EPIC Working Group Conveners Meeting

19 August 2022

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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

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

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.

Adapted from Elke/Rolf presentation at the EICUGM 2022

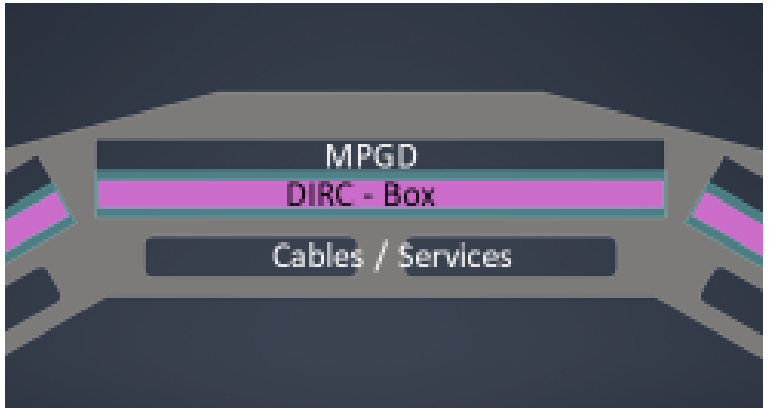
Near Term Task 2: Services and Cables

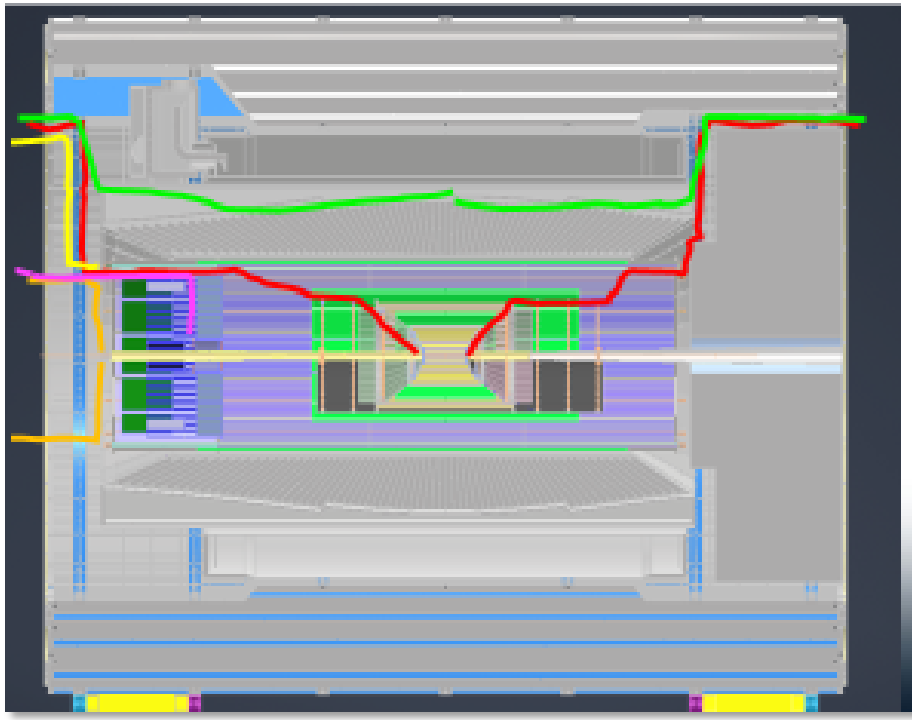
We need information on services and cables for all subsystems

→ 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 EEEmcal





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

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

Adapted from Elke/Rolf presentation at the EICUGM 2022

EIC Global Geometry Database

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

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/

Adapted from 20 May Detector-1 WG Convener meeting

Tools available to help with task list management

Main page | Discussion

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

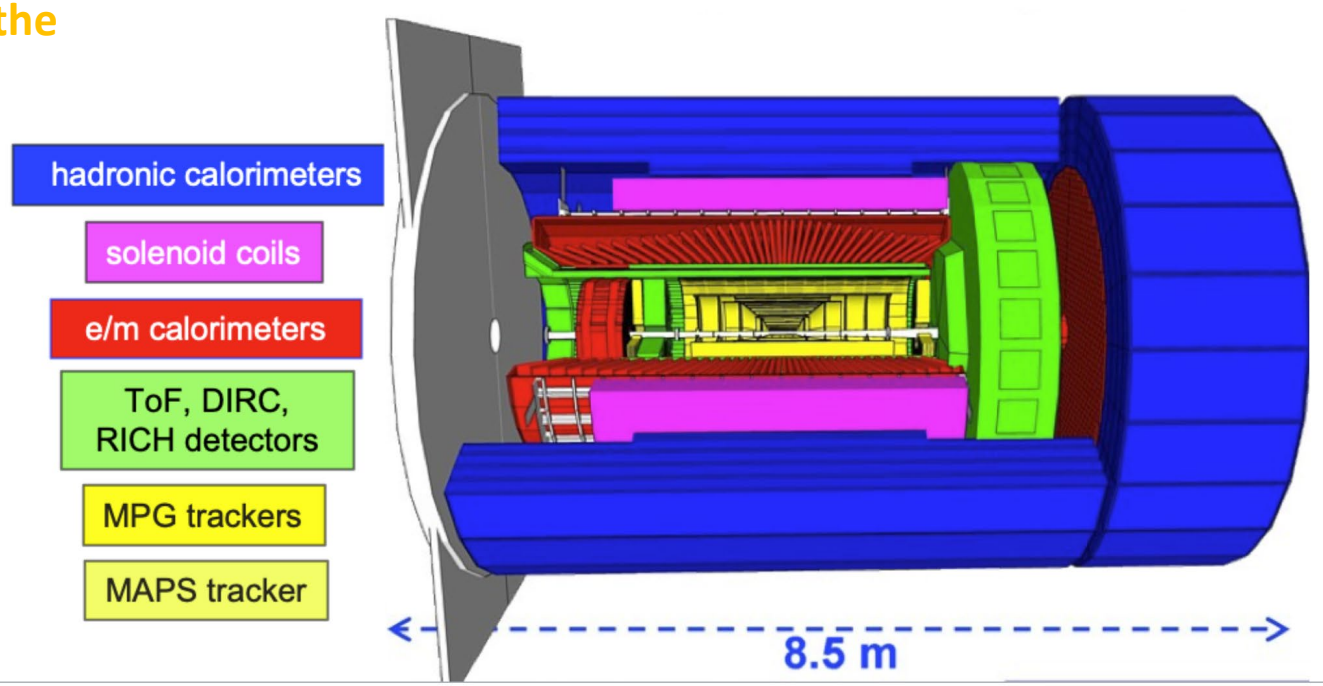
Navigation
Recent changes
Random page
Help about MediaWiki

Tools
What links here
Related changes

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

Welcome to the EPIC Wiki

Example on the next page



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

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. Furletova, 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. Furletova, 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

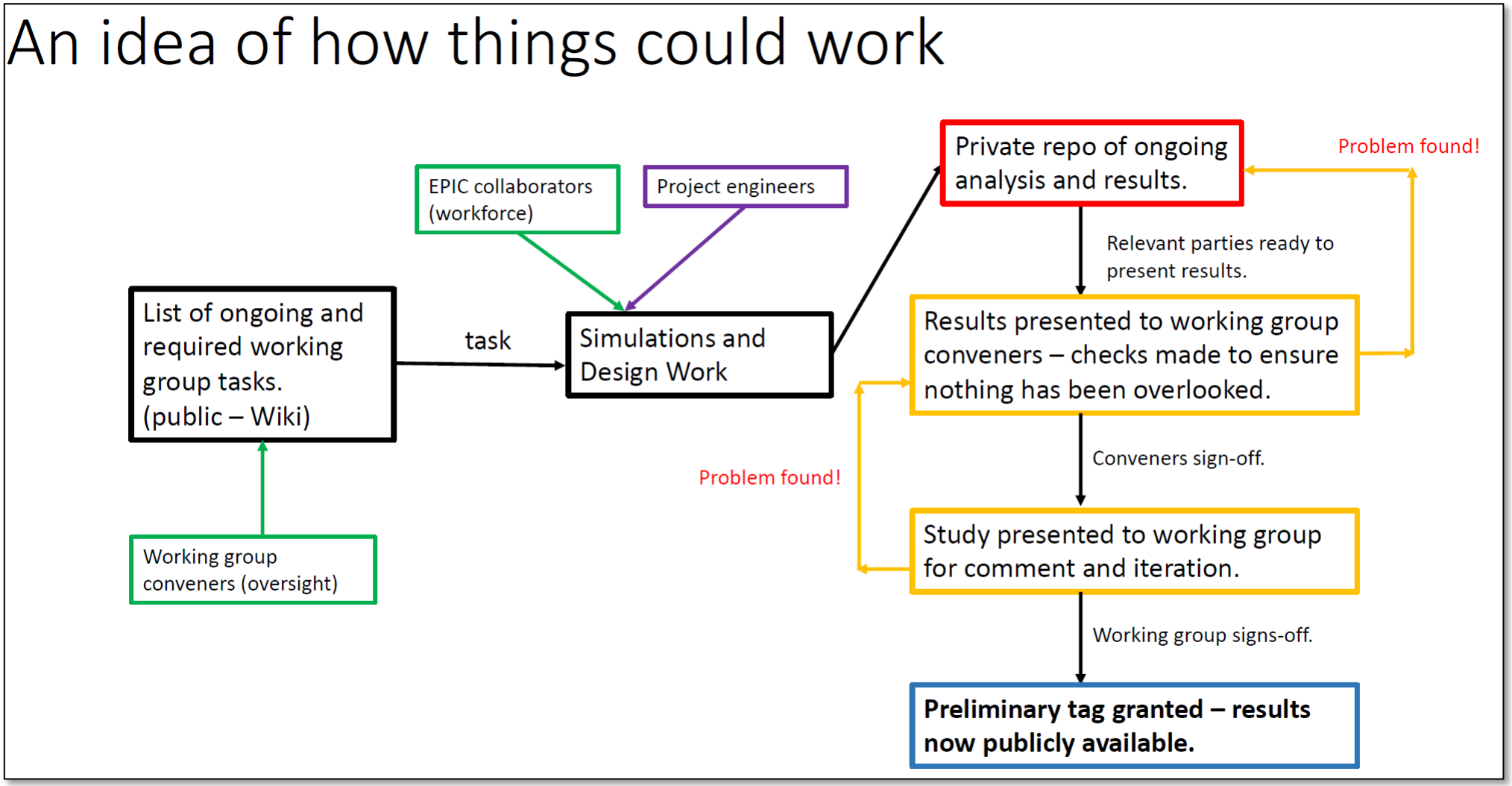
Slide from Alex Jentsch and the EPIC Far-Forward WG presentation 8/5/22 (https://indico.bnl.gov/event/16033/contributions/66684/attachments/42613/71426/EPIC_DWG_task_management_8_2_2022_v2.pdf)

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

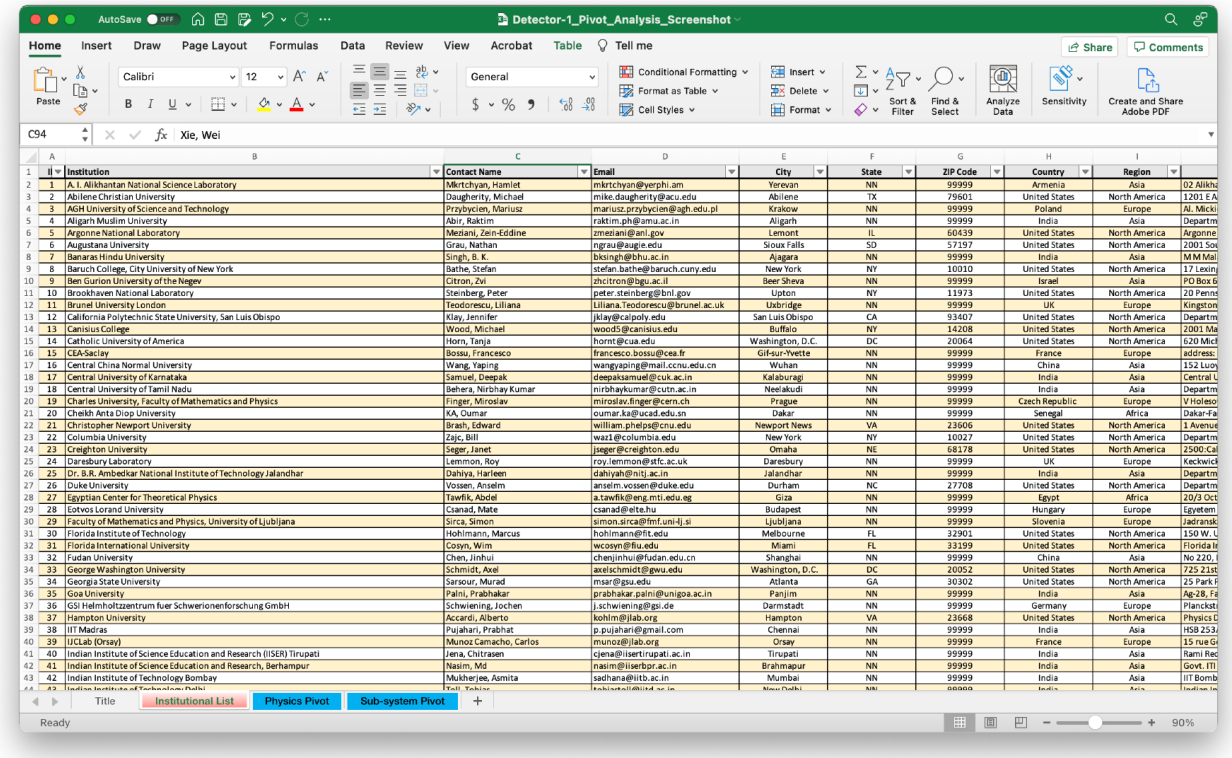
Slide from Alex Jentsch and the EPIC Far-Forward WG presentation 8/5/22 (https://indico.bnl.gov/event/16033/contributions/66684/attachments/42613/71426/EPIC_DWG_task_management_8_2_2022_v2.pdf)



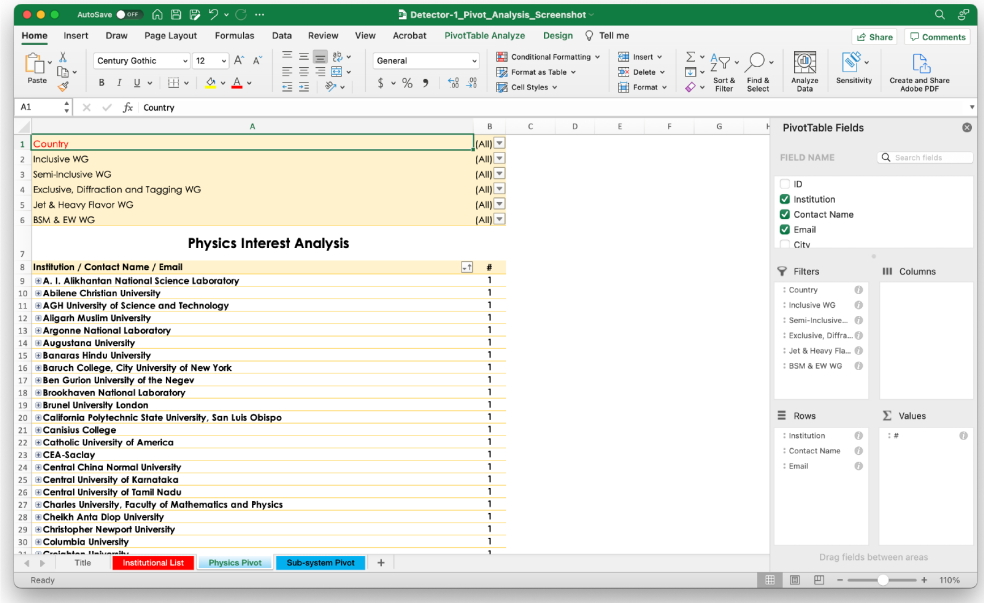
Tools available to help with engaging and organizing workforce

Reminder of Institutional List and Tools

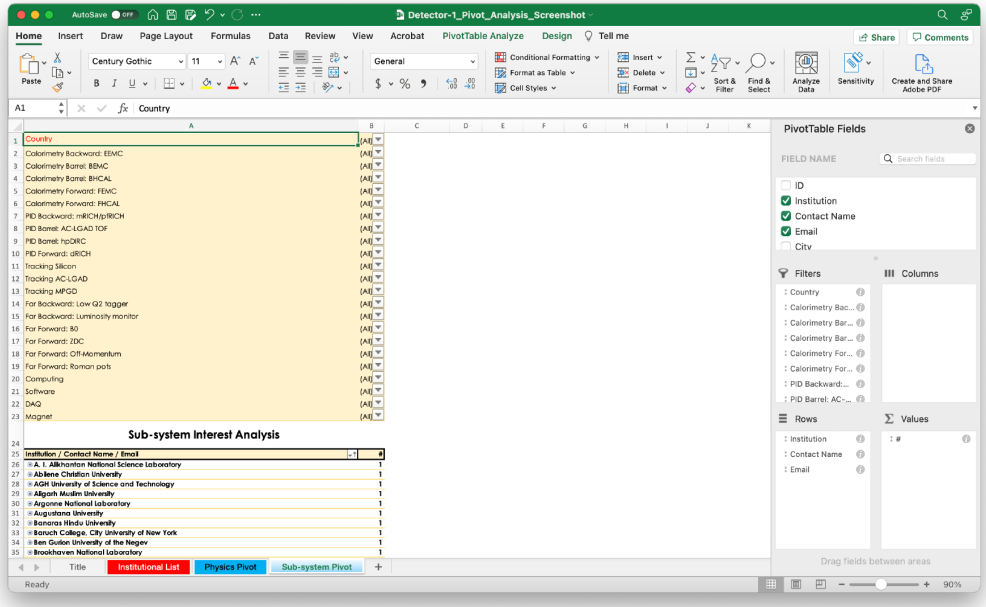
Sheet: Institutions



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

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)

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