

Update on Project Detector / Detector 1

EIC User Group Quarterly Meeting – 31 March 2022

Silvia Dalla Torre, Or Hen, Tanja Horn,
John Lajoie, Ernst Sichtermann,
Bernd Surrow, Thomas Ullrich

DPAP report

- ❑ The final DPAP report was released on 21 March and can be downloaded from the [DPAP Panel Meeting web site](#). Based on the DPAP recommendations, the EIC project has confirmed that the ECCE detector design will serve as the reference in developing a technical design for CD-2/3a.

*“The EIC Project recognizes that the panel recommended ECCE as the Project Detector. As described in the panel report, we will urge the proto-collaboration to: (1) **integrate new collaborators** in a manner that enables them to make contributions that impact the capabilities and success of the experiment in significant ways, including new collaborating individuals and groups into positions of responsibility and leadership; and (2) **integrate new experimental concepts** and technologies that improve physics capabilities without introducing inappropriate risk. **ECCE is the reference design for this optimization and consolidation so that the Project Detector can advance to CD2/3a in a timely way**” – email communication from the EIC Project Team on 13 March 2022.*

- ❑ From the DPAP report: “...none of the three proto-collaborations is yet large enough or strong enough for successful development of a detector for Day 1 of the EIC”. → wise to combine efforts

The Path Forward

Work starting by working with the EIC community to consolidate and develop the EIC project detector based on the ECCE reference design. Active discussions with EIC PM, the EICUG Steering committee, and the proto-collaborations are underway with two main focus areas:

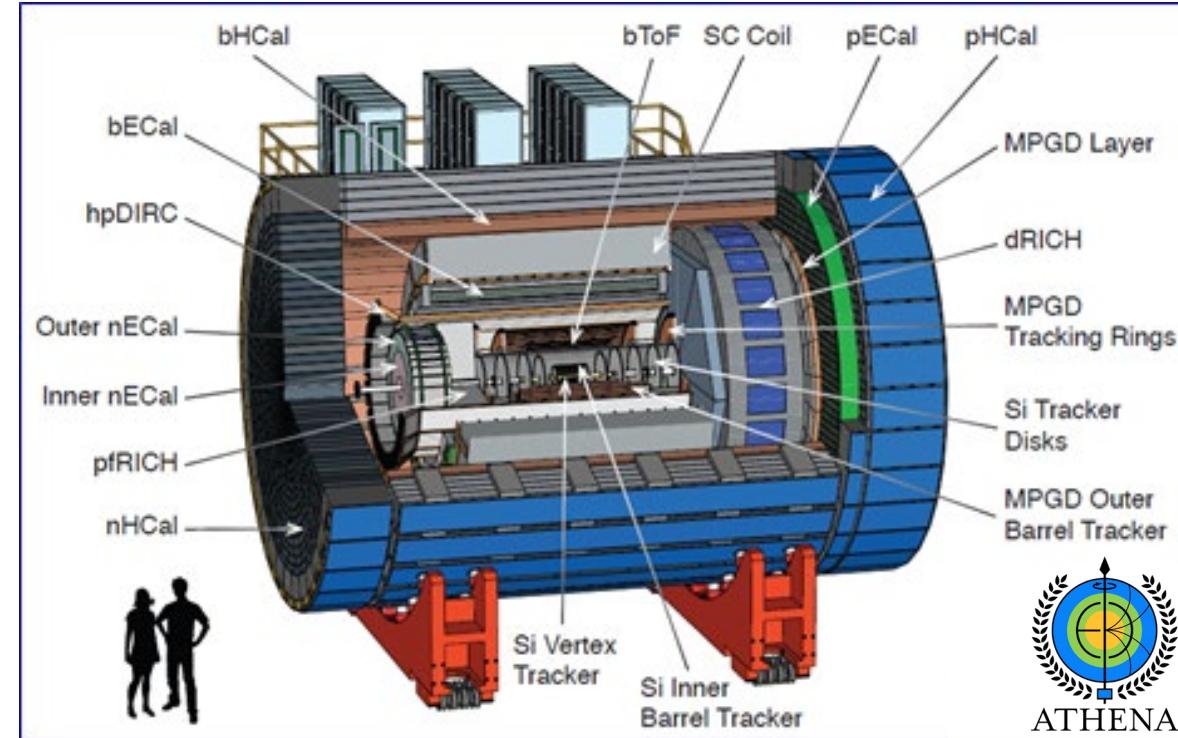
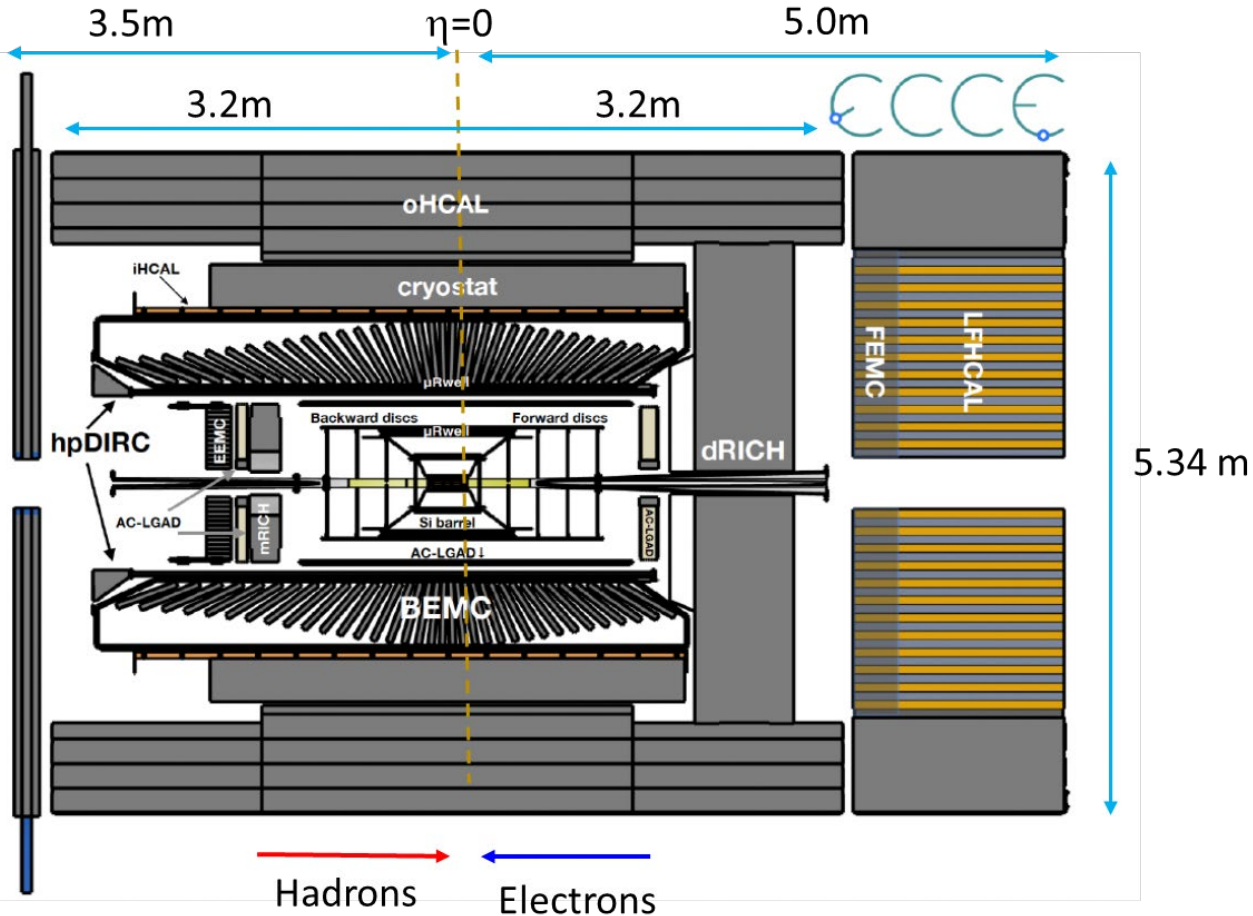
- *Evolve the reference design* towards the technical design of a global detector based on science and an eye to cost and risk
- Move towards the new Detector 1 collaboration including the elements of the Proto-Collaborations' "Culture"

Calendar of Meetings

Also internal proto-collaboration meetings with their Teams/Working Groups and Teams/WG+Conveners

- ❑ March 10: ECCE and ATHENA Follow-up Meetings
- ❑ March 10, 11: ECCE and ATHENA separately with host labs (Tim Hallman participating)
- ❑ March 13: communication from EIC Project
- ❑ March 14: Follow-up Meeting ECCE with host labs
- ❑ March 14: Reach out from EIC Project for meeting with ECCE and ATHENA Leadership on detector 1
- ❑ March 20: Joint meeting ECCE-ATHENA-EIC Project, Action items defined
- ❑ March 22: ECCE and ATHENA Leadership meeting
- ❑ March 24: Follow up joint meeting ECCE-ATHENA-EIC Project, initial thinking on optimization and consolidation of detector 1 based on the ECCE reference design towards detector 1 technical design
- ❑ March 29: Follow up ECCE and ATHENA Leadership meeting
- ❑ March 29: Kickoff meeting on Path to detector 2: ATHENA, CORE, ECCE, EIC UG Chair/Vice-Chair, EIC Project
- ❑ March 31: Joint presentation at Quarterly EIC UG meeting on the Path Forward

The ECCE Detector Design



Also need to include:
 + Far-Forward/Far-Backward
 + DAQ/Electronics and Software

Now in the optimization/consolidation phase need to also compare with ATHENA detector solutions

Activities Needed by the Project for the next Review and Progress Towards CD-2/3A

(Initial thoughts by EIC PM presented in 3/24 meeting with ATHENA-ECCE-EICPM)

- ❑ Update existing P6 Cost and Schedule for EIC Detector starting from ECCE Reference Design information and folding in ATHENA information as sounding board (assigned to EIC Project L3 CAMs).
- ❑ Magnet: risk reassessment and start of 1.5 T E&D contract with CEA Saclay (assigned to EIC Project Magnet Team).
 - revisit and update the existing assessment with additional information on the expected radiation dose during sPHENIX running as well as sPHENIX operations
- ❑ Global inventories (assigned to ECCE and ATHENA leadership)
 - possible in-kind contributions, on which time scale can they be realized - discussing EIC-Asia and EIC-Europe meetings in the near future
 - Expertise/interest of possible groups and gap analysis

Activities to fully define the Project Detector Technically

(Initial thoughts by EIC PM presented in 3/24 meeting with ATHENA-ECCE-EICPM)

- ❑ Detailed ECCE detector space, dimensional and material information to ensure all start from the same page for simulations (assigned to ECCE Team).
 - Layout ECCE in a CAD program to start on the detailed design of the individual sub-detectors, support structures, front-end electronics and services
- ❑ Reach out to Si Consortium, EEmCal consortium, dRICH and hpDIRC groups and all ongoing R&D efforts of interest for Detector-1 to have them check/validate the ECCE reference detector design is optimized (within available space).
- ❑ Establish joint working groups on:
 - Consolidation and optimization of detector technologies
 - Define an electronics group and embed it in these joint working group meetings to progress on ASIC and overall readout design/needs
 - Advise on path to collaboration formation

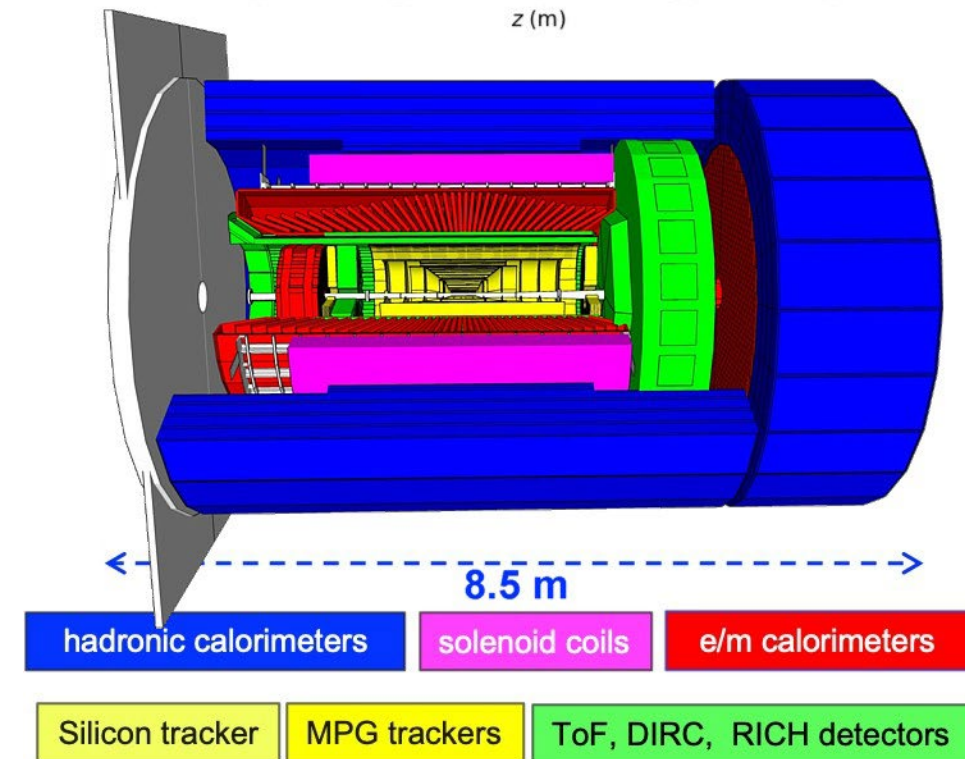
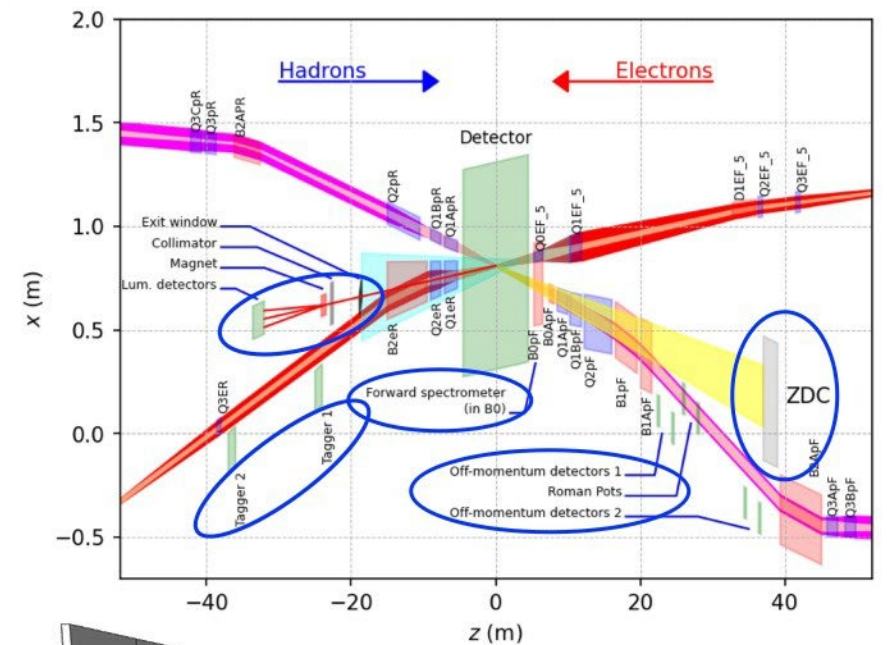
Proposed Charges for Joint Working Groups

- ❑ Create joint homogeneous working groups grouping items listed into existing Working Group Structures of ATHENA and ECCE
- ❑ Reach out to existing Consortia that seem universal (EICSC, EEEMCAL, MPGD, DIRC, DRICH)
- ❑ Each joint WG should hold a kickoff meeting where the designs of each proposal are presented in detail
- ❑ WG conveners lead a discussion to identify any non-trivial differences and/or need of further optimization
- ❑ For each non-trivial difference working groups will then work to prepare a pro/con list accounting for technical performance risk and cost. Decision on non-trivial differences will then be done in consultation with the project.
- ❑ Constant validation of performances for physics during the optimization process
- ❑ Working groups will work closely with the project towards the technical design taking into account global integration

Towards a Technical Design

In organizing kickoff meetings/path forward take into account the different needs of the subsystems

- ❑ Systems that share many commonalities between the ECCE and ATHENA designs and/or physics output and do not seem to be very sensitive to design differences.
- ❑ Systems that differ significantly between the ECCE and ATHENA designs, but have a similar technical approach/design concept. Do not anticipate substantial complications comparing their performance, risk and cost in a way that will allow making an informed decision on the appropriate setup for the technical design stage.
- ❑ Systems that are very different between the ECCE and ATHENA designs, cover a large rapidity range, and are very versatile in terms of the physics they are used for (e.g., different focus/requirements in the negative eta vs. positive eta range). Anticipate some challenges in comparing their performance.



What's next – 1-4 weeks timescale

Activities towards the consolidation and technical evolution of the ECCE Reference Design

- Collect information on detailed detector space, dimensions, materials – CAD layout
- Collect information on global inventories (in-kind, expertise, etc.)
- Reach out to the Consortia to have their contribution in checking/validating if the reference detector design is optimized

Start the formation of joint Working Groups ASAP, e.g., through kick-off meetings/mini-workshops organized by the joint conveners

- Strive to have first working groups working together by the end of next week / early following week

Towards a Technical Design – Summary

Joint WG process is an opportunity to build collaboration and trust – understand why different choices were made and how to improve the reference design so that the full EIC program can be carried out

Anticipate the **first Detector 1 Meeting** for the **end of April** – tentatively Thursday 28 April at 10:00AM ET (to be confirmed)