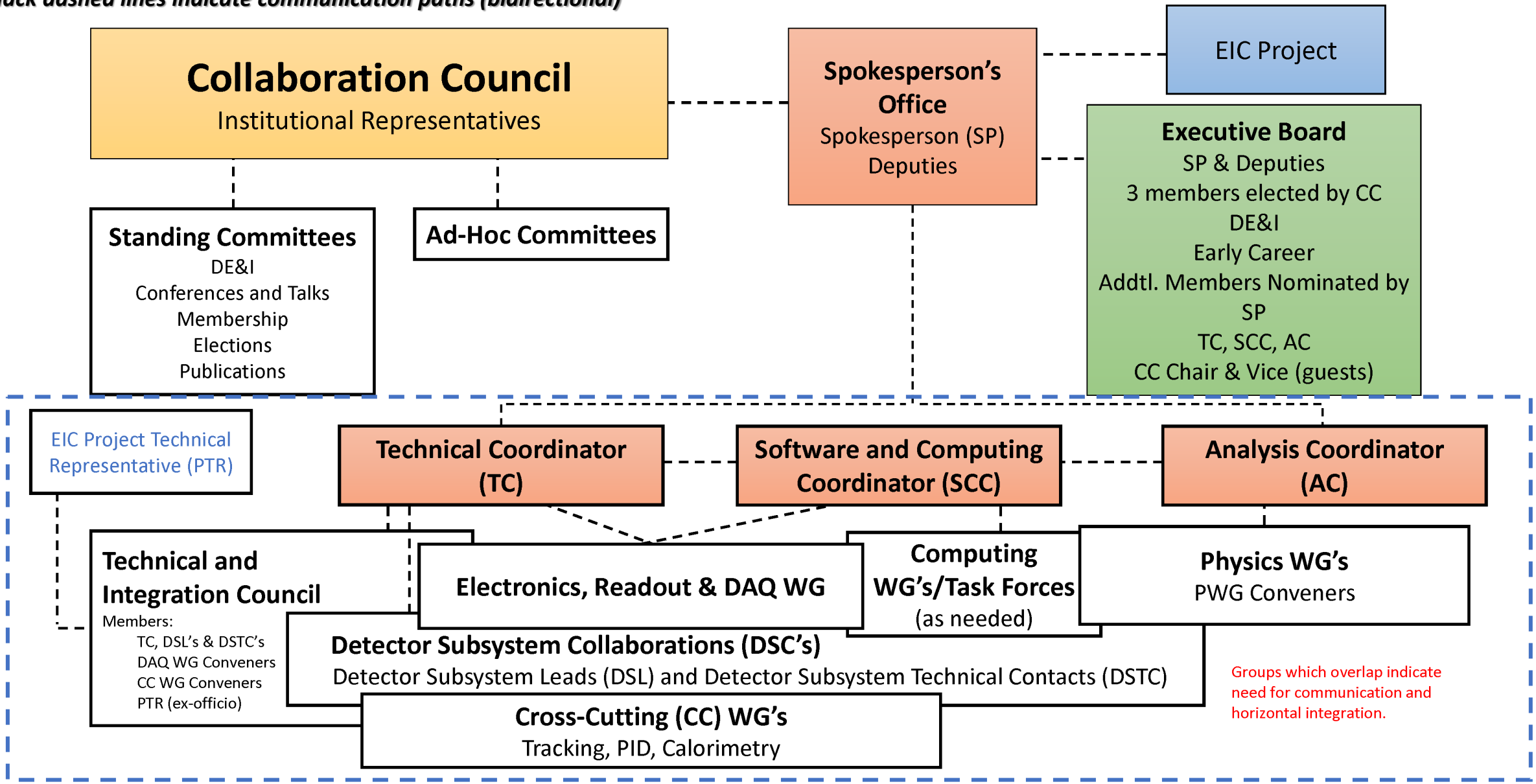
- Addresses EIC science program as outlined in the EIC white paper and NAS report
- Must be ready for Day-1 EIC operations
- Working towards pre-TDR and CD-2/3A

ePIC Collaboration Structure

Black dashed lines indicate communication paths (bidirectional)



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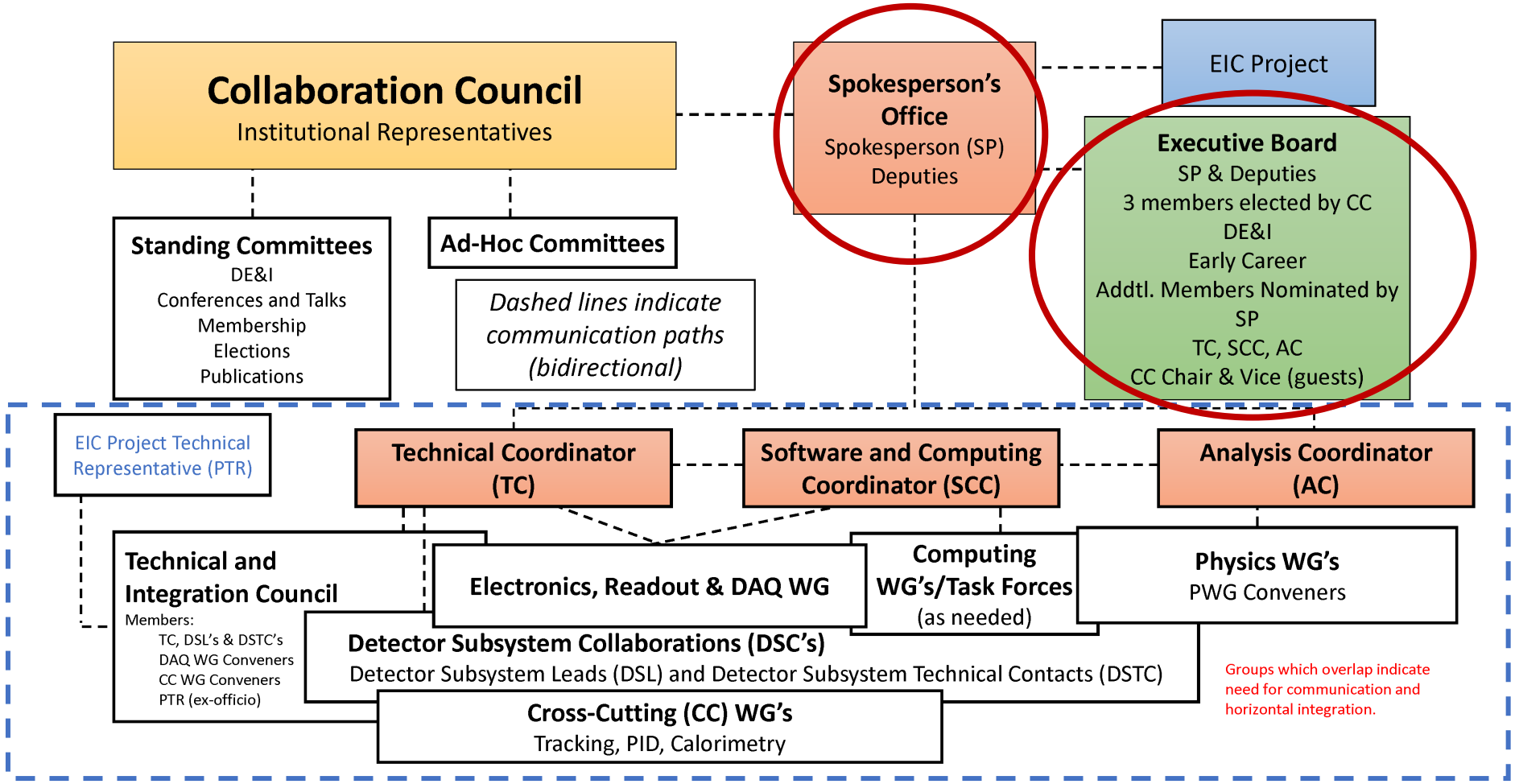
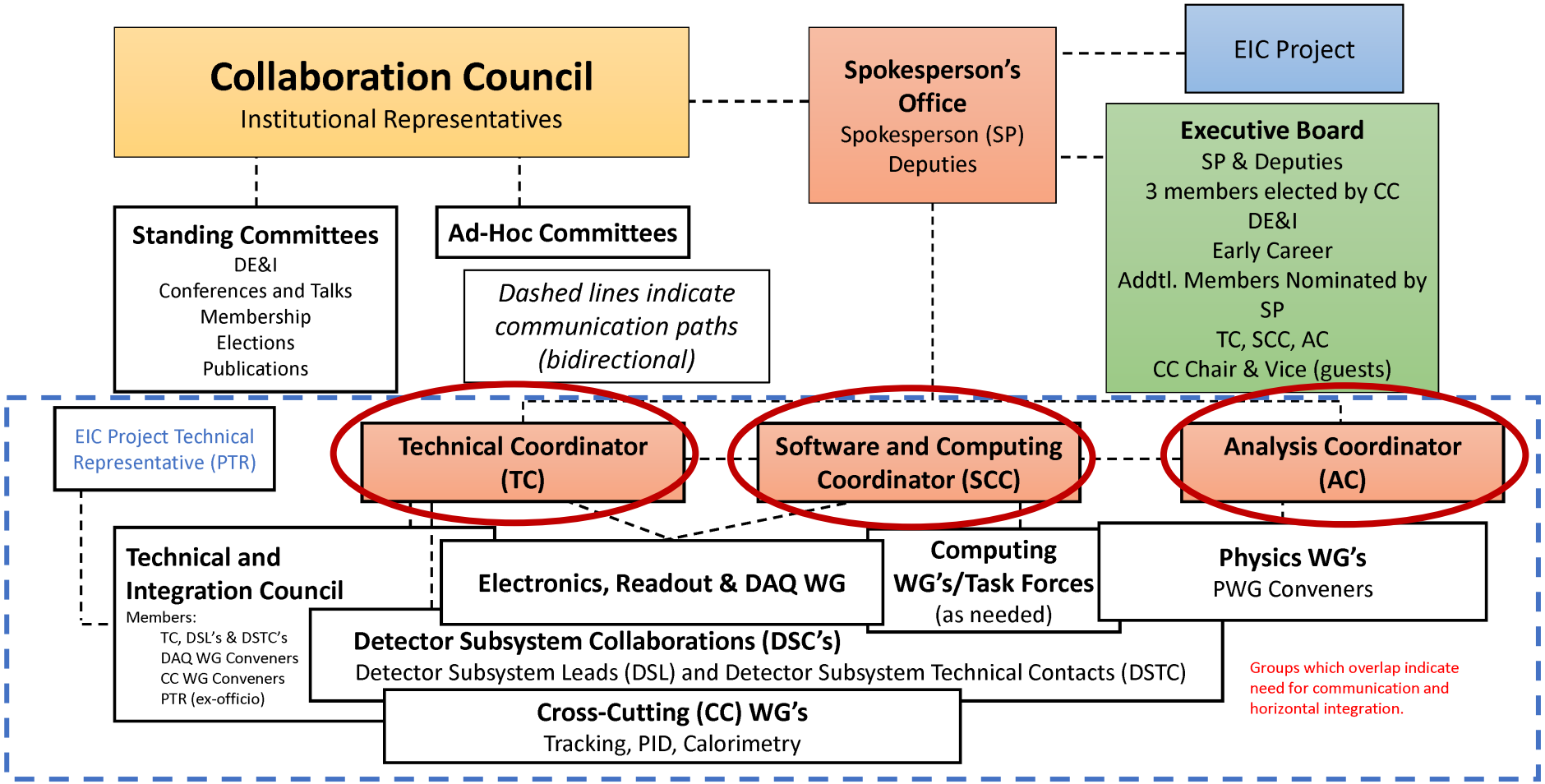


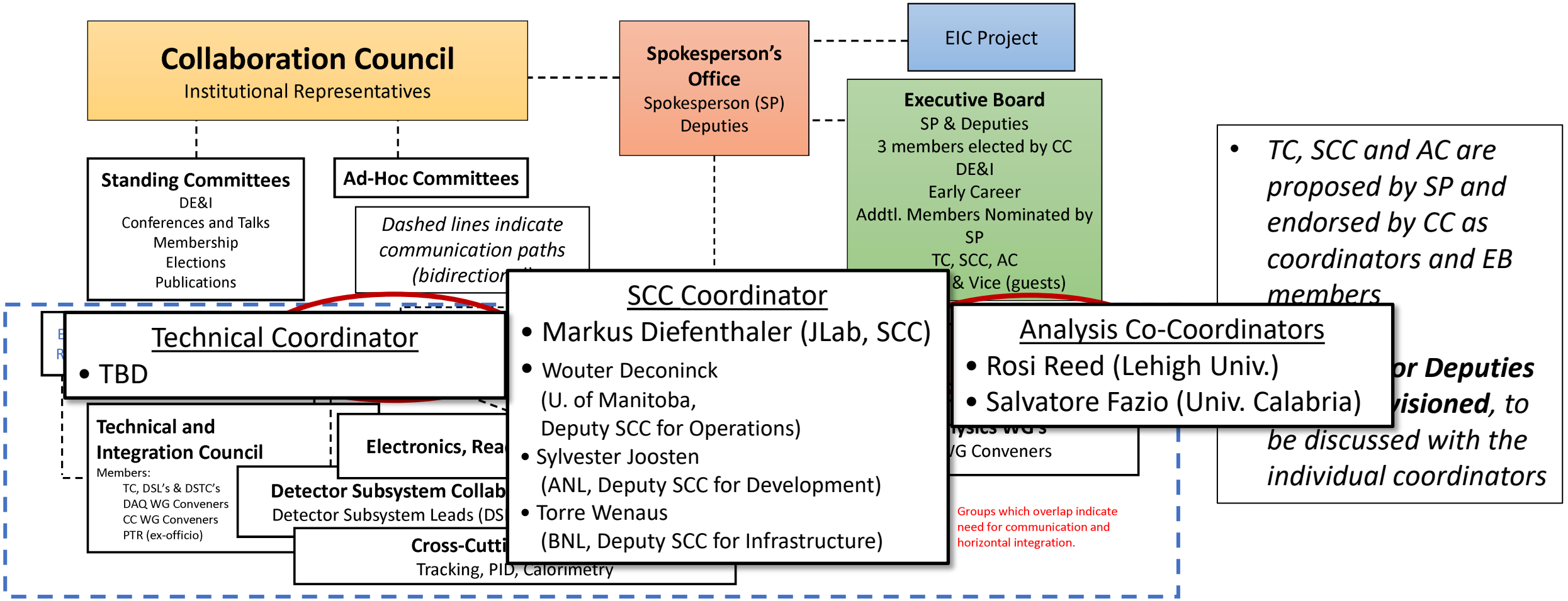
- *EB members advise the SP Office and provide needed input from collaboration stakeholders*
- *CC Chair and Vice Chair standing guests*
- *SP Office provides clear direction and accountability*

ePIC Collaboration Structure



- *TC, SCC and AC are proposed by SP and endorsed by CC as coordinators and EB members*
- ***Coordinator Deputies can be envisioned**, to be discussed with the individual coordinators*

ePIC Collaboration Structure



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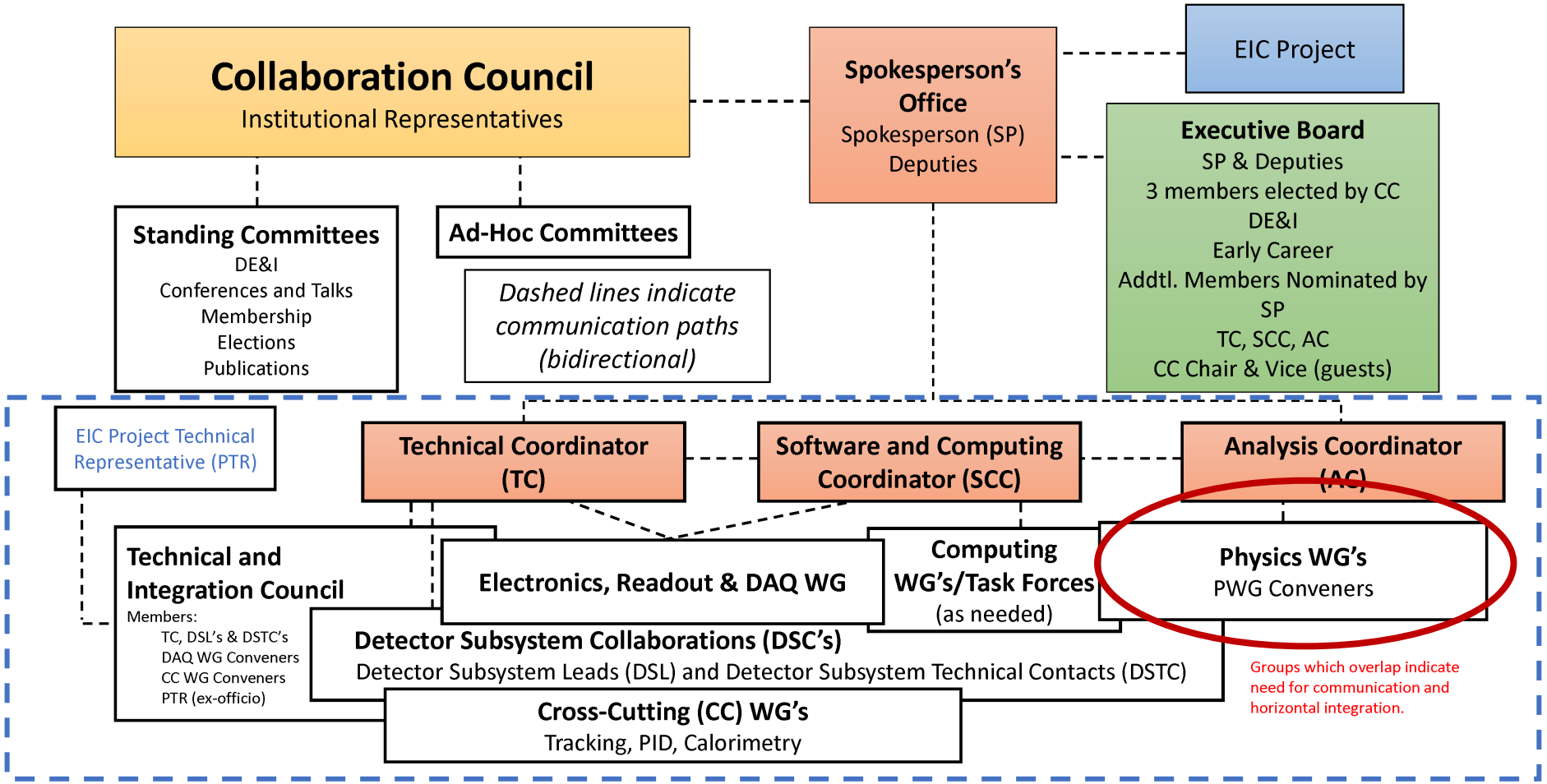
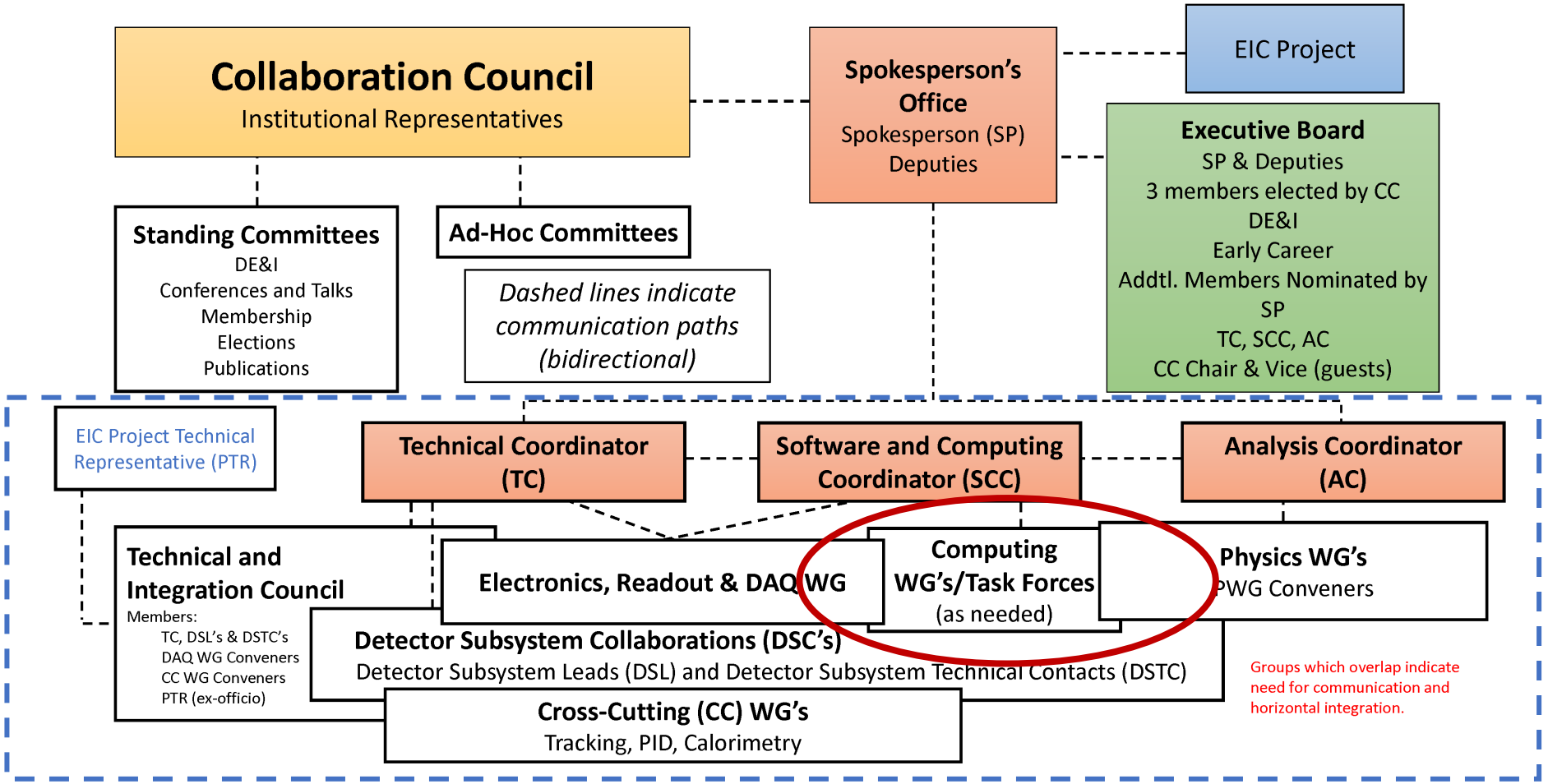


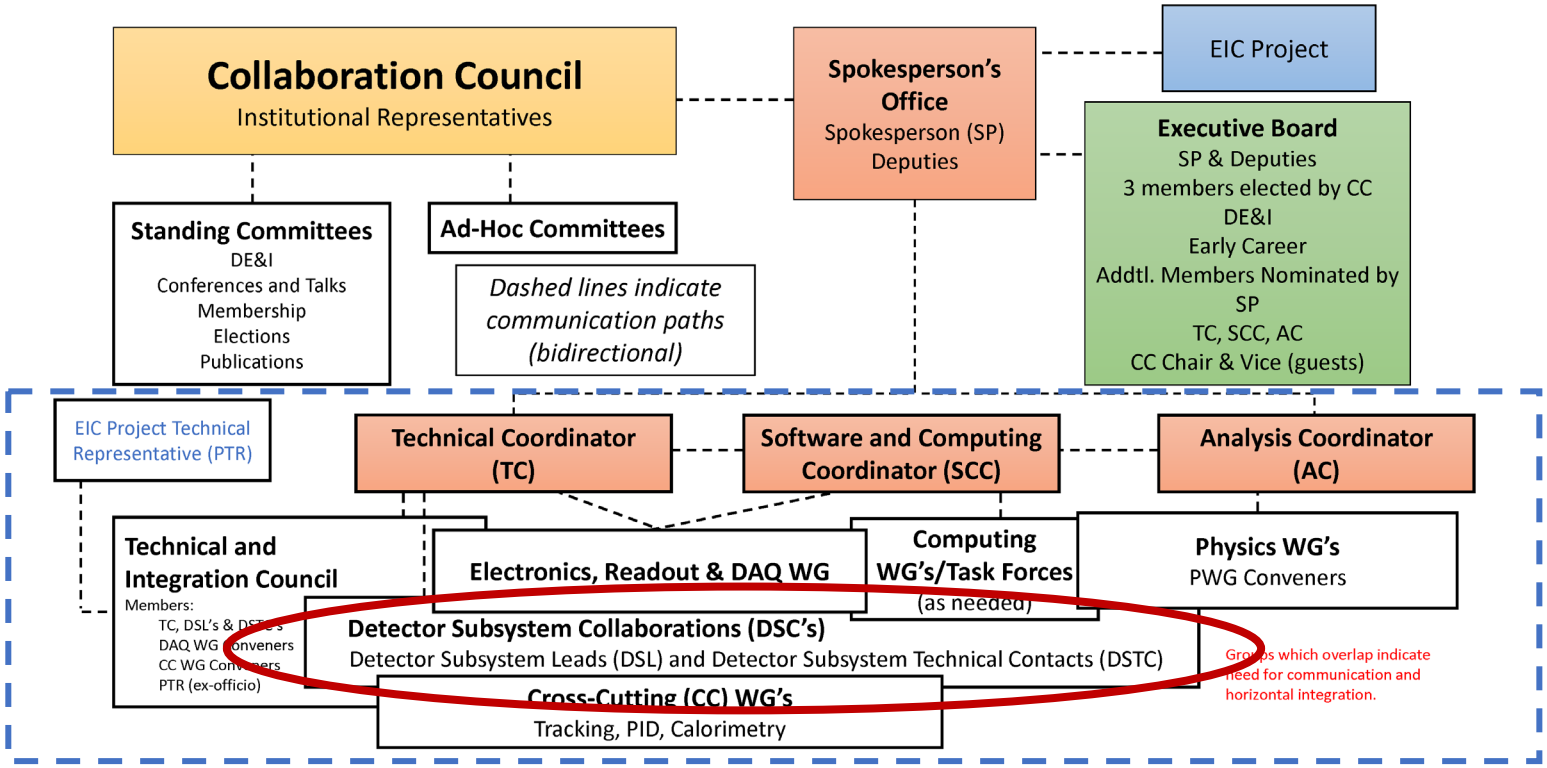
- ***Primary Goal**: To use physics performance as a tool to guide the technical design*
- *WG structure provides a clear entry point for new collaborators*
- *Physics WGs with ~ 2 conveners*
- *Number and domain of WGs to be discussed with the present WGs/collaboration*
- *Enhance flexibility and communication with short-term task forces*

ePIC Collaboration Structure



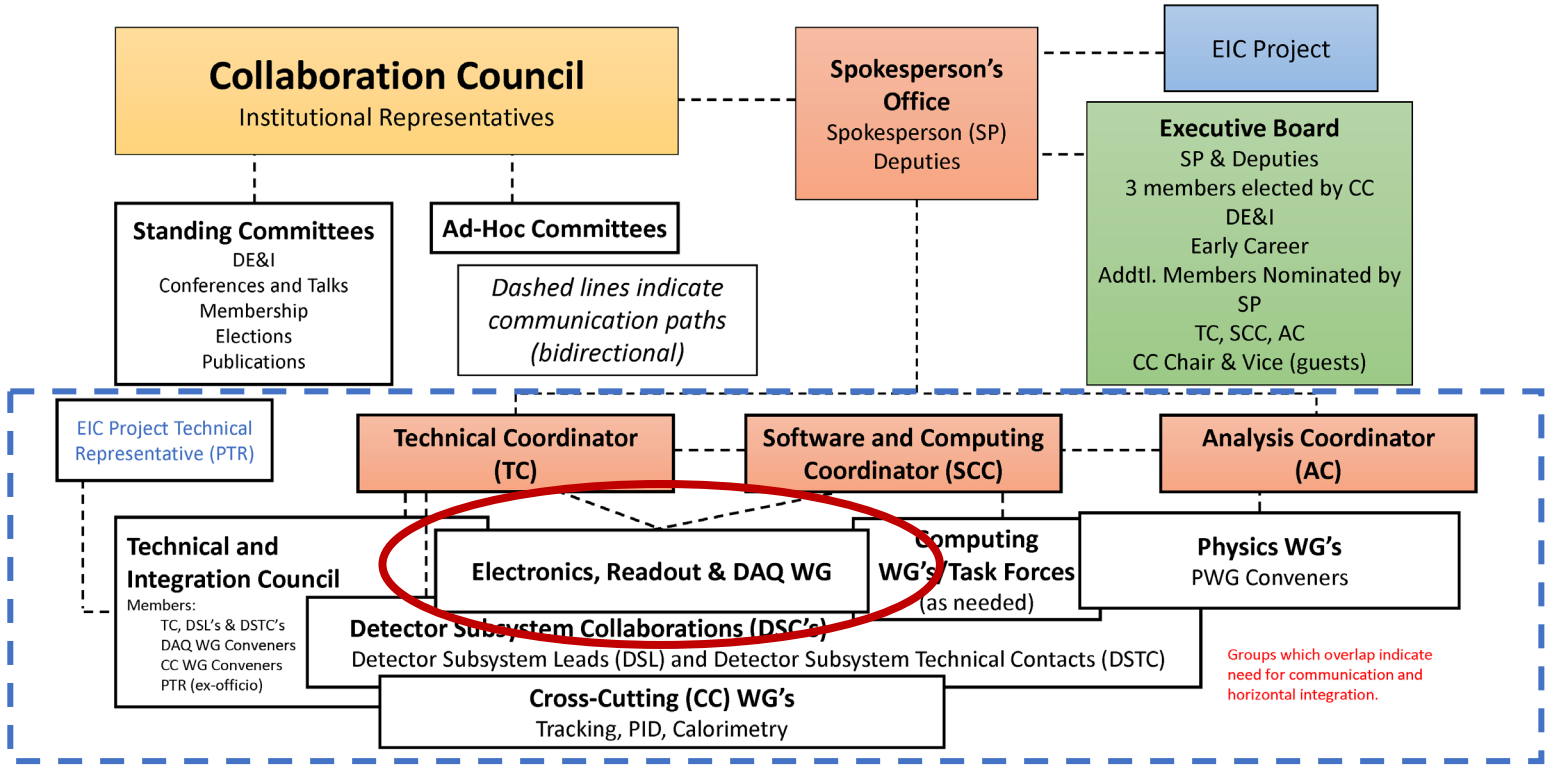
- *Software and Computing Coordinator*
  - *Interface with labs*
  - *Coordinates collaboration activity*
- *Computing WG/Task Forces:*
  - *Software architecture*
  - *Simulations*
  - *Computing resources*
  - *Advanced algorithms & AI*
  - *Documentation and User Support*
  - *…*
- *A dedicated WG and flexible structure of subgroups*

ePIC Collaboration Structure



- *Need to **evolve DWGs** to a structure more appropriate to the (pre-)TDR/construction phase:* ***WGs → Detector Subsytems***
- *Each project corresponds to a subdetector built by a **Detector Subsystem Collaboration (DSC)** of the groups and institutions contributing to it*
- *Each project collaboration will choose its **Detector Subsystem Lead (DSL)** and **Detector Subsystem Technical Contact (DSTC)***
- DSL/DSTC (Collab.) <-> L4 Tech. Contacts (Project)

ePIC Collaboration Structure



- ***RO and DAQ**, which is cross-cutting to sub-detectors, remains a separate WG with ~2-4 conveners*

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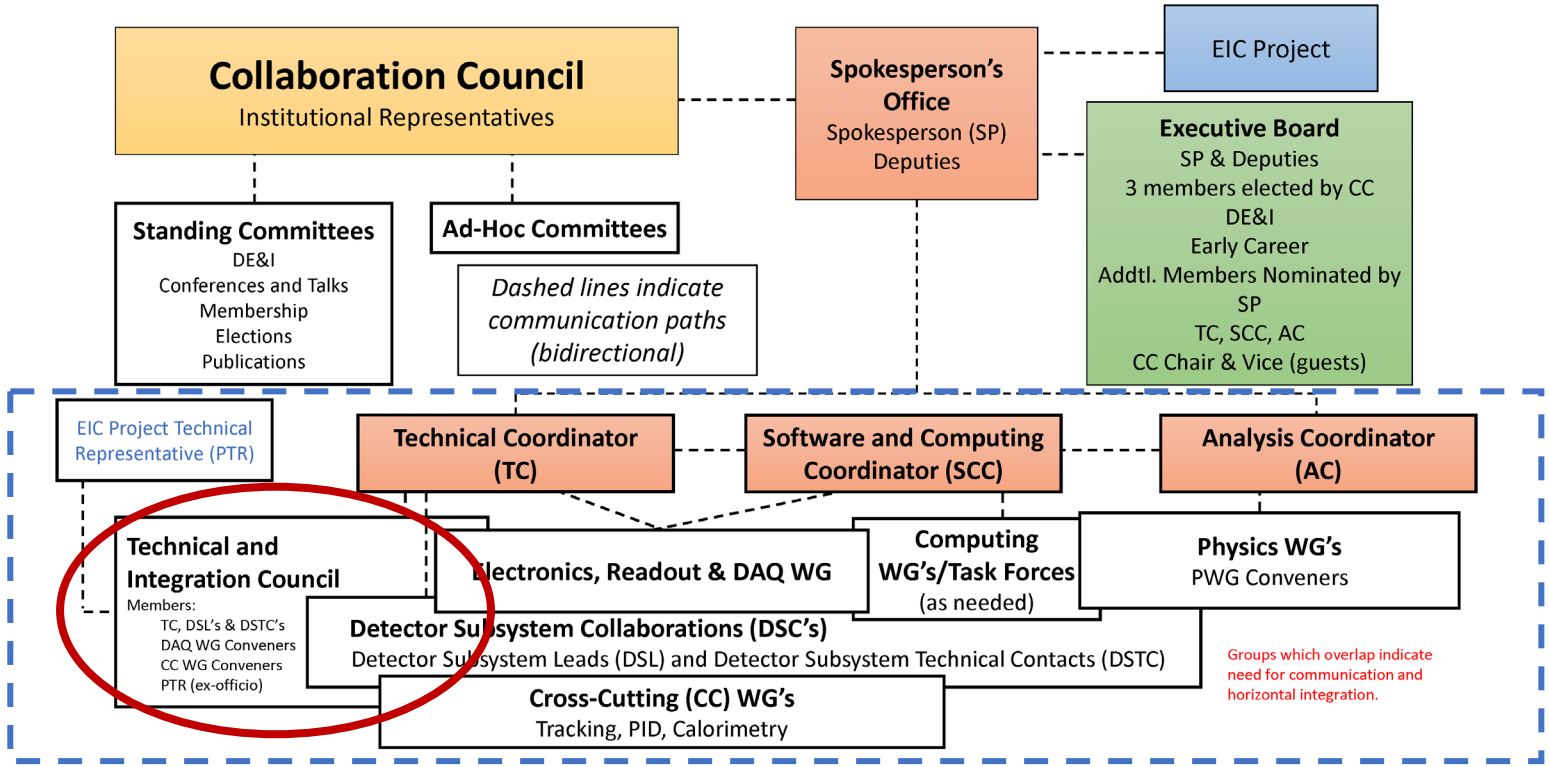

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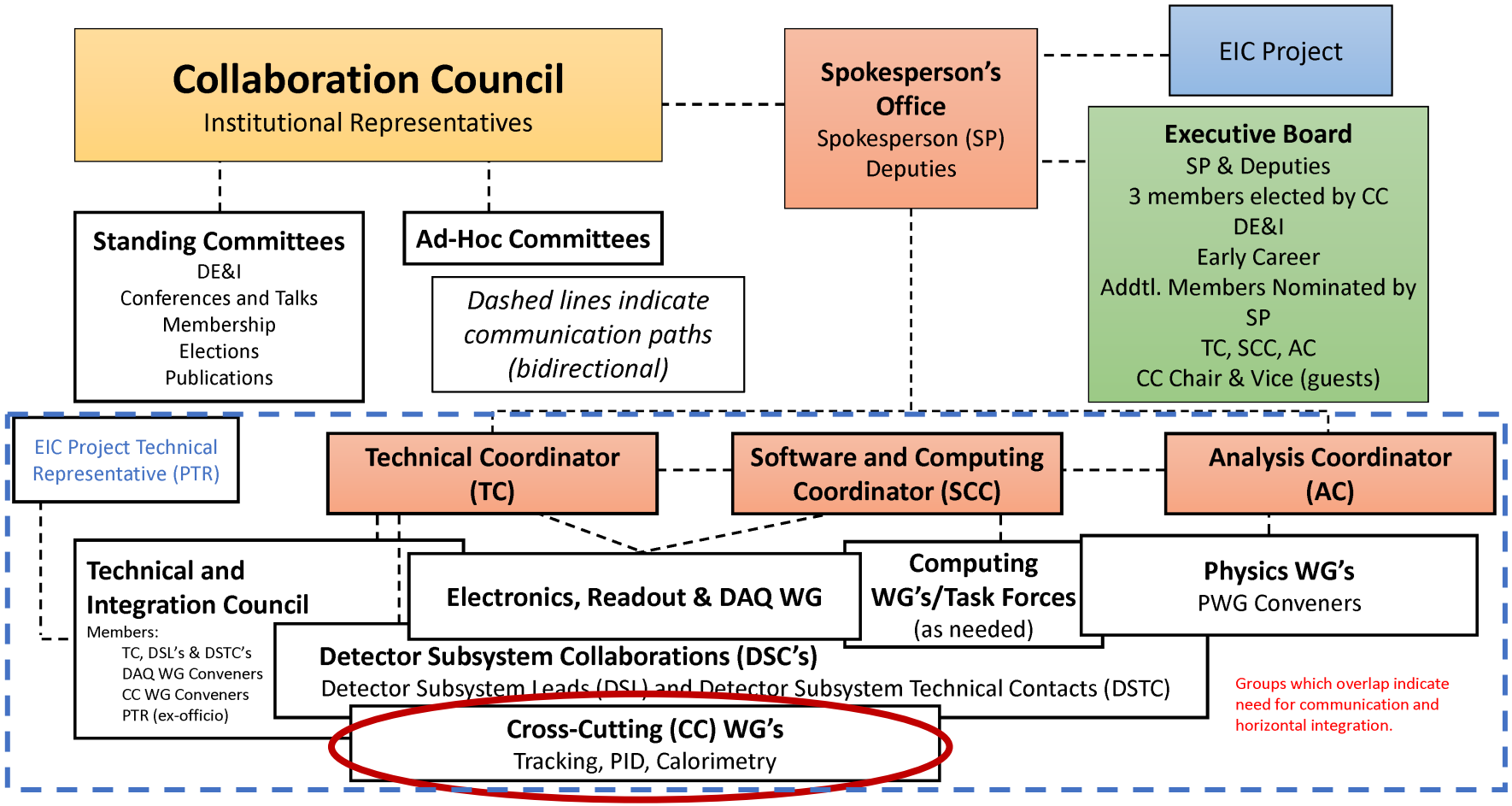
- DSL/DSTC (Collab.) <-> L4 Tech. Contacts (Project)

***Technical and Integration Council** is formed by*

- *TC*
- *DSL's and DSTC's*
- *DAQ WG conveners*
- *CC WG conveners*
- *EIC PTR (ex-offico)*

- ***RO and DAQ**, which is cross-cutting to sub-detectors, remains a separate WG with ~2-4 conveners*

ePIC Collaboration Structure



- *Cross-Cutting WG's (CCWG's) preserve a forum to complete the design of integrated systems and evolve the analysis software and techniques.*

ePIC Collaboration Ongoing Activities

- Barrel EMCal Technology Review – Mar. 13-14th
  - Examine technology options (SciGlass or Imaging EMCal)
- Backwards PID Technology Review – Mar. 20-21st
  - Examine technology implementations (mRICH or proximity-focused)

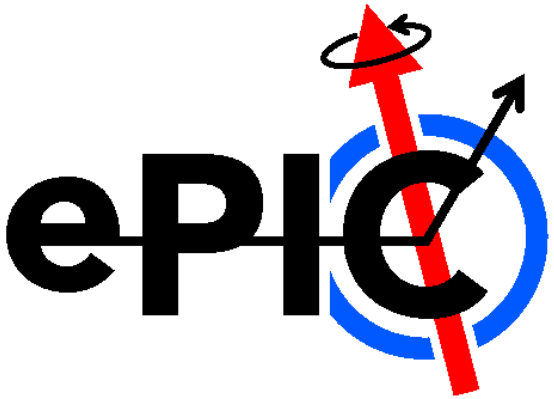
- Collaboration Council meeting March 24th
  - Endorse management plan and coordinators, form committees

- Next ePIC Collaboration Meeting:
  - Organized jointly with EIC Users Group Meeting
  - Univ. of Warsaw, July 23-31st
  - Early career, EICUG and ePIC meetings

ePIC Collaboration Engagement

- To be successful we will not only need to grow the ePIC Collaboration but take full advantage of the skills, talents, and capabilities of all our collaborators
  - Silvia and I are dedicated to making ePIC a collegial, friendly, safe, and welcoming environment for everyone
  - Support the development of junior scientists

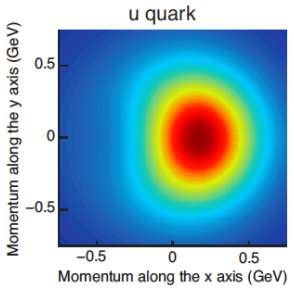
- ePIC Software Tutorial Sessions:
  - Analyzing Simulation Output (Mar. 7 & 10th)
    - https://indico.bnl.gov/event/18373/
  - Running Simulations (Mar. 14-15th)
    - https://indico.bnl.gov/event/18360/

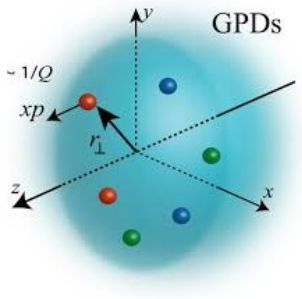


- Support international groups by helping them engage with ePIC, match their talents and capabilities to the work that need to be done
  - Formation of DSC's an opportunity to engage new collaborators
- Key WG convener positions still to be determined

Conclusions

- The EIC is a new QCD laboratory designed to elucidate:
  - Origin of Nucleon Mass & Spin
  - Confinement
  - Nucleon / Nuclear Femtography
  - Dense Gluon States
  - BSM physics

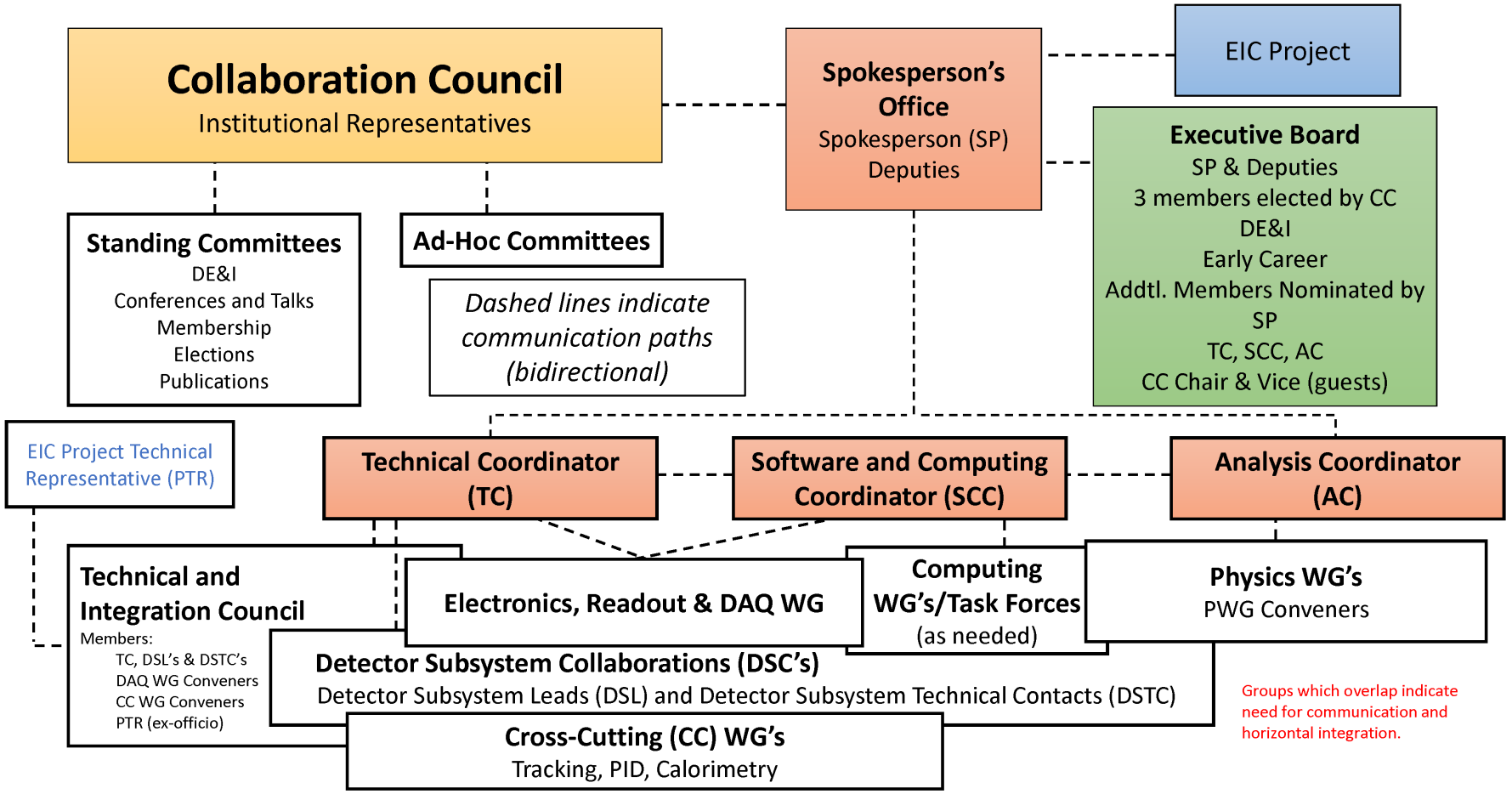




- The ePIC Collaboration is maturing into a scientific organization that is up to the challenge of realizing the EIC science program
  - EIC detectors are an enormous undertaking that will require participation and expertise from the international community


BACK UP

Detector Decision Flow



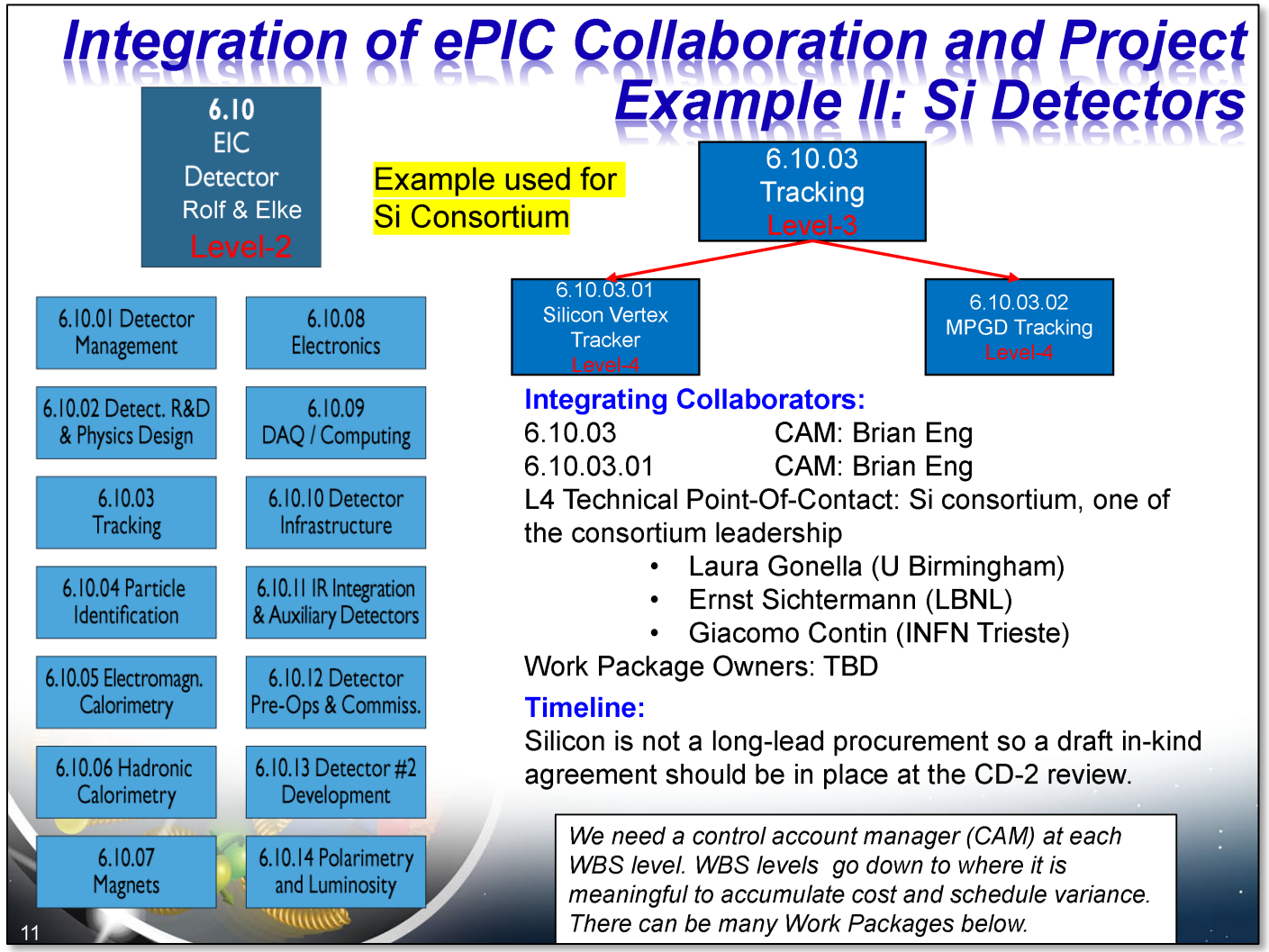
- *Review, analysis and report by TIC*
- *Recommendation formulated by SP Office in consultation with EB*
- *SP Office ensures communication with EIC Project and CC, consistent with ePIC charter*

ePIC Charter lines 66-70:

"Whenever unforeseen constraints identified by the EIC Project require substantial modifications to the detector design, the Collaboration will work with the EIC Project on related technical proposals, will assess the impact on physics capabilities of EPIC and will report their findings to the EIC project. In cases of particular relevance, this may even necessitate the Spokesperson to call for a Collaboration Council vote on the proposed changes."

Integration with EIC Project (I)

Slide from Elke and Rolf



For Si Tracker, seems logical that DSL/DSTC can be drawn from EICSC, and overlap with L4 Technical Contacts

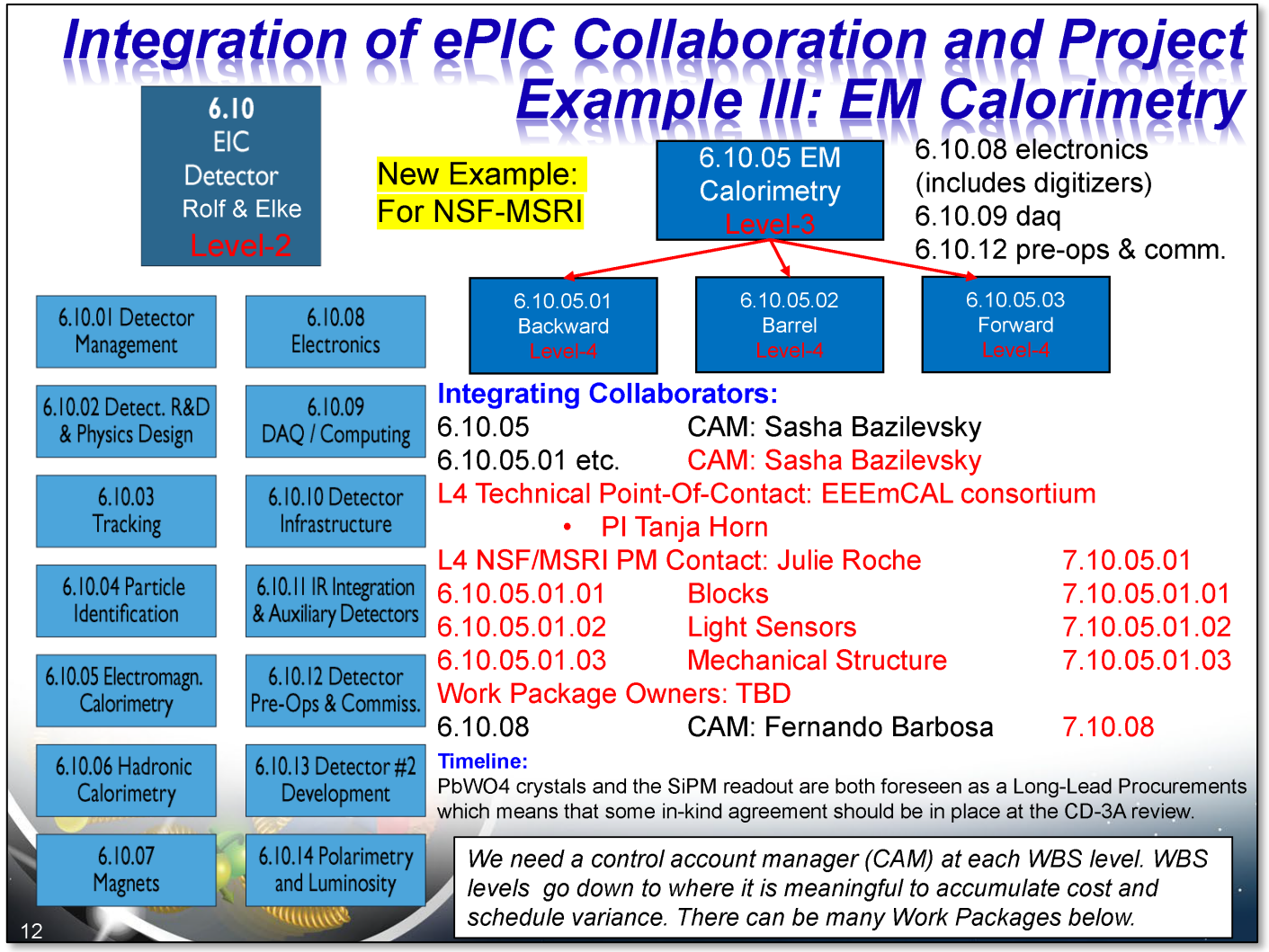
MPGD tracking may be broken down further to μRWell and μMegas at the DSL/DSTC level.

Work Package Owners can also be drawn from the collaboration.

The goal is a tight integration between the project and the collaboration at a technical level.

Integration with EIC Project (II)

Slide from Elke and Rolf



This example looks at how things might be structured for a potential in-kind contribution.

Again, DSL/DSTC connected with project as L4 Technical Contact. Work Package Owners can also be drawn from the collaboration (examples shown).

The goal is a tight integration between the project and the collaboration at a technical level.

Starting DSC scheme (Draft)

DWG (now)	DSC (in management plan)	Notes
Tracking	Si Tracker (barrel and discs) Gaseous Trackers	build on EICSC
Calorimetry	Backwards ECAL Backwards HCAL Barrel ECAL Barrel HCAL Forward ECAL Forward HCAL For. HCAL insert	build on EEMCal consortium (currently not in reference)
Cherenkov PID	Backward RICH hpDIRC dRICH	
TOF	Barrel AC-LGAD Forward AC-LGAD	
FFWD	RP's + OMD B0 Tracker ZDC	
FBWD	Lumi. Pair Spectrometer Calorimeters Low-Q^2 tracker	some DSL/DSTC overlap to start