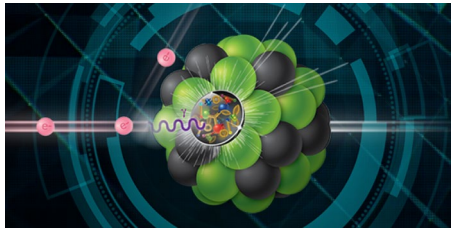


EPIC Working Group Conveners Meeting

4 November 2022

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

Calendar – recent highlights and upcoming events

- ✓ ❑ October 2022: First simulation campaign started, detector subsystem review etc.
  - ✓ ○ October 18/19: 60% Design Review Magnet
  - ✓ ○ October 12-13: Resource Review Board kick-off meeting
  - ✓ ○ October 19-21: Detector Advisory Committee meeting
  - ✓ ○ Start of the first phase of the simulation campaign – a lot of effort here!
- → ❑ November 2022++: Validation first simulation campaign, detector subsystem reviews,
  - ○ November 15-16: EIC Generic Detector R&D Meeting
  - ○ December (first two weeks): Calorimeter Review
  - ○ December (before end of CY): Polarimetry Review
  - ○ Incremental Integration/Installation Review
  - ○ more subsystem reviews (Tracking, PID, Infrastructure, Magnet Incremental Design and Safety)
- ❑ January 31 – February 2023: DOE OPA Status Review
- ❑ May 2023: first version of pre-TDR October 2023: final version of pre-TDR

First EPIC Simulation Campaign – STARTED!

Dear EPIC Collaborators,

We are happy to announce that the first set of single particle jobs have completed and the output files are available on S3 at the following location:

S3/eictest/EPIC/RECO/22.10.0/

Underneath this bucket are the two detector configurations, and their corresponding files. You can list the files by (e.g.) mc find S3/eictest/EPIC/Reco/22.10.0/ to see what is available.

We note that these files have known limitations, for example with the calorimeter clustering, as discussed in the general meeting last week. However, we encourage the working groups to take a look at these first sets of files and provide feedback on other issues that you come across.

Looking forward to hearing from you,

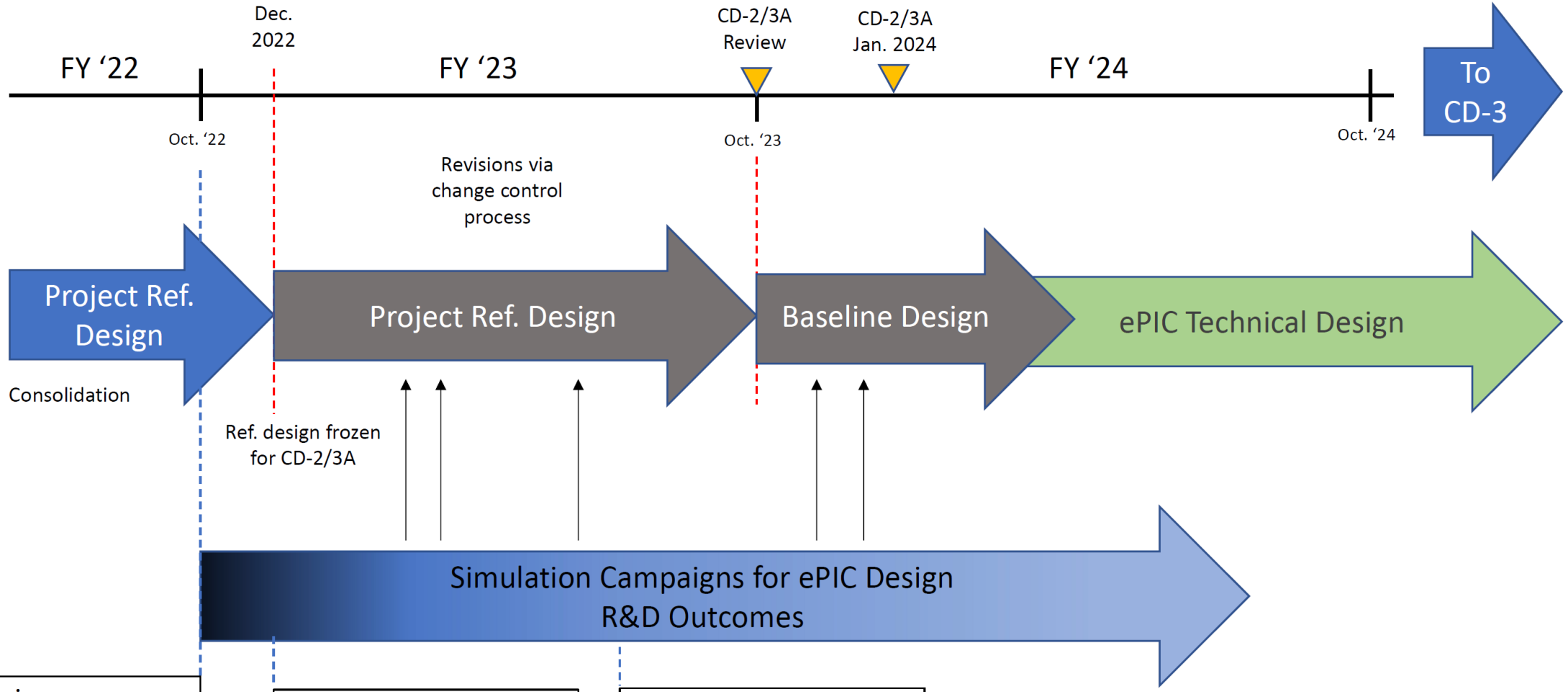
The SimQA and Computing and Software working groups

- There are two detector geometries ("arches" and "brycecanyon") - fixed and tagged for simulation runs. You can see the geometry tags in the github repository:
  https://github.com/eic/epic
- The latest geometry tag is "22.1.0". You can tell the geometry tag for a set of simulation files from the file location in S3.

Action Item for the WGs:

- software liasons with each WG to actively examine the reconstructed output and simulation geometry to identify any remaining issues.
- At the next SimQA meeting every Det WG is expected to present 1-2 slides based on their examination of the geometry and single particle files.

EPIC Design Towards CD2/3A



First Campaign:
- Commission software stack
- Two configurations to compare large-scale variations
- Background embedding and tracking development

Second Campaign:
- Focus on single, integrated ePIC design
- Targeted subsystem design studies/variations

Additional Campaigns:
- As needed
- Refine detector design to include frames, etc. to assess physics impact

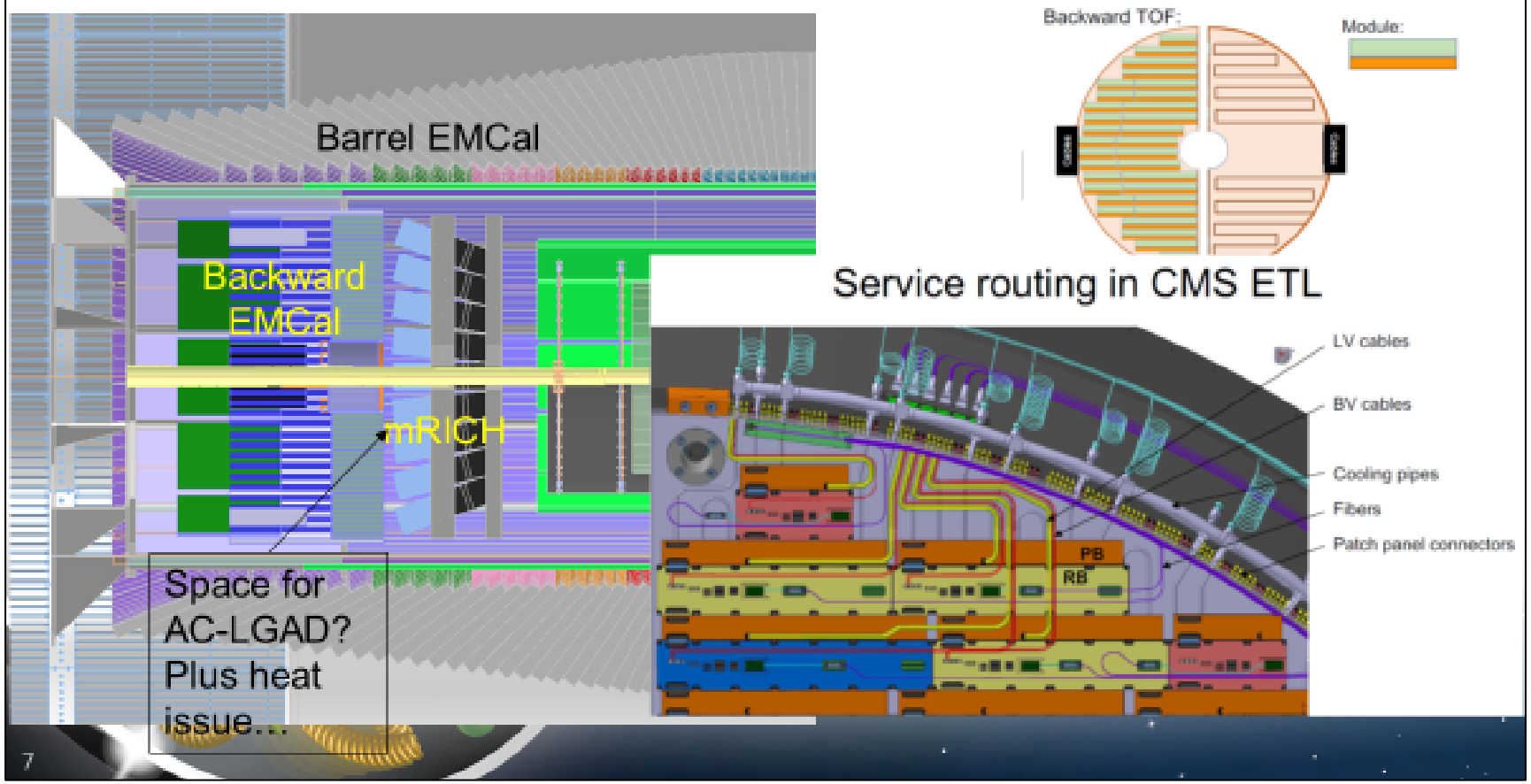
• • •

EPIC Design Towards CD2/3A

- The EIC Project assumed a “detector-1” reference design based on the YR work for CDR development and to achieve CD-1
  - This was updated after the DPAP process to reflect “detector-1” at that stage – this was integrated in the project cost book, and what was used for the FPD-led EIC Project status review.
- The Project must freeze the ePIC reference design in order to prepare for CD-2/3A, and explicitly for the upcoming January Office of Project Assessment review of the EIC.
  - The reference design will be determined from our best understanding at this point.
  - This will allow work to continue to an ~60% design completion by CD-2/3A towards a baselined detector
- Nevertheless, **the ePIC design optimization process will continue and is not expected to be completed by the end of 2022**
  - The ePIC design optimization process will proceed through a series of simulation campaigns.
- The ePIC reference design can be updated but only through the project change control process:
  - The change control process is important – changes must be justified by performance, cost and risk!
  - Changes should be the exception, not the rule.
  - Example: changing from SiPM readout to LAPPDs
- This will result in a unified ePIC Technical Design going into CD-3

Integration Process: Backward Detectors

- Backward EMCal is crucial for EIC, and we rely on it's high-precision performance.
- It has to be in a stable ambient temperature environment (< +/- 1° C)
- Even if material at the front face will not affect performance much, materials further away will and have to be minimized.
- AC-LGAD would provide both material and "a toaster" nearby…



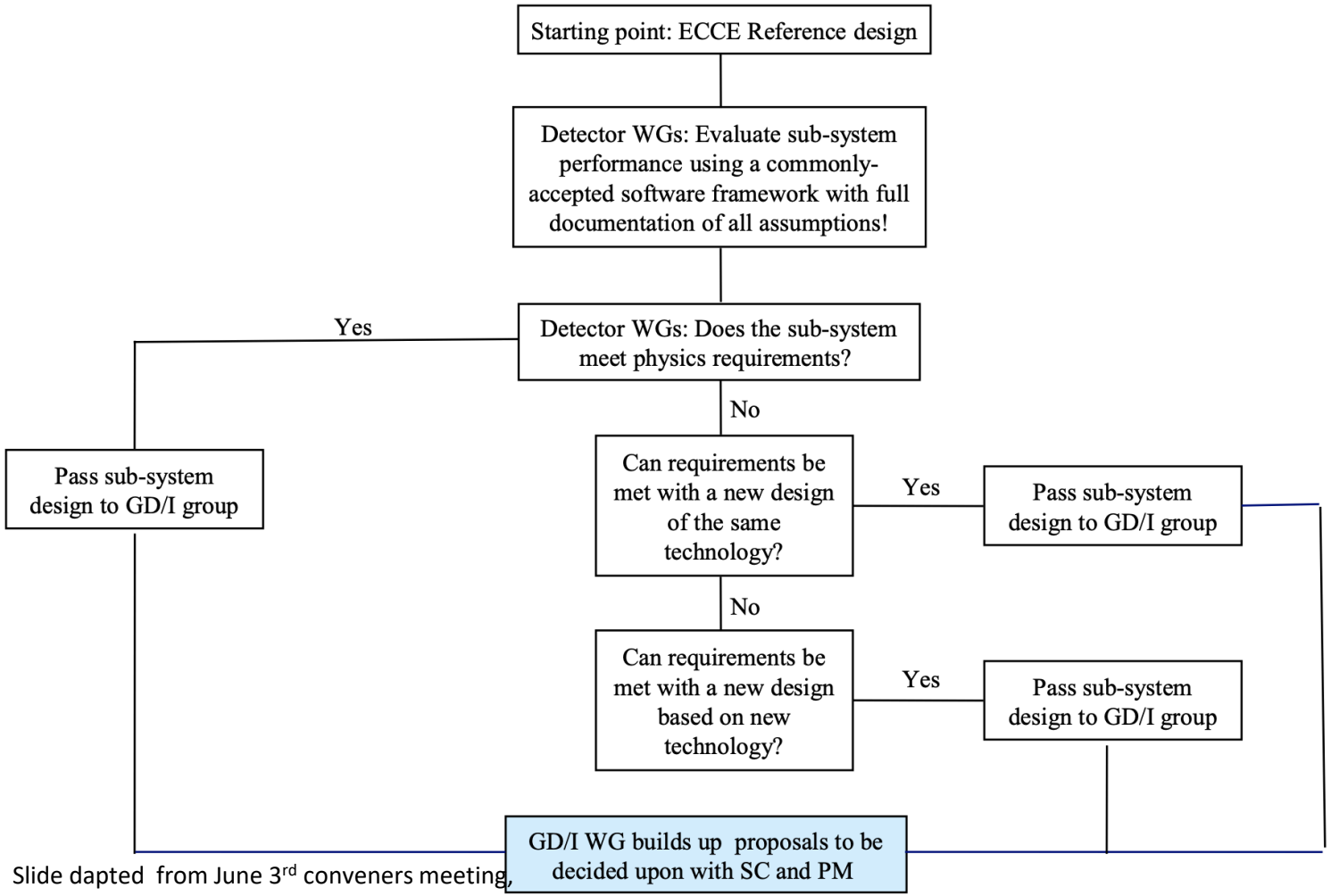
Integration process identifies possible issue with backward detectors TOF

- AC-LGAD impact on backward EMCal performance

Adapted from Elke/Rolf presentation at the 20 Sept 2022 EPIC General Meeting

Consolidation Reference Design: Backward Detectors

Consolidation Roadmap: Backward TOF



Slide dapted from June 3rd conveners meeting, June 24th bi-weekly meeting,

Charge to the GD/I WG

- In your professional opinion, are the challenges of incorporating an AC-LGAD TOF layer in the backward end cap severe enough to justify replacing it with an alternative solution?
- Alternatively, should the collaboration invest more resources trying to find a way to make it fit without damaging the performance of other detectors, such as the backward EMCal?
- Do you see any fundamental issues in using the RICH photo-sensors and interaction vertex measurements for TOF and/or t0 measurements?

GD/I's Assessment of the Backward ToF

Carlos Munoz Camacho (IJCLab, CNRS/IN2P3),
Jin Huang (BNL), Richard Milner (MIT), Joe Osborn (BNL),
Silvia Dalla Torre (INFN-Trieste), Thomas Ullrich (BNL)

From GD/I presentation at the 28 October 2022 General EPIC meeting (Link)

- The physics WGs have identified that the sole purpose of the backwarc TOF is to provide *t0* tagging that matches the precision needed for the TOF measurement in the barrel and forward directions.
- No compelling physics requirements have been identified that would motivate low-p hadron PID in the backward region.

- In recent meetings, multiple challenges related to AC-LGAD as the backward TOF have been identified:
  - Space available for the MAPS-tracking volume
  - Power dissipation that can compromise the performance of the crystal ECAL
  - The amount of material in front of ECAL.
- Although we encourage design and engineering studies to resolve these concerns, we recommend not to include the backward AC-LGAD TOF as the baseline choice for the backward TOF (but as a risk contingency
- We believe a fast RICH photo-sensor, specifically the LAPPD, provides a better-integrated detector solution for the backward *t0* measurement.

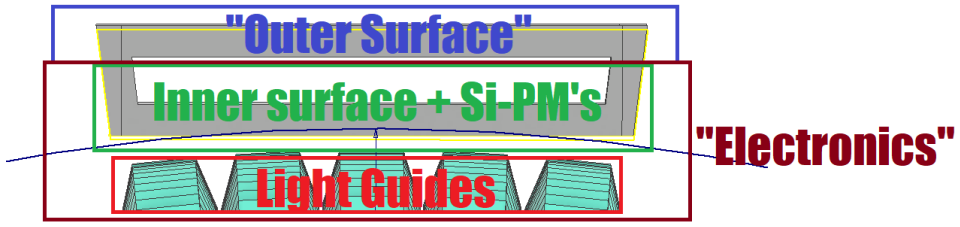
EIC Global Geometry: Recent Updates

Email of 11 October 2022

13 October 2022 Update: Barrel EMCal Inner Surface components (Initiated by Elke Aschenauer)

EIC GEOMETRY **THU, 13 OCT 2022 16:43:59**

Region	Component	Sub-Component	WBS	Length (cm)	Inner Radius (cm)	Outer Radius (cm)	Offset from Center (cm)	Physical Start (cm)	Physical End (cm)	Volume (m^3)	Weight (kg)	Technology
HADRON DIRECTION END CAP	Hadron Calorimeter		6.10.06	140	17.5	267	359.6	359.6	499.6	27.65	177,068	FeSc, WSc last segment
	Electromagnetic Calorimeter		6.10.05	30	14.0	195	329.6	329.6	359.6	3.57	23,048	Pb/Sc
	Service Gap			9			320	320	329			
CENTRAL DETECTOR	Dual RICH		6.10.04	120	15.0	185	180	195	315	11.43	2,123	Aerogel/Gas
		Detector Section		*100*	15.0	*185*	*215*	*215*	*315*	*10.68*		
		Aerogel Section		*20*	15.0	*110*	*195*	*195*	*215*	*0.75*		
	HD Time of Flight/Tracker		6.10.03	15	8	67	180	180	195	0.21	42	AC/LGAD
	Barrel Hadron Calorimeter		6.10.06	639.2		268.2	0	-319.6	319.6	72.22	462,406	FeSc
		HD Section		*170*	*195.3*	*268.2*	*150*	*150*	*320*	*18.05*		
		Central Section		*300*	*183.3*	*268.2*	*0*	*-150*	*150*	*36.13*		
		LD Section		*170*	*195.3*	*268.2*	*-150*	*-320*	*-150*	*18.05*		
	Solenoid Magnet		6.10.07	384	142	177	-10	-202	182	13.47	45,956	Solenoid
	Barrel EMCal*	*EMCal Outer Support*		492.2	132	141		-293.9	198.3	3.80	5,965	Steel
		EMCal Outer Surface		492.2	130.5	131.5	-45	-293.9	198.3	0.41	1,098	Aluminum
		EMCal Electronics		492.2	120.5	130.5	-45	-293.9	198.3	3.88	7,617	Near eta=0
		Barrel EMcal	6.10.05	492.2	80.5	120.5	-45	-293.9	198.3	12.43	43,613	Sci Glass
		EMCal Inner Surface		492.2	78.55	80.5	-45	-293.9	198.3	0.48		Aluminum
		Offset (Air)		492.2	78.85	80.5	-45	-293.9	198.3	0.41		Air
		Aluminum plate		492.2	78.55	78.85	-45	-293.9	198.3	0.07	198	Aluminum
	DIRC Support			458	65	79	-273	-273	185	1.33	523	Steel
		Dirc Bar + MPGD Support		*458*	*70*	*75*	*-273*	*-273*	*185*	*1.04*		
		Readout Support		*30*	*70*	*105*	*-273*	*-273*	*-303*	*0.29*		
	Integrated DIRC/MPGD Detector		6.10.04	488	71.5	76.5	-303	-303	185	0.86	661	Fused silica bars
		MPGD Tracker		*342*	*73*	*75*	*-197*	*-197*	*145*	*0.32*	*64*	*muRWell (plane type)*
		DIRC Bar Box		*458*	*70*	*73*	*-273*	*-273*	*185*	*0.62*	*430*	
		DIRC Readout		*30*	*70*	*100*	*-273*	*-273*	*-303*	*0.24*	*168*	
	Barrel Time of Flight/Tracker		6.10.03	270	63	66	0	-120	120	0.33	66	AC/LGAD



Inner Surfaces is the ~3mm Aluminum not ~2cm as listed in the spreadsheet
Study of lightguide length needed completed

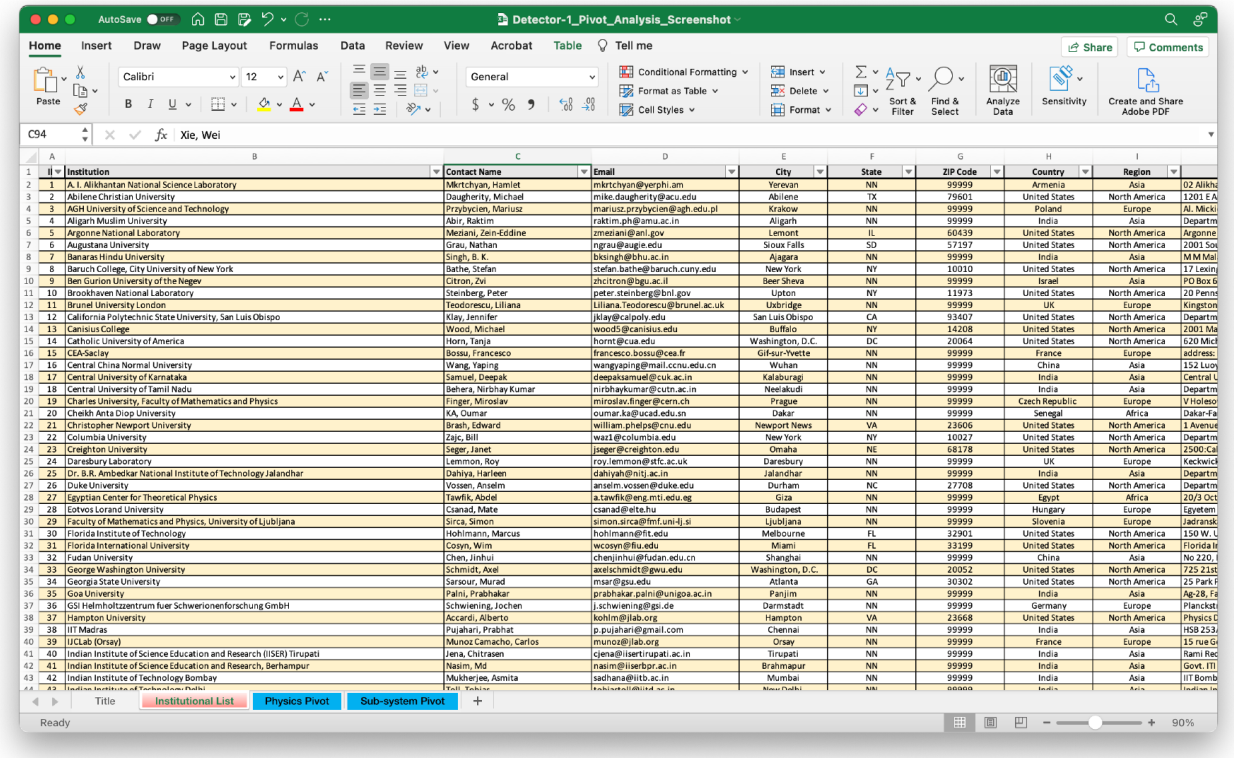
Direct link to 13 Oct 2022 Detector Matrix:
https://eic.jlab.org/Geometry/Detector/Detector-20221013164359.html

Please review and update simulation models as needed

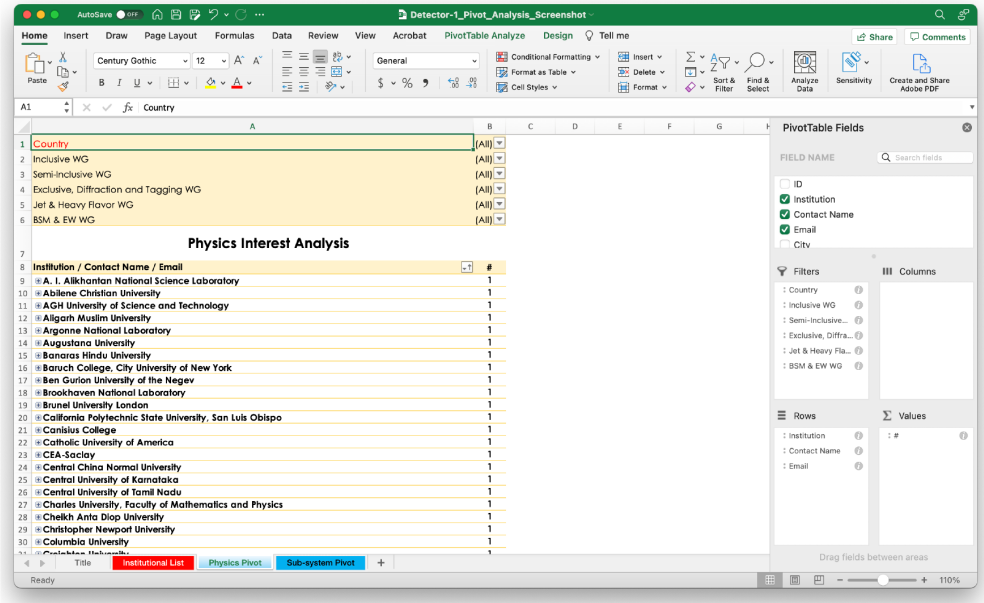
Tools available to help WGs with engaging and organizing workforce

Reminder of Institutional List and Tools

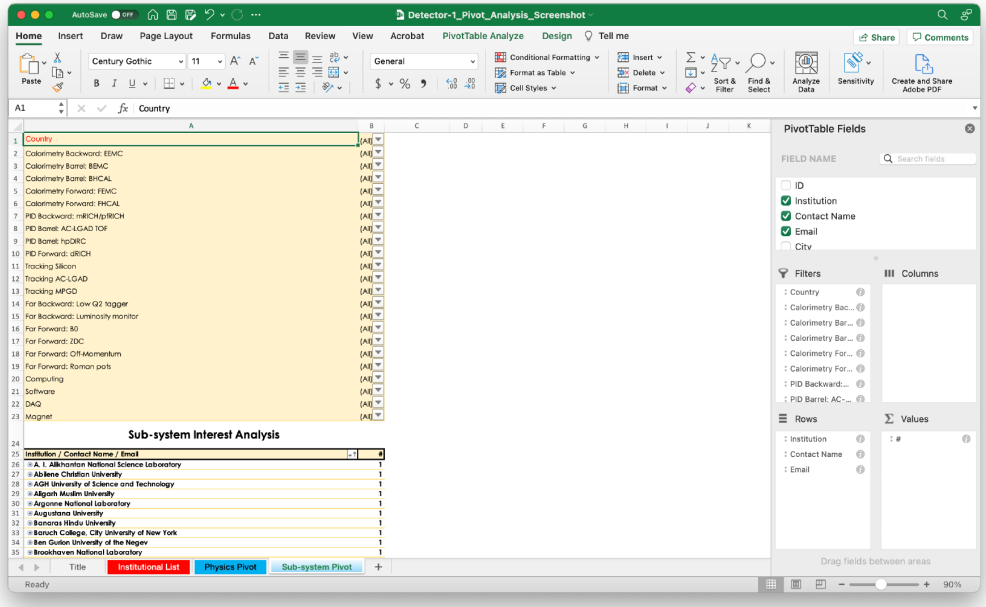
Sheet: Institutions



Sheet: Pivot Physics



Sheet: Pivot Sub-system



Institutional Tables: https://tuprd-my.sharepoint.com/:x:/g/personal/tue59914_temple_edu/EcGrTZU6CuFPjXt1foRZY-4Bv5z1In1x2wY9Li3y9YgwnQ?rtime=_1KMEJV_2kg

Tools available to help WGs with task management

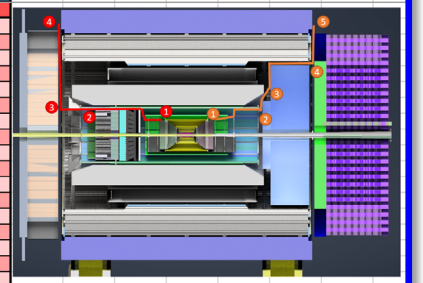
Link to the EPIC Wiki: https://wiki.bnl.gov/EPIC/index.php?title=Main_Page

Main page | Discussion

Main Page

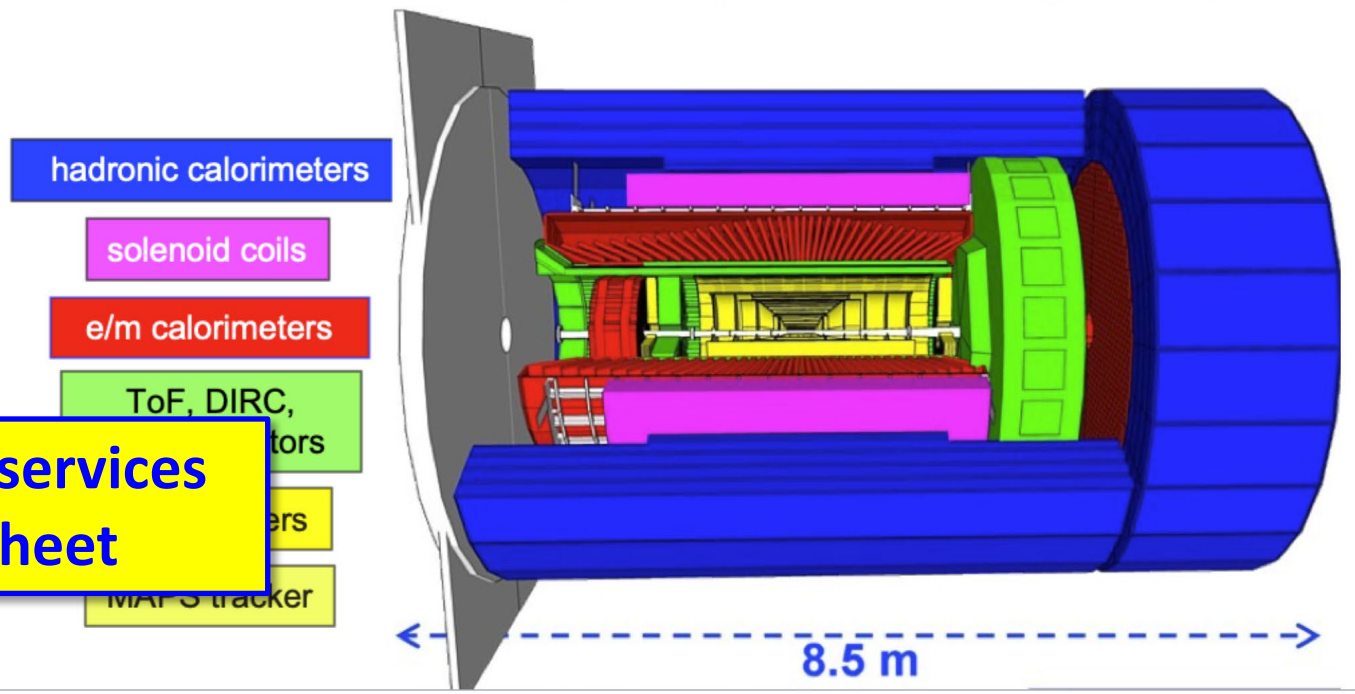
Main page
Collaboration Info
Integration
Global Detector/Integration
DAQ
Main DAQ Page
Software
Simulation production&QA
Software and Computing
EIC Project
Info from the Project
Navigation
Recent changes
Random page
Help about MediaWiki

Subsytem	Item	Quantity	Diameter (cm)	Cross Area (cm^2)	+50% Packing for Bundles	+50% for MISC spacing needs	Available Space (cm^2)	% Occupied
Red Path From 1 to 2								
AC LGAD TOF	Lv *	288	0.6	81.43	122.15	183.22		
	Hv *	288	1.2	325.72	488.58	732.87		
	Fiber *	144	0.6	40.72	61.07	91.61		
Inner MPGDs	FEE PWR	66	1.7	149.81	224.71	337.07		
	FEE data	66	0.32	5.31	7.96	11.94		
	Hv	99	0.32	7.96	11.94	17.91		
	Lv	16	1.163	17.00	25.50	38.24		
	Gas	22	0.4	2.76	4.15	6.22		
	Cooling	33	0.625	10.12	15.19	22.78		
mRICH	Lv Digital *	64	0.4	8.04	12.06	18.10		
	Lv Anaglog *	64	0.4	8.04	12.06	18.10		
	Lv Peltier *	64	0.4	8.04	12.06	18.10		
	HV Bias *	256	0.3	18.10	27.14	40.72		
	Hv *	256	0.35	24.63	36.95	55.42		
	Hv LAPPD *	64	0.4	8.04	12.06	18.10		
	Gas SIPM	24	0.6	6.79	10.18	15.27	12 sectors, 2 slots each, 2.54 cm by 12.5 cm	
	Gas Aerogel	24	0.6	6.79	10.18	15.27		
	Cooling	24	1.2	27.14	40.72	61.07		
Total		1962		756.44	1134.66	1701.99	762	223%



LINK to cables/services official spreadsheet

Welcome to the EPIC Wiki



For detector envelops please look to the Central Detector Parameter Tables geometry database

Info on the collaboration organization can be found here

Information on the EIC Project R&D can be found here

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

Link to Central Detector Geometry Database

Services and Cables – good progress

Subsystem	Initial Entries
EE HCal	✓
EE EMCal	✓
EE Si Disks	
Barrel HCal	✓
Barrel ECal (SciGlass)	✓
Barrel Ecal (imaging	✓
Outer MPGDs	✓
DIRC	✓
Barrel AC-LGAD TOF	✓
Inner MPGDs	✓
Silicon Sagitta Detector	
Silicon Vertex Detector	
HE Silicon Disks	
mRICH	✓

- Initial round of entries moving along nicely - Si tracker items are being worked on
- Space estimates: there are two factors of 50%: 1) the maximum packing fraction one can have per safety guidelines, 2) overhead.
  - Some areas look presently oversubscribed but that is exactly why EIC PM needs the info.
  - Also use this info for heating estimates

Subsystem	Initial Entries
EE AC-LGAD TOF	✓
FE AC-LGAD TOF	✓
dRICH	✓
HE EMCAL	✓
HE HCAL	✓

Community Long Range Plans

NuPECC

NuPECC LRP2024 Community input

May 30, 2022 to October 30, 2022

Enter your search term

Registration

Contact

nupecc_lrp2024@ph.tu...

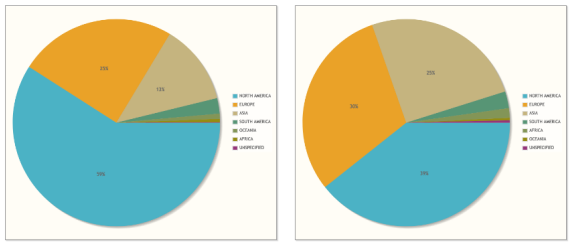
The Electron-Ion Collider

A U.S. facility for the European community
to explore the mysteries of the building blocks of matter

Contact persons: M. Radici[1], S. Dalla Torre[2], D. Sokhan[3]
On behalf of the Electron-Ion Collider (EIC) User Group

Abstract

This document is submitted as input to the NuPECC Long Range Plan 2024 by three European members of the EIC Users Group Steering Committee (Vice Chair, one "at-large" member, and the EU Representative). We submit the document on behalf of the international EIC Users Group (EICUG) community, but we specifically represent 335 European members of the EICUG (25%) based in 80 institutions (30% of the total) located in Armenia, Czech Republic, Finland, France, Germany, Hungary, Ireland, Israel, Italy, Netherlands, Norway, Poland, Slovenia, Spain, Sweden, Switzerland, Ukraine, and the United Kingdom. This European involvement is an important driver of the EIC, but can also be beneficial for a number of related ongoing and planned nuclear physics experiments in Europe. In this document, the shared interest regarding scientific questions and detector R&D between the EIC and European nuclear physics communities is outlined. The aim is to highlight how these synergies offer ample opportunities to foster progress at the forefront of nuclear physics.



European fraction (orange) of EICUG members (left, 25%) and institutions (right, 30%).

[1]: INFN Sezione di Pavia, I-27100 Pavia, Italy; email: marco.radici@pv.infn.it

[2]: INFN Sezione di Trieste, I-34149 Trieste, Italy; email: silvia.dallatorre@ts.infn.it

[3]: IRFU, CEA, Université Paris-Saclay, F91191 Gif-sur-Yvette, France (on leave from University of Glasgow, UK); email: daria.sokhan@cea.fr

Submitted October 2022

NSAC

Long Range Plan Update and Discussion

NSAC Meeting, Sept 28, 2022

Gail Dodge

Timeline

- ✓ DNP organized town halls already underway
- ✓ Working on forming subcommittees
- ✓ Closed kickoff meeting Oct. 26 in New Orleans
  - Agencies will talk to committee
  - Presentation about budgets
  - Subcommittees
  - Writing assignments & proposed outline of LRP
  - Agenda and timing of resolution meeting
- ✓ Writing underway
- Whitepapers due end of February 2023
- Late spring/summer: 5 - 7 day resolution meeting
  - 1st part will include presentations by people who are r committee
  - 2nd part will be closed and in-person
- Editing LRP document
- October 2023 – draft report ready

EIC White Paper Draft in preparation by EICUG Task Force

Contents

EPIC and NSAC Long Range Plan

Thank you for agreeing to contribute to the EIC White Paper. We (the EICUG steering committee) plan to dedicate an entire chapter to the ePIC detector and we would like to include ~2 page long summaries on the following detector packages:

Timeline from EICUG

Oct 26: ePIC tracking/Calo/Vertexing sections due -> Renee has not received contributions
Oct 31: email updated draft with ePIC tracking/Calo/Vertexing sections -> not done because of above
Nov. 2: tentative commitment to get drafts from Zhenyu+Franck+Friederike
Nov. 7: last date to receive comments from reviewers
Nov. 14: polished first draft to EICUG
Nov. 17: EICUG Quarterly Meeting

Path Forward

- ❑ Validation, algorithm development and optimizations of the first simulation campaign
  - ➢ Consider to start each Det WG meeting with (a) a one-slide report from the GD/I meeting and (b) a one-slide report from the simulations liaison
  - ➢ Consider the formation of topical groups withing the WG's to attack specific problems.
- ❑ Continue Integration Process
  - ➢ Consider to have at least one of the Det WG conveners attend each GD/I meeting
  - ➢ Space for readout, cables, services – please update the spreadsheet on the Wiki: Link
  - ➢ Detector subsystem, i.e. its material, impact the performance of other ones
- ❑ Detector Envelope Reference for the next Simulation Campaigns
  - ➢ Check Global Geometry Database and update simulation models as needed: Link to the Geometry Database (use the one with the latest timestamp)

Comp/SW convener changes

Dear ePIC:

Preview of email announcement

This email is to make everyone aware of some changes in the Computing and Software co

David Lawrence has informed us of his desire to step down as a Computing ctive immediately. As many of you know, David was instrumental in helping develop the co PIC and has put an enormous amount of effort into the development of the reconstruction f he intends to continue to lead the development of EICrecon, his responsibilities at JLab h as available for convener responsibilities. The SC expresses its sincere gratitude to David for time and effort he has put into getting ePIC this far.

The SC recognizes that we are i will have an approved charter and elected leadership soon. However, we are at a delicate peri st simulation campaign and stand up a new reconstruction framework and we do not feel w and Software effort short-handed. In consultation with the Computing and Software ers, we have asked Markus Diefenthaler to step in as a Computing and Software convener, effective i has graciously agreed to do so.

Thank you David for your service as Computing and Software Convener!

Welcome Markus in your new role as Computing and Software Convener!

We ask everyone in ePIC to join us in both thanking David for his service, and in welcoming Markus in his new role.

Regards,
Silvia, Or, Tanja, John and Bernd

Summary

- Successful start of the simulation campaign – thanks to the Computing/Software and Sim/QA!
  - Several concerns, e.g., workforce, were noted and included in the resolutions
- A lot of work remains in front of us – most immediate attention needed towards validation, development, and optimization of the first 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:
  - November 2022: validation, development, etc. first simulation campaign EPIC
  - December 2022: finalize reference EPIC detector
  - May 2023: first version of pre-TDR
  - October 2023: final version of pre-TDR (what you roughly need here are the answers to the example task lists like in the dRICH example of slide 5)