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ATHENA –A new detector proposed at the Electron-Ion Collider

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The ATHENA (A Totally Hermetic Electron-Nucleus Apparatus) detector is designed to deliver the full physics program of the Electron-Ion Collider (EIC) as set out in the community EIC White Paper and the U.S. National Academy of Sciences report, providing the best possible acceptance, resolution, and particle identification capabilities. ATHENA has been designed to accommodate all necessary subsystems without compromising performance, leaving room for future upgrades as an entirely new detector. Central to the proposal is a new, large-bore magnet with a maximum field strength of 3T. Particle tracking and vertex reconstruction will be performed using next-generation silicon pixel sensors and state-of-the-art micro-pattern gas detectors. Combining magnetic field strength and high resolution and low mass tracking technologies optimizes momentum resolution and vertex reconstruction. The large bore of the magnet allows for layered, complementary, state-of-the-art particle identification technologies. A novel hybrid imaging/sampling electromagnetic calorimeter is proposed for the barrel region of the detector, along with a high-resolution crystal calorimeter in the electron-going direction. The hadron endcap will have calorimetry, tracking, and particle identification detectors optimized for high-momentum hadron identification and high-energy jet reconstruction. We have striven for hermeticity by closely integrating the far-forward and far-backward detectors with the central detector to achieve maximal kinematic coverage and optimize particle detection at small scattering angles. A careful balance between the choice of cutting-edge and mature detector technologies achieves the necessary detector performance while minimizing risk and providing a cost-effective solution achievable on the required timescale. Scalable modern technology choices assure optimum performance for multi-year operations from day one.
The review of the ATHENA detector following the Call for Collaboration Proposals for Detectors at the EIC is still ongoing. The outcome of this review process is expected to be announced at the beginning of March 2022.

Submitted on behalf of a Collaboration?

Yes

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