17th Bi-Weekly Meeting

Or Hen, Tanja Horn, John Lajoie

November 8th, 2021.

T – 23 days; Where do we stand?

- ✓ Detector
  - ✓ Design complete
  - ✓ Cost / risk / schedule assessment complete
- ✓ Simulation processing complete
  - Detector performance studies **ongoing**
  - Physics studies **Near Completion**
- ✓✗ Technotes
  - drafting **ongoing**
  - review **ongoing**
- Proposal drafting **ongoing**

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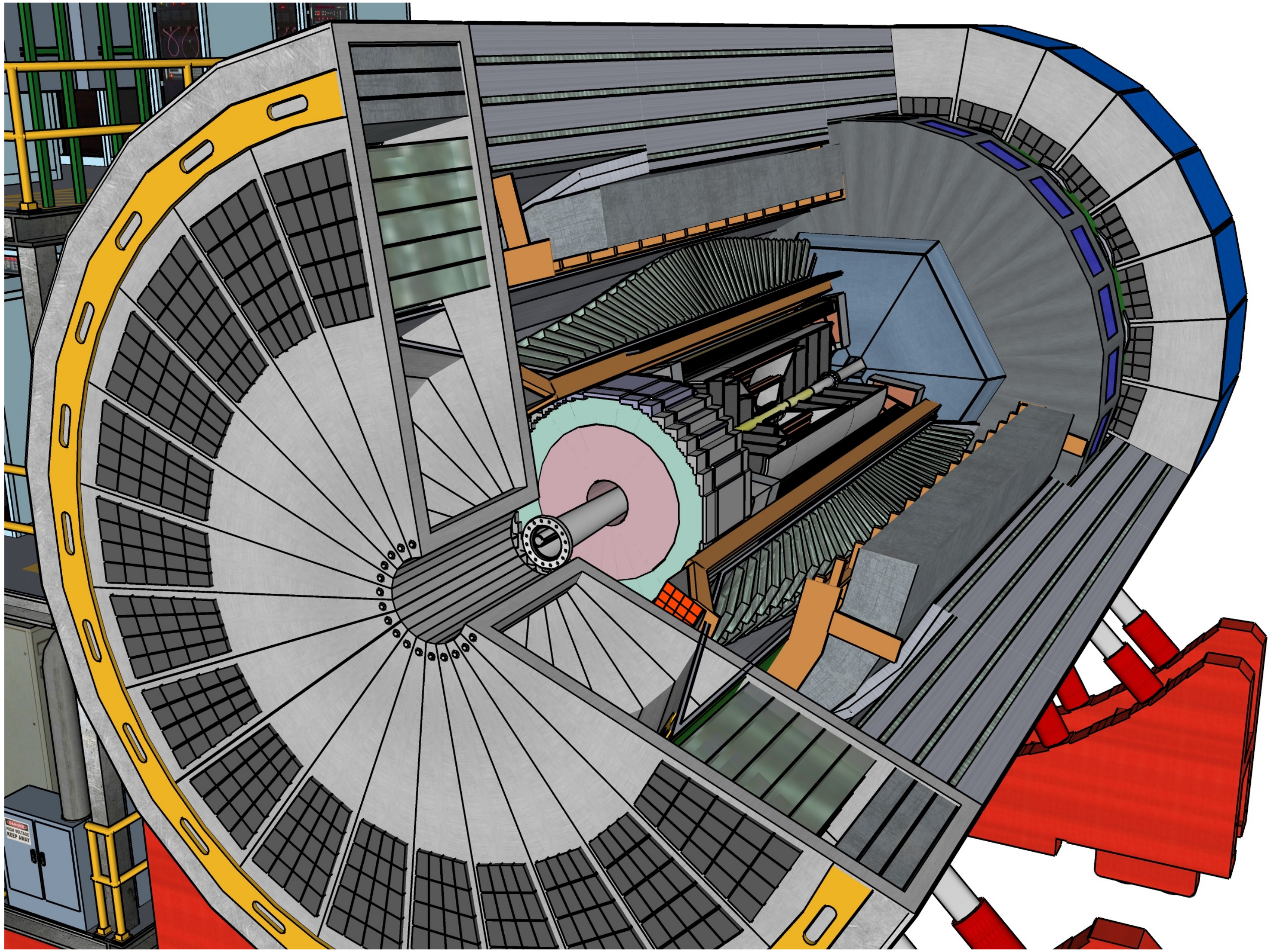
ECCE Detector



ECCE Barrel

Tracking:

- ITS3 MAPS Si for vertex (3 layers) & sagitta (2 layers)
- μRWell outer layer (double)
- AC-LGAD before DIRC
- μRWell after DIRC

h-PID:

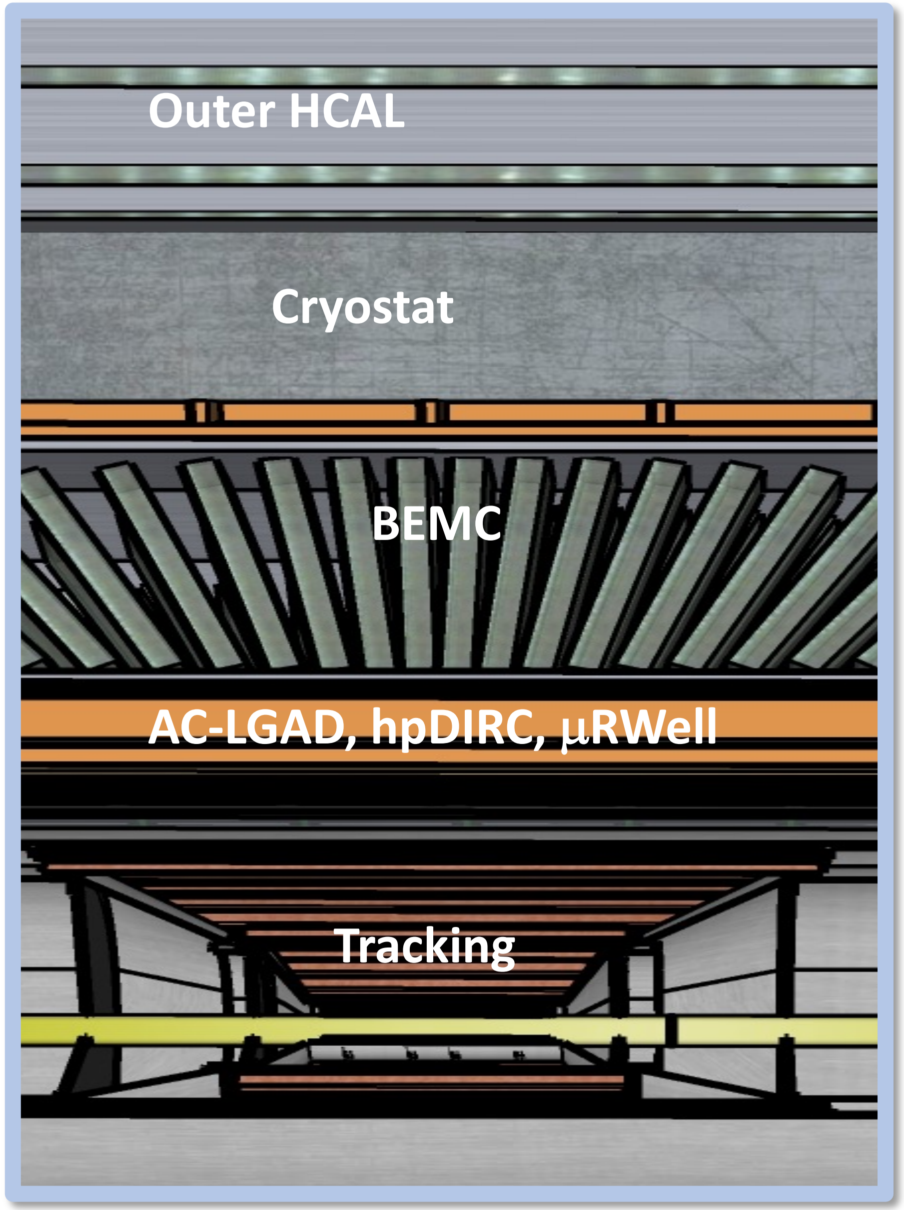
- hpDIRC & AC-LGAD TOF

Electron ID:

- SciGlass Projective EM Calorimeter (+ instrumented frame)

HCAL:

- Fe/Sc (sPHENIX re-use)



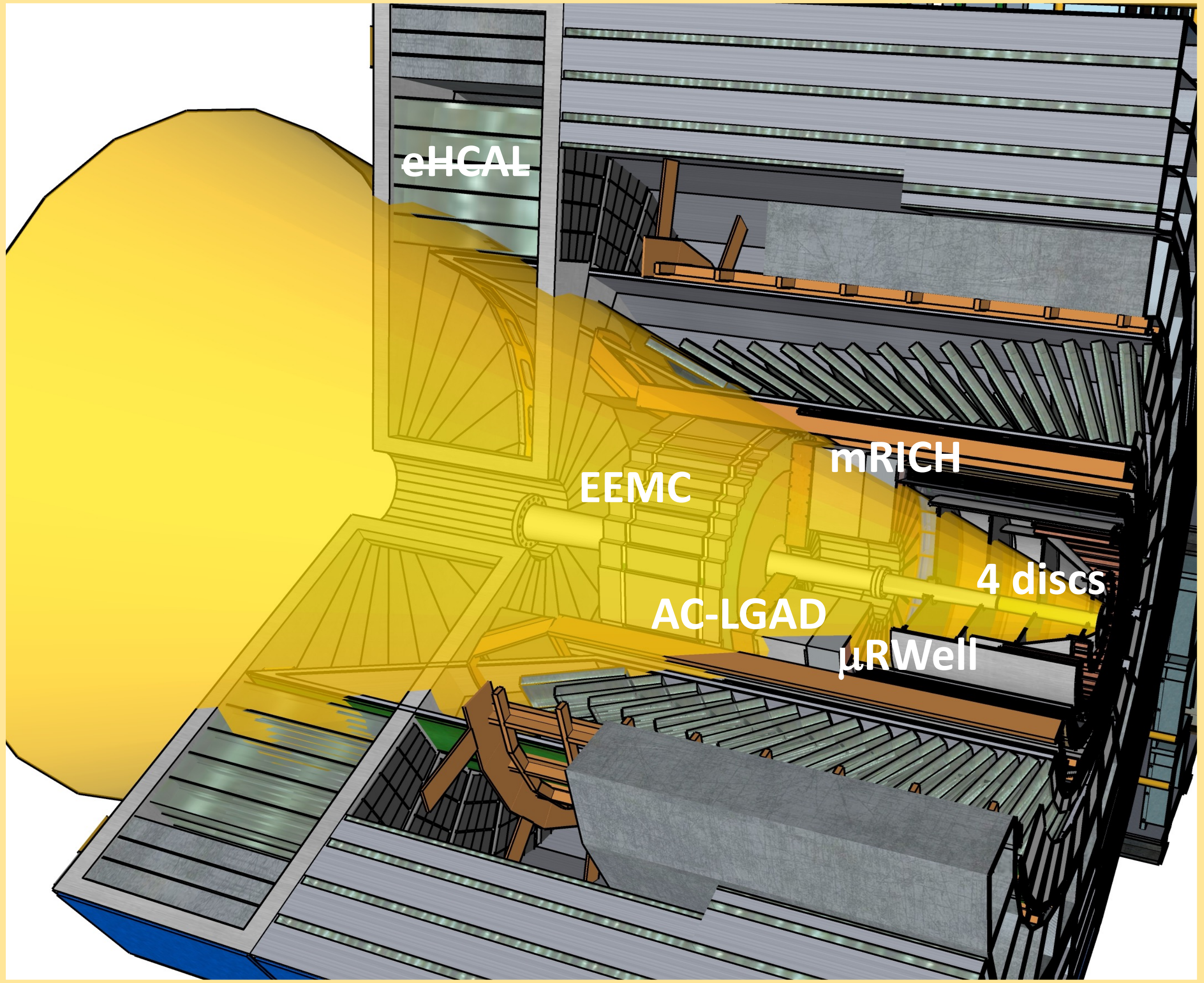
ECCE e-Endcap

Tracking:
- ITS3 MAPS Si disks (x4)
- µRWell before mRICH [?]
- AC-LGAD after mRICH

h-PID:
- mRICH & AC-LGAD TOF

Electron ID:
- PbWO4 EM Calorimeter (some reuse)

~~**HCAL:**~~
- ~~Fe/Sc (STAR re-use)~~
- Un-instrumented flux return



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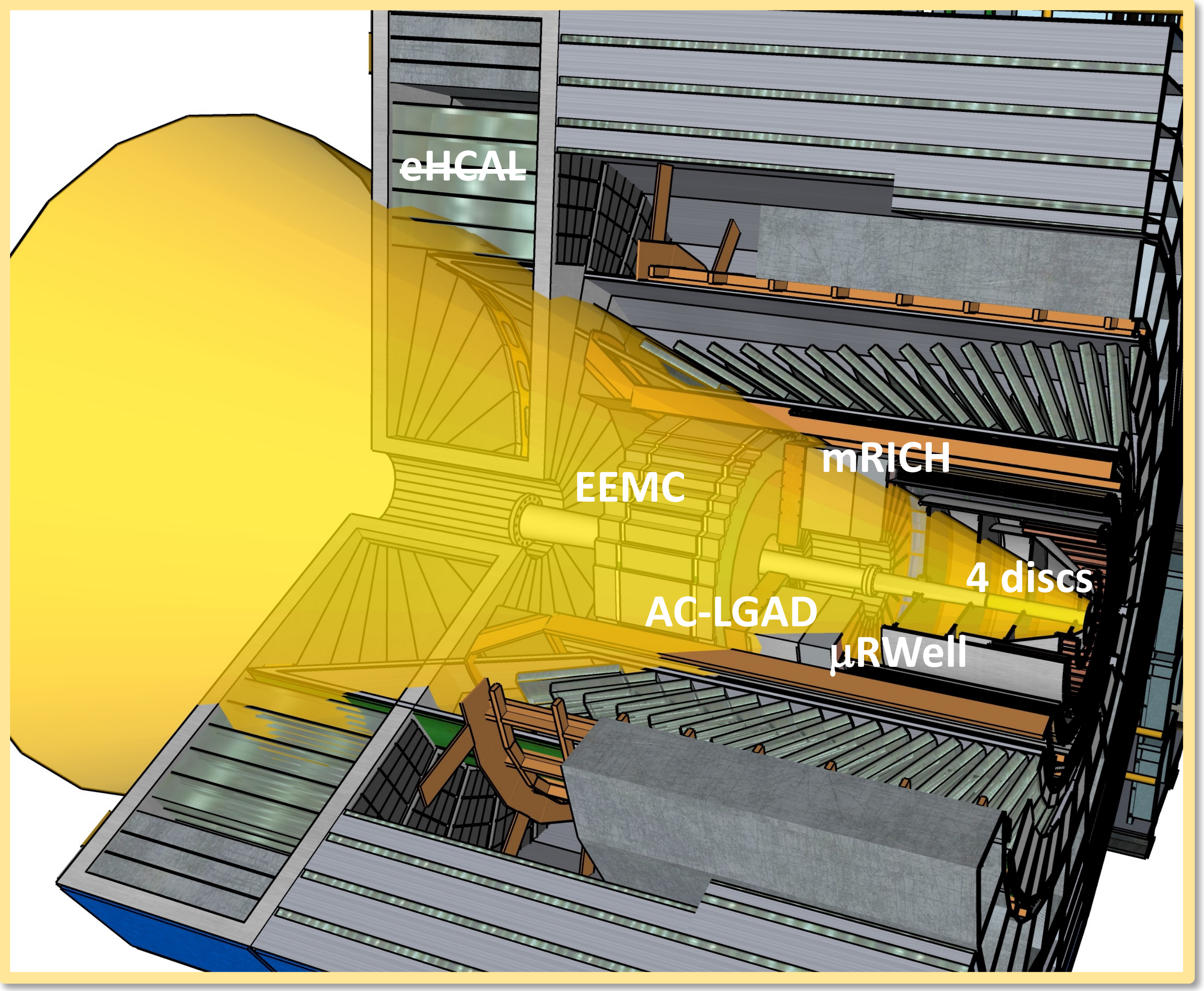
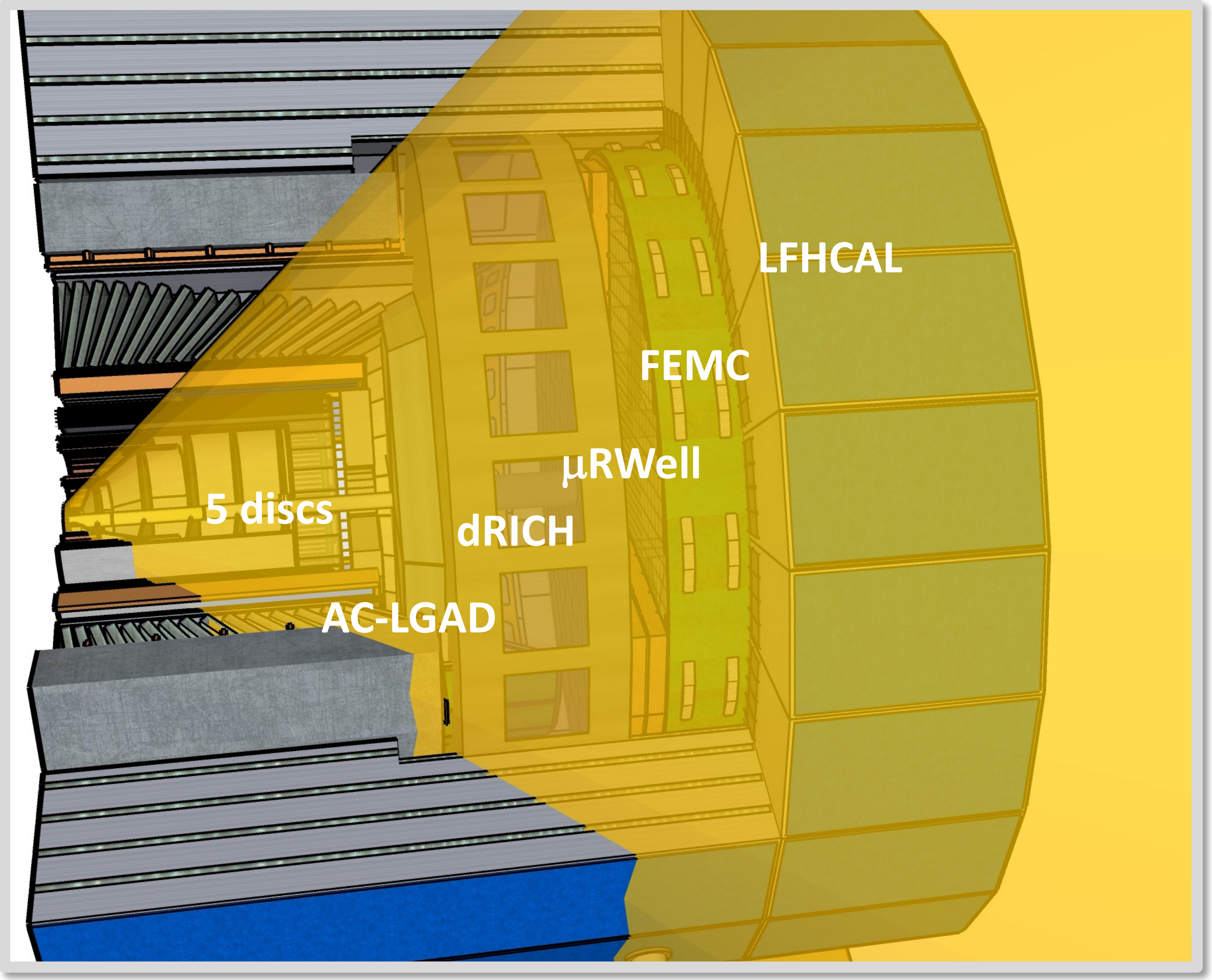


ECCE h-Endcap

Tracking:
- ITS3 MAPS Si disks (x5)
- AC-LGAD before dRICH
- μRWell after dRICH [?]

PID:
- dRICH & AC-LGAD TOF

Calorimetry:
- Pb/ScFi shashlik (EMCal)
- Long. separated HCAL



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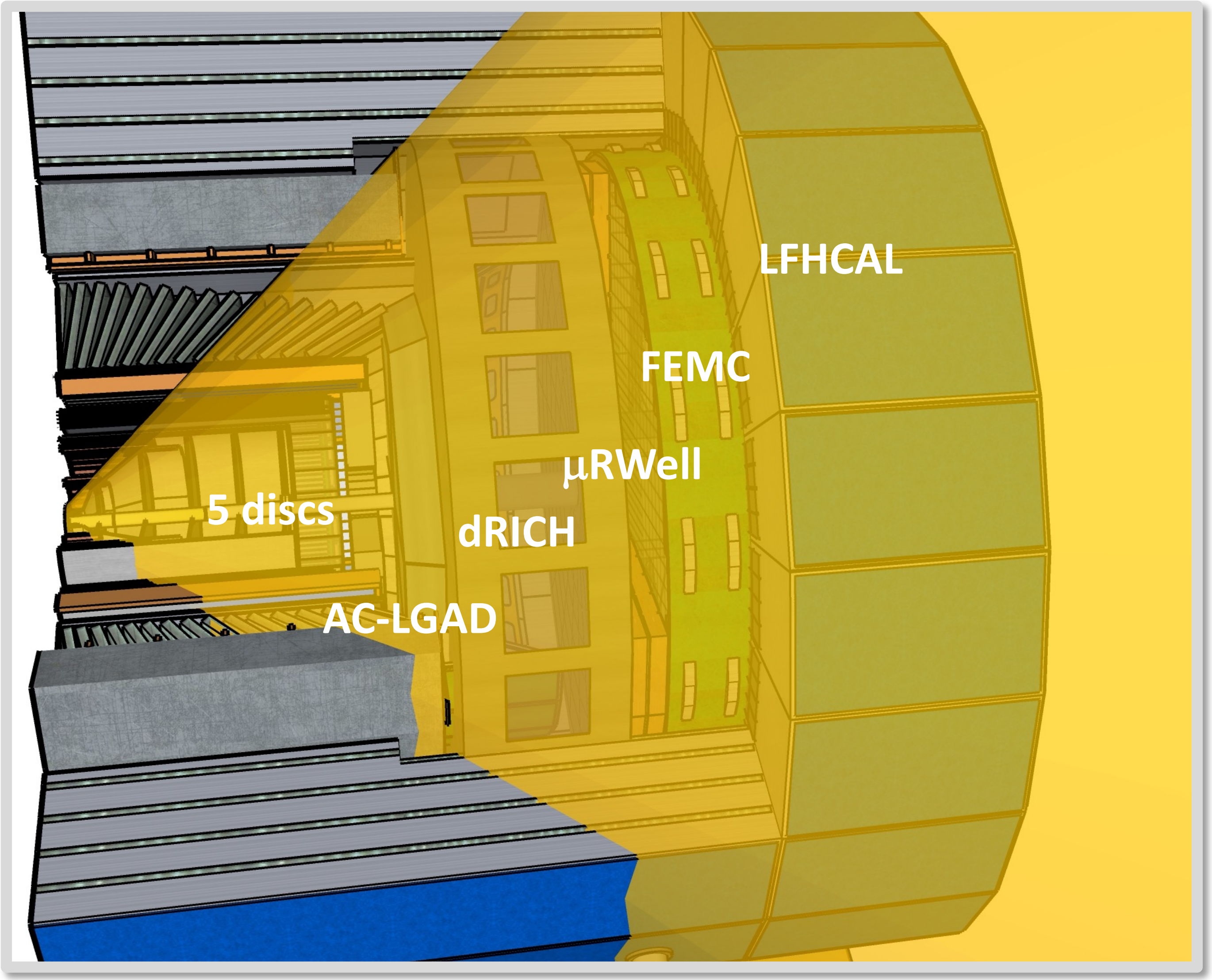


ECCE Far Forward/Back

Far Forward:

- ZDC
- B0 (Si tracker + EMCal)
- Off-momentum tracker

Luminosity monitor:

- EMCal for direct photons
- Tracker + EMCal for e^+/e^- detection

Low-Q^2 tagger:

- CLAS12-like design with a Timepix tracker & EMCal.

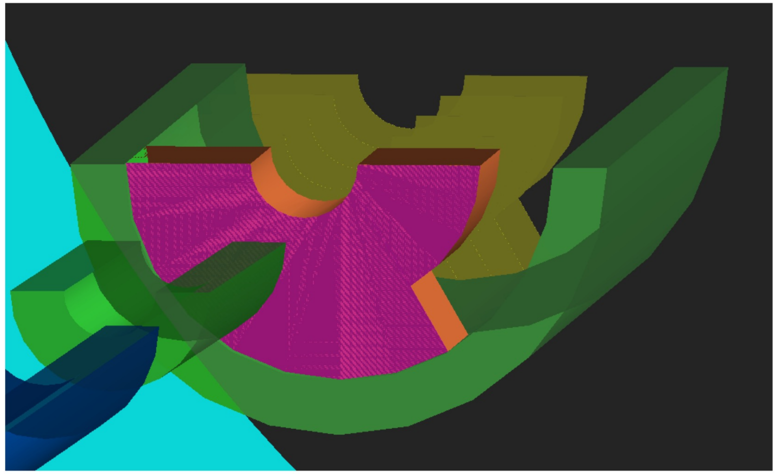
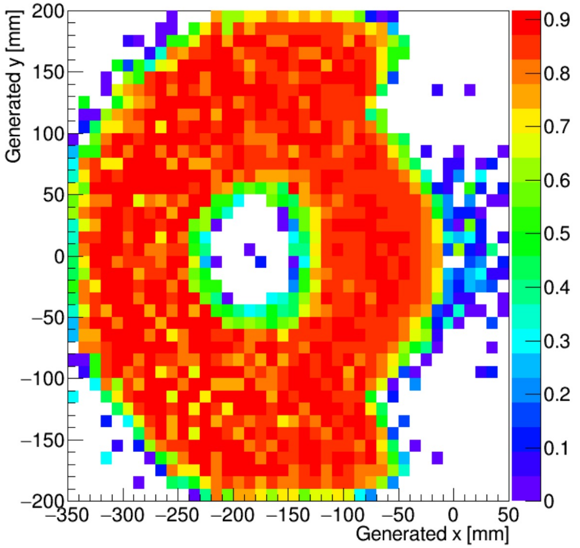
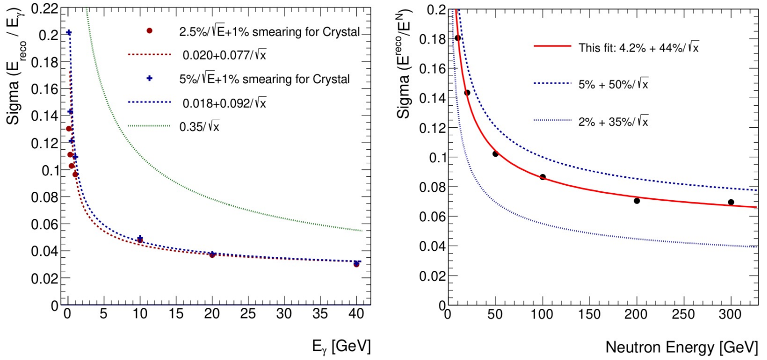


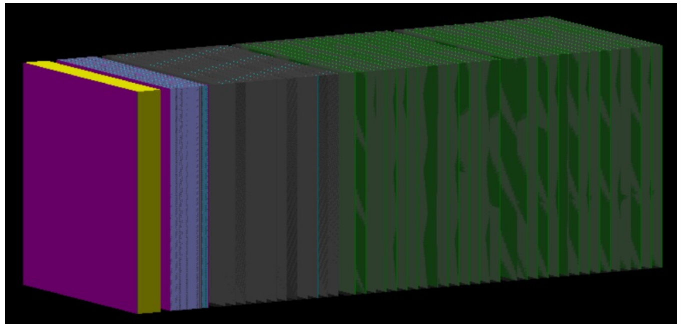
Figure 1: B0 design. Particles come in from the top right side of the figure. The detecto consists of 4 silicon pixel layers (yellow) and one lead-tungsten EM section (brown). A laye representing 2mm of copper as dead material used in present studies is also shown for the B0 EM section in magenta.

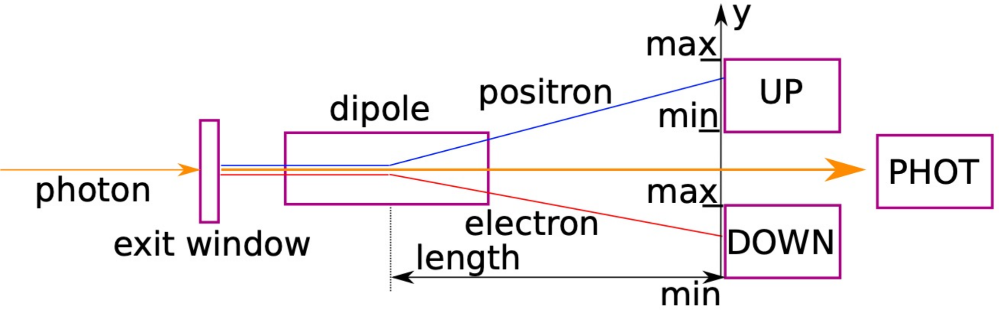




(a) Photons **(b)** Neutrons

Figure 15: Estimation of the energy resolution for (a) single photons and (b) single neutrons. The photon or neutron energy is reconstructed from the deposited energy in each active material. No readout system is in the simulation. The energy of crystal layer is smeared by $2.5\%/\sqrt{E}+1\%$. It is compared to $5\%/\sqrt{E}+1\%$ smearing for the photon case. Estimated resolution is fitted as a function of the induced energy and compared to the physics requirements, $35\%/\sqrt{E}$ for photons and $50\%/\sqrt{E}+5\%$ for neutrons.





Cost / Risk / Schedule

DONE! ☺

ECCE Project Plan Status

- Cost and Schedule Marathon – 11/4/2021
  - Complete review of all subsystems, including cost, schedule, risk, R&D
  - More details from Detector Team
- Remaining work:
  - Finalize project plan and associated schedule, risk, R&D documentation
    - Some additional scrubbing over the next week
    - Double-check subsystem risk updates incorporated
- Project plan will be made available as part of supplemental documentation.
- There is a *clear path* to achieving our goal of making ECCE *a low-risk, cost-effective, flexible and optimized EIC detector*

ECCE Cost *Snapshot* 11/7/2021

Analysis of current project plan costs from ORNL:

ADJUSTED ECCE Planning 11/7

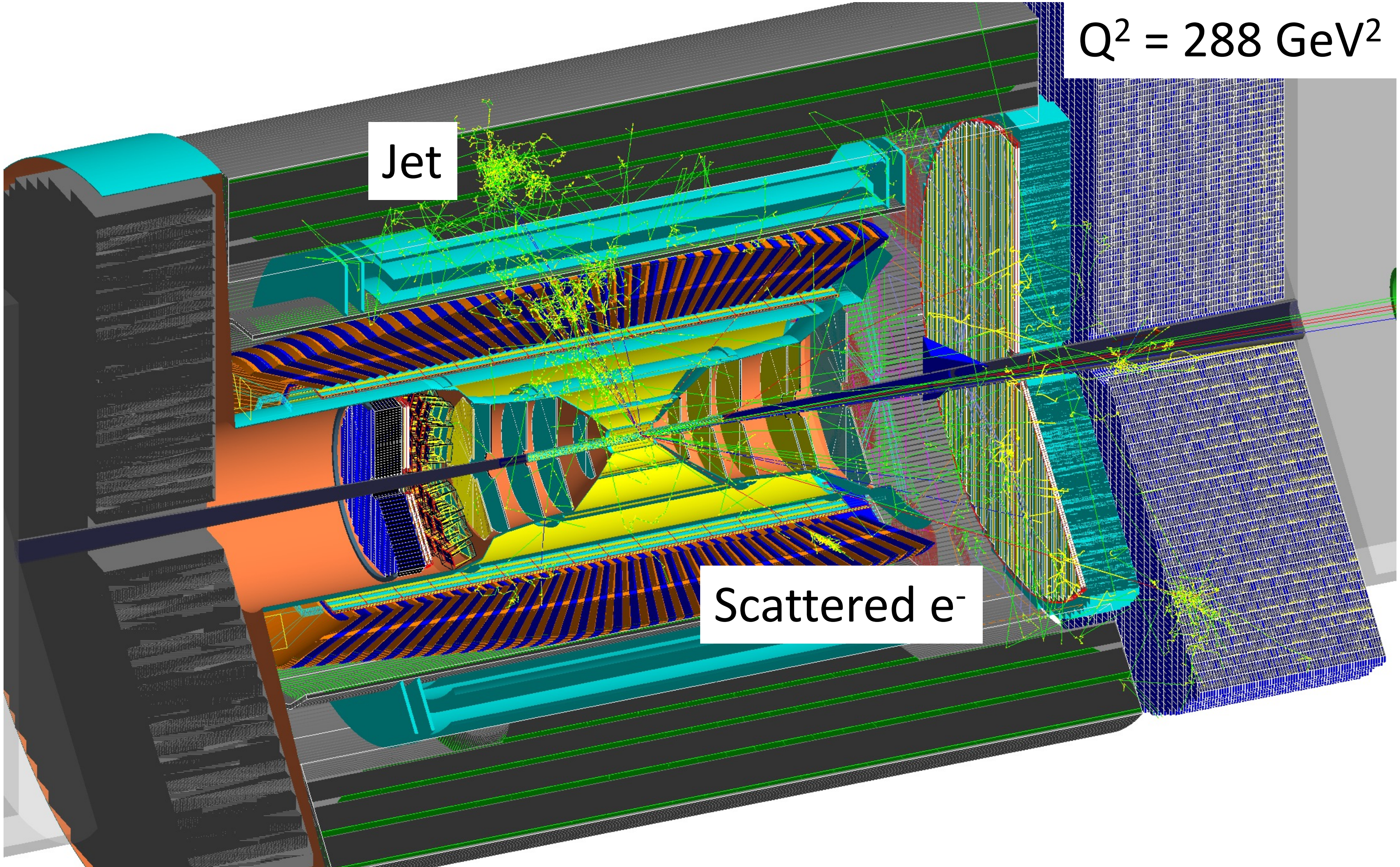
	In-Kind ($M)	On-Project ($M)	Total ($M)	PM Estimate ($M)	Deviation From Project Estimate (%)
Detector Management	0	7.4	7.4	7.4	0.00%
Detector R&D	0	12.251	12.251	12.1	1.25%
Tracking	7.183	22.881	30.064	31.1	-3.33%
PID	6.118	28.247	34.365	26.5	29.68%
EM Calorimetry	7.398	21.368	28.766	36.2	-20.54%
Hadronic Calorimetry	9.423	14.239	23.662	33.1	-28.51%
Magnet	9.037	3.391	12.428	29.7	-58.15%
Electronics	7.837	14.498	22.335	17.1	30.61%
DAQ Computing	1.151	5.689	6.84	8.7	-21.38%
Detector Infrastructure	4.111	22.289	26.4	26.4	0.00%
IR Integration & Aux Det.	7.283	0.138	7.421	8.1	-8.38%
Luminosity Monitor	1.475	0.388	1.863	2	-6.85%
Pre-Ops and Commissioning	0	8.7	8.7	8.7	0.00%
TOTAL	61.016	161.479	222.495	247.1	-9.96%
	66.32%	104.11%	90.04%		

NOTE: Includes <u>all</u> ECCE scope!

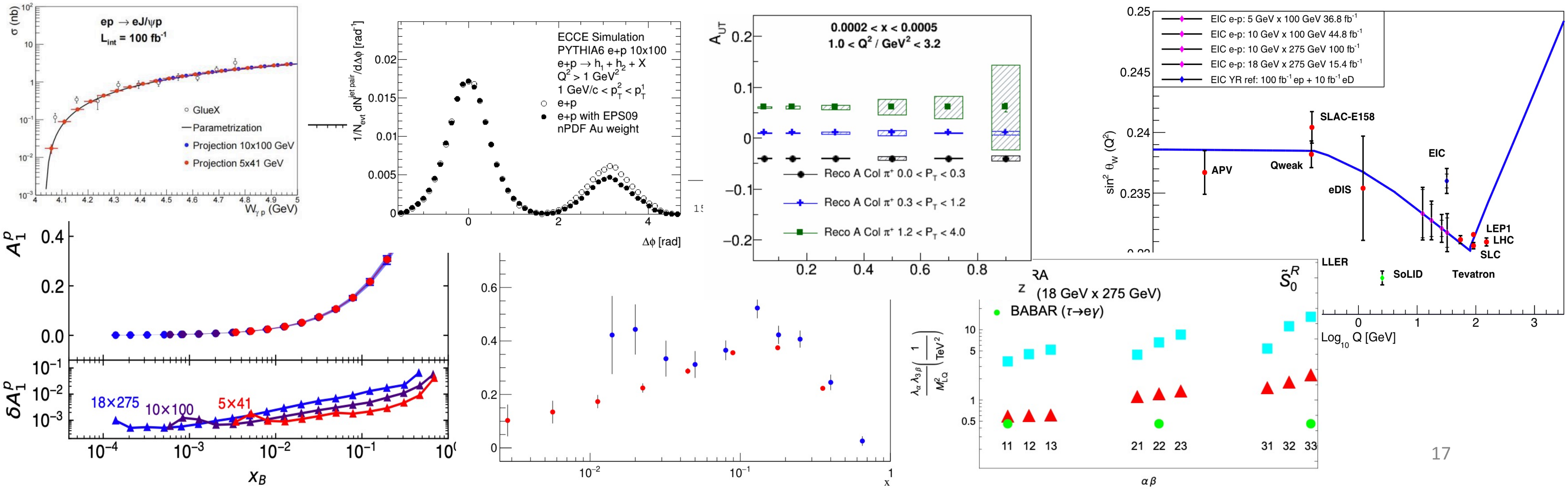
Total Delta ($M)	-24.605
In-Kind Delta ($M)	-30.984
On-Project Delta ($M)	6.379

Total cost *below* reference estimate
Underachieving on in-kind (66%)
On-project costs currently at 104%

Physics



ECCE Physics



ECCE Technotes

Technical	Physics	
BaBar solenoid	Jet Reconstruction	Inclusive reactions
Calorimetry	Diffractive & Tagged Reactions	Breit Frame jet reconstruction using Centauro Algorithm
Tracking	Exclusive Reactions	longitudinal double-spin asymmetry in SIDIS
Particle Identification	Open Heavy Flavor Nuclear Modification	XYZ Spectroscopy
DAQ & Electronics	DIS & SIDIS kinematic resolution	Dihadron Azimuthal Correlations
Far-forward / backward	single hadron transverse single spin asymmetry	Electroweak & BSM
Computing	unpolarzied TMDs	Quarkonia
Schedule, Cost, & Risk	nuclear matter Modification of jet yields	

ECCE Proposal

ECCE Proposal

ECCE path to collaboration formation

- ECCE chose to assemble as a *consortium,* as opposed to a *collaboration*.
- This allowed for a flexible, light-weight, structure that focus on detector design & performance studies with minimal biocritical overhead.
- Following the proposal review we will evolve into a formal collaboration.

ECCE path to collaboration formation

- The proposal will outline this process and an expected collaboration structure.
- It will also be clear that the outlined structure is only a discussion starting point, that is agreed upon by the ECCE consortium IB. The ECCE collaboration will eventually decide about the final structure.
- This is an important distinction. Following the review, the community might re-assemble. Efforts might be merged. Groups might switch efforts and those working on multiple efforts will likely choose one.
- It is important for new group to be part of the ECCE collaboration formation and not be tied down to a pre-determined structures.

ECCE path to collaboration formation

- Unlike the physics, detector, project, and DEI parts of the proposal, this section was not discussed with the consortium in detail.

- We will hold this discussion now ☺

ECCE path to collaboration formation

The ECCE *collaboration* is envisioned to deliver on three main objectives:

- Work with the EIC project to deliver an on-time and on-budget project detector based on the design presented above.
- Develop monitoring tools required to support the EIC commissioning using the ECCE detector.
- Develop data processing and analysis tools required to produce physics results very soon after data are starting to be collected.

For the successful realization of an on-time and on-budget project detector we put forward a collaboration leadership structure consisting of a collaboration elected IB chair and spokesperson, and a spokesperson appointed leadership team with two deputy spokespersons and a series of coordinators (technical; detector resources; physics; diversity equity and inclusion; and software and computing). Below we detail the expected responsibilities of each function in the leadership team:

ECCE path to collaboration formation

- **Spokesperson and deputies** are expected to manage and coordinate the collaboration activities. This include, for example, arrangement of regular collaboration meetings, oversight of scientific priorities, assessment of run plans and needs, coordination of communication with the EIC project, and solicitation and integration of new groups. We envision for the Spokesperson to be elected by the entire collaboration for a two year term and for a significant onsite presence to be required of either the Spokesperson or one of their deputies.

- **Institutional Board (IB) chair** is expected to set the agenda for IB meetings, handle any issues raised by collaboration members, appoint selected standing committees (e.g. talks committee) and ad-hoc committees when the need arises by the IB, setup IB votes, and manage the spokesperson election. In contrast to the deputy spokespersons and technical coordinators, who are appointed by the spokespersons, the IB chair is envisioned to be elected by the IB for a two year term. We expect that in the first election that IB chair will be appointed for three years such that future IB chair and spokesperson elections are offset by a year.

ECCE path to collaboration formation

- **Technical Coordinator** is expected to oversee and coordinate the day-to-day technical aspects of the experimental equipment and any upgrades the collaboration is planning. The Technical Coordinator is expected to have 100% on-site residency and work closely with the local EIC project teams at both BNL and JLab.

  As JLab and BNL are full partners in the EIC project, and significant part of the detector development leadership is foreseen to be taken by JLab, we expect to also appoint a deputy Technical Coordinator with significant on-site presence at JLab. This appointment will allow to best capitalize on the specific strength of each lab in detector construction and development, computing, electronics etc.

- **Detector Resource Coordinator** is expected to oversee and coordinate the user-provided in-kind contributions to the ECCE detector. The detector resource coordinator works hand-in-hand with both the collaboration and the EIC Project to help ensure the user commitments stay on track, and to help resolve potential issues. With time, as the detector construction progresses, we expect for the Detector Resource Coordinator role to evolve in a Detector Upgrade Coordinator role.

ECCE path to collaboration formation

- **Software and Computing Coordinator** is expected to oversee and manage development and implementation of software tools for the processing of acquired data for physics analysis, and coordinate the detector calibration and physics simulation tasks. The Software and Computing Coordinator will also oversees and coordinates the distributed computing tasks to various clusters available at BNL, JLab and key users institutions.
- **Physics Coordinator** is expected to oversee and manage the physics analysis tasks between the various physics working groups. Their goal is to ensures the physics data, as well as results from relevant technical studies, are analyzed and published in a timely fashion. The Physics Coordinator is expected to work closely with the theory community to maximize the impact of EIC data.

ECCE path to collaboration formation

- **Diversity Equity and Inclusion (DEI) Coordinator** is expected to oversee the general collaboration conduct to ensure ECCE is a welcoming environment were everyone can excel to the best of their abilities, independently of their origin and background. Specifically, the DEI coordinator will work closely with the collaboration leadership team to minimize bias (contuse or otherwise) in personnel appointments. They will serve as ex-officio member on all internal committees making personal decisions (e.g. talks committee) and will be in charge of ensuring the uphold of our code-of-conduct and bylaws and will setup review committees when complaints of violations come up.

ECCE path to collaboration formation

The spokesperson and IB chair election, as well as the initiation of the ECCE bylaws formation process, will take place as part of a 'collaboration formation meeting' that we expect to take place soon after the proposal review is completed and span several days. We emphasize that the decision to defer this process until after the proposal review is motivated by the expectation that that outcome of the review process can lead changes in how the EIC physics community arranged itself around the different efforts. Specifically, we expect for new groups to join ECCE and want to ensure they are fully integrated into our structure such that we best benefit from their expertise. To this end we believe it is important to for such ground to take an active part in the collaboration formation process and not be tied down by existing bylaws and an already appointed leadership team. Therefore, while discussions at the 'collaboration formation meeting' will initiate based on the structure described above (that is endorsed by the ECCE consortia IB), we will have the ability to refine and modify it to best fit the outcome of the proposal review process and the needs and views of the new collaborating institutions to best support our task to deliver an on-time and on-budget project detector.

Proposal Review process

Timeline for Proposal Evaluation

December 1, 2021 Proposals submitted: ATHENA, ECCE, CORE expected
Proposals distributed to Advisory Panel and DAC members

December 13-15, 2021 First public Advisory Panel meeting (3 days, Virtual)

- Presentations from proto-collaborations
- Panel discussion of DAC input (written report)
- Panel develops homework questions for collaborations to address at January meeting

January 19-21, 2022 Second 3-day public Advisory Panel meeting

- Responses to homework and further input from DAC
- Panel begins Report writing

March 1, 2022 Panel Report & Recommendations submitted

Detector Proposal Advisory Panel Public Meeting
December 13-15, 2021

(Remote, via Zoom)

Each Proto-collaboration will make two presentations:

Part 1: Overview of key points, addressing the science requirements in the Call for Proposals, the conceptual realization of the detector given the technology choices, and expected performance via simulation studies.

Part 2: Describe the collaboration structure, the proposed schedule and cost (including potential sources of non-project funding and assumptions), the R&D needs and risks, and potential upgrade paths.

Draft Charge to the Advisory Panel

The primary goal of the EIC Detector Proposal Advisory Panel is to advise BNL and JLab on how to realize an optimal set of experimental equipment at the EIC utilizing the resources and expertise of the EIC user community. This advice should address the following:

- The first priority is to identify the optimal approach to realize a detector system, designated Detector 1, to be primarily funded by the EIC project and capable of addressing the science case in the EIC White Paper and NAS Report.

- The second priority is to assess options for an alternate detector system, designated Detector 2, possibly addressing science beyond the White Paper and NAS Report and/or enabling some complementarity to Detector 1. Such a second detector could be envisioned to be realized up to 3-5 years after Detector 1. Currently, the EIC project scope does not include the construction of Detector 2 or the accelerator components needed for the second interaction region.

Draft Charge to the Advisory Panel

Based on the proposals submitted, the Panel should evaluate the scientific merit, the expected scientific performance, technical risk, cost, and schedule of the experiment proposed as well as the availability of resources. We welcome guidance and advice on the following topics:

- What are the strengths and weaknesses of the submitted collaboration proposals for detectors at the EIC, including the criteria listed above?
- How can the resources and expertise of the EIC user community be best utilized?
- Comment on the complementary science reach of two potential EIC detectors to be located at Interaction Points 6 (IP6) and 8 (IP8).

EIC Project Detector Advisory Committee (DAC)

Name	Institition	Expertise
Edward Kinney	Boulder CO	EIC Science, general
Ewa Rondio	Warsaw	EIC Science, general
Werner Riegler	CERN	Integration
Greg Rakness	FNAL	Integration
Peter Krizan	U Ljubljana	Particle Identification
Ana Amelia Machado	University of Campinas, Brazil	Particle Identification, Sensors
Heidi Schellman	Oregon State	Computing
Brigitte Vachon	McGill	Electronics
Glenn Young	BNL	Calorimetry
Etiennette Auffray	CERN	Calorimetry
Andrew White	U. Texas Arlington	Tracking
Chi Yang	SDU China	Tracking

+ two project experts focusing oncost / risk / schedule

To aid the Panel in its assessment, the EIC Project Detector Advisory Committee (DAC) will provide an independent evaluation of each of the detector proposals, based on the DAC's expertise in detector technologies and related cost and risk assessment.

Next steps

- Working groups focusing on tech notes
- SC (+ godparents + …) working on proposal text.
  - ➔ Full draft by end of week.
  - ➔ To consortium review by ~mid month.
- Running high/low field simulations and a few selected studies as the need arises.