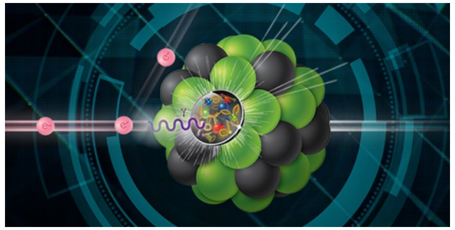


EPIC Working Group Conveners Meeting

30 September 2022

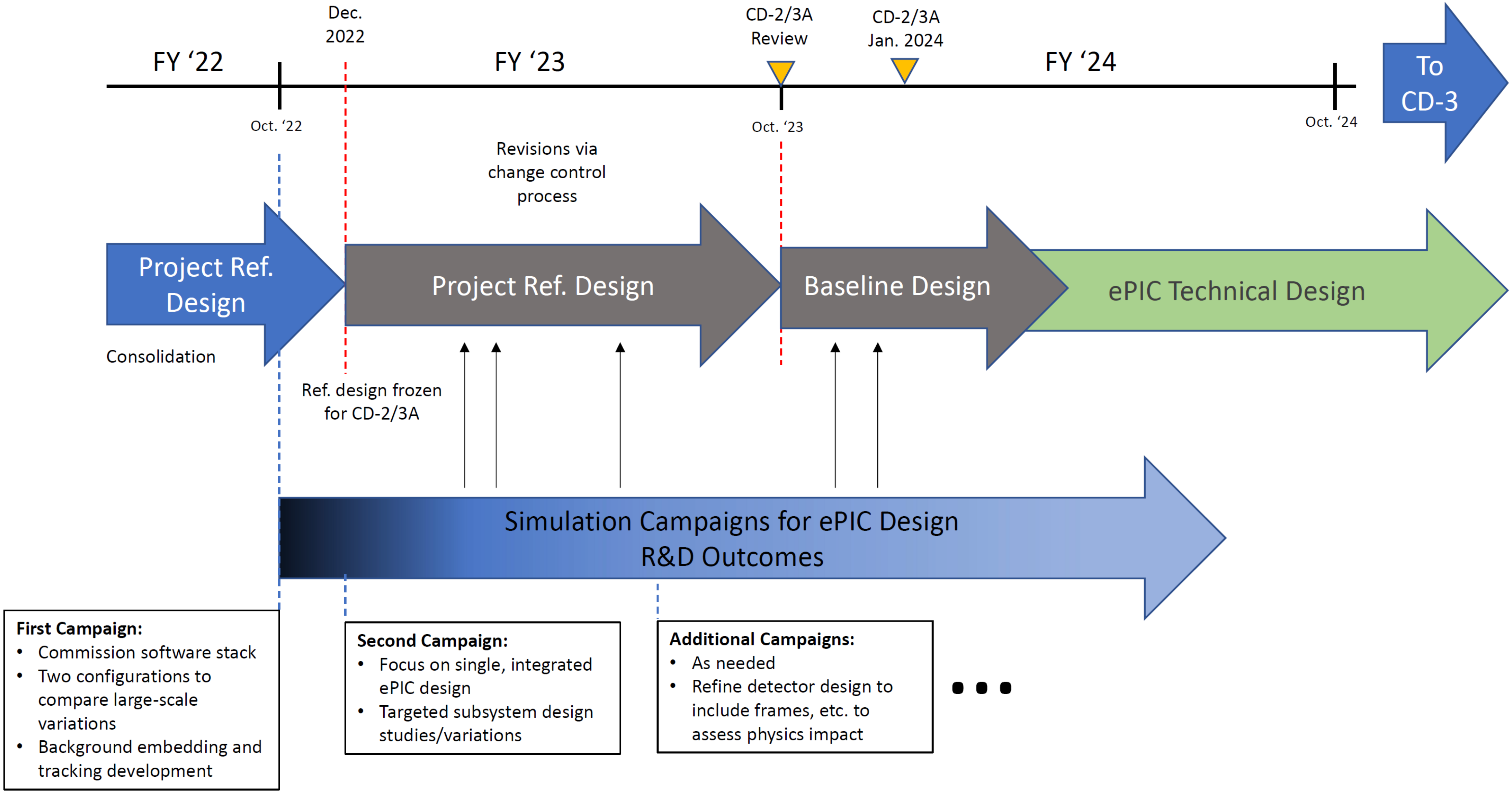
Silvia Dalla Torre, Or Hen, Tanja Horn, John Lajoie, Bernd Surrow

Calendar – near(ish) term over the next year

- ❑ August 2022: Detector subsystem reviews (3/X complete now)
- ❑ September 2022: Preparations for simulation campaign, LRP activities
  - Preparations for simulation campaign (software framework implementation)
  - September 23-25: QCD Town Meeting 2022 – EIC recommendation(s) put forward
- ❑ October 2022++: **First simulation campaign EPIC, detector subsystem reviews, etc**
  - October 17: Simulation Campaign production starts
  - October 18/19: 60% Design Review Magnet
  - October 19-21: Detector Advisory Committee meeting
  - October-December: more subsystem reviews (EM Cal, Tracking, Hadronic Cal, PID, Infrastructure and Installation, Polarimetry)
- ❑ November/December 2022: finalize Project Reference Design
- ❑ May 2023: first version of pre-TDR October 2023: final version of pre-TDR

Rapid pace remains – and is necessary to make EIC a reality.

EPIC Design Towards CD2/3A



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

Reminder of Action: List of items for Reference 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 in the EPIC Wiki*
- 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.
- Such a list tells you where you need to be at CD-2/3A

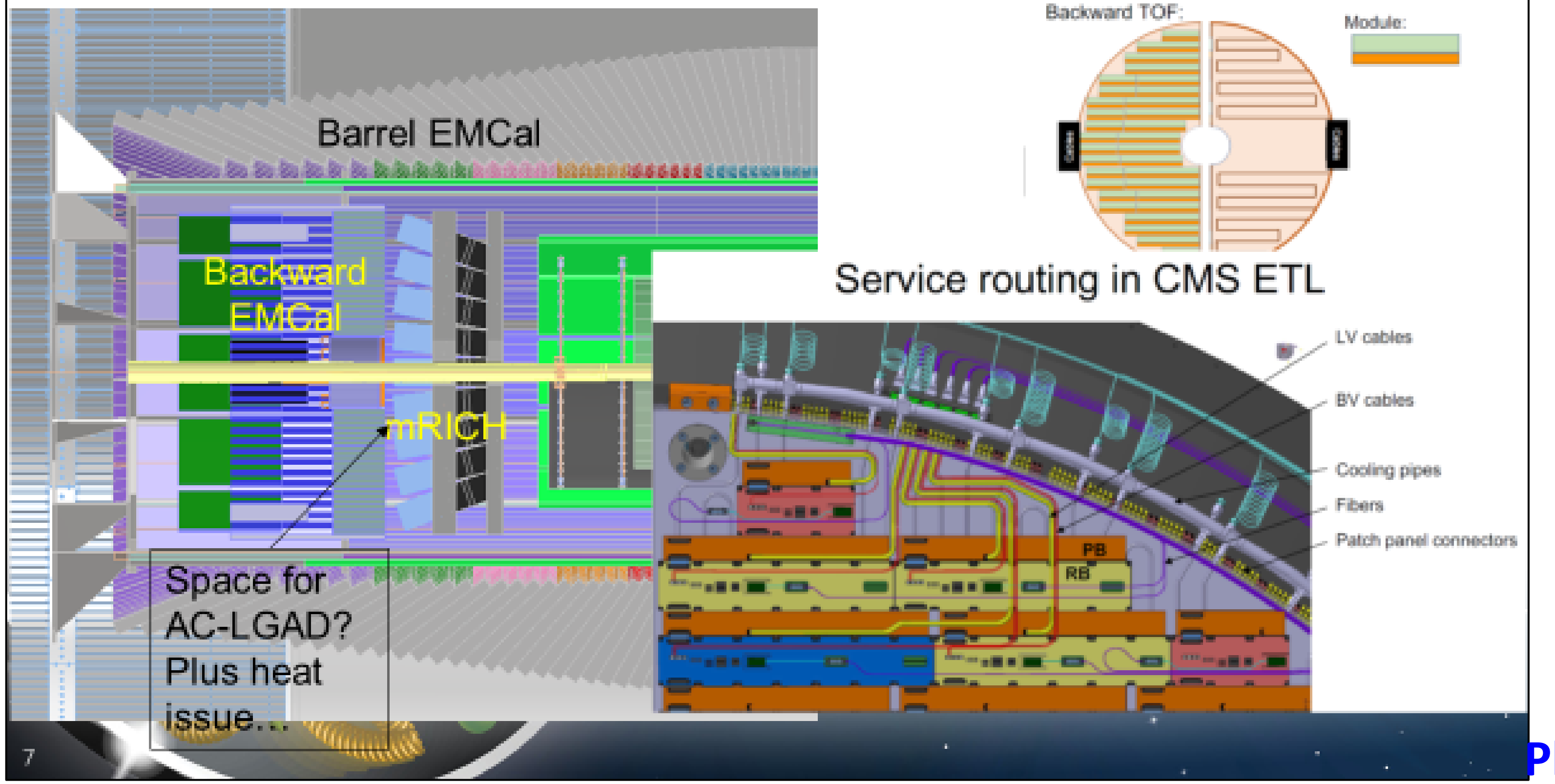
The initial list was requested by 9/2/2022 at the 19 August WG Convener meeting – thanks to those that posted!

Adapted from Elke/Rolf presentation at the EICUGM 2022

Another Action for Reference Design: Integration

Example: *Integration Progress – 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…



- ❑ Do we have enough space for the detector, its readout and *cables/services*
- ❑ Does a *detector, i.e. its material, impact the performance of other ones*
- ❑ Tools: ***Overall integration model consistent with the EIC Global Geometry Database***
- ❑ Discussion Forum: GD/I

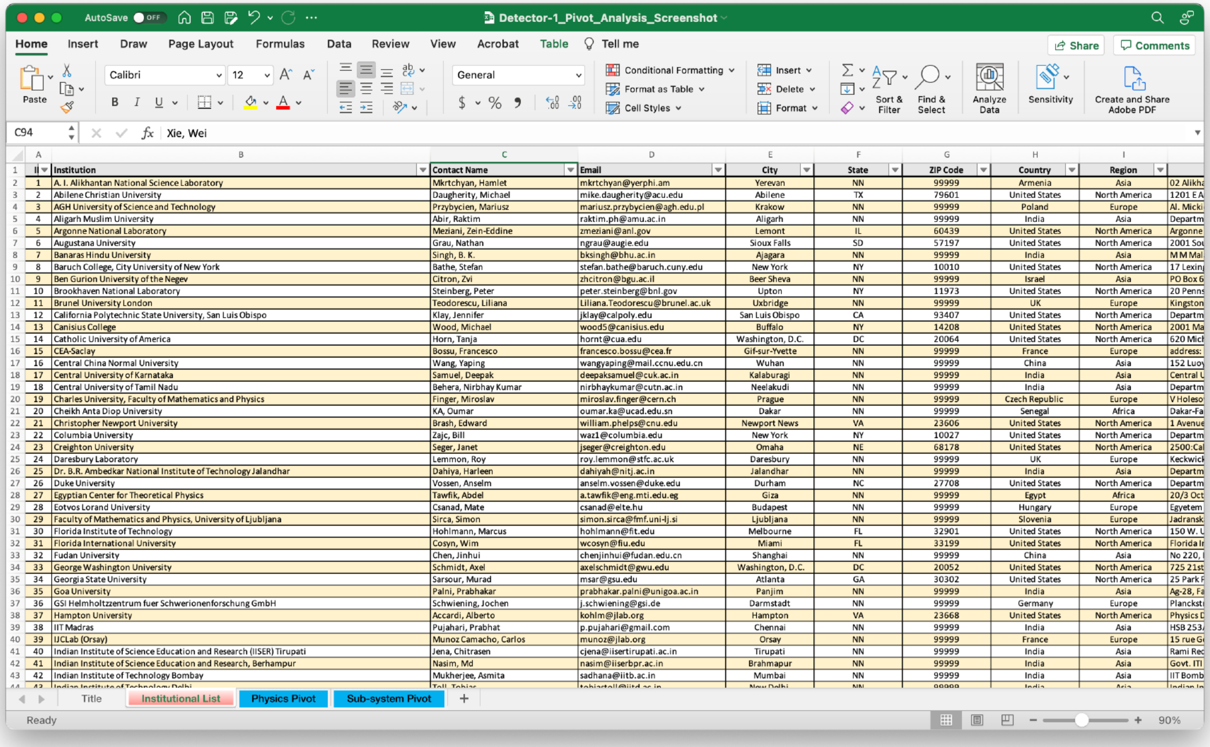
Please review latest Global Geometry Database and as needed initiate updates

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

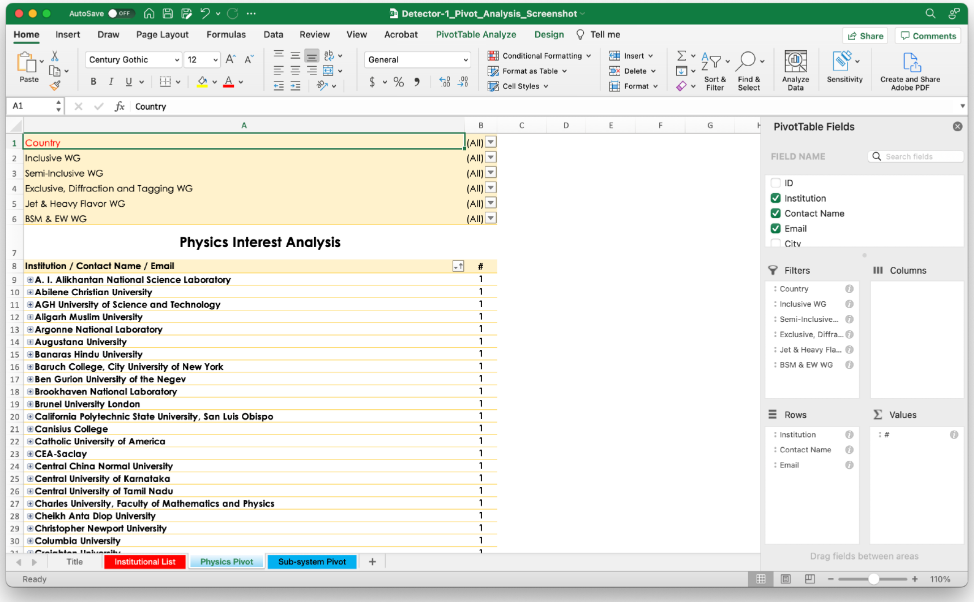
Tools available to help WGs with engaging and organizing workforce

Reminder of Institutional List and Tools

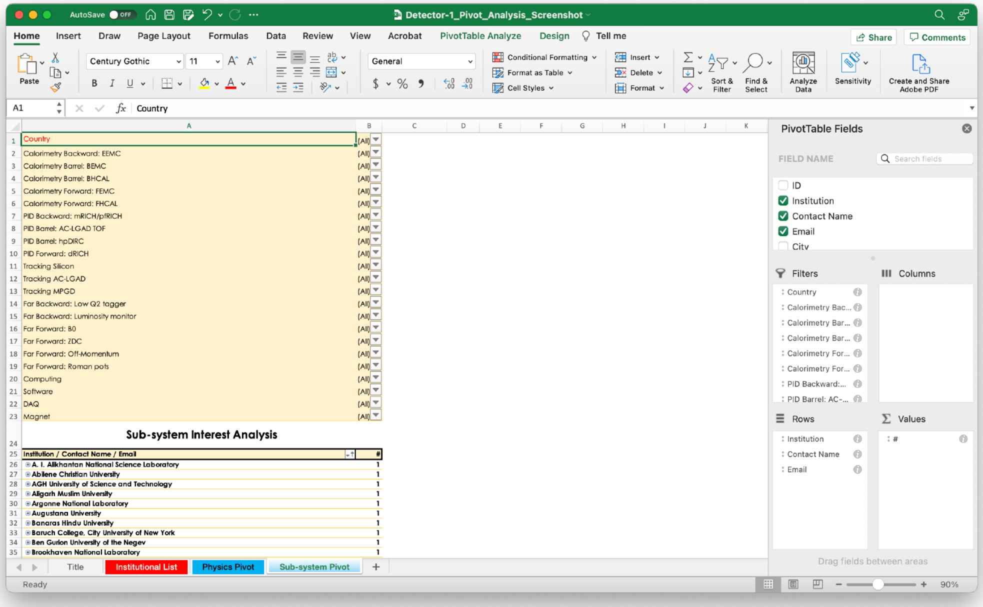
Sheet: Institutions



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 | Discuss

Main Page

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

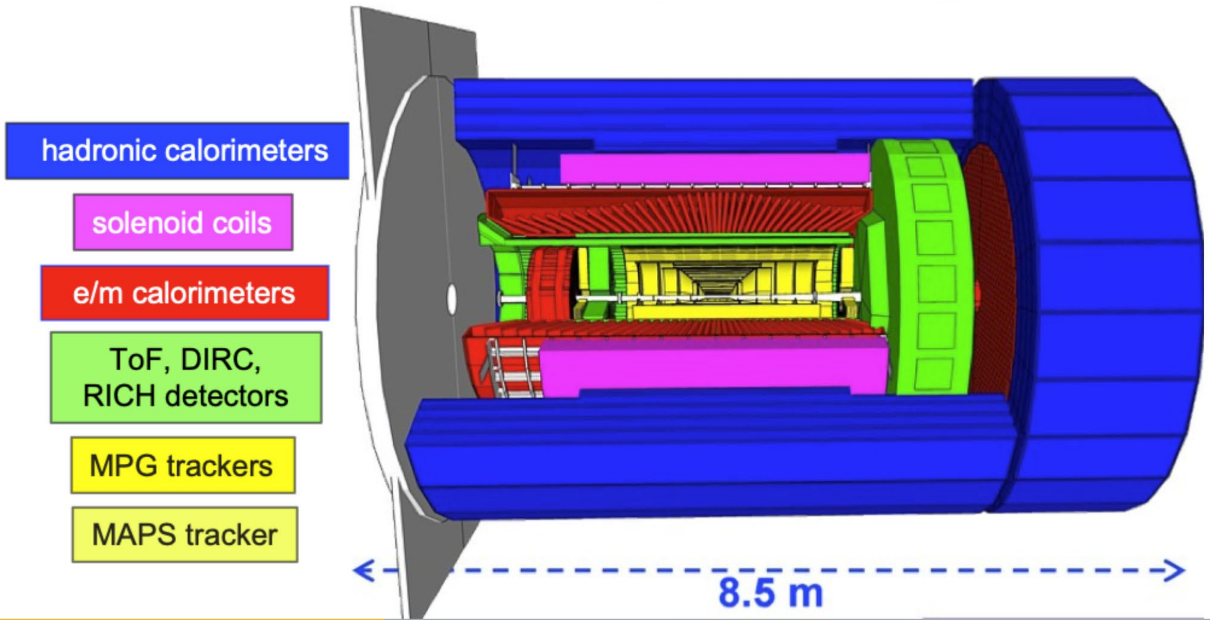
Software
- Simulation production&QA
- Software and Computing

Navigation
- Recent changes
- Random page
- Help about MediaWiki

Tools

Welcome to the EPIC Wiki

Many great updates here from the WGs!



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

NEW link to Central Detector Geometry Database

EIC Global Geometry Database

Detector envelope consistency is important for the simulation campaigns

to provide consistency of detector envelopes between:

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

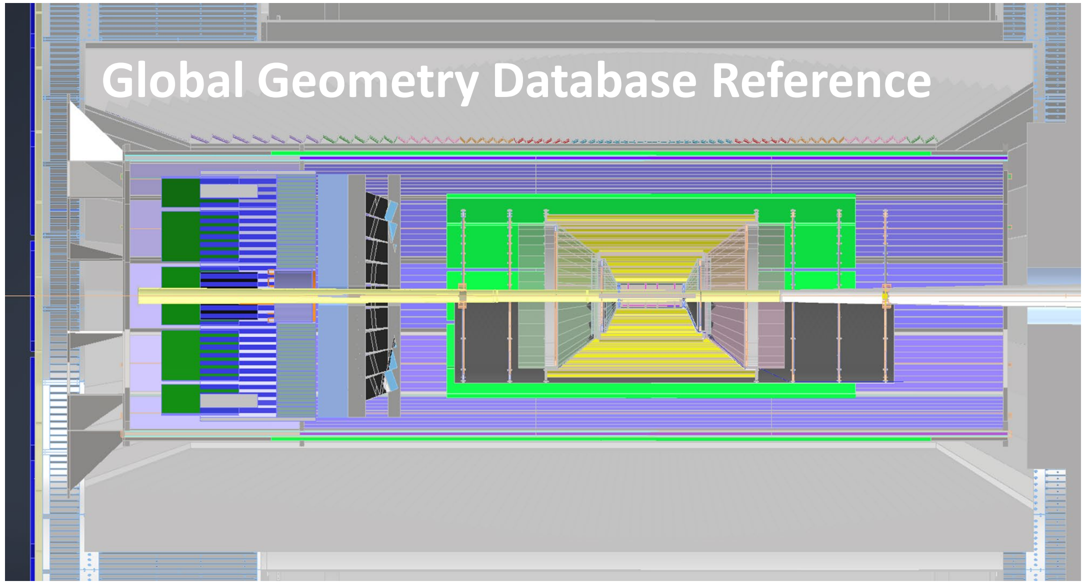
- **Gatekeeper**: Tanja Horn (for Detecfor-1 contacts; work together with system engineer Walt Akers for global changes and improvements)
  - Keep some info on changes and why
- **Legs of input:**
  - Global Detector/Integration Group:
    - Collects all information from working groups
    - Balances detector technology needs versus each other
  - Detector-1 Sim/QA Working Group:
    - Collects all trade-offs of material budget versus science performance
    - Implements version control for simulations
  - EIC Project Detector Leads:
    - Collect input from E&D process (Space needs for frames and supports, Space needs for service/cooling, Requirements of accelerator and vacuum integration)
    - Fold keep-in volumes into requirements/interface control document

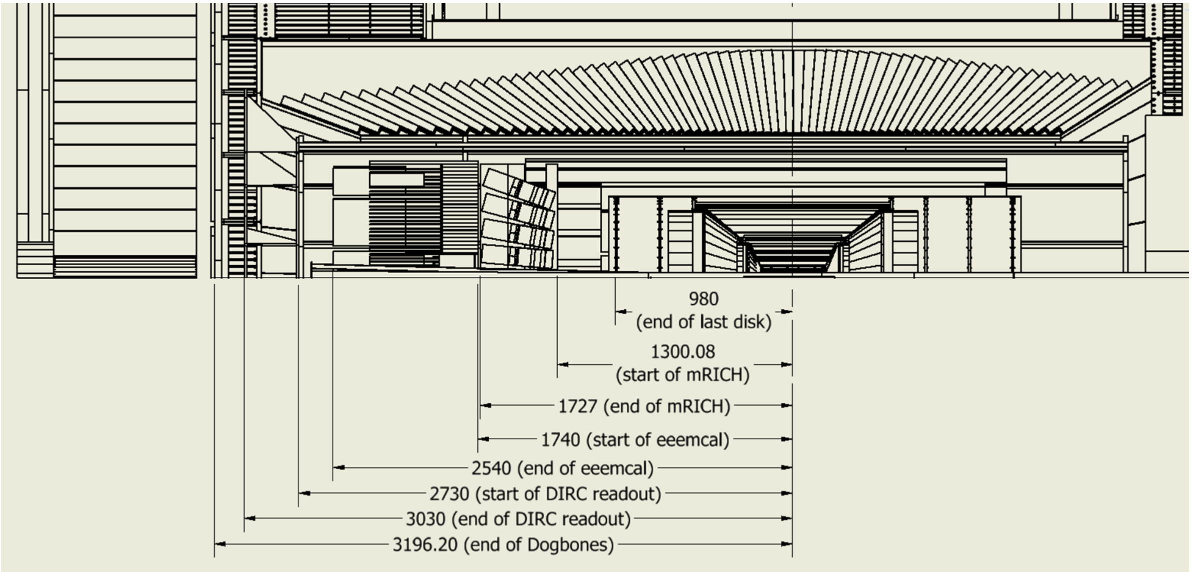
Geometry Database –
https://eic.jlab.org/Geometry/Detector/

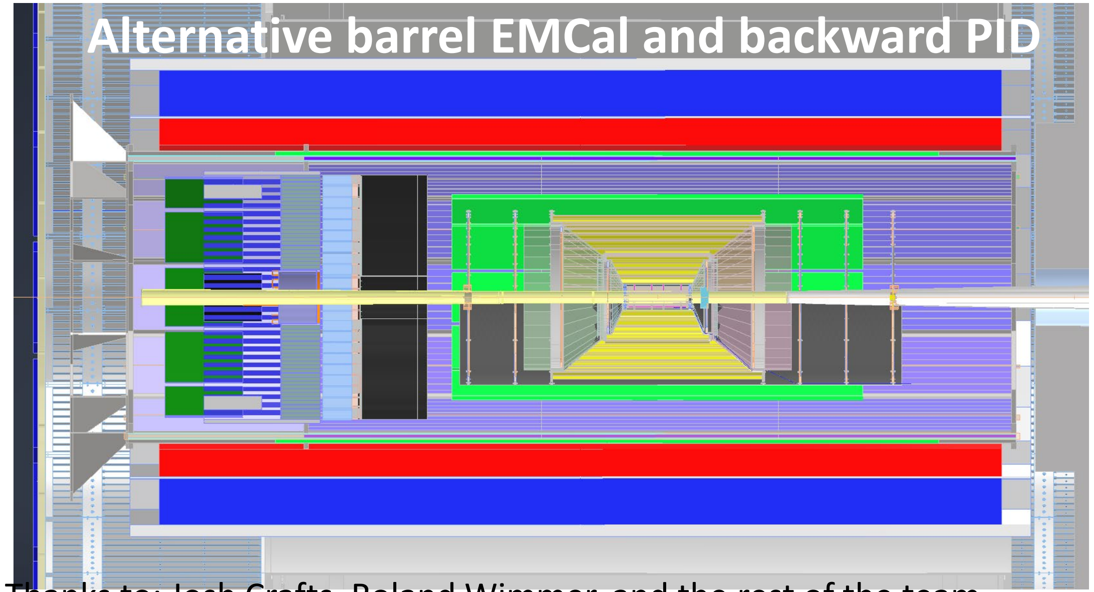
Please update bookmarks – latest version to be used is dated: 9/29/2022

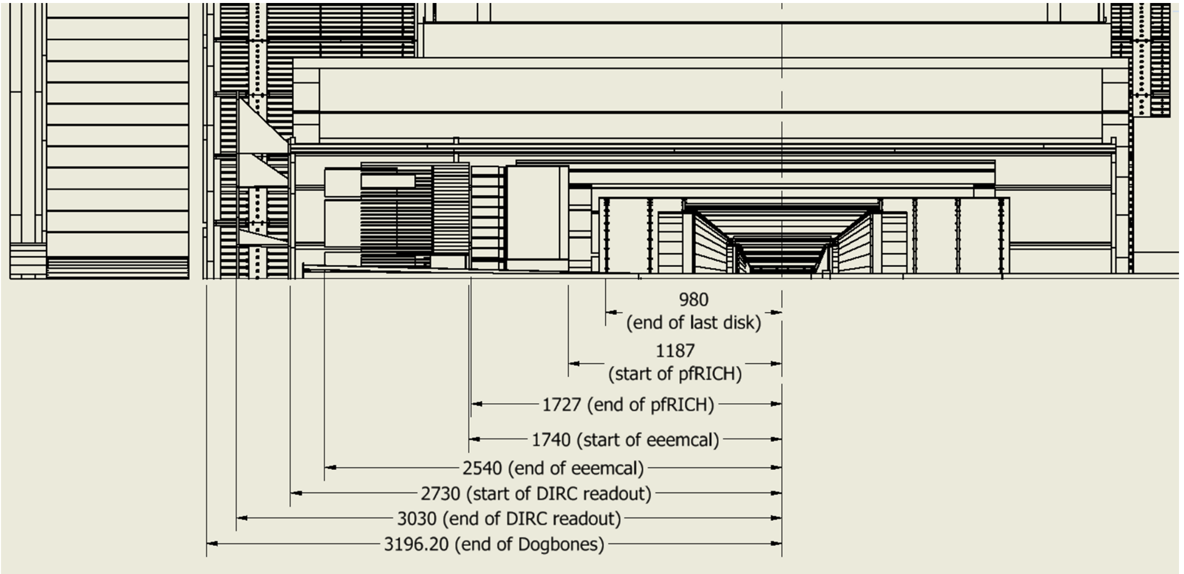
Adapted from 20 May Detector-1 WG Convener meeting

EIC Global Geometry: Detector Envelopes









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

EIC Global Geometry: Detector Envelopes

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

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

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

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

Please review and update simulation models as needed

EIC Global Geometry: Detector Envelopes

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

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

Region	Component	Sub-Component	WBS	Length (cm)	Inner Radius (cm)	Outer Radius (cm)	Offset from Center (cm)	Physical Start (cm)	Physical End (cm)	Volume (m^3)	Weight (kg)	Technology	Notes
	Service Gap			9			320	320	329				Offset: measured from location nearest to interaction point
CENTRAL DETECTOR	Dual RICH		6.10.04	120	15.0	185	180	195	315	11.43	2,123	Aerogel/Gas	Offset: measured from face nearest to interaction point Volume: calculated as sum of the sub-sections Weight: based on parametric estimate from CLAS LTCC
		Detector Section		*100*	15.0	*185*	*215*	*215*	*315*	*10.68*			*Offset: measured from face nearest to interaction point*
		Aerogel Section		*20*	15.0	*110*	*195*	*195*	*215*	*0.75*			*Offset: measured from face nearest to interaction point*
	HD Time of Flight/Tracker		6.10.03	15	8	67	180	180	195	0.21	42	AC/LGAD	Offset: measured from face nearest to interaction point Weight: based on parametric estimate from SBS Gem
	Barrel Hadron Calorimeter		6.10.06	639.2		268.2	0	-319.6	319.6	72.22	462,406	FeSc	Offset: measured from center of detector Volume: calculated as sum of the sub-sections Weight: estimated as 79% iron and 21% plastic
		HD Section		*170*	*195.3*	*268.2*	*150*	*150*	*320*	*18.05*			*Offset: measured from face nearest to interaction point*
		Central Section		*300*	*183.3*	*268.2*	*0*	*-150*	*150*	*36.13*			*Offset: measured from center of detector*
		LD Section		*170*	*195.3*	*268.2*	*-150*	*-320*	*-150*	*18.05*			*Offset: measured from face nearest to interaction point*
	Solenoid Magnet		6.10.07	384	142	177	-10	-202	182	13.47	45,956	Solenoid	Weight: based on parametric estimate from CLEO II
	Barrel EMCal*	*EMCal Outer Support*		492.2	132	141		-293.9	198.3	3.80	5,965	Steel	Weight: calculated as 20% of total volume as steel (balance is air)
		EMCal Outer Surface		492.2	130.5	131.5	-45	-293.9	198.3	0.41	1,098	Aluminum	Weight: calculated as 100% Aluminum
		EMCal Electronics		492.2	120.5	130.5	-45	-293.9	198.3	3.88	7,617	Near eta=0	Weight: calculated as 25% silicon (balance is air)
		Barrel EMcal	6.10.05	492.2	80.5	120.5	-45	-293.9	198.3	12.43	43,613	Sci Glass	Weight: based on parametric estimate from CMS EMCal
		EMCal Inner Surface		492.2	78.55	80.5	-45	-293.9	198.3	0.48	1,300	Aluminum	Weight: calculated as 100% Aluminum
	DIRC Support			458	65	79	-273	-273	185	1.33	523	Steel	Offset: measured from point where DIRC bar connects to the readout Volume: calculated as sum of sub-sections Weight: estimated as 5% of total volume as steel (balance is air & detector)
		Dirc Bar + MPGD Support		*458*	*70*	*75*	*-273*	*-273*	*185*	*1.04*			
		Readout Support		*30*	*70*	*105*	*-273*	*-273*	*-303*	*0.29*			*Readout support is triangular frame, therefore volume is halved.*
	Integrated DIRC/MPGD Detector		6.10.04	488	71.5	76.5	-303	-303	185	0.86	661	Fused silica bars	Detector is totally enclosed by DIRC Support. This is the entire envelope of the detector + readout Weight: calculated as sum of sub-components
		MPGD Tracker		*342*	*73*	*75*	*-197*	*-197*	*145*	*0.32*	*64*	*muRWell (plane type)*	*Weight: based on parametric estimate from SBS Gem*
		DIRC Bar Box		*458*	*70*	*73*	*-273*	*-273*	*185*	*0.62*	*430*		*Weight: calculated as 30% quartz (balance is air & support system)*
		DIRC Readout		*30*	*70*	*100*	*-273*	*-273*	*-303*	*0.24*	*168*		*Readout is triangular, therefore volume is halved.* *Weight: Calculated as 30% silicon(balance is air & support system)*
	Barrel Time of Flight/Tracker		6.10.03	270	63	66	0	-120	120	0.33	66	AC/LGAD	Weight: based on parametric estimate from SBS Gem Length in z needs to be determined
	Inner Tracker (Si, MPGD)	*Alternative based on pfRICH see line 43*	6.10.03	310	3.62	60	0	-130	180	3.49	528	MAPS	Weight: calculated as 3% aluminum and 3% silicon (balance is air)
	Modular RICH	*Alternative Technology pfRICH, see line 38*	6.10.04	42.7	8.0	63	-130	-130	-172.7	0.52	97	Aerogel	Offset: measured from face nearest to interaction point Weight: based on parametric estimate from CLAS LTCC
	LD Time of Flight/Tracker REMOVED		6.10.03	10	-7.3	64	-161	-161	-171	0.13	25	AC/LGAD	Offset: measured from face nearest to interaction point Weight: based on parametric estimate from SBS Gem
	LD EMCal		6.10.05	60	9.0	63	-174	-174	-234	0.73	4,738	PbWO4	Offset: measured from face nearest to interaction point Weight: estimated as 85% lead glass and 15% steel
	Service Gap			10			-320	-320	-330	0.00			Offset: measured from location nearest to interaction point

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

Please review and update simulation models as needed

EIC Global Geometry: Detector Envelopes

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

EIC GEOMETRY THU, 29 SEP 2022 12:21:25

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
LEPTON DIRECTION ENDCAP	Backward HCal	*HCal*	6.10.06	45	12.4	275	-329.6	-329.6	-374.6			Iron/SC
		Flux Return		20.32	12.9	271.3	-375	-375	-395.32			Iron
CENTRAL DETECTOR ALTERNATIVES	Proximity Focusing RICH	*Alternative Technology to mRICH, see line 28*	6.10.04	54.1	8.0	63	-118.6	-118.6	-172.7	0.66	0	Aerogel + Gas
	Barrel EMCal Alternative	*Imaging Part*	6.10.05	434.5	78.3	92.25	-257	-257	177.5	3.26		Pb+Sc+Si
		Sampling Part		434.5	93.3	117	-257	-257	177.5	6.82		PB+Sc
		LD Readout Electronics		15	78.3	117	-272	-257	-272	0.36		
		HD Readout Electronics		15	78.3	117	177.5	177.5	192.5	0.36		
	Inner Tracker (Si, MPGD)	*Alternative based on pfRICH*	6.10.03	298.6	3.6	60	0	-118.6	180	3.36	19	MAPS

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

Please review and update simulation models as needed

Path Forward

- Task list towards Detector Reference Design
  - If not done yet, please post a bullet list to the EPIC Wiki following the example of the dRICH presented in previous Convener Meetings
- Integration towards Detector Reference Design
  - Using detector envelopes from reference design check for
    - Enough space for readout, cables, services
    - Detector subsystem, i.e. its material, impact the performance of other ones
- Detector Envelope Reference for Simulation Campaigns
  - Check Global Geometry Database and update simulation models as needed

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

Summary

- Successful QCD Town Meeting and subsequent discussions
  - 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 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 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)

October Sim Campaign - Software and GD/I View

→ **More in the next presentation**

- Running a full production takes significant time and effort
- We do not have the computational or person resources to run all permutations of subdetector combinations
- Computing/software and SimQA groups have the ability to run two complete detector configurations
- We need to determine:
  - What those two detector configurations will be
  - What questions we aim to answer from this first campaign
- Disclaimer:
  - This will not be the last simulation campaign
  - This campaign will not answer every question that needs to be answered prior to CD2
  - This is a starting point of a continuous optimization process

Adapted from Joe Osborn presentation at the 26 Sept 2022 GD/I meeting

October Sim Campaign - Software and GD/I View

Simulation samples

- Already collected simulation samples for campaign 0 are still relevant
  - We will plan to run the same samples in October unless we explicitly hear otherwise from the WGs
- Available as a google sheet here
  - Locations of input event generations and outputs from campaign 0
- Requests from:
  - Exclusive/Diffractive
    - Variety of generators/requests, too many to list
  - Inclusive
    - Djangoh ep and ed, variety of energies
  - Jets/HF
    - Pythia8, variety of Q^2 and energies
  - SIDIS
    - Pythia6, variety of Q^2 and energies

- ❑ PWG: Review requests, required time frame, and impact
- ❑ What is needed for the DWGs? Timeframe?

Adapted from Joe Osborn presentation at the 26 Sept 2022 GD/I meeting

October Sim Campaign - Software and GD/I View

detector region	option A	option B	notes
all	"standard" Si tracker system (layers: 5 in barrel; 5 disks in FW; 5 disks in BW)		if possible, converge towards 1 single configuration with 1 single envelop
barrel	2 MPGD layers (1 behind DIRC; first layer at 55 cm)	1 MPGD layer (in front of the DIRC)	option B more consistent with imaging Ecal
FW	no MPGD behind the RICH		
barrel	"standard" DIRC		
FW	"standard" dRICH		not realistic to elaboirate two different optics by mid October
BW	mRICH	pfRICH	pfRICH shorter than in ATHENA: ~45 cm in total
FW/BW	standard Ecal and Hcal	standard & insert in the BW Ecal	status of implementation in gloal simulation: advanced; about inseret, to be used in October simulation if a preliminary mechanical support will be designed
barrel	SciGlass Ecal	imaging Ecal (same inner radius, 21 X0)	thicker imaging Ecal if supported by preliminary srudies
barrel	HCAL outside	HCAL outside	implementation in progress
BW	ToF layer (10 cm; 8% X0; pixel 0.5*0.5 mm^2)	no	BW ToF layer simulated if intregration in the the detector layout possible (second priority)
FW	ToF layer (15 cm; 8% X0; pixel 0.5*0.5 mm^2)		X0 correlated to resolution
barrel	ToF layer (1 % X0; strips)		X0 correlated to resolution
FFW/FBW	"standard"		implementation advanced; some open points in B0; ZDC is the "ATHENA" one;
	1.7 T scaled from BaBar magnet		

→ **More in the next presentation**

Adapted from Silvia Dalla Torre presentation at the 26 Sept 2022 GD/I meeting

EIC Detector Consortia

Name	Focus/Interest	Subsystem	Contacts	Institutions
hpDIRC	hpDIRC	PID	Greg Kalicy (kalicy@cua.edu), Joe Schwiening (j.schwiening@gsi.de)	CUA, ODU, SBU, GSI…
dRICH	dRICH	PID	Marco Contalbrigo (mcontalb@fe.infn.it), Evaristo Cisbani (evaristo.cisbani@roma1.infn.it), Anselm Vossen (Anselm.vossen@duke.edu)	INFN-RM1, U. Ferrara, Duke U., SBU, NISER, ….
EEEMCAL	Electromagnetic Cal (e-endcap, possibly barrel)	EM Cal	Tanja Horn (hornt@cua.edu)	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 (wl33@rice.edu), Alessandro Tricoli (Alessandro.Tricoli@cern.ch), Zhenyu Ye (yezhenyu@uic.edu)	BNL, Santa Cruz, UIC, Rice U., LANL, IJCLab-Orsay, ORNL
EICSC	Silicon tracking	Tracking	Laura Gonella (laura.gonella@cern.ch), Ernst Sichtermann (EPSichtermann@lbl.gov), Domenico Elia (domenico.elia@cern.ch), (gdeptuch@bnl.gov>), (nicoleapadula@lbl.gov), Iain Sedgwick (iain.sedgwick@stfc.ac.uk), Peter Jones (p.g.jones@bham.ac.uk),	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)

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

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)

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

Adapted from Elke/Rolf presentation at the EICUGM 2022

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*: 1st version of by May 2023
  → final version by October 2023

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

Pre-TDR Outline

Adapted from Elke/Rolf
presentation at the EICUGM 2022

Working model will be similar as we used to create the CDR, a mix of the project CAMs and some users, and use where we can input from the CDR, YR, proposals, technical notes, etc

Chapter 2: Physics Goals and Requirements (should be short, < 50 pages)

- 2.1 EIC Context and History (like CDR 2.2 or YR section 1)
- 2.2 The Science Goals of the EIC and the Machine Parameters (like CDR 2.3)
- 2.3 The EIC Science (follow YR structure)
- 2.4 Scientific Requirements

Chapter 3: Accelerators (contribution to IR)

Chapter 8: Integration and Commissioning (Elke contributor)

Chapter 10: Experimental Systems

- 10.1 Experimental Equipment Requirements Summary (like CDR 8.2)
- 10.2 General Detector Considerations and Operations Challenges (YR 10, CDR 8.3)
- 10.3 EIC Detector
- 10.4 Detector R&D Summary
- 10.5 Detector Integration
- 10.6 Detector Commissioning and Pre-Operations

Appendix-B: Integration of a Second Experiment

Plans for Design Maturity

Adapted from Elke/Rolf presentation at the EICUGM 2022

System	Estimated Design % Complete ---------------------- Now	Estimated Design % Complete ----------------------- CD-2 / 3A	Estimated Date for Final Design Complete	Comments
6.10.02 Detector R&D/Physics Design	0%	60%	06/30/2026	Project R&D just started
6.10.03 Tracking	10%	50%	12/31/2026	Need only late
6.10.04 PID	15%	50%	03/31/2026	hpDIRC well underway
6.10.05 EmCal	20%	85%	12/31/2024	eEMCAL far ahead
6.10.06 HCal	15%	70%	06/30/2025	Barrel Hcal reuse, rest delayed
6.10.07 Magnets	30%	100%	12/31/2023	LLP, completed 30% design
6.10.08 Electronics	10%	50%	03/31/2027	ASICs/electronics can come in late

Plans for Design Maturity

Adapted from Elke/Rolf presentation at the EICUGM 2022

System	Estimated Design % Complete ---------------------- Now	Estimated Design % Complete ---------------------- CD-2 / 3A	Estimated Date for Final Design Complete	Comments
6.10.09 DAQ/Computing	5%	50%	03/31/2027	DAQ/computing can come in late
6.10.10 Infrastructure	15%	40%	06/30/2026	Good start for reuse, but finals after detectors
6.10.11 IR Integration and Ancillary Detectors	10%	50%	12/31/2025	Know things fit, just do as we can, need B0 design
6.10.12 Pre-Ops and Commissioning	0%	30%	12/31/2024	Will have plan at CD-2/3A, develop more later
6.10.14 Polarimetry & Luminosity	15%	50%	12/31/2025	Know what we need to do, pace and completion driven by accel.