

# EPIC Working Group Conveners Meeting

19 August 2022

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

# Calendar – near(ish) term over the next year



☐ July 2022: EICUG Meeting at SBU



☐ August 2022++: **Simulation campaign and detector subsystem reviews**

- 22-23 August: Independent EIC Software Infrastructure Review
- 29 August: Formal Project Electronics/DAQ Review
- October (*in scheduling*): 60% Design Review Magnet
- October++: more subsystem reviews (EM Cal, Tracking, Hadronic Cal, PID, Detector Infrastructure and Installation, Polarimetry and Luminosity)
- Preparations for simulation campaign (software framework implementation)

☐ October 2022: simulation campaign EPIC

☐ December 2022: finalize definition of all subsystem technologies

☐ May 2023: first version of pre-TDR

☐ October 2023: final version of pre-TDR

# What to expect in a formal review – in general

- ❑ Reviewers: Experts in the field (mostly external to EIC community, from national/international academic and research institutions)
- ❑ Attendance: in formal project subsystem status review constrained to (DOE/NP reps and) EPIC leadership – by invitation only
- ❑ An example agenda – here an early draft from Electronics/DAQ Subsystem Review:
  - 8:00 am Welcome and Introduction – introduce the general EIC detector
  - 8:30 am Electronics Requirements – Fernando Barbosa (JLab)
  - 9:10 am DAQ Timing System and Interface to Detectors – Jeff Landgraf (BNL)
  - 9:30 am DAQ and Online Computing – David Abbott (JLab)
  - 9:50 am Break
  - 10:10 am A few talks of 15 min each ASIC# requirements and status various EIC user institutions
  - 11:40 am Summary
  - 11:50 am Executive Session
  - 1:30 pm Closeout

# Major steps of the EIC Project

- ❑ Some items rely heavily on the WGs – require simulations
- ❑ Others done in collaboration with the EIC Project team, e.g., the CAMs
- ❑ Timelines are important

## The Path to CD-2/3A

- ❑ Form collaboration and define subsystem responsibilities
  - in-kind contributions need to be identified and agreements need to be in an advanced state (close to final)
  - Integrate collaboration in WBS – structure of detector
- ❑ Finalize scope of EIC Project Detector
  - all subsystem technologies defined by end of CY2022
- ❑ Continuous refinement of subsystem requirements and interfaces
- ❑ Refine cost, schedule and labor needs for each subsystem
  - detailed documentation of basis – of – estimates
  - Long Lead Procurement (LLP) items of the detector will be further refined
  - define scope contingency items
- ❑ Bring level of design on average to 50-60% @ CD2/3A, with LLP items needing to be at final design stage (~90%)
- ❑ Produce pre-TDR\*: 1<sup>st</sup> version of by May 2023
  - final version by October 2023

\*TDR is needed by CD-3, about one year later



# Near Term Task 1: List of items towards Prelim Design

## Example: dRICH

- need to define the sub-detector technology to a level of detail that we can baseline cost, schedule and workforce and functional requirements needs
- what do we build: a CF-gas + Aerogel RICH or is the CF-gas replaced with a pressurized or cooled Argon
  - vessel design needs to be well advanced
- geometry of the subsystem and how it is integrated in the overall detector
- photon-sensor technology and # of readout – channels
- what is the front-end electronics, what ASIC will be used
- define mirror - system
- what needs to be cooled and how
- 3d-CAD of the detector with details how the detector will be assembled, drawings of the different components but not on fabrication quality
- design of gas system
- slow control and monitoring of hardware systems are needed, how do we realize it
- A worked-out concept (but no detailed plan) of assembly and service needs

*There can still be some open questions (but not affecting costs and schedule in major way), further engineering design to be done, detailed drawings to be done, etc.*

- ❑ WGs: create/update such a bullet list for each subsystem
- ❑ Many of these items can be (are being) worked out and documented by the WGs in collaboration with the Detector Consortia, the EIC PM, etc.

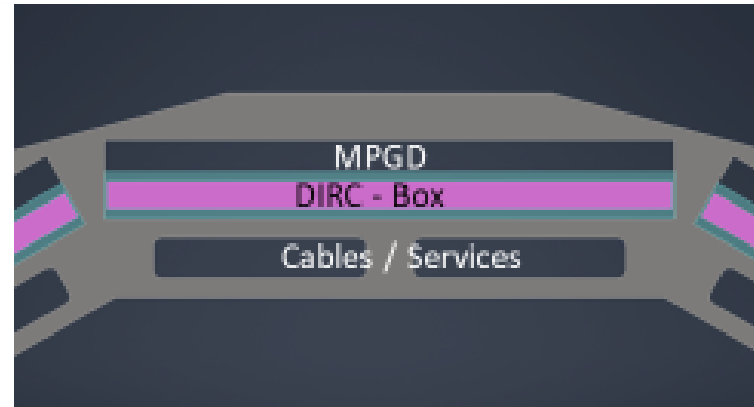
# Near Term Task 2: Services and Cables

## We need information on services and cables for all subsystems

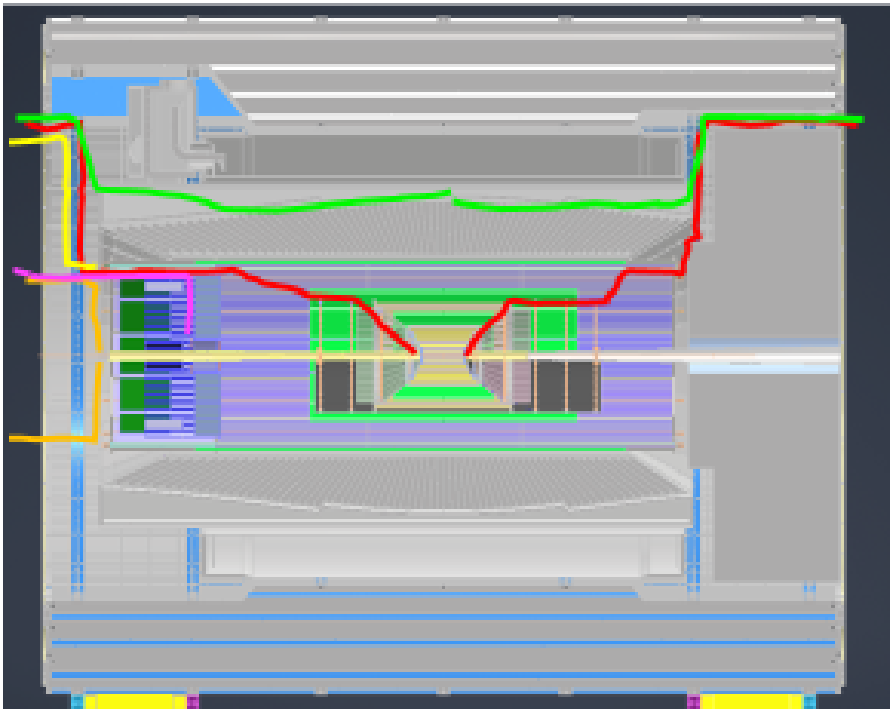
→ This drives the space for services we leave in the present design iteration

Recall earlier DIRC + MPDG integration optimization

- Support structure will hold the DIRC bar boxes, DIRC readout, GEM trackers, and all other systems inside of the DIRC
- Will allow for cooling and cables to be brought out from the inner detectors
- DIRC readout will be a separate piece capable of being detached
- Support was designed around both the barrel Emcal and the EEEEmcal



- ❑ WGs: create/update the information on cables and services for each subsystem



Cables and Services coming out on eEndcap-side:

- Barrel: MAPS, AC-LGAD, MPDG
- endcap: mRICH/pfRICH, MAPS, AC-LGAD
- half of eECAL, MPDG above DIRC
- DIRC

Cables and Services coming out on eEndcap-side:

- Barrel: MAPS, AC-LGAD, MPDG
- endcap: dRICH, MAPS, AC-LGAD
- half of eECAL, MPDG above DIRC

Electron-Ion Collider

Adapted from Elke/Rolf presentation at the EICUGM 2022

# EIC Global Geometry Database

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

This consistency is important for the simulation campaign → WGs review and as needed initiate updates through one of the legs of input, e.g., the GD/I

- ❑ **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/>

# Tools available to help with task list management



Main page  
Collaboration Info

Detector

Tracking

Cherenkov PID

TOF PID

Calorimetry

**Far Forward**

Far Backward

Experimental Solenoid

Physics

Inclusive

SIDIS

Exclusive, Diffraction and Tagging

BSM&Precision EW

Jets/HF

Integration

Global Detector/Integration

DAQ

Main DAQ Page

Software

Simulation production&QA

Software and Computing

Navigation

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Tools

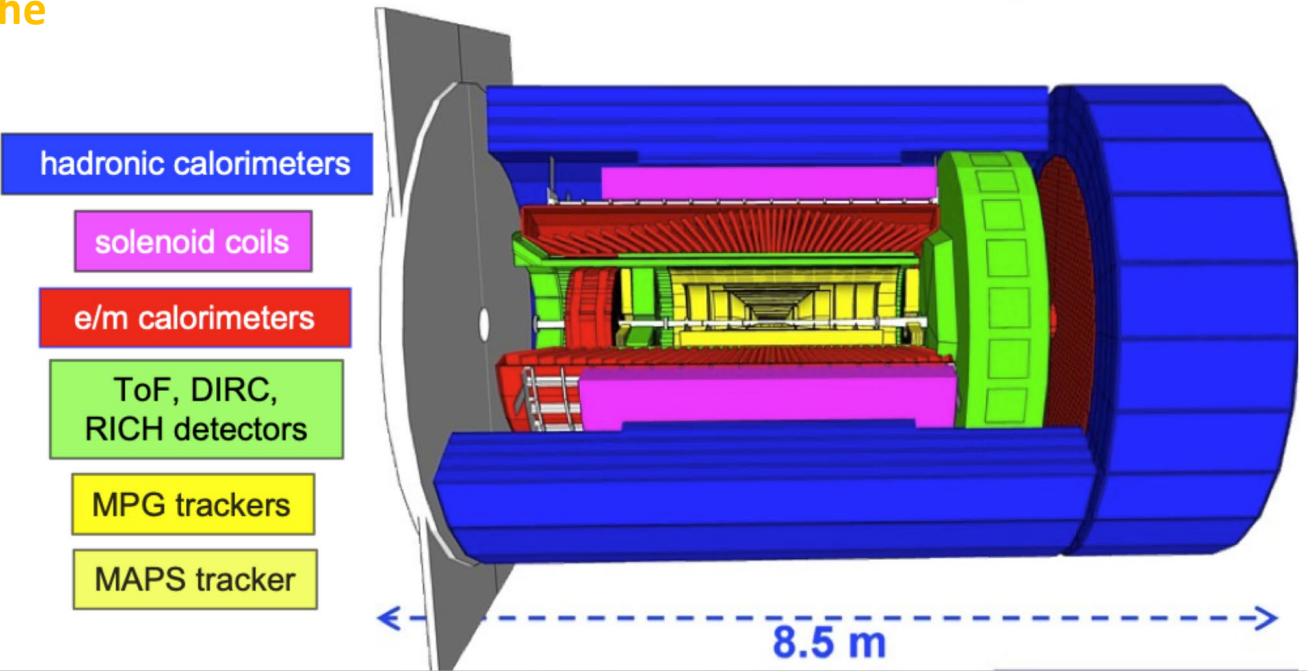
What links here

Related changes

Main page Discussion

## Main Page

[Welcome to the EPIC Wiki](#)



This website is work in progress, please pardon our appearance.

Info on the collaboration organization can be found [here](#)

Information on the EIC Project R&D can be found [here](#)

Link to the EPIC Wiki:  
[https://wiki.bnl.gov/EPIC/index.php?title=Main\\_Page](https://wiki.bnl.gov/EPIC/index.php?title=Main_Page)

Example on the next page

# Task List Example: Far Forward WG

## EPIC Far-Forward Tasks Table

### EPIC Software Framework Implementation

- **Description:** Initial inclusion and testing of Far-Forward systems in EPIC simulation framework.
- **Work Start:** October 2022
- **Expected Duration:** 2-4 months
- **Required Expertise:** Medium/High
- **Task assigned to:** A. Jentsch (initially)
- **Notes:** The initial work should be done by experts, but this initial work will likely conclude quickly. After that, we will need to do (lots of) testing.
- **Links:**

### Machine-Detector Interface

#### RP/OMD Impedance Study

- **Description:** Work with machine group to analyze impedance impact of base Roman Pots/Off-Momentum Detector design, and iterate on design as needed.
- **Work Start:** July 2022
- **Expected Duration:** 6-12 months
- **Required Expertise:** High
- **Task assigned to:** A. Jentsch, Y. Furltova, C. Videbaek, A. Blednykh, C. Hetzel
- **Notes:** Work done by machine engineers and scientists together.
- **Links:**

#### Vacuum System Impact on FF Detectors

- **Description:** Work with machine group to study impact of the vacuum design on the detector acceptances and backgrounds.
- **Work Start:** Summer 2022
- **Expected Duration:** 6-12 months
- **Required Expertise:** High
- **Task assigned to:** A. Jentsch, Y. Furltova, C. Videbaek, A. Blednykh, C. Hetzel
- **Notes:** Work done by machine engineers and scientists together.
- **Links:**

### Sub-system Studies

#### B0 Calorimetry study

- **Description:** Work on spatial constraints of engineering structure needed for PWO4 EMCAL, including cabling, PMTs, etc. Study possibility of HCAL system.
- **Work Start:** September 2022

Slide from Alex Jentsch and the EPIC Far-Forward WG presentation 8/5/22 ([https://indico.bnl.gov/event/16033/contributions/66684/attachments/42613/71426/EPIC\\_DWG\\_task\\_management\\_8\\_2\\_2022\\_v2.pdf](https://indico.bnl.gov/event/16033/contributions/66684/attachments/42613/71426/EPIC_DWG_task_management_8_2_2022_v2.pdf))

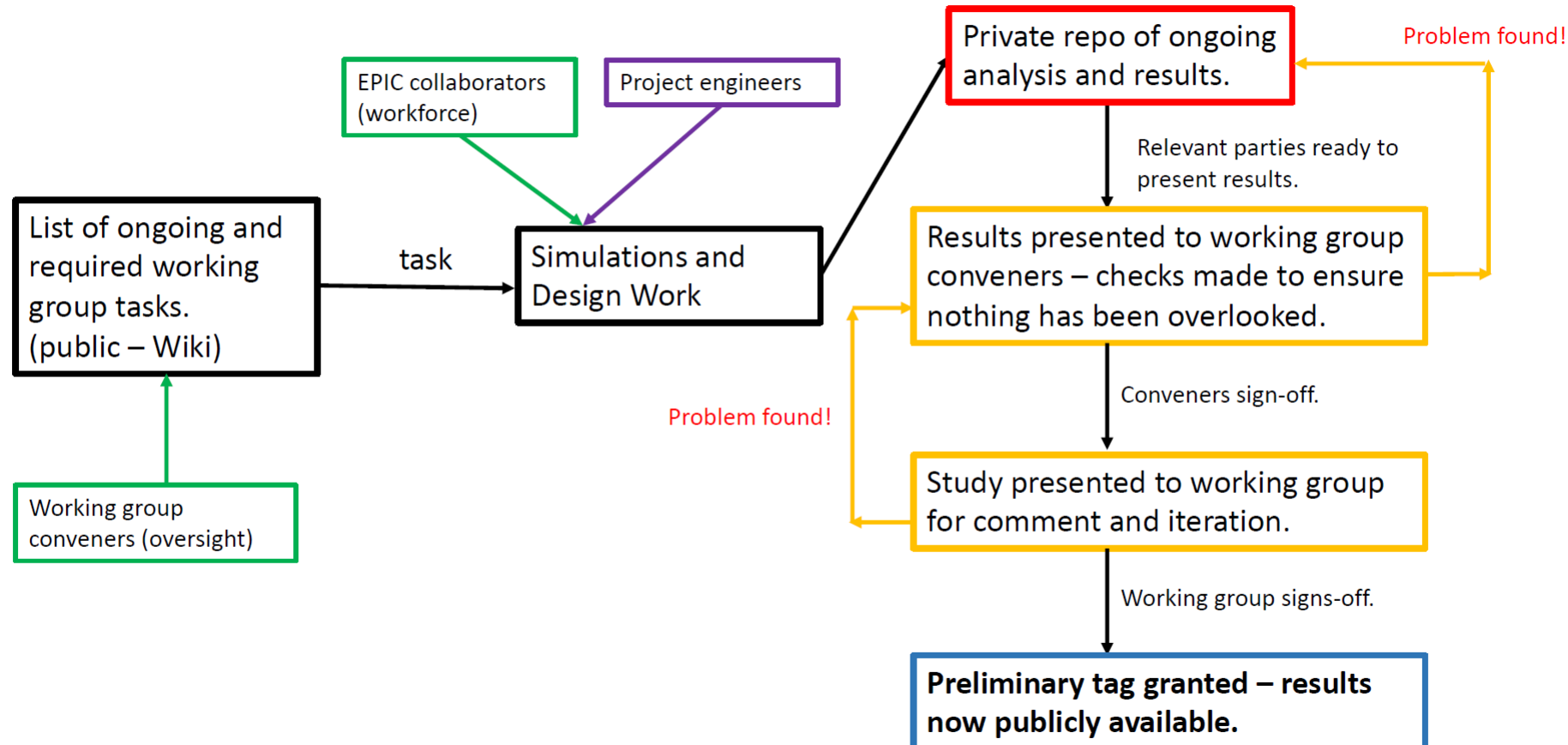
### Simple idea:

- List topic/task, expected time commitment, required expertise, etc.
- Give people the ability to see specific needs, and realize they could actually get involved directly.
- Everybody wins in this scenario: working groups have a stronger workforce, larger EICUG can begin to take ownership of part of the work and feel connected to the EIC in a tangible way.

# Workflow - Management of (simulation) results example

Slide from Alex Jentsch and the EPIC Far-Forward WG presentation 8/5/22  
([https://indico.bnl.gov/event/16033/contributions/66684/attachments/42613/71426/EPIC\\_DWG\\_task\\_management\\_8\\_2\\_2022\\_v2.pdf](https://indico.bnl.gov/event/16033/contributions/66684/attachments/42613/71426/EPIC_DWG_task_management_8_2_2022_v2.pdf))

## An idea of how things could work



# Tools available to help with engaging and organizing workforce

## Reminder of Institutional List and Tools

### Sheet: Institutions

Institution	Contact Name	Email	State	ZIP Code	Country	Region
A. I. Alkhoran National Science Laboratory	Marichyan, Harmit	marichyan@verpbi.am	Yerevan	9999	Armenia	Asia
Abilene Christian University	Daugherty, Michael	mike.daugherty@acu.edu	Abilene	79601	United States	North America
AGH University of Science and Technology	Przybycien, Mariusz	mariusz.przybycien@agh.edu.pl	Krakow	99999	Poland	Europe
Aligarh Muslim University	Abir, Raktim	raktim.ph@amu.ac.in	Aligarh	99999	India	Asia
Argonne National Laboratory	Mesera, Zenn-Eddine	mesera@anl.gov	Lemont	60439	United States	North America
Augustana University	Grau, Nathan	ngrau@augie.edu	Sioux Falls	57137	United States	North America
Banaras Hindu University	Singh, B. K.	bksingh@bhu.ac.in	Varanasi	99999	India	Asia
Baruch College, City University of New York	Barthe, Stefan	stefan.barthe@baruch.cuny.edu	New York	10010	United States	North America
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California Polytechnic State University, San Luis Obispo	Klay, Jennifer	jklay@calpoly.edu	San Luis Obispo	93407	United States	North America
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CEA-Saclay	Bossu, Francesco	francesco.bossu@cea.fr	Gif-sur-Yvette	99999	France	Europe
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Central University of Karnataka	Saravu, Deepak	deepak.saravu@ucak.ac.in	Kalburgi	99999	India	Asia
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Charles University, Faculty of Mathematics and Physics	Finger, Miroslav	miroslav.finger@cern.ch	Prague	99999	Czech Republic	Europe
Cheikh Anta Diop University	KA, Oumar	oumar.ka@ucad.edu.sn	Dakar	99999	Senegal	Africa
Christopher Newport University	Brady, Edward	edward.brady@cnu.edu	Newport News	23606	United States	North America
Columbia University	Zieg, Bill	bill.zieg@columbia.edu	New York	10027	United States	North America
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Dr. B. R. Ambedkar National Institute of Technology Jalandhar	Dahiya, Harleen	dahiya@nitji.ac.in	Jalandhar	99999	India	Asia
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Egyptian Center for Theoretical Physics	Tawfik, Abdel	a.tawfik@eng.mti.edu.eg	Giza	99999	Egypt	Africa
Eotvos Lorand University	Csanad, Mate	csanad@elte.hu	Budapest	99999	Hungary	Europe
Faculty of Mathematics and Physics, University of Ljubljana	Sitica, Simona	simona.sitica@fmf.uni-lj.si	Ljubljana	99999	Slovenia	Europe
Florida Institute of Technology	Hohmann, Marcus	m.hohmann@fit.edu	Melbourne	32801	United States	North America
Florida International University	Cornyn, Wim	wcornyn@fiu.edu	Miami	33199	United States	North America
Fudan University	Chen, Jinhui	chenjinhui@fudan.edu.cn	Shanghai	99999	China	Asia
George Washington University	Schmidt, Axel	axelschmidt@gwu.edu	Washington, D.C.	20052	United States	North America
Georgia State University	Saravu, Deepak	deepak.saravu@gsu.edu	Atlanta	30302	United States	North America
Goa University	Palni, Prabhakar	prabhakar.palni@unipga.ac.in	Panaji	99999	India	Asia
GSI Helmholtzzentrum fuer Schwerionenforschung GmbH	Schwiening, Jochen	j.schwiening@gsi.de	Darmstadt	99999	Germany	Europe
Hampton University	Azzardi, Alberto	alberto.azzardi@hamu.edu	Hampton	23668	United States	North America
IIT Madras	Palani, Prabhakar	p.palani@iitmadras.ac.in	Chennai	99999	India	Asia
IITCLab (Orsay)	Munoz Camacho, Carlos	munozc@lab.org	Orsay	99999	France	Europe
Indian Institute of Science Education and Research (IISER) Tirupati	Jena, Chitrasen	cjena@iiseritirupati.ac.in	Tirupati	99999	India	Asia
Indian Institute of Science Education and Research, Berhampur	Nasim, Md	nasim@iiserbar.ac.in	Brahmapur	99999	India	Asia
Indian Institute of Technology Bombay	Mukherjee, Asmita	asmita@iitb.ac.in	Mumbai	99999	India	Asia
Indian Institute of Technology Delhi	Reddy, Tejas	tejas@iitd.ac.in	New Delhi	99999	India	Asia

Institutional Tables: [https://tuprd-my.sharepoint.com/:x/g/personal/tue59914\\_temple\\_edu/EcGrTZU6CuFPjXt1foRZY-4Bv5z1In1x2wY9Li3y9YgwnQ?rt=1KMEJV\\_2kg](https://tuprd-my.sharepoint.com/:x/g/personal/tue59914_temple_edu/EcGrTZU6CuFPjXt1foRZY-4Bv5z1In1x2wY9Li3y9YgwnQ?rt=1KMEJV_2kg)

### Sheet: Pivot Physics

Institution / Contact Name / Email	Country	Inclusive WG	Semi-inclusive WG	Exclusive	Diffraction and Tagging WG	Jet & Heavy Flavor WG	BSM & EW WG
A. I. Alkhoran National Science Laboratory	Armenia	1	1	1	1	1	1
Abilene Christian University	United States	1	1	1	1	1	1
AGH University of Science and Technology	Poland	1	1	1	1	1	1
Aligarh Muslim University	India	1	1	1	1	1	1
Argonne National Laboratory	United States	1	1	1	1	1	1
Augustana University	United States	1	1	1	1	1	1
Banaras Hindu University	India	1	1	1	1	1	1
Baruch College, City University of New York	United States	1	1	1	1	1	1
Ben Gurion University of the Negev	Israel	1	1	1	1	1	1
Brookhaven National Laboratory	United States	1	1	1	1	1	1
Brunei University London	UK	1	1	1	1	1	1
California Polytechnic State University, San Luis Obispo	United States	1	1	1	1	1	1
Canisius College	United States	1	1	1	1	1	1
Catholic University of America	United States	1	1	1	1	1	1
CEA-Saclay	France	1	1	1	1	1	1
Central China Normal University	China	1	1	1	1	1	1
Central University of Karnataka	India	1	1	1	1	1	1
Central University of Tamil Nadu	India	1	1	1	1	1	1
Charles University, Faculty of Mathematics and Physics	Czech Republic	1	1	1	1	1	1
Cheikh Anta Diop University	Senegal	1	1	1	1	1	1
Christopher Newport University	United States	1	1	1	1	1	1
Columbia University	United States	1	1	1	1	1	1
Creighton University	United States	1	1	1	1	1	1
Daresbury Laboratory	UK	1	1	1	1	1	1
Dr. B. R. Ambedkar National Institute of Technology Jalandhar	India	1	1	1	1	1	1
Duke University	United States	1	1	1	1	1	1
Egyptian Center for Theoretical Physics	Egypt	1	1	1	1	1	1
Eotvos Lorand University	Hungary	1	1	1	1	1	1
Faculty of Mathematics and Physics, University of Ljubljana	Slovenia	1	1	1	1	1	1
Florida Institute of Technology	United States	1	1	1	1	1	1
Florida International University	United States	1	1	1	1	1	1
Fudan University	China	1	1	1	1	1	1
George Washington University	United States	1	1	1	1	1	1
Georgia State University	United States	1	1	1	1	1	1
Goa University	India	1	1	1	1	1	1
GSI Helmholtzzentrum fuer Schwerionenforschung GmbH	Germany	1	1	1	1	1	1
Hampton University	United States	1	1	1	1	1	1
IIT Madras	India	1	1	1	1	1	1
IITCLab (Orsay)	France	1	1	1	1	1	1
Indian Institute of Science Education and Research (IISER) Tirupati	India	1	1	1	1	1	1
Indian Institute of Science Education and Research, Berhampur	India	1	1	1	1	1	1
Indian Institute of Technology Bombay	India	1	1	1	1	1	1
Indian Institute of Technology Delhi	India	1	1	1	1	1	1

# EIC Detector Consortia

Name	Focus/Interest	Subsystem	Contacts	Institutions
hpDIRC	hpDIRC	PID	Greg Kalicy ( <a href="mailto:kalicy@cua.edu">kalicy@cua.edu</a> ), Joe Schwiening ( <a href="mailto:j.schwiening@gsi.de">j.schwiening@gsi.de</a> )	CUA, ODU, SBU, GSI...
dRICH	dRICH	PID	Marco Contalbrigo ( <a href="mailto:mcontalb@fe.infn.it">mcontalb@fe.infn.it</a> ), Evaristo Cisbani ( <a href="mailto:evaristo.cisbani@roma1.infn.it">evaristo.cisbani@roma1.infn.it</a> ), Anselm Vossen ( <a href="mailto:Anselm.vossen@duke.edu">Anselm.vossen@duke.edu</a> )	INFN-RM1, U. Ferrara, Duke U., SBU, NISER, ....
EEEMCAL	Electromagnetic Cal (e-endcap, possibly barrel)	EM Cal	Tanja Horn ( <a href="mailto:hornt@cua.edu">hornt@cua.edu</a> )	Abilene Christian U., AANL, CUA, Charles U./Prague, FIU, IJCLab-Orsay, James Madison U., Lehigh U., MIT/MIT-Bates, Ohio U., U. Kentucky, W&M
AC-LGAD	AC-LGAD	Tracking	Wei Li ( <a href="mailto:wl33@rice.edu">wl33@rice.edu</a> ), Alessandro Tricoli ( <a href="mailto:Alessandro.Tricoli@cern.ch">Alessandro.Tricoli@cern.ch</a> ), Zhenyu Ye ( <a href="mailto:yezhenyu@uic.edu">yezhenyu@uic.edu</a> )	BNL, Santa Cruz, UIC, Rice U., LANL, IJCLab-Orsay, ORNL
EICSC	Silicon tracking	Tracking	Laura Gonella ( <a href="mailto:laura.gonella@cern.ch">laura.gonella@cern.ch</a> ), Ernst Sichtermann ( <a href="mailto:EPSichtermann@lbl.gov">EPSichtermann@lbl.gov</a> ), Domenico Elia ( <a href="mailto:domenico.elia@cern.ch">domenico.elia@cern.ch</a> ), ( <a href="mailto:gdeptuch@bnl.gov">gdeptuch@bnl.gov</a> ), ( <a href="mailto:nicoleapadula@lbl.gov">nicoleapadula@lbl.gov</a> ), Iain Sedgwick ( <a href="mailto:iain.sedgwick@stfc.ac.uk">iain.sedgwick@stfc.ac.uk</a> ), Peter Jones ( <a href="mailto:p.g.iones@bham.ac.uk">p.g.iones@bham.ac.uk</a> )	U. Birmingham, LBNL, Daresbury (and additional UK institutions: Brunel, Lancaster, etc.), BNL, INFN-Bari, ORNL (becoming more active in particular in erD104), LANL (largely on mechanical area)

2022												
Project:	eRD101	eRD102	eRD103	eRD104	eRD105	eRD106	eRD107	eRD108	eRD109	eRD110	eRD111	eRD112
Title:	mRICH	dRICH	hpDIRC	Silicon Service reduction	SciGlass	Forward ECal	Forward HCal	Cylindrical MPGD	ASIC/Electronics	Photosensors	Si-Vertex	AC-LGAD
Contact:	X. He (GSU), M.Contalbrigo (U. Ferrara)	E. Cisbani (INFN-RM1), M.Contalbrigo (U. Ferrara), A. Vossen (Duke)	G. Kalicy (CUA), J. Schwiening (GSI)	L. Gonella (B'ham), I. Sedgwick (RAL), E.P. Sichtermann (LBL), Leo Greiner (LBL), Giacomo Contin (LBL), Domenico Elia (INFN, Bari) and Grzegorz Deptuch (BNL)	T. Horn and .L. Pegg (CUA)	H.Z. Huang (UCLA), O. Tsai (UCLA)	H.Z. Huang (UCLA), O. Tsai (UCLA)	K. Gnanvo (UVA)		Y. Ilieva (SC), C. Zorn (JLab), J. Xie (ANL), A. Kiselev (BNL), Pietro Antonioli (INFN)	L. Gonella (B'ham), I. Sedgwick (RAL), E.P. Sichtermann (LBL), Leo Greiner (LBL), Giacomo Contin (LBL), Domenico Elia (INFN, Bari) and Grzegorz Deptuch (BNL)	Zh. Ye (UIC)

And EIC Project R&D Consortia (some overlap 100% with the EIC Detector Consortia)

# The Path Forward

## **WG Tasks for the next WG Convener Meeting (9/2/22)**

- ❑ Create/update a Task List including all Subsystems of the WG (c.f. slide 5ff)
  - Machine-Detectors Interfaces
  - Software Framework Implementation
  - Subsystem Studies
  - Backgrounds
  - Physics Benchmarks
- ❑ Cables and Services (c.f. slide 6)
  - Collect and document the information
  - Cross check against geometry database and mechanical model

# Summary

- ❑ Successful EICUG Meeting and subsequent discussions
  - Several concerns, e.g., workforce, were noted and are being addressed
- ❑ A lot of work in front of us – most immediate attention needed towards preparation for October simulation campaign and upcoming technical reviews
- ❑ **Thanks to everyone for your efforts!** for keeping all of us on track for the near(ish) term goals over the next year:
  - October 2022: simulation campaign EPIC
  - December 2022: finalize definition of all subsystem technologies
  - May 2023: first version of pre-TDR
  - October 2023: final version of pre-TDR