***Current ATHENA proposal does not fit the guidance for “EIC Detector 1”***

“Detector 1 Collaboration Proposals: Experiments must address the EIC White Paper and NAS Report science case. The *collaboration should propose a system* that meets the performance requirements described in the EIC CDR and EICUG YR.”

 **Problem with the proposed tracking and PID setup:**

1. So far, all simulation results were done for “one particle per event” without realistic hit reconstruction, track finding, and backgrounds connected to high intensity E- and Hadron beams. So, these results can be misleading.

2. The proposed Barrel (+/- 1 in pseudo rapidity) tracking and PID setup with 3T B-field will “provide” only a maximum of 4-5 hits/track (including 3 hits from the vertex detector) for particles with Pt (P) less than 0.23 (0.36) GeV/c, and there is no PID. For particles with Pt (P) less than 0.42 (0.62) GeV/c 4 more hits/track will be added, but there is no DIRC (PID) data. It means 60-70% of charge particles in this pseudo rapidity interval or will not be reconstructed either PID will not be done (see the spectrum in YR).

3. It has not been demonstrated how primary and secondary vertexes can be found and reconstructed in the proposed setup. Thus, there are no K0 and Λ Physics in the proposal.

4. The necessary trigger approaches were not discussed entirely.

5. What arguments were used to select a “Large Size (in R) Magnet”? What are PRO/CONs in a comparison with “Compact setup design” (only Si tracking setup)?

**Possible tracking and PID option to fix above issues:**

1. **Compact setup (smaller in R magnet).**

**Significantly reduce the cost of: Magnet, EMC, (HCAL+muon detectors), DIRC (including end-cup setups).**

 **Funding can be available for 2-3 more Si layers in R, plus second ToF in ~19 cm R position. (ALICE-3 LoI example).**

 **Aerogel (only) detectors in the hadron end-cup (Eta ~1-2)??**

 **And RICH + ToF for Eta > 2??**

 **B)**  **If a Large Size Magnet is the final decision, use in the Barrel setup an additional miniTPC detector with GridPix readout in the available radial position (R = 20-45 cm) and +/- 45 cm in Z.**

1. It is very well known that TPC is the best for track finding including secondaries even with possible background, and the most cost-effective approach.

2. A small size TPC “allows” construction of a detector with rather small thickness both the field cage and Cathode (E- scattering direction) using available experience.

3. The GridPix technology was invented and tested to be sensitive to each ionization electron (LC TPC team). A stand-alone simulation demonstrated that needed PID performance (dN/dX) up to 0.6 GeV/c (exactly the gap in DIRC response) and a lot of tracking hits in the gas thickness >=25 cm with the precision (including diffusions) into 65-105 µm limits can be realized.

4. From another side the GridPix technology is fast and the best to minimize material thickness in the TPC read-out end cap (Hadron’s direction). Only this part of the miniTPC “needs” R&D efforts to select the read-out setup, gas mixture and guarantee the needed cooling performance.

5. A miniTPC can be considered only as part of the “Day 1” setup, because of the specifics of an installation procedure and support structure, and for these reasons cannot be proposed as an upgrade option.

 So, have the ToF as an upgrade option.

 ***Once more. Any (final) simulation results can be considered and discussed only with realistic detector response simulation and all backgrounds included.***