Highlights of the homework answers: ATHENA management

ATHENA Collaboration meeting
February 3rd , 2022

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ATHENA

Questions concerning ATHENA management

- 6 DPAP questions and 1 DAC question have addressed management aspects
  - DPAP C-1

    Q: What are your plans for incorporating engineering and other technical effort into the project

  - DPAP C-2

    Q: How are you evaluating that the groups taking responsibility for detector systems and their subsystems have the technical capability necessary to successfully execute the tasks?

  - DPAP O-1 & further DPAP question along the same line

    Q: What staging scenarios are available, if staging were to become necessary?

    QUESTION:
    At a very high level, what would be your approach if staging of the detector construction were to become necessary, either due to technical or funding issues? How would this impact the cost profile and need for Project funds?

  - DPAP O-2

    Q: Describe the accessibility of your detector systems and their electronics for urgent interventions and for annual maintenance. How long does urgent access to detector components and electronics require during beam operations? Are there any detectors or electronics that are not accessible even during annual maintenance periods?

  - DPAP E-6

    Q: Describe how the development of the readout electronics for different subdetectors will be centrally coordinated.

  - DAC CR1

    Q: ***When would decisions need to be taken on upgrade vs. baseline technologies (for each decision)? What is the cost related to carrying the baseline development to those dates?***

Questions concerning ATHENA management

- General comments
  - Several questions go beyond the present stage of ATHENA life and activity
    - e.g., our scientific activity is presently organized around the WGs guided by the WG conveners
    - It is clear that, moving toward TDR and, later, construction, this has to evolve in a different structure, needed:
    - A Technical Coordinator (TC) and a Technical Board (TB)
    - Technical coordinators of specific sectors (e.g. subdetector systems, electronics, …)
    - Subdetectors boards (representative of involved institutions and technical experts)
  - This evolution has to be undersood in detail, discussed at appropriate level within the whole collaboration
  - → Our answers have explained that we are fully aware of this needs,
  - → We included examples of potential bodies to be established in ATHENA,
  - → The construction of all this is totally open to the inputs of the whole Collaboration and no specific agreement/promise has been taken

Proposal-related activity after the submission

- 6 DPAP questions and 1 DAC question have addressed management aspects

➢ DPAP C-1

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Relationship between the EIC project and ATHENA Collaboration

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Relationship between the EIC project and ATHENA Collaboration

- General comments
  - Questions go beyond the present stage of ATHENA life and activity
    - e.g., our scientific activity is presently organized around the WGs guided by the WG conveners
    - We all know that, moving toward TDR and, later, construction, this has to evolve in a different structure
    - Future needs:
    - A Technical Coordinator (TC) and a Technical Board (TB)
    - Technical coordinators of specific sectors (e.g. subdetector systems, electronics, …)
    - Subdetectors boards (representative of involved institutions and technical experts)
    - …
  - This evolution has to be understood in detail, **discussed** at appropriate level **within the whole collaboration**
  - → Our answers have explained that we are fully aware of this needs
  - → We included examples of **potential bodies** to be established in ATHENA
  - → The future construction of all this remains totally open to the inputs of the whole Collaboration

Relationship between the EIC project and ATHENA Collaboration

- incorporating engineering and technical manpower
  - Precise labor needs to be elaborated (this job started within the costing exercise)
  - Along the project execution, periodic reporting to the project will included labor needs and achievements
  - engineers and high-level technicians providing non-trivial contributions will be associated to the intellectual recognition of the detector or sub-detector systems

- Central coordination of electronics
  - **Full coordination of the 2 main ingredients:**
    - the **internal ATHENA** effort
      - Internal coordination bodies related to electronics matter
    - the **project** effort, with 2 main branches
      - FEE ASIC development and coordination
      - DAQ development and coordination

Relationship between the EIC project and ATHENA Collaboration

- evaluating that the groups taking responsibility for detector systems and their subsystems have the technical capability necessary to successfully execute the tasks
  - ➢ Active role of ATHENA as a collaboration in the agreements between the project and the Institutions:
    - ⊙ **The agreements between the Project and the Institutions must be formulated in consultation with ATHENA**
  - ➢ **ATHENA can contribute** to establishing capabilities with **its own experts**
  - ➢ **Evaluation elements:**
    - ⊙ **previous experience** of the groups
    - ⊙ official **commitments of the groups**
    - ⊙ **visits** to their **laboratories/workshops**

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Detector Maintenance, Options and strategies

Detector Maintenance, Options and Strategies

- Largely related to the conceptual design of the detector infrastructure (support and services) illustrated in our supplemental material
  - **all** detector systems are accessible during an annual maintenance period
    - roll the detector from its in-beam location into the assembly hall at IP-6;
    - one week to roll out and one week to roll back (based on STAR experience)
  - Detector systems accessible **in beam location**
    - timeframe 2+ hours – one needs to open endcap calorimeters
      - **Lepton Endcap:** hadron and electromagnetic calorimeter
      - **Barrel:** Hadron Calorimeter, DIRC, restricted access to Pb/SciFi ECal-electronics
      - **Hadron Endcap:** hadron and electromagnetic calorimeter, GEM-Tracker behind dRICH
      - **other systems:** Read-Out electronics (fADCs, TDCs, …) , DAQ, timing system, HV, LV, gas-systems
  - For all the front-end electronics, LV, HV systems of the detectors will have **remote soft and hard resets integrated,** all cooling systems will have **emergency interlocks to shutdown**
  - Access to FF, BF: **during short access periods** → timeframe 1+ hours

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Collaboration Strategy, Upgrades and staging

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Collaboration Strategy, Upgrades and Staging

- About upgrading the ATHENA baseline
  - ➢ We have strictly followed what is stated in our Proposal
  - ➢ In general, the common answer for all possible upgrades of the present baseline design is the finalizing of the TDR for CD-3 (July 2024) which implies ~March 2024.
  - ➢ Later decision implying Change Control Process can be envisaged in a limited number of cases
  - ➢ We have discussed in detail all the upgrade cases envisaged in the Proposal, namely:
    - ⊙ μRwell
    - ⊙ Photosensors
    - ⊙ Radiator gas in dRICH
    - ⊙ Aggregation cards instead of FELIX cards
  - ➢ About costing, the cost to bring the suggested technologies to a level where they can become baseline technology depends on the required R&D and engineering cost

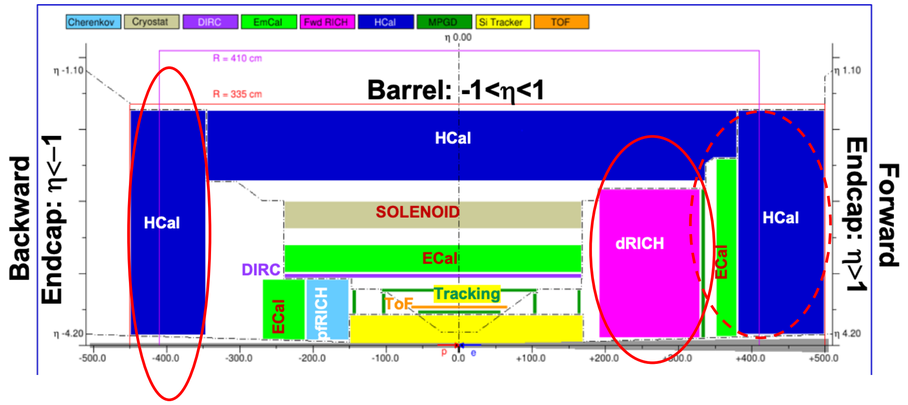
Relationship between the EIC project and ATHENA Collaboration

- About staging
  - ➢ An important **clarification**: following our explicit request, DPAP has explained that, in their questions, **staging does not mean descoping, it is merely a delay** dictated by financial or technical issues
  - ➢ Or first answer (question O-1)
    - ⊙ ATHENA design is optimized; it already represents an effort minimizing the devices at detector design level.
    - ⊙ Subsystem removal or delay as imposed by a staging process, will negatively impact the physics capabilities.
  - ➢ DPAP insisted also asking for costing implications
    - ⊙ Underlying once more the impact on physics reach, we built 3 hypothetical scenarios and related costing implications

Relationship between the EIC project and ATHENA Collaboration

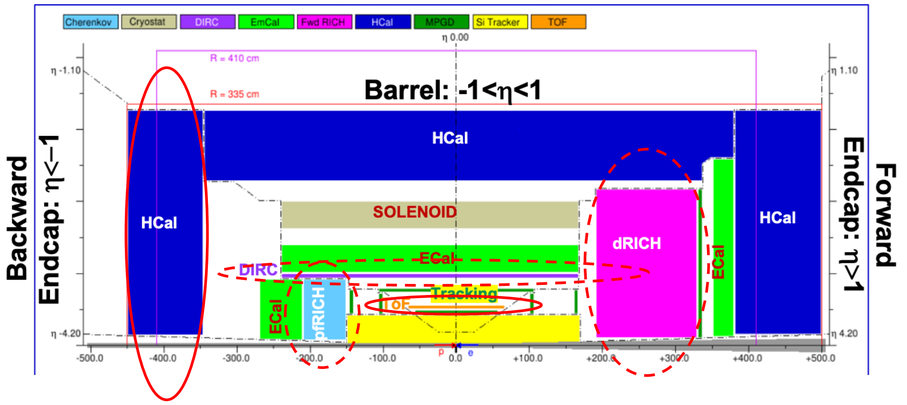
General Philosophy to choose the staging scenarios: the integration of the staged detector(s) can be done without compromises from the beginning, to make a later installation as seamless and cost / time effective as possible

Scenario-1:



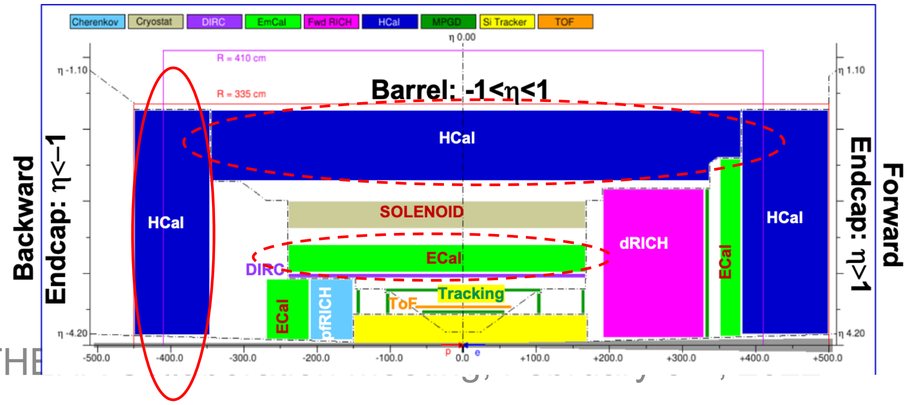
- no dRICH
- no μRWell tracker behind dRICH
- no nHCAL
- no readout electronics of pECal and pHCal

Scenario-2:



- no ToF
- no nHCAL
- no photon-sensors and readout electronics of PID-detectors (dRICH, DIRC, pfRICH)

Scenario-3:



- no Si-sensors and readout electronics for imaging layers of bECal
- no Scintillators and readout electronics of bHCal
- no nHCAL

Relationship between the EIC project and ATHENA Collaboration

- some limited reduction of the costing rate in the early years of the project (detector construction period) can be achieved moving between 10 M and 20 M from period 2026-2029 to 2030-2031
- the effect of staging results in an increase of the total project cost
  - ➢ **Material and labor** : + 2M-3M (longer escalation period)
  - ➢ **Extra installation resources** are not included in these estimates, even if they are probably not particularly relevant thanks to the careful choice of the staged items, where only items that do not imply major detector disassembly/reassembly have been considered
  - ➢ Also the **relevant extra cost corresponding to support the work force for two more years** is not included in our estimations

- The **impact** of any staging scenario is detrimental **on the physics reach of the ATHENA detector** and, in case of further delays, would prevent to match the WP and NAS physics scope

- The **impact** of staging **on the coherence and enthusiasm of the collaboration and in-kind contributions** could not be evaluated in such short time