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| Requirements, Specifications, and Interfaces: Interface Requirements for the EIC Detector Systems |                  |                                   | Revision: 00          |

Electron-Ion Collider, Requirements, Specifications, and Interfaces

# Interface Requirements for the EIC Detector Systems

## December 12, 2024

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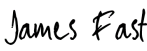
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| 00         | 12/12/2024     |                      | Initial release   |

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## LIST OF ACRONYMS

|         |                                                   |
|---------|---------------------------------------------------|
| AC-LGAD | AC-Coupled Low-Gas Avalanche Detector             |
| ATLAS   | Automatically Tuned Linear Algebra Software       |
| CDR     | Conceptional Design Report                        |
| COTS    | Commercial Off the Shelf                          |
| DAQ     | Data Acquisition                                  |
| DET     | EIC Detector                                      |
| DIRC    | Detection of Internally Reflected Cherenkov Light |
| DVCS    | Deeply Virtual Compton Scattering                 |
| EEI     | Electrical Equipment Inspection                   |
| EIC     | Electron-Ion Collider                             |
| EMI     | Electromagnetic Interference                      |
| ESR     | Electron Storage Ring                             |
| FCC     | Federal Communications Commission                 |
| FEB     | Front End Board                                   |
| FELIX   | Front-End Link Exchange                           |
| FEP     | Front-End Processor                               |
| GEM     | Gas Electron Multiplier                           |
| HSR     | Hadron Storage Ring                               |
| HV      | High Voltage                                      |
| HVAC    | Heating/Ventilation/Air Conditioning              |
| IP      | Interaction Point                                 |
| IR      | Interaction Region                                |
| LED     | Light Emitting Device                             |
| LV      | Low Voltage                                       |
| MAPS    | Monolithic Active Pixel Sensor                    |
| ML      | Machine Learning                                  |
| MPGD    | Micro Pattern Gaseous Detectors                   |
| NAS     | National Academy of Sciences                      |
| NEC     | National Electric Code                            |
| NEMA    | National Electrical Manufacturers Association     |
| NFPA    | National Fire Protection Association              |
| NRTL    | Nationally Recognized Testing Laboratory          |
| OS      | Operating System                                  |
| PCB     | Printed Circuit Boards                            |
| PID     | Particle Identification                           |
| PWO     | PbWO <sub>4</sub>                                 |
| RCS     | Rapid Cycling Synchrotron                         |
| RFI     | Radio Frequency Interference                      |
| RICH    | Ring-Imaging Cherenkov Detector                   |

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|      |                            |
|------|----------------------------|
| RPOT | Roman Pots                 |
| STAR | Solenoidal Tracker at RHIC |
| UL   | Underwriter Laboratories   |
| VAC  | Volts A/C                  |
| VME  | Versa Module Europa        |
| WAH  | Wide Access Hall           |
| WBS  | Work Break Down Structure  |

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## Interface Requirements for the EIC Detector Systems

### 1. PURPOSE AND SCOPE

This document presents the interface requirements for the EIC Detector Systems. This document is a requirement of the Systems Engineering and Requirements Management Plans [6][5]. Interfaces are part of the requirements management process and are collected and maintained in accordance with the Interface Management Plan [7]. The Interface Management Plan specifies the need for Interface Requirement Documents, which are companions to the general/functional/performance requirements documents. Taken together, they provide a complete foundation for designing detector systems that can successfully integrate and operate within the larger EIC environment.

Interfaces are listed by sub-system beginning in section 4. Each subsection within section 4 will contain the interfaces associated with an individual sub-system. Interfaces may be repeated in multiple sub-systems if they are connected with one another.

### 2. DETECTOR SYSTEMS SUMMARY

The physics program of an EIC imposes several challenges on the design of a general-purpose detector, and more globally the extended interaction region, as it spans center-of-mass energies from 29 GeV to 141 GeV, different combinations of both beam energy and particle species, and several distinct physics processes. The various physics processes encompass inclusive measurements  $e + p/A \rightarrow e' + X$ ; semi-inclusive processes  $e + p/A \rightarrow e' + h + X$ , which require detection of at least one hadron in coincidence with the scattered lepton; and exclusive processes  $e + p/A \rightarrow e' + N' A' + \gamma/h$ , which require the detection of all particles in the reaction with high precision. The EIC CDR [3] and the Yellow Report [4] discuss in detail how the requirements on the accelerator, the interaction region and the experimental equipment flow down from the EIC science.

The EIC general-purpose detector, ePIC, must be capable to cover the physics program detailed in the NAS review [1] at the full center-of-mass energy range and luminosity ( $10^{33-34} \text{ cm}^{-2}\text{s}^{-1}$ ). The central detector consists of a solenoidal magnet, the central detector with 6 subsystems and a lepton and hadron endcap with each 6 subsystems. Further data-acquisition and trigger, infrastructure, and integration as well as online software efforts are included in the scope. The EIC experimental equipment does not stop at the central detector. To realize the full science program, the design of the IR and the integration of the far backward and forward detectors along the outgoing lepton and hadron beam are equally critical. There are further implications to both the detector and the integration of the detector and interaction region to accommodate the large range of ion species required for the EIC science program, and the various electron and proton/ion beam polarizations.

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Figure 1 illustrates the EIC accelerator complex, at the time this document was signed the decision was just taken to remove the RCS from the tunnel and build a green-field solution, this is not yet reflected in the figure. Figure 2 shows the EIC general-purpose detector and how it is embedded together with its ancillary detectors into the EIC interaction region at IR6.

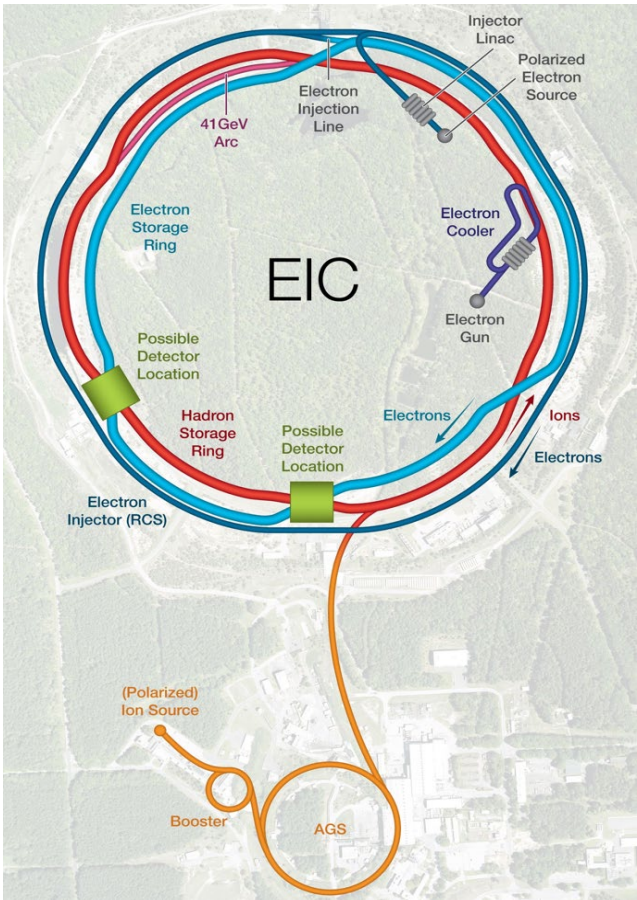


Figure 1: The EIC accelerator complex, the EIC detector is located at the IR6 interaction region



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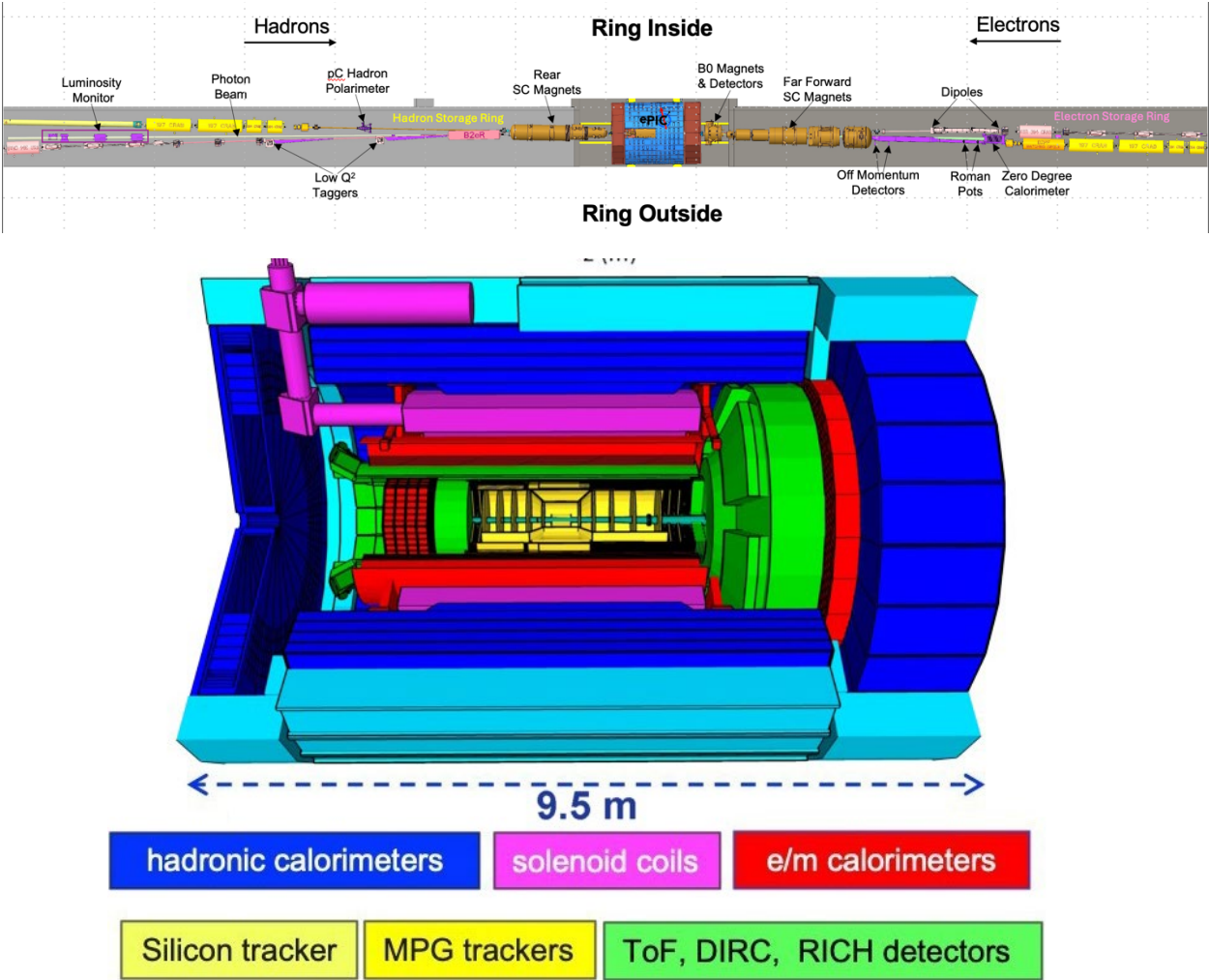


Figure 2: The top shows, how the EIC general-purpose detector, ePIC, is embedded together with its ancillary detectors into the EIC interaction region at IR6. Note that the forward direction is the on the incoming lepton beam side and the backward direction is on the incoming hadron beam side in this figure. The bottom shows the ePIC detector indicating in the different colors the different subsystem detector categories.

3. DETECTOR SUB-SYSTEMS

The detector system consists of ten sub-systems that are aggregated into a single, fully integrated detector package that will operate within the interaction region. Each of these sub-systems has a complete set of requirement and interface documents that describe its functions, performance requirements and interconnectivity both within the detector system and to the larger environment. The following sub-systems are included in the detector.

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### 3.1. Tracking Systems

The compact tracker consists of a MAPS silicon barrel vertex detector augmented by MAPS tracking layers and by a set of forward/backward disks, and several GEM stations, all placed into solenoid with a 1.7 T solenoidal field, with an inner diameter of 2.84 m. To have good, charged particle-identification (PID) at central rapidities, a DIRC is complemented with AC-LGAD layers for tracking and Time-of-Flight. The vertex detector covering the central rapidity range (-1 to 1) has multiple layers of high-resolution MAPS sensors with a 20  $\mu\text{m}$  pixel size and an effective thickness of only 0.3% radiation length per layer. Such a setup enables a momentum resolution better than 3% for scattered electrons and secondary charged hadrons for momenta up to a few tenths of GeV/c in the pseudo-rapidity range  $-4$  to  $4$ . For a compact forward tracker design, it is critical to maintain high spatial resolution.

### 3.2. Particle Identification Systems

The PID detector systems cover the three main regions of the central detector. These are the magnet bore region and the two regions in the direction of the incoming (backward) and outgoing (forward) hadron beam. The central region is assumed to harbor a high performance DIRC (hpDIRC) detector based on detector components from the BaBar DIRC, in particular the quartz bars. It is optimized by a focusing system to provide proton-kaon separation up to 6GeV/c. The forward region will be equipped with a dual RICH (dRICH) detector optimized for a wide range in particle momenta using Aerogel and gas as the two radiator materials. On the backward side, in the direction of the outgoing electron beam, a modular RICH (mRICH) detector will provide hadron identification at moderate momenta. Alternatively, the mRICH detector could be replaced by a proximity focusing Aerogel RICH. It is expected that these detectors will be constructed by the EIC user community.

### 3.3. Electromagnetic Calorimetry Systems

A general-purpose EIC detector is supposed to have a  $4\pi$  hermetic coverage in tracking, PID and calorimetry. For the electromagnetic (e/m) calorimetry there are several technology options available, for both the high-resolution homogeneous and the medium-resolution sampling solutions. The choice will depend on the actual requirements for a given part of the acceptance, driven by the physics requirements and simulations. The e/m calorimetry subsystem can be split into three distinct parts, the electron-going endcap, barrel, and hadron-going endcap. The majority of the e/m calorimeter options were developed within the generic EIC detector R&D program. For the most backward pseudo-rapidities in the electron endcap the highest resolution is required as provided by  $\text{PbWO}_4$  crystals. The high-energy resolution  $\text{PbWO}_4$  crystals is a well-established technology, where EIC can rely on the experience of CERN/CMS, GSI/PANDA and also the Jefferson Lab experiments. In the less-backward pseudo-rapidity region extending to the more

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central barrel region, around pseudo-rapidity of zero, medium- to high-resolution is required. Starting around pseudo-rapidity near zero, in the positive and forward pseudo-rapidity (hadron endcap) region medium resolution will be required leading to a sampling calorimeter solution. In the barrel region, a hybrid sampling calorimeter of sufficient resolution based on scintillating fibers embedded in lead coupled with imaging calorimetry based on sensors may provide an alternate solution that is complementary to SciGlass. In the forward hadron endcap region, a lead-scintillator shaslik calorimeter is envisioned or alternately a sampling calorimeter based on scintillating fibers with a tungsten powder epoxy mix. It is anticipated that the electron endcap and barrel e/m calorimeters will be an integral part of the central detector, while the hadron endcap e/m calorimeter will be co-located on the hadron-endcap hadronic calorimeter carriage.

### 3.4. Hadronic Calorimetry Systems

Several physics studies indicate that an EIC detector will require a continuous hadronic calorimetry (HCal) coverage in the polar angular range from approximately 2 to 178 degrees, in order to meet the scientific goals. The HCal subsystem will be naturally split into the barrel part and the two endcaps. As mentioned already, the barrel part is reused from the already existing sPHENIX detector. The endcaps need to be designed and manufactured from scratch, in a close connection to the e/m calorimetry subsystem. The latter typically provides the very first interaction length of the active tower matrix, and in case of the h-going endcap will be assembled on the same heavy duty roller platform. It is currently envisioned that each of the HCal tower matrices in the endcaps will be built utilizing a technology based forming towers from an alternating steel scintillator structure. The photo-sensors will be embedded into the scintillators. The lepton endcap hadron calorimeter will mainly function as a tail-catcher and to identify neutral hadrons.

### 3.5. Solenoid Magnet

This section includes all labor and materials to design, procure, fabricate, cold test, magnetic measurements, surveys, installation & commissioning, and system test & integration of the solenoid magnet system (magnet system includes coils, support structure, cryostat, control & instrumentation for magnet, quench protection, magnet power supply, current leads, trim coil power supply, cryogenic flex-line, and associated connectors). This will also include all the vendor visits for various sub-systems.

### 3.6. Electronics Systems

This section covers the effort for the front-end electronics integrated on the different sub-detectors. One estimates ~700k channels for a reference EIC detector. Costs cover the final design and construction of all the electronics from the detectors to the input of the DAQ system and include the fabrication and procurement of ASICs; printed circuit boards (PCB) such as FEB and FEP cards; high voltage (HV), low voltage (LV), bias power supply systems; cabling and optical fibers.

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### 3.7. Data Acquisition and Computing Systems

This section covers the effort for the data-acquisition (DAQ) and computing needed to collect all the data from the front-end electronics. The current plan for the DAQ is to not have any trigger, but to collect all the data from the different sub-detectors and only suppress detector pedestals and noise. This type of DAQ is commonly referred to as a streaming DAQ. The cost was estimated based on the FELIX cards developed for ATLAS. In addition, the servers, network switches and network fibers needed to fully collect the data are costed as well. Currently the need of ~88 Felix cards and ~44 servers are assumed to collect the data from the ~700k channels.

### 3.8. Detector Infrastructure

This section covers the entire effort needed to design and built the support structures for the EIC detector and includes the support to complete the installation scope prior to commissioning.

### 3.9. IR Integration and Ancillary Detectors

The EIC physics program requires several detectors along the outgoing lepton and hadron beam line. These include the low- $Q^2$  tagger along the outgoing electron beam. Along the hadron outgoing beam, these include the Zero-degree calorimeter, for neutron and photon detection and the silicon detectors for charged particles scatters at  $< 20$  mrad: B0-tracker inside the BO magnet, off-momentum detectors after the B1-dipole magnet and the Roman Pots integrated into the beam pipe vacuum system between B1 and B2.

### 3.10. Polarimetry and Luminosity Systems

All design and construction activities needed to integrate the Luminosity Monitor into the IR as well as the construction activities for hadron and electron beam polarimetry in the hadron SR and the lepton RCS and ESR.

## 4. INTERFACE REQUIREMENTS

Each of the following subsections represents a sub-system within the larger EIC detector system. All internal and external interface requirements that are associated with that sub-system will be provided there. Interface requirements may be repeated if they are relevant to multiple sub-systems.

Note that in some cases the connected sub-system ("To") is identified as TBD (to be determined). This indicates that the sub-system exists outside of the Detector system, and the relationship has not been fully identified yet. As the design continues, these connections will be resolved and the document will be updated to reflect the newest information.

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#### 4.1. DET-TRAK : Tracking Systems (WBS 6.10.03)

Interfaces associated with the tracking systems located in the forward, barrel, and backward sections of the central detector.

| Interface ID          | From     | To       | Description                                                                                                                                                          |
|-----------------------|----------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-COMP-ONLINE.081 | DET-TRAK | DET-COMP | Cables required to transfer data from the detector to the online data acquisition system.                                                                            |
| I-DET-COMP-ONLINE.082 | DET-TRAK | DET-COMP | A fiber connection will be provided from the DAQ system to the barrel tracking system's readout board to perform configuration, control, and data acquisition.       |
| I-DET-COMP-ONLINE.083 | DET-TRAK | DET-COMP | A network connection will be provided from the DAQ system to the barrel tracking system's slow controls interface.                                                   |
| I-DET-COMP-ONLINE.084 | DET-TRAK | DET-COMP | A fiber connection will be provided from the DAQ system to the barrel tracking system's readout board for timing synchronization.                                    |
| I-DET-ELEC.069        | DET-TRAK | DET-ELEC | Bias voltage DC power will be provided from the electronics racks to support electronics in the silicon photomultipliers.                                            |
| I-DET-ELEC.070        | DET-TRAK | DET-ELEC | High voltage DC power will be provided from the electronics racks to support silicon sensors and gas detectors.                                                      |
| I-DET-ELEC.071        | DET-TRAK | DET-ELEC | Low voltage DC power will be provided from the electronics racks to support electronics in the detector.                                                             |
| I-DET-INF-BAR.016     | DET-TRAK | DET-INF  | A single structural support system will support the silicon detectors and the micro-pattern gaseous detectors within the DIRC detector.                              |
| I-DET-INF-BAR.021     | DET-TRAK | DET-INF  | The DIRC support system will provide support for the silicon trackers in the detector barrel.                                                                        |
| I-DET-INF-BAR.022     | DET-TRAK | DET-INF  | The weight of the barrel tracking systems will be transferred to the DIRC support system.                                                                            |
| I-DET-INF-FWD.012     | DET-TRAK | DET-INF  | The maximum forward location for the tracking system is limited by the position of the AC LGAD Time of Flight Detector. Modifications to either must be coordinated. |
| I-DET-INF-FWD.013     | DET-TRAK | DET-INF  | The interior radius of the tracking detectors is governed by the size of the beamline.                                                                               |
| I-DET-INF-INT.098     | DET-TRAK | DET-INF  | Air, liquid or other cooling technology will be required for the tracking detectors.                                                                                 |
| I-DET-INF-INT.099     | DET-TRAK | DET-INF  | Gas will need to be provided to the trackers for detector operation.                                                                                                 |

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| Interface ID      | From     | To      | Description                                                                                                                                                          |
|-------------------|----------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-INT.100 | DET-TRAK | DET-INF | A single structural support system will support the silicon detectors and the micro-pattern gaseous detectors within the DIRC detector.                              |
| I-DET-INF-INT.105 | DET-TRAK | DET-INF | Conduits must be provided within the DIRC support system that are adequate to deliver services (power, signal, cooling) to the barrel tracking detectors.            |
| I-DET-INF-INT.106 | DET-TRAK | DET-INF | The exterior radius of the silicon trackers is limited by the interior bore of the DIRC support system. Modifications to either must be coordinated.                 |
| I-DET-INF-INT.107 | DET-TRAK | DET-INF | The maximum forward location for the DIRC is limited by the position of the silicon trackers.                                                                        |
| I-DET-INF-INT.110 | DET-TRAK | DET-INF | The maximum size of the silicon trackers is limited by the interior radius of the barrel Time of Flight detector. Modifications to either must be coordinated.       |
| I-DET-INF-INT.111 | DET-TRAK | DET-INF | The maximum backward location for the tracking system is limited by the position of the pRICH/mRICH. Modifications to either must be coordinated.                    |
| I-DET-INF-BAR.021 | DET-TRAK | DET-PID | The DIRC support system will provide support for the silicon trackers in the detector barrel.                                                                        |
| I-DET-INF-BAR.022 | DET-TRAK | DET-PID | The weight of the barrel tracking systems will be transferred to the DIRC support system.                                                                            |
| I-DET-INF-FWD.012 | DET-TRAK | DET-PID | The maximum forward location for the tracking system is limited by the position of the AC LGAD Time of Flight Detector. Modifications to either must be coordinated. |
| I-DET-INF-INT.105 | DET-TRAK | DET-PID | Conduits must be provided within the DIRC support system that are adequate to deliver services (power, signal, cooling) to the barrel tracking detectors.            |
| I-DET-INF-INT.106 | DET-TRAK | DET-PID | The exterior radius of the silicon trackers is limited by the interior bore of the DIRC support system. Modifications to either must be coordinated.                 |
| I-DET-INF-INT.107 | DET-TRAK | DET-PID | The maximum forward location for the DIRC is limited by the position of the silicon trackers.                                                                        |
| I-DET-INF-INT.110 | DET-TRAK | DET-PID | The maximum size of the silicon trackers is limited by the interior radius of the barrel Time of Flight detector. Modifications to either must be coordinated.       |
| I-DET-INF-INT.111 | DET-TRAK | DET-PID | The maximum backward location for the tracking system is limited by the position of the pRICH/mRICH. Modifications to either must be coordinated.                    |

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| Doc No. EIC-SEG-RSI-064                                                                           | Author: W. Akers | Effective Date: December 12, 2024 | Review Frequency: N/A |
| Requirements, Specifications, and Interfaces: Interface Requirements for the EIC Detector Systems |                  |                                   | Revision: 00          |

| Interface ID       | From     | To  | Description                                                                                                                            |
|--------------------|----------|-----|----------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-FWD.013  | DET-TRAK | TBD | The interior radius of the tracking detectors is governed by the size of the beamline.                                                 |
| I-DET-TRAK-BAR.001 | DET-TRAK | TBD | The silicon is in close proximity with the beamline. During bakeout the heat will need to be removed to prevent damage to the silicon. |

#### 4.2. DET-PID : Particle Identification Systems (WBS 6.10.04)

Interfaces associated with the particle identification systems located in the forward, barrel, and backward sections of the central detector.

| Interface ID          | From    | To       | Description                                                                                                                                                                                   |
|-----------------------|---------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-INT.003     | DET-PID | DET      | The DIRC structure will provide integrated pathways for cabling and services to be delivered from the interior detectors (pf RICH/mRICH and silicon trackers) to the exterior infrastructure. |
| I-DET-COMP-ONLINE.045 | DET-PID | DET-COMP | A fiber connection will be provided from the DAQ system to the barrel PID detector's readout board to perform configuration, control, and data acquisition.                                   |
| I-DET-COMP-ONLINE.046 | DET-PID | DET-COMP | A network connection will be provided from the DAQ system to the barrel PID detector's slow controls interface.                                                                               |
| I-DET-COMP-ONLINE.047 | DET-PID | DET-COMP | A fiber connection will be provided from the DAQ system to the barrel PID detector's readout board for timing synchronization.                                                                |
| I-DET-COMP-ONLINE.048 | DET-PID | DET-COMP | Signal cables will run from the DIRC electronics to the DAQ system.                                                                                                                           |
| I-DET-COMP-ONLINE.049 | DET-PID | DET-COMP | Signal cables from environmental sensors will run from the DIRC electronics to the DAQ system to provide detector shutdown/protection system.                                                 |
| I-DET-COMP-ONLINE.050 | DET-PID | DET-COMP | Signal cables will run from the DIRC electronics to the DAQ system.                                                                                                                           |
| I-DET-COMP-ONLINE.051 | DET-PID | DET-COMP | Signal cables from environmental sensors will run from the DIRC electronics to the DAQ system to provide detector shutdown/protection system.                                                 |
| I-DET-COMP-ONLINE.052 | DET-PID | DET-COMP | Signal cables will run from the pfRICH/mRICH electronics to the DAQ system.                                                                                                                   |
| I-DET-COMP-ONLINE.053 | DET-PID | DET-COMP | Signal cables from environmental sensors will run from the pfRICH/mRICH electronics to the DAQ system to provide a detector shutdown/protection system.                                       |

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| Doc No. EIC-SEG-RSI-064                                                                           | Author: W. Akers | Effective Date: December 12, 2024 | Review Frequency: N/A |
| Requirements, Specifications, and Interfaces: Interface Requirements for the EIC Detector Systems |                  |                                   | Revision: 00          |

| Interface ID          | From    | To       | Description                                                                                                                                                                                                                                 |
|-----------------------|---------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-COMP-ONLINE.054 | DET-PID | DET-COMP | Signal cables will run from the dRICH electronics to the DAQ system.                                                                                                                                                                        |
| I-DET-COMP-ONLINE.055 | DET-PID | DET-COMP | Signal cables from environmental sensors will run from the cold photosensors to the DAQ system to provide a detector shutdown/protection system.                                                                                            |
| I-DET-INF-BAR.003     | DET-PID | DET-ECAL | The DIRC bar boxes will be supported by a frame inside the barrel Electromagnetic Calorimeter, that allows the boxes to be extracted using a system of rollers.                                                                             |
| I-DET-INF-BAR.005     | DET-PID | DET-ECAL | The weight of the backward ECAL will be transferred to the DIRC detector support and must be accommodated by all subsequent support systems.                                                                                                |
| I-DET-INF-BAR.006     | DET-PID | DET-ECAL | The DIRC support system will provide support for the backward electromagnetic calorimeter.                                                                                                                                                  |
| I-DET-INF-INT.013     | DET-PID | DET-ECAL | The backward position and shape of the barrel EMCAL is limited by the size and shape of the DIRC readout supports. Changes to the size or position of either must be coordinated with the other.                                            |
| I-DET-INF-INT.014     | DET-PID | DET-ECAL | The maximum size of the DIRC is limited to the interior bore of the barrel ECAL (and its support structures). Modifications to either must be coordinated.                                                                                  |
| I-DET-INF-INT.015     | DET-PID | DET-ECAL | The forward position and shape of the barrel ECAL is limited by the backward face of the Dual RICH detector and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated. |
| I-DET-INF-INT.017     | DET-PID | DET-ECAL | The maximum backward location for the DIRC is limited by the position of the backward electromagnetic calorimeter. Modifications to either must be coordinated.                                                                             |
| I-DET-INF-INT.018     | DET-PID | DET-ECAL | The exterior radius of the backward ECAL is limited by the interior bore of the DIRC support system. Modifications to either must be coordinated.                                                                                           |
| I-DET-INF-INT.019     | DET-PID | DET-ECAL | The backward ECAL must mitigate the heat generated by the backward RICH detector.                                                                                                                                                           |
| I-DET-INF-INT.020     | DET-PID | DET-ECAL | The position of the backward ECAL in the forward direction is limited by the backward face of the pRICH/mRICH detector. Modifications to either must be coordinated.                                                                        |
| I-DET-INF-INT.025     | DET-PID | DET-ECAL | The maximum forward location for the dRICH is limited by the forward ECAL and the adjacent cabling pathway that                                                                                                                             |



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| Doc No. EIC-SEG-RSI-064                                                                           | Author: W. Akers | Effective Date: December 12, 2024 | Review Frequency: N/A |
| Requirements, Specifications, and Interfaces: Interface Requirements for the EIC Detector Systems |                  |                                   | Revision: 00          |

| Interface ID      | From    | To       | Description                                                                                                                                                                                                          |
|-------------------|---------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                   |         |          | provides services to the interior detectors. Modifications to either must be coordinated.                                                                                                                            |
| I-DET-ELEC.046    | DET-PID | DET-ELEC | Bias voltage DC power will be provided from the electronics racks to support electronics the silicon photomultipliers.                                                                                               |
| I-DET-ELEC.047    | DET-PID | DET-ELEC | High voltage DC power will be provided from the electronics racks to support silicon sensors and gas detectors.                                                                                                      |
| I-DET-ELEC.048    | DET-PID | DET-ELEC | Low voltage DC power will be provided from the electronics racks to support electronics in the detector.                                                                                                             |
| I-DET-ELEC.049    | DET-PID | DET-ELEC | High voltage power will be delivered from the power supplies on the carriage to the photosensors in the DIRC.                                                                                                        |
| I-DET-ELEC.050    | DET-PID | DET-ELEC | Low voltage power will be delivered from the power supplies on the carriage to the DIRC electronics.                                                                                                                 |
| I-DET-ELEC.051    | DET-PID | DET-ELEC | High voltage power will be delivered from the power supplies on the carriage to the photosensors in the DIRC.                                                                                                        |
| I-DET-ELEC.052    | DET-PID | DET-ELEC | Low voltage power will be delivered from the power supplies on the carriage to the DIRC electronics.                                                                                                                 |
| I-DET-ELEC.053    | DET-PID | DET-ELEC | High voltage power will be delivered from the power supplies on the carriage to the photosensors in the pfRICH/mRICH.                                                                                                |
| I-DET-ELEC.054    | DET-PID | DET-ELEC | Low voltage power will be delivered from the power supplies on the carriage to the pfRICH/mRICH electronics.                                                                                                         |
| I-DET-ELEC.055    | DET-PID | DET-ELEC | Bias voltage DC power will be delivered from the power supplies on the carriage to the photosensors.                                                                                                                 |
| I-DET-ELEC.056    | DET-PID | DET-ELEC | Low voltage power will be delivered from the power supplies on the carriage to the dRICH electronics.                                                                                                                |
| I-DET-INF-BAR.012 | DET-PID | DET-HCAL | The Dual RICH will be supported by a structural system within the barrel hadron calorimeter.                                                                                                                         |
| I-DET-INF-INT.032 | DET-PID | DET-HCAL | The size of the dRICH is limited by the interior bore of the barrel HCAL, and must provide adequate space for cables and services to itself and the interior detectors. Modifications to either must be coordinated. |
| I-DET-INF-INT.036 | DET-PID | DET-HCAL | The maximum backward location for the DIRC is limited by the backward HCAL and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated.           |

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| <b>Doc No.</b> EIC-SEG-RSI-064                                                                           | <b>Author:</b> W. Akers | <b>Effective Date:</b> December 12, 2024 | <b>Review Frequency:</b> N/A |
| <b>Requirements, Specifications, and Interfaces:</b> Interface Requirements for the EIC Detector Systems |                         |                                          | <b>Revision:</b> 00          |

| <b>Interface ID</b> | <b>From</b> | <b>To</b> | <b>Description</b>                                                                                                                                                                               |
|---------------------|-------------|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-BAR.003   | DET-PID     | DET-INF   | The DIRC bar boxes will be supported by a frame inside the barrel Electromagnetic Calorimeter, that allows the boxes to be extracted using a system of rollers.                                  |
| I-DET-INF-BAR.005   | DET-PID     | DET-INF   | The weight of the backward ECAL will be transferred to the DIRC detector support and must be accommodated by all subsequent support systems.                                                     |
| I-DET-INF-BAR.006   | DET-PID     | DET-INF   | The DIRC support system will provide support for the backward electromagnetic calorimeter.                                                                                                       |
| I-DET-INF-BAR.012   | DET-PID     | DET-INF   | The Dual RICH will be supported by a structural system within the barrel hadron calorimeter.                                                                                                     |
| I-DET-INF-BAR.017   | DET-PID     | DET-INF   | The DIRC prism box containing the photosensor readouts, will be supported by an external structure supporting the ECAL within the solenoid magnet.                                               |
| I-DET-INF-BAR.018   | DET-PID     | DET-INF   | The pfRICH/mRICH will be supported by the DIRC bar box support system.                                                                                                                           |
| I-DET-INF-BAR.019   | DET-PID     | DET-INF   | The barrel Time of Flight will be supported by the DIRC bar box assembly.                                                                                                                        |
| I-DET-INF-BAR.020   | DET-PID     | DET-INF   | The DIRC support system will provide support for the upstream PID detector system.                                                                                                               |
| I-DET-INF-BAR.021   | DET-PID     | DET-INF   | The DIRC support system will provide support for the silicon trackers in the detector barrel.                                                                                                    |
| I-DET-INF-BAR.022   | DET-PID     | DET-INF   | The weight of the barrel tracking systems will be transferred to the DIRC support system.                                                                                                        |
| I-DET-INF-FWD.011   | DET-PID     | DET-INF   | The interior radius of the dRICH is governed by the size of the beamline and its associated flanges and support system.                                                                          |
| I-DET-INF-FWD.012   | DET-PID     | DET-INF   | The maximum forward location for the tracking system is limited by the position of the AC LGAD Time of Flight Detector. Modifications to either must be coordinated.                             |
| I-DET-INF-INT.003   | DET-PID     | DET-INF   | The DIRC structure will provide integrated pathways for cabling and services to be delivered from the interior detectors (pf RICH/mRICH and silicon trackers) to the exterior infrastructure.    |
| I-DET-INF-INT.013   | DET-PID     | DET-INF   | The backward position and shape of the barrel EMCAL is limited by the size and shape of the DIRC readout supports. Changes to the size or position of either must be coordinated with the other. |

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| Requirements, Specifications, and Interfaces: Interface Requirements for the EIC Detector Systems |                  |                                   | Revision: 00          |

| Interface ID      | From    | To      | Description                                                                                                                                                                                                                                 |
|-------------------|---------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-INT.014 | DET-PID | DET-INF | The maximum size of the DIRC is limited to the interior bore of the barrel ECAL (and its support structures). Modifications to either must be coordinated.                                                                                  |
| I-DET-INF-INT.015 | DET-PID | DET-INF | The forward position and shape of the barrel ECAL is limited by the backward face of the Dual RICH detector and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated. |
| I-DET-INF-INT.017 | DET-PID | DET-INF | The maximum backward location for the DIRC is limited by the position of the backward electromagnetic calorimeter. Modifications to either must be coordinated.                                                                             |
| I-DET-INF-INT.018 | DET-PID | DET-INF | The exterior radius of the backward ECAL is limited by the interior bore of the DIRC support system. Modifications to either must be coordinated.                                                                                           |
| I-DET-INF-INT.019 | DET-PID | DET-INF | The backward ECAL must mitigate the heat generated by the backward RICH detector.                                                                                                                                                           |
| I-DET-INF-INT.020 | DET-PID | DET-INF | The position of the backward ECAL in the forward direction is limited by the backward face of the pRICH/mRICH detector. Modifications to either must be coordinated.                                                                        |
| I-DET-INF-INT.025 | DET-PID | DET-INF | The maximum forward location for the dRICH is limited by the forward ECAL and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated.                                   |
| I-DET-INF-INT.032 | DET-PID | DET-INF | The size of the dRICH is limited by the interior bore of the barrel HCAL, and must provide adequate space for cables and services to itself and the interior detectors. Modifications to either must be coordinated.                        |
| I-DET-INF-INT.036 | DET-PID | DET-INF | The maximum backward location for the DIRC is limited by the backward HCAL and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated.                                  |
| I-DET-INF-INT.088 | DET-PID | DET-INF | The heat generated by the photo-multiplier tubes and associated electronics must be removed using a process cooling system.                                                                                                                 |
| I-DET-INF-INT.089 | DET-PID | DET-INF | The heat generated by the detector and its electronics must be removed using a process cooling system.                                                                                                                                      |
| I-DET-INF-INT.090 | DET-PID | DET-INF | The heat generated by the photomultipliers and associated electronics must be removed using a process cooling system.                                                                                                                       |

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| <b>Requirements, Specifications, and Interfaces:</b> Interface Requirements for the EIC Detector Systems |                         |                                          | <b>Revision:</b> 00          |

| Interface ID      | From    | To      | Description                                                                                                                                                                                |
|-------------------|---------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-INT.091 | DET-PID | DET-INF | A continuous flow of dry nitrogen will be required to protect the aerogel radiator.                                                                                                        |
| I-DET-INF-INT.092 | DET-PID | DET-INF | A fluid cooling system will be required to keep the operating temperature of the photosensors at -30 degrees Celsius.                                                                      |
| I-DET-INF-INT.093 | DET-PID | DET-INF | A recovery system will need to be included for the radiator gas used by the dRICH to prevent accidental release.                                                                           |
| I-DET-INF-INT.094 | DET-PID | DET-INF | Sufficient insulation will need to be added around all coolant lines to prevent condensation and ensure that ice doesn't form.                                                             |
| I-DET-INF-INT.095 | DET-PID | DET-INF | A continuous flow of dry nitrogen will be required to protect the aerogel radiator.                                                                                                        |
| I-DET-INF-INT.096 | DET-PID | DET-INF | This gas will be required to create a protective atmosphere for the cold photosensors and to prevent condensation and freezing.                                                            |
| I-DET-INF-INT.097 | DET-PID | DET-INF | A continuous recirculating flow of radiator gas will be required.                                                                                                                          |
| I-DET-INF-INT.101 | DET-PID | DET-INF | The maximum forward location for the solenoid is limited by the position of the Dual RICH detector and the cabling plenum (gap) between them. Modifications to either must be coordinated. |
| I-DET-INF-INT.102 | DET-PID | DET-INF | The maximum diameter of the barrel Time of Flight detector is limited by the interior bore of the DIRC detector. Modifications to either must be coordinated.                              |
| I-DET-INF-INT.103 | DET-PID | DET-INF | The exterior radius of the pfRICH/mRICH is limited by the interior bore of the DIRC support system. Modifications to either must be coordinated.                                           |
| I-DET-INF-INT.104 | DET-PID | DET-INF | The maximum forward location for the DIRC is limited by the position of the dRICH detector and the cabling plenum between them. Modifications to either must be coordinated.               |
| I-DET-INF-INT.105 | DET-PID | DET-INF | Conduits must be provided within the DIRC support system that are adequate to deliver services (power, signal, cooling) to the barrel tracking detectors.                                  |
| I-DET-INF-INT.106 | DET-PID | DET-INF | The exterior radius of the silicon trackers is limited by the interior bore of the DIRC support system. Modifications to either must be coordinated.                                       |
| I-DET-INF-INT.107 | DET-PID | DET-INF | The maximum forward location for the DIRC is limited by the position of the silicon trackers.                                                                                              |

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| <b>Doc No.</b> EIC-SEG-RSI-064                                                                           | <b>Author:</b> W. Akers | <b>Effective Date:</b> December 12, 2024 | <b>Review Frequency:</b> N/A |
| <b>Requirements, Specifications, and Interfaces:</b> Interface Requirements for the EIC Detector Systems |                         |                                          | <b>Revision:</b> 00          |

| <b>Interface ID</b> | <b>From</b> | <b>To</b> | <b>Description</b>                                                                                                                                                                                                   |
|---------------------|-------------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-INT.108   | DET-PID     | DET-INF   | The maximum backward location for the barrel Time of Flight detector is limited by the position of the pfRICH/mRICH detector and the adjacent cabling pathway. Modifications to either must be coordinated.          |
| I-DET-INF-INT.109   | DET-PID     | DET-INF   | The maximum forward location for the barrel Time of Flight detector is limited by the position of the forward Time of Flight detector and the adjacent cabling pathway. Modifications to either must be coordinated. |
| I-DET-INF-INT.110   | DET-PID     | DET-INF   | The maximum size of the silicon trackers is limited by the interior radius of the barrel Time of Flight detector. Modifications to either must be coordinated.                                                       |
| I-DET-INF-INT.111   | DET-PID     | DET-INF   | The maximum backward location for the tracking system is limited by the position of the pfRICH/mRICH. Modifications to either must be coordinated.                                                                   |
| I-DET-INF-INT.112   | DET-PID     | DET-INF   | The interior radius of the pfRICH/mRICH is governed by the size of the beamline and its associated flanges and support system.                                                                                       |
| I-DET-INF-BAR.017   | DET-PID     | DET-MAG   | The DIRC prism box containing the photosensor readouts, will be supported by an external structure supporting the ECAL within the solenoid magnet.                                                                   |
| I-DET-INF-INT.101   | DET-PID     | DET-MAG   | The maximum forward location for the solenoid is limited by the position of the Dual RICH detector and the cabling plenum (gap) between them. Modifications to either must be coordinated.                           |
| I-DET-INF-BAR.021   | DET-PID     | DET-TRAK  | The DIRC support system will provide support for the silicon trackers in the detector barrel.                                                                                                                        |
| I-DET-INF-BAR.022   | DET-PID     | DET-TRAK  | The weight of the barrel tracking systems will be transferred to the DIRC support system.                                                                                                                            |
| I-DET-INF-FWD.012   | DET-PID     | DET-TRAK  | The maximum forward location for the tracking system is limited by the position of the AC LGAD Time of Flight Detector. Modifications to either must be coordinated.                                                 |
| I-DET-INF-INT.105   | DET-PID     | DET-TRAK  | Conduits must be provided within the DIRC support system that are adequate to deliver services (power, signal, cooling) to the barrel tracking detectors.                                                            |
| I-DET-INF-INT.106   | DET-PID     | DET-TRAK  | The exterior radius of the silicon trackers is limited by the interior bore of the DIRC support system. Modifications to either must be coordinated.                                                                 |
| I-DET-INF-INT.107   | DET-PID     | DET-TRAK  | The maximum forward location for the DIRC is limited by the position of the silicon trackers.                                                                                                                        |

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| Requirements, Specifications, and Interfaces: Interface Requirements for the EIC Detector Systems |                  |                                   | Revision: 00          |

| Interface ID           | From    | To       | Description                                                                                                                                                    |
|------------------------|---------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-INT.110      | DET-PID | DET-TRAK | The maximum size of the silicon trackers is limited by the interior radius of the barrel Time of Flight detector. Modifications to either must be coordinated. |
| I-DET-INF-INT.111      | DET-PID | DET-TRAK | The maximum backward location for the tracking system is limited by the position of the pFRICH/mRICH. Modifications to either must be coordinated.             |
| I-DET-INF-FWD.011      | DET-PID | TBD      | The interior radius of the dRICH is governed by the size of the beamline and its associated flanges and support system.                                        |
| I-DET-INF-INT.112      | DET-PID | TBD      | The interior radius of the pFRICH/mRICH is governed by the size of the beamline and its associated flanges and support system.                                 |
| I-DET-PID-BAR-DIRC.001 | DET-PID | TBD      | This system will generate light pulses to monitor the response of the photosensors, and to adjust timing correlations within the detector.                     |
| I-DET-PID-BAR-TOF.001  | DET-PID | TBD      | This system will generate light pulses to monitor the response of the photosensors, and to adjust timing correlations within the detector.                     |
| I-DET-PID-BCK.001      | DET-PID | TBD      | This system will generate light pulses to monitor the response of the photosensors, and to adjust timing correlations within the detector.                     |

#### 4.3. DET-ECAL : Electromagnetic Calorimetry Systems (WBS 6.10.05)

Interfaces associated with the electromagnetic calorimeters located in the forward, barrel, and backward sections of the central detector.

| Interface ID          | From     | To       | Description                                                                                                                                           |
|-----------------------|----------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-COMP-ONLINE.020 | DET-ECAL | DET-COMP | A fiber connection will be provided from the DAQ system to the barrel ECAL's readout board to perform configuration, control, and data acquisition.   |
| I-DET-COMP-ONLINE.021 | DET-ECAL | DET-COMP | A network connection will be provided from the DAQ system to the barrel ECAL's slow controls interface.                                               |
| I-DET-COMP-ONLINE.022 | DET-ECAL | DET-COMP | A fiber connection will be provided from the DAQ system to the barrel ECAL's readout board for timing synchronization.                                |
| I-DET-COMP-ONLINE.023 | DET-ECAL | DET-COMP | A fiber connection will be provided from the DAQ system to the backward ECAL's readout board to perform configuration, control, and data acquisition. |
| I-DET-COMP-ONLINE.024 | DET-ECAL | DET-COMP | A network connection will be provided from the DAQ system to the backward ECAL's slow controls interface.                                             |

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|---------------------------------------------------------------------------------------------------|------------------|-----------------------------------|-----------------------|
| Doc No. EIC-SEG-RSI-064                                                                           | Author: W. Akers | Effective Date: December 12, 2024 | Review Frequency: N/A |
| Requirements, Specifications, and Interfaces: Interface Requirements for the EIC Detector Systems |                  |                                   | Revision: 00          |

| Interface ID          | From     | To       | Description                                                                                                                                                              |
|-----------------------|----------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-COMP-ONLINE.025 | DET-ECAL | DET-COMP | A fiber connection will be provided from the DAQ system to the backward ECAL's readout board for timing synchronization.                                                 |
| I-DET-COMP-ONLINE.026 | DET-ECAL | DET-COMP | A fiber connection will be provided from the DAQ system to the forward ECAL's readout board to perform configuration, control, and data acquisition.                     |
| I-DET-COMP-ONLINE.027 | DET-ECAL | DET-COMP | A network connection will be provided from the DAQ system to the forward ECAL's slow controls interface.                                                                 |
| I-DET-COMP-ONLINE.028 | DET-ECAL | DET-COMP | A fiber connection will be provided from the DAQ system to the forward ECAL's readout board for timing synchronization.                                                  |
| I-DET-ELEC.019        | DET-ECAL | DET-ELEC | Bias voltage DC power provided from the electronics racks to support electronics in the silicon photomultipliers.                                                        |
| I-DET-ELEC.020        | DET-ECAL | DET-ELEC | High voltage DC power will be provided from the electronics racks to support silicon sensors and gas detectors.                                                          |
| I-DET-ELEC.021        | DET-ECAL | DET-ELEC | Low voltage DC power provided from the electronics racks to support electronics in the detector.                                                                         |
| I-DET-ELEC.022        | DET-ECAL | DET-ELEC | Bias voltage DC power will be provided from the electronics racks to support electronics the silicon photomultipliers.                                                   |
| I-DET-ELEC.023        | DET-ECAL | DET-ELEC | High voltage DC power will be provided from the electronics racks to support silicon sensors and gas detectors.                                                          |
| I-DET-ELEC.024        | DET-ECAL | DET-ELEC | Low voltage DC power will be provided from the electronics racks to support electronics in the detector.                                                                 |
| I-DET-ELEC.025        | DET-ECAL | DET-ELEC | Bias voltage DC power provided from the electronics racks to support electronics in the silicon photomultipliers.                                                        |
| I-DET-ELEC.026        | DET-ECAL | DET-ELEC | High voltage DC power will be provided from the electronics racks to support silicon sensors and gas detectors.                                                          |
| I-DET-ELEC.027        | DET-ECAL | DET-ELEC | Low voltage DC power provided from the electronics racks to support electronics in the detector.                                                                         |
| I-DET-INF-BAR.001     | DET-ECAL | DET-HCAL | The barrel ECAL will be supported by a structural support system that extends through the bore of the solenoid magnet and is supported by the barrel Hadron Calorimeter. |
| I-DET-INF-BAR.002     | DET-ECAL | DET-HCAL | The weight of the barrel ECAL will be transferred to the barrel Hadron Calorimeter and must be accommodated by all intermediate and subsequent support systems.          |
| I-DET-INF-BAR.004     | DET-ECAL | DET-HCAL | The backward ECAL will be supported by an integrated support structure that is attached to the DIRC support frame.                                                       |

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| <b>Doc No.</b> EIC-SEG-RSI-064                                                                           | <b>Author:</b> W. Akers | <b>Effective Date:</b> December 12, 2024 | <b>Review Frequency:</b> N/A |
| <b>Requirements, Specifications, and Interfaces:</b> Interface Requirements for the EIC Detector Systems |                         |                                          | <b>Revision:</b> 00          |

| Interface ID      | From     | To       | Description                                                                                                                                                                                                                                |
|-------------------|----------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-BAR.007 | DET-ECAL | DET-HCAL | The forward ECAL will be supported by the forward Hadron Calorimeter endcap. Because the forward ECAL must split into two parts to provide access to the barrel, each half must be independently affixed to the Hadron Calorimeter halves. |
| I-DET-INF-BAR.008 | DET-ECAL | DET-HCAL | The weight of the forward ECAL will be transferred to the forward Hadron Calorimeter endcap and must be accommodated by all subsequent support systems.                                                                                    |
| I-DET-INF-FWD.004 | DET-ECAL | DET-HCAL | The forward HCAL will support the weight of the forward electromagnetic calorimeter that is embedded within it.                                                                                                                            |
| I-DET-INF-INT.016 | DET-ECAL | DET-HCAL | The backward position of the backward ECAL is limited by the backward Hadron Calorimeter and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated.                   |
| I-DET-INF-INT.023 | DET-ECAL | DET-HCAL | The exterior radius of the forward ECAL is limited by the interior bore of the barrel Hadron Calorimeter. Modifications to either must be coordinated.                                                                                     |
| I-DET-INF-INT.024 | DET-ECAL | DET-HCAL | The forward position of the forward ECAL is limited by the forward Hadron Calorimeter. Modifications to either must be coordinated.                                                                                                        |
| I-DET-INF-BAR.001 | DET-ECAL | DET-INF  | The barrel ECAL will be supported by a structural support system that extends through the bore of the solenoid magnet and is supported by the barrel Hadron Calorimeter.                                                                   |
| I-DET-INF-BAR.002 | DET-ECAL | DET-INF  | The weight of the barrel ECAL will be transferred to the barrel Hadron Calorimeter and must be accommodated by all intermediate and subsequent support systems.                                                                            |
| I-DET-INF-BAR.003 | DET-ECAL | DET-INF  | The DIRC bar boxes will be supported by a frame inside the barrel Electromagnetic Calorimeter, that allows the boxes to be extracted using a system of rollers.                                                                            |
| I-DET-INF-BAR.004 | DET-ECAL | DET-INF  | The backward ECAL will be supported by an integrated support structure that is attached to the DIRC support frame.                                                                                                                         |
| I-DET-INF-BAR.005 | DET-ECAL | DET-INF  | The weight of the backward ECAL will be transferred to the DIRC detector support and must be accommodated by all subsequent support systems.                                                                                               |
| I-DET-INF-BAR.006 | DET-ECAL | DET-INF  | The DIRC support system will provide support for the backward electromagnetic calorimeter.                                                                                                                                                 |
| I-DET-INF-BAR.007 | DET-ECAL | DET-INF  | The forward ECAL will be supported by the forward Hadron Calorimeter endcap. Because the forward ECAL must split into two parts to provide access to the barrel, each half must be independently affixed to the Hadron Calorimeter halves. |



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| Interface ID      | From     | To      | Description                                                                                                                                                                                                                                 |
|-------------------|----------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-BAR.008 | DET-ECAL | DET-INF | The weight of the forward ECAL will be transferred to the forward Hadron Calorimeter endcap and must be accommodated by all subsequent support systems.                                                                                     |
| I-DET-INF-BAR.014 | DET-ECAL | DET-INF | Each half of the forward ECAL must be continuously supported and stabilized while it is moved between the opened and closed positions.                                                                                                      |
| I-DET-INF-FWD.004 | DET-ECAL | DET-INF | The forward HCAL will support the weight of the forward electromagnetic calorimeter that is embedded within it.                                                                                                                             |
| I-DET-INF-FWD.008 | DET-ECAL | DET-INF | Each half of the forward ECAL must be continuously supported and stabilized while it is moved between the opened and closed positions.                                                                                                      |
| I-DET-INF-INT.012 | DET-ECAL | DET-INF | The exterior radius of the barrel ECAL (and its support system) is limited by the interior bore of the solenoid magnet. Modifications to either must be coordinated.                                                                        |
| I-DET-INF-INT.013 | DET-ECAL | DET-INF | The backward position and shape of the barrel EMCAL is limited by the size and shape of the DIRC readout supports. Changes to the size or position of either must be coordinated with the other.                                            |
| I-DET-INF-INT.014 | DET-ECAL | DET-INF | The maximum size of the DIRC is limited to the interior bore of the barrel ECAL (and its support structures). Modifications to either must be coordinated.                                                                                  |
| I-DET-INF-INT.015 | DET-ECAL | DET-INF | The forward position and shape of the barrel ECAL is limited by the backward face of the Dual RICH detector and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated. |
| I-DET-INF-INT.016 | DET-ECAL | DET-INF | The backward position of the backward ECAL is limited by the backward Hadron Calorimeter and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated.                    |
| I-DET-INF-INT.017 | DET-ECAL | DET-INF | The maximum backward location for the DIRC is limited by the position of the backward electromagnetic calorimeter. Modifications to either must be coordinated.                                                                             |
| I-DET-INF-INT.018 | DET-ECAL | DET-INF | The exterior radius of the backward ECAL is limited by the interior bore of the DIRC support system. Modifications to either must be coordinated.                                                                                           |
| I-DET-INF-INT.019 | DET-ECAL | DET-INF | The backward ECAL must mitigate the heat generated by the backward RICH detector.                                                                                                                                                           |

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| Interface ID      | From     | To      | Description                                                                                                                                                                                               |
|-------------------|----------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-INT.020 | DET-ECAL | DET-INF | The position of the backward ECAL in the forward direction is limited by the backward face of the pRICH/mRICH detector. Modifications to either must be coordinated.                                      |
| I-DET-INF-INT.021 | DET-ECAL | DET-INF | The bore of the backward ECAL must be designed to allow it to be inserted/removed over the existing beamline flanges.                                                                                     |
| I-DET-INF-INT.022 | DET-ECAL | DET-INF | The interior radius of the backward ECAL is governed by the size of the beamline.                                                                                                                         |
| I-DET-INF-INT.023 | DET-ECAL | DET-INF | The exterior radius of the forward ECAL is limited by the interior bore of the barrel Hadron Calorimeter. Modifications to either must be coordinated.                                                    |
| I-DET-INF-INT.024 | DET-ECAL | DET-INF | The forward position of the forward ECAL is limited by the forward Hadron Calorimeter. Modifications to either must be coordinated.                                                                       |
| I-DET-INF-INT.025 | DET-ECAL | DET-INF | The maximum forward location for the dRICH is limited by the forward ECAL and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated. |
| I-DET-INF-INT.026 | DET-ECAL | DET-INF | The interior radius of the forward ECAL is governed by the size of the beamline. Modifications to either must be coordinated.                                                                             |
| I-DET-INF-INT.065 | DET-ECAL | DET-INF | The imaging layers must be cooled with an independent system (TBD).                                                                                                                                       |
| I-DET-INF-INT.066 | DET-ECAL | DET-INF | The barrel ECAL will require chilled water or LCW cooling to maintain a safe operating temperature.                                                                                                       |
| I-DET-INF-INT.067 | DET-ECAL | DET-INF | The backward ECAL will require chilled water or LCW cooling to maintain the temperature of the silicon photomultipliers, the electronics, and the crystals.                                               |
| I-DET-INF-INT.068 | DET-ECAL | DET-INF | The forward ECAL will require chilled water or LCW cooling to maintain a safe operating temperature.                                                                                                      |
| I-DET-INF-INT.012 | DET-ECAL | DET-MAG | The exterior radius of the barrel ECAL (and its support system) is limited by the interior bore of the solenoid magnet. Modifications to either must be coordinated.                                      |
| I-DET-INF-BAR.003 | DET-ECAL | DET-PID | The DIRC bar boxes will be supported by a frame inside the barrel Electromagnetic Calorimeter, that allows the boxes to be extracted using a system of rollers.                                           |
| I-DET-INF-BAR.005 | DET-ECAL | DET-PID | The weight of the backward ECAL will be transferred to the DIRC detector support and must be accommodated by all subsequent support systems.                                                              |

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| <b>Interface ID</b> | <b>From</b> | <b>To</b> | <b>Description</b>                                                                                                                                                                                                                          |
|---------------------|-------------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-BAR.006   | DET-ECAL    | DET-PID   | The DIRC support system will provide support for the backward electromagnetic calorimeter.                                                                                                                                                  |
| I-DET-INF-INT.013   | DET-ECAL    | DET-PID   | The backward position and shape of the barrel EMCAL is limited by the size and shape of the DIRC readout supports. Changes to the size or position of either must be coordinated with the other.                                            |
| I-DET-INF-INT.014   | DET-ECAL    | DET-PID   | The maximum size of the DIRC is limited to the interior bore of the barrel ECAL (and its support structures). Modifications to either must be coordinated.                                                                                  |
| I-DET-INF-INT.015   | DET-ECAL    | DET-PID   | The forward position and shape of the barrel ECAL is limited by the backward face of the Dual RICH detector and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated. |
| I-DET-INF-INT.017   | DET-ECAL    | DET-PID   | The maximum backward location for the DIRC is limited by the position of the backward electromagnetic calorimeter. Modifications to either must be coordinated.                                                                             |
| I-DET-INF-INT.018   | DET-ECAL    | DET-PID   | The exterior radius of the backward ECAL is limited by the interior bore of the DIRC support system. Modifications to either must be coordinated.                                                                                           |
| I-DET-INF-INT.019   | DET-ECAL    | DET-PID   | The backward ECAL must mitigate the heat generated by the backward RICH detector.                                                                                                                                                           |
| I-DET-INF-INT.020   | DET-ECAL    | DET-PID   | The position of the backward ECAL in the forward direction is limited by the backward face of the pRICH/mRICH detector. Modifications to either must be coordinated.                                                                        |
| I-DET-INF-INT.025   | DET-ECAL    | DET-PID   | The maximum forward location for the dRICH is limited by the forward ECAL and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated.                                   |
| I-DET-INF-INT.021   | DET-ECAL    | TBD       | The bore of the backward ECAL must be designed to allow it to be inserted/removed over the existing beamline flanges.                                                                                                                       |
| I-DET-INF-INT.022   | DET-ECAL    | TBD       | The interior radius of the backward ECAL is governed by the size of the beamline.                                                                                                                                                           |
| I-DET-INF-INT.026   | DET-ECAL    | TBD       | The interior radius of the forward ECAL is governed by the size of the beamline. Modifications to either must be coordinated.                                                                                                               |

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#### 4.4. DET-HCAL : Hadronic Calorimetry Systems (WBS 6.10.06)

Interfaces associated with the hadronic calorimeters located in the forward, barrel, and backward sections of the central detector.

| Interface ID          | From     | To       | Description                                                                                                                                                                                          |
|-----------------------|----------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-INT.005     | DET-HCAL | DET-ANC  | The position of the forward HCAL is bounded by the B0 magnet in the forward direction. Changes to the size or position of either must be coordinated with the other.                                 |
| I-DET-COMP-ONLINE.031 | DET-HCAL | DET-COMP | A fiber connection will be provided from the DAQ system to the barrel HCAL's readout board to perform configuration, control, and data acquisition.                                                  |
| I-DET-COMP-ONLINE.032 | DET-HCAL | DET-COMP | A connection from the DAQ system to the barrel HCAL's slow controls interface. CLARIFY with Data acquisition whether a slow control interface will be independent of the regular control interface.  |
| I-DET-COMP-ONLINE.033 | DET-HCAL | DET-COMP | A fiber connection will be provided from the DAQ system to the barrel HCAL's readout board for timing synchronization.                                                                               |
| I-DET-COMP-ONLINE.034 | DET-HCAL | DET-COMP | A fiber connection will be provided from the DAQ system to the backward HCAL's readout board to perform configuration, control, and data acquisition.                                                |
| I-DET-COMP-ONLINE.035 | DET-HCAL | DET-COMP | A connection from the DAQ system to the barrel HCAL's slow controls interface. CLARIFY with Data acquisition whether a slow control interface will be independent of the regular control interface.  |
| I-DET-COMP-ONLINE.036 | DET-HCAL | DET-COMP | A fiber connection will be provided from the DAQ system to the backward HCAL's readout board for timing synchronization.                                                                             |
| I-DET-COMP-ONLINE.037 | DET-HCAL | DET-COMP | A fiber connection will be provided from the DAQ system to the forward HCAL's readout board to perform configuration, control, and data acquisition.                                                 |
| I-DET-COMP-ONLINE.038 | DET-HCAL | DET-COMP | A connection from the DAQ system to the forward HCAL's slow controls interface. CLARIFY with Data acquisition whether a slow control interface will be independent of the regular control interface. |
| I-DET-COMP-ONLINE.039 | DET-HCAL | DET-COMP | A fiber connection will be provided from the DAQ system to the forward HCAL's readout board for timing synchronization.                                                                              |
| I-DET-INF-BAR.001     | DET-HCAL | DET-ECAL | The barrel ECAL will be supported by a structural support system that extends through the bore of the solenoid magnet and is supported by the barrel Hadron Calorimeter.                             |

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| Interface ID      | From     | To       | Description                                                                                                                                                                                                                                |
|-------------------|----------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-BAR.002 | DET-HCAL | DET-ECAL | The weight of the barrel ECAL will be transferred to the barrel Hadron Calorimeter and must be accommodated by all intermediate and subsequent support systems.                                                                            |
| I-DET-INF-BAR.004 | DET-HCAL | DET-ECAL | The backward ECAL will be supported by an integrated support structure that is attached to the DIRC support frame.                                                                                                                         |
| I-DET-INF-BAR.007 | DET-HCAL | DET-ECAL | The forward ECAL will be supported by the forward Hadron Calorimeter endcap. Because the forward ECAL must split into two parts to provide access to the barrel, each half must be independently affixed to the Hadron Calorimeter halves. |
| I-DET-INF-BAR.008 | DET-HCAL | DET-ECAL | The weight of the forward ECAL will be transferred to the forward Hadron Calorimeter endcap and must be accommodated by all subsequent support systems.                                                                                    |
| I-DET-INF-FWD.004 | DET-HCAL | DET-ECAL | The forward HCAL will support the weight of the forward electromagnetic calorimeter that is embedded within it.                                                                                                                            |
| I-DET-INF-INT.016 | DET-HCAL | DET-ECAL | The backward position of the backward ECAL is limited by the backward Hadron Calorimeter and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated.                   |
| I-DET-INF-INT.023 | DET-HCAL | DET-ECAL | The exterior radius of the forward ECAL is limited by the interior bore of the barrel Hadron Calorimeter. Modifications to either must be coordinated.                                                                                     |
| I-DET-INF-INT.024 | DET-HCAL | DET-ECAL | The forward position of the forward ECAL is limited by the forward Hadron Calorimeter. Modifications to either must be coordinated.                                                                                                        |
| I-DET-ELEC.028    | DET-HCAL | DET-ELEC | Bias voltage DC power will be provided from the electronics racks to support the silicon photomultipliers.                                                                                                                                 |
| I-DET-ELEC.029    | DET-HCAL | DET-ELEC | High voltage DC power will be provided from the electronics racks to support silicon sensors and gas detectors.                                                                                                                            |
| I-DET-ELEC.030    | DET-HCAL | DET-ELEC | Low voltage DC power will be provided from the electronics racks to support electronics in the detector.                                                                                                                                   |
| I-DET-ELEC.031    | DET-HCAL | DET-ELEC | Bias voltage DC power will be provided from the electronics racks to support the silicon photomultipliers.                                                                                                                                 |
| I-DET-ELEC.032    | DET-HCAL | DET-ELEC | High voltage DC power will be provided from the electronics racks to support silicon sensors and gas detectors.                                                                                                                            |
| I-DET-ELEC.033    | DET-HCAL | DET-ELEC | Low voltage DC power will be provided from the electronics racks to support electronics in the detector.                                                                                                                                   |
| I-DET-ELEC.034    | DET-HCAL | DET-ELEC | Bias voltage DC power will be provided from the electronics racks to support the silicon photomultipliers.                                                                                                                                 |

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| I-DET-ELEC.035    | DET-HCAL | DET-ELEC | High voltage DC power will be provided from the electronics racks to support silicon sensors and gas detectors.                                                                                                                            |
| I-DET-ELEC.036    | DET-HCAL | DET-ELEC | Low voltage DC power will be provided from the electronics racks to support electronics in the detector.                                                                                                                                   |
| I-DET-INF-BAR.001 | DET-HCAL | DET-INF  | The barrel ECAL will be supported by a structural support system that extends through the bore of the solenoid magnet and is supported by the barrel Hadron Calorimeter.                                                                   |
| I-DET-INF-BAR.002 | DET-HCAL | DET-INF  | The weight of the barrel ECAL will be transferred to the barrel Hadron Calorimeter and must be accommodated by all intermediate and subsequent support systems.                                                                            |
| I-DET-INF-BAR.004 | DET-HCAL | DET-INF  | The backward ECAL will be supported by an integrated support structure that is attached to the DIRC support frame.                                                                                                                         |
| I-DET-INF-BAR.007 | DET-HCAL | DET-INF  | The forward ECAL will be supported by the forward Hadron Calorimeter endcap. Because the forward ECAL must split into two parts to provide access to the barrel, each half must be independently affixed to the Hadron Calorimeter halves. |
| I-DET-INF-BAR.008 | DET-HCAL | DET-INF  | The weight of the forward ECAL will be transferred to the forward Hadron Calorimeter endcap and must be accommodated by all subsequent support systems.                                                                                    |
| I-DET-INF-BAR.009 | DET-HCAL | DET-INF  | The barrel HCAL will be supported by a rolling carriage that allows the central detector to be moved between the assembly area and the experimental hall.                                                                                  |
| I-DET-INF-BAR.010 | DET-HCAL | DET-INF  | The barrel HCAL will support the weight of all of the sub-detectors and components within the central detector.                                                                                                                            |
| I-DET-INF-BAR.011 | DET-HCAL | DET-INF  | The cumulative weight of the HCAL and all of the sub-detectors it supports will be transferred to the detector carriage.                                                                                                                   |
| I-DET-INF-BAR.012 | DET-HCAL | DET-INF  | The Dual RICH will be supported by a structural system within the barrel hadron calorimeter.                                                                                                                                               |
| I-DET-INF-BCK.001 | DET-HCAL | DET-INF  | Adequate clearance must be provided for either of the detector carriages to be rolled aside to allow access to sub-detectors within the barrel.                                                                                            |
| I-DET-INF-BCK.002 | DET-HCAL | DET-INF  | The backward HCAL consists of two halves, each of which are support by an independent carriage.                                                                                                                                            |
| I-DET-INF-BCK.003 | DET-HCAL | DET-INF  | The weight of each half of the backward HCAL will be transferred to the carriage that is supporting it.                                                                                                                                    |
| I-DET-INF-FWD.003 | DET-HCAL | DET-INF  | The forward HCAL consists of two halves, each of which are support by an independent carriage.                                                                                                                                             |

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| Interface ID      | From     | To      | Description                                                                                                                                                                                                              |
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| I-DET-INF-FWD.004 | DET-HCAL | DET-INF | The forward HCAL will support the weight of the forward electromagnetic calorimeter that is embedded within it.                                                                                                          |
| I-DET-INF-FWD.005 | DET-HCAL | DET-INF | The weight of each half of the forward HCAL, and its embedded subdetectors, will be transferred to the associated carriage.                                                                                              |
| I-DET-INF-FWD.009 | DET-HCAL | DET-INF | Adequate clearance must be provided for either of the detector carriages to be rolled aside to allow access to sub-detectors within the barrel.                                                                          |
| I-DET-INF-INT.005 | DET-HCAL | DET-INF | The position of the forward HCAL is bounded by the B0 magnet in the forward direction. Changes to the size or position of either must be coordinated with the other.                                                     |
| I-DET-INF-INT.016 | DET-HCAL | DET-INF | The backward position of the backward ECAL is limited by the backward Hadron Calorimeter and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated. |
| I-DET-INF-INT.023 | DET-HCAL | DET-INF | The exterior radius of the forward ECAL is limited by the interior bore of the barrel Hadron Calorimeter. Modifications to either must be coordinated.                                                                   |
| I-DET-INF-INT.024 | DET-HCAL | DET-INF | The forward position of the forward ECAL is limited by the forward Hadron Calorimeter. Modifications to either must be coordinated.                                                                                      |
| I-DET-INF-INT.027 | DET-HCAL | DET-INF | The forward position of the backward HCAL is limited by the barrel HCAL and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated.                  |
| I-DET-INF-INT.028 | DET-HCAL | DET-INF | The exterior radius of the backward HCAL should be consistent with the radius of the barrel HCAL.                                                                                                                        |
| I-DET-INF-INT.029 | DET-HCAL | DET-INF | The exterior radius of the forward HCAL should be consistent with the radius of the barrel HCAL.                                                                                                                         |
| I-DET-INF-INT.030 | DET-HCAL | DET-INF | The backward position of the forward HCAL is limited by the barrel HCAL and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated.                  |
| I-DET-INF-INT.031 | DET-HCAL | DET-INF | The exterior radius of the solenoid magnet is limited by the interior bore of the barrel HCAL and necessary support structures. Modifications to either must be coordinated.                                             |
| I-DET-INF-INT.032 | DET-HCAL | DET-INF | The size of the dRICH is limited by the interior bore of the barrel HCAL, and must provide adequate space for cables                                                                                                     |

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| Doc No. EIC-SEG-RSI-064                                                                           | Author: W. Akers | Effective Date: December 12, 2024 | Review Frequency: N/A |
| Requirements, Specifications, and Interfaces: Interface Requirements for the EIC Detector Systems |                  |                                   | Revision: 00          |

| Interface ID      | From     | To      | Description                                                                                                                                                                                                           |
|-------------------|----------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                   |          |         | and services to itself and the interior detectors. Modifications to either must be coordinated.                                                                                                                       |
| I-DET-INF-INT.034 | DET-HCAL | DET-INF | The forward position of the backward HCAL is limited by the barrel HCAL and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated.               |
| I-DET-INF-INT.035 | DET-HCAL | DET-INF | The maximum backward location for the solenoid magnet is limited by the backward HCAL and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated. |
| I-DET-INF-INT.036 | DET-HCAL | DET-INF | The maximum backward location for the DIRC is limited by the backward HCAL and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated.            |
| I-DET-INF-INT.038 | DET-HCAL | DET-INF | The position of the backward HCAL is limited in the backward direction by the adjacent accelerator magnets.                                                                                                           |
| I-DET-INF-INT.039 | DET-HCAL | DET-INF | The interior radius of the backward HCAL is governed by the size of the beamline.                                                                                                                                     |
| I-DET-INF-INT.041 | DET-HCAL | DET-INF | The interior radius of the forward HCAL is governed by the size of the beamline.                                                                                                                                      |
| I-DET-INF-INT.075 | DET-HCAL | DET-INF | Heat from the silicon photomultipliers and front end electronics will be rejected into the outside room via forced air.                                                                                               |
| I-DET-INF-INT.076 | DET-HCAL | DET-INF | The exterior radius of the barrel HCAL is limited by the detector carriage, the electronics platforms, and other Hall infrastructure.                                                                                 |
| I-DET-INF-INT.077 | DET-HCAL | DET-INF | Heat from the silicon photomultipliers and front end electronics will be rejected into the outside room via forced air.                                                                                               |
| I-DET-INF-INT.078 | DET-HCAL | DET-INF | Heat from the silicon photomultipliers and front end electronics will be rejected into the outside room via forced air. DO WE NEED CW FOR COOLING HERE?                                                               |
| I-DET-INF-INT.031 | DET-HCAL | DET-MAG | The exterior radius of the solenoid magnet is limited by the interior bore of the barrel HCAL and necessary support structures. Modifications to either must be coordinated.                                          |
| I-DET-INF-INT.035 | DET-HCAL | DET-MAG | The maximum backward location for the solenoid magnet is limited by the backward HCAL and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated. |



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| Interface ID      | From     | To      | Description                                                                                                                                                                                                          |
|-------------------|----------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-BAR.012 | DET-HCAL | DET-PID | The Dual RICH will be supported by a structural system within the barrel hadron calorimeter.                                                                                                                         |
| I-DET-INF-INT.032 | DET-HCAL | DET-PID | The size of the dRICH is limited by the interior bore of the barrel HCAL, and must provide adequate space for cables and services to itself and the interior detectors. Modifications to either must be coordinated. |
| I-DET-INF-INT.036 | DET-HCAL | DET-PID | The maximum backward location for the DIRC is limited by the backward HCAL and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated.           |
| I-DET-INF-INT.038 | DET-HCAL | TBD     | The position of the backward HCAL is limited in the backward direction by the adjacent accelerator magnets.                                                                                                          |
| I-DET-INF-INT.039 | DET-HCAL | TBD     | The interior radius of the backward HCAL is governed by the size of the beamline.                                                                                                                                    |
| I-DET-INF-INT.041 | DET-HCAL | TBD     | The interior radius of the forward HCAL is governed by the size of the beamline.                                                                                                                                     |

#### 4.5. DET-MAG : Solenoid Magnet (WBS 6.10.07)

Interfaces associated with the solenoid magnet.

| Interface ID          | From    | To       | Description                                                                                                                                     |
|-----------------------|---------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-INT.001     | DET-MAG | DET      | No detectors or components constructed with magnetic material may be added to the detector without prior consultation with the magnet group.    |
| I-DET-INF-INT.002     | DET-MAG | DET      | All subordinate detectors are dependent on the continuous operation of the solenoid and on the delivery of a consistent, stable magnetic field. |
| I-DET-COMP-ONLINE.040 | DET-MAG | DET-COMP | Control cabling for the magnet instrumentation will be run from the solenoid to the instrumentation rack on the carriage.                       |
| I-DET-COMP-ONLINE.041 | DET-MAG | DET-COMP | Live monitoring data from the solenoid's operation must be recorded and maintained for diagnostic purposes.                                     |
| I-DET-COMP-ONLINE.042 | DET-MAG | DET-COMP | A network connection will be provided from the DAQ system to the solenoid cryogenic's slow controls interface.                                  |
| I-DET-COMP-ONLINE.043 | DET-MAG | DET-COMP | A network connection will be provided from the DAQ system to the solenoid's slow controls interface.                                            |
| I-DET-COMP-ONLINE.044 | DET-MAG | DET-COMP | A network connection will be provided from the DAQ system to the slow controls interface of the solenoid's power supply.                        |

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| Interface ID      | From    | To       | Description                                                                                                                                                                                                           |
|-------------------|---------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-INT.012 | DET-MAG | DET-ECAL | The exterior radius of the barrel ECAL (and its support system) is limited by the interior bore of the solenoid magnet. Modifications to either must be coordinated.                                                  |
| I-DET-ELEC.037    | DET-MAG | DET-ELEC | Bias voltage DC power will be provided from the electronics racks to support the magnet cryogenic systems.                                                                                                            |
| I-DET-ELEC.038    | DET-MAG | DET-ELEC | High voltage DC power will be provided from the electronics racks to support the magnet instrumentation and control systems.                                                                                          |
| I-DET-ELEC.039    | DET-MAG | DET-ELEC | Lower voltage DC power will be provided from the electronics racks to support the magnet cryogenic systems.                                                                                                           |
| I-DET-ELEC.040    | DET-MAG | DET-ELEC | Bias voltage DC power will be provided from the electronics racks to support the magnet instrumentation and control systems.                                                                                          |
| I-DET-ELEC.041    | DET-MAG | DET-ELEC | High voltage DC power will be provided from the electronics racks to support the magnet power supply.                                                                                                                 |
| I-DET-ELEC.042    | DET-MAG | DET-ELEC | Low voltage DC power will be provided from the electronics racks to support the magnet instrumentation and control systems.                                                                                           |
| I-DET-ELEC.043    | DET-MAG | DET-ELEC | Bias voltage DC power will be provided from the electronics racks to support the magnet power supply.                                                                                                                 |
| I-DET-ELEC.044    | DET-MAG | DET-ELEC | High voltage DC power will be provided from the electronics racks to support electronics in the detector.                                                                                                             |
| I-DET-ELEC.045    | DET-MAG | DET-ELEC | Low voltage DC power will be provided from the electronics racks to support the magnet power supply.                                                                                                                  |
| I-DET-INF-INT.031 | DET-MAG | DET-HCAL | The exterior radius of the solenoid magnet is limited by the interior bore of the barrel HCAL and necessary support structures. Modifications to either must be coordinated.                                          |
| I-DET-INF-INT.035 | DET-MAG | DET-HCAL | The maximum backward location for the solenoid magnet is limited by the backward HCAL and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated. |
| I-DET-INF-BAR.015 | DET-MAG | DET-INF  | Total weight of the solenoid and all embedded components must be supported.                                                                                                                                           |
| I-DET-INF-BAR.017 | DET-MAG | DET-INF  | The DIRC prism box containing the photosensor readouts, will be supported by an external structure supporting the ECAL within the solenoid magnet.                                                                    |

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| Interface ID      | From    | To      | Description                                                                                                                                                                                                           |
|-------------------|---------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-INT.001 | DET-MAG | DET-INF | No detectors or components constructed with magnetic material may be added to the detector without prior consultation with the magnet group.                                                                          |
| I-DET-INF-INT.002 | DET-MAG | DET-INF | All subordinate detectors are dependent on the continuous operation of the solenoid and on the delivery of a consistent, stable magnetic field.                                                                       |
| I-DET-INF-INT.012 | DET-MAG | DET-INF | The exterior radius of the barrel ECAL (and its support system) is limited by the interior bore of the solenoid magnet. Modifications to either must be coordinated.                                                  |
| I-DET-INF-INT.031 | DET-MAG | DET-INF | The exterior radius of the solenoid magnet is limited by the interior bore of the barrel HCAL and necessary support structures. Modifications to either must be coordinated.                                          |
| I-DET-INF-INT.035 | DET-MAG | DET-INF | The maximum backward location for the solenoid magnet is limited by the backward HCAL and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated. |
| I-DET-INF-INT.042 | DET-MAG | DET-INF | The solenoid will require a continuous flow of cryogenics to maintain temperature in both the experimental hall and the maintenance area. Interface includes cryogenic source and warm return.                        |
| I-DET-INF-INT.079 | DET-MAG | DET-INF | The power supply, located in an adjacent electrical room, will need to be cooled with low conductivity water.                                                                                                         |
| I-DET-INF-INT.080 | DET-MAG | DET-INF | The solenoid will require a continuous flow of cryogenics to maintain temperature in both the experimental hall and the maintenance area. Interface includes cryogenic source and warm return.                        |
| I-DET-INF-INT.081 | DET-MAG | DET-INF | Solenoid will be provided power via the power supply located in an adjacent room.                                                                                                                                     |
| I-DET-INF-INT.082 | DET-MAG | DET-INF | The instrumentation rack for the solenoid will require backup/UPS power adequate to safely shutdown the system in the event of a power failure.                                                                       |
| I-DET-INF-INT.084 | DET-MAG | DET-INF | A boundary must be established to identify the extent of the magnet's stray field during operations.                                                                                                                  |
| I-DET-INF-INT.085 | DET-MAG | DET-INF | An ice management system will be required to melt accumulated ice on the chimney. (Water should evaporate and will not require drainage)                                                                              |
| I-DET-INF-INT.086 | DET-MAG | DET-INF | The cryogenic connection must be as close as possible to the source.                                                                                                                                                  |

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| Interface ID      | From    | To      | Description                                                                                                                                                                                |
|-------------------|---------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-INT.087 | DET-MAG | DET-INF | The LCW water cooled leads must be fully supported along their path between the electrical room and the magnet.                                                                            |
| I-DET-INF-INT.101 | DET-MAG | DET-INF | The maximum forward location for the solenoid is limited by the position of the Dual RICH detector and the cabling plenum (gap) between them. Modifications to either must be coordinated. |
| I-DET-INF-INT.118 | DET-MAG | DET-INF | A supply and return of liquid nitrogen must be provided to the experimental hall for cooling the solenoid magnet during operation.                                                         |
| I-DET-INF-INT.119 | DET-MAG | DET-INF | A supply and return of liquid helium must be provided to the experimental hall for cooling the solenoid magnet during operation.                                                           |
| I-DET-INF-INT.120 | DET-MAG | DET-INF | A supply and return of liquid nitrogen must be provided to the assembly hall for cooling the solenoid magnet during maintenance.                                                           |
| I-DET-INF-INT.121 | DET-MAG | DET-INF | A supply and return of liquid helium must be provided to the assembly hall for cooling the solenoid magnet during maintenance.                                                             |
| I-DET-INF-BAR.017 | DET-MAG | DET-PID | The DIRC prism box containing the photosensor readouts, will be supported by an external structure supporting the ECAL within the solenoid magnet.                                         |
| I-DET-INF-INT.101 | DET-MAG | DET-PID | The maximum forward location for the solenoid is limited by the position of the Dual RICH detector and the cabling plenum (gap) between them. Modifications to either must be coordinated. |
| I-DET-INF-INT.118 | DET-MAG | TBD     | A supply and return of liquid nitrogen must be provided to the experimental hall for cooling the solenoid magnet during operation.                                                         |
| I-DET-INF-INT.119 | DET-MAG | TBD     | A supply and return of liquid helium must be provided to the experimental hall for cooling the solenoid magnet during operation.                                                           |
| I-DET-INF-INT.120 | DET-MAG | TBD     | A supply and return of liquid nitrogen must be provided to the assembly hall for cooling the solenoid magnet during maintenance.                                                           |
| I-DET-INF-INT.121 | DET-MAG | TBD     | A supply and return of liquid helium must be provided to the assembly hall for cooling the solenoid magnet during maintenance.                                                             |

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#### 4.6. DET-ELEC : Electronic Systems (WBS 6.10.08)

Interfaces associated with the electronic systems that service all central and ancillary detectors.

| Interface ID   | From     | To      | Description                                                                                                                            |
|----------------|----------|---------|----------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-ELEC.001 | DET-ELEC | DET-ANC | The detector will receive bias voltage DC power provided from the electronics racks to support electronics.                            |
| I-DET-ELEC.002 | DET-ELEC | DET-ANC | The detector will receive high voltage DC power provided by the Detector Electronics group to support silicon sensors and calorimeter. |
| I-DET-ELEC.003 | DET-ELEC | DET-ANC | The detector will receive low voltage DC power provided by the Detector Electronics group.                                             |
| I-DET-ELEC.004 | DET-ELEC | DET-ANC | The detector will receive bias voltage DC power provided by the Detector Electronics group to support electronics.                     |
| I-DET-ELEC.005 | DET-ELEC | DET-ANC | The detector will receive high voltage DC power provided by the Detector Electronics group to support silicon sensors and calorimeter. |
| I-DET-ELEC.006 | DET-ELEC | DET-ANC | The detector will receive low voltage DC power provided by the Detector Electronics group.                                             |
| I-DET-ELEC.007 | DET-ELEC | DET-ANC | The detector will receive bias voltage DC power provided by the Detector Electronics group to support electronics.                     |
| I-DET-ELEC.008 | DET-ELEC | DET-ANC | The detector will receive high voltage DC power provided by the Detector Electronics group to support silicon sensors and calorimeter. |
| I-DET-ELEC.009 | DET-ELEC | DET-ANC | The detector will receive low voltage DC power provided by the Detector Electronics group.                                             |
| I-DET-ELEC.010 | DET-ELEC | DET-ANC | The detector will receive bias voltage DC power provided by the Detector Electronics group to support electronics.                     |
| I-DET-ELEC.011 | DET-ELEC | DET-ANC | The detector will receive high voltage DC power provided by the Detector Electronics group to support silicon sensors and calorimeter. |
| I-DET-ELEC.012 | DET-ELEC | DET-ANC | The detector will receive low voltage DC power provided by the Detector Electronics group.                                             |
| I-DET-ELEC.013 | DET-ELEC | DET-ANC | The detector will receive bias voltage DC power provided by the Detector Electronics group to support electronics.                     |
| I-DET-ELEC.014 | DET-ELEC | DET-ANC | The detector will receive high voltage DC power provided by the Detector Electronics group to support silicon sensors and calorimeter. |

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| Interface ID          | From     | To       | Description                                                                                                                                      |
|-----------------------|----------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-ELEC.015        | DET-ELEC | DET-ANC  | The detector will receive low voltage DC power provided by the Detector Electronics group.                                                       |
| I-DET-ELEC.016        | DET-ELEC | DET-ANC  | The detector will receive bias voltage DC power provided by the Detector Electronics group to support electronics.                               |
| I-DET-ELEC.017        | DET-ELEC | DET-ANC  | The detector will receive high voltage DC power provided by the Detector Electronics group to support silicon sensors and calorimeter.           |
| I-DET-ELEC.018        | DET-ELEC | DET-ANC  | The detector will receive low voltage DC power provided by the Detector Electronics group.                                                       |
| I-DET-COMP-ONLINE.029 | DET-ELEC | DET-COMP | Monitoring system cables will run from the south platform to the DAQ control room to allow monitoring of the power supplies and the electronics. |
| I-DET-COMP-ONLINE.030 | DET-ELEC | DET-COMP | Controls cables allowing fast shutdown and machine interlocks will run from the south platform to the DAQ control room.                          |
| I-DET-ELEC.019        | DET-ELEC | DET-ECAL | Bias voltage DC power provided from the electronics racks to support electronics in the silicon photomultipliers.                                |
| I-DET-ELEC.020        | DET-ELEC | DET-ECAL | High voltage DC power will be provided from the electronics racks to support silicon sensors and gas detectors.                                  |
| I-DET-ELEC.021        | DET-ELEC | DET-ECAL | Low voltage DC power provided from the electronics racks to support electronics in the detector.                                                 |
| I-DET-ELEC.022        | DET-ELEC | DET-ECAL | Bias voltage DC power will be provided from the electronics racks to support electronics the silicon photomultipliers.                           |
| I-DET-ELEC.023        | DET-ELEC | DET-ECAL | High voltage DC power will be provided from the electronics racks to support silicon sensors and gas detectors.                                  |
| I-DET-ELEC.024        | DET-ELEC | DET-ECAL | Low voltage DC power will be provided from the electronics racks to support electronics in the detector.                                         |
| I-DET-ELEC.025        | DET-ELEC | DET-ECAL | Bias voltage DC power provided from the electronics racks to support electronics in the silicon photomultipliers.                                |
| I-DET-ELEC.026        | DET-ELEC | DET-ECAL | High voltage DC power will be provided from the electronics racks to support silicon sensors and gas detectors.                                  |
| I-DET-ELEC.027        | DET-ELEC | DET-ECAL | Low voltage DC power provided from the electronics racks to support electronics in the detector.                                                 |
| I-DET-ELEC.028        | DET-ELEC | DET-HCAL | Bias voltage DC power will be provided from the electronics racks to support the silicon photomultipliers.                                       |
| I-DET-ELEC.029        | DET-ELEC | DET-HCAL | High voltage DC power will be provided from the electronics racks to support silicon sensors and gas detectors.                                  |

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| <b>Interface ID</b> | <b>From</b> | <b>To</b> | <b>Description</b>                                                                                                                                                           |
|---------------------|-------------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-ELEC.030      | DET-ELEC    | DET-HCAL  | Low voltage DC power will be provided from the electronics racks to support electronics in the detector.                                                                     |
| I-DET-ELEC.031      | DET-ELEC    | DET-HCAL  | Bias voltage DC power will be provided from the electronics racks to support the silicon photomultipliers.                                                                   |
| I-DET-ELEC.032      | DET-ELEC    | DET-HCAL  | High voltage DC power will be provided from the electronics racks to support silicon sensors and gas detectors.                                                              |
| I-DET-ELEC.033      | DET-ELEC    | DET-HCAL  | Low voltage DC power will be provided from the electronics racks to support electronics in the detector.                                                                     |
| I-DET-ELEC.034      | DET-ELEC    | DET-HCAL  | Bias voltage DC power will be provided from the electronics racks to support the silicon photomultipliers.                                                                   |
| I-DET-ELEC.035      | DET-ELEC    | DET-HCAL  | High voltage DC power will be provided from the electronics racks to support silicon sensors and gas detectors.                                                              |
| I-DET-ELEC.036      | DET-ELEC    | DET-HCAL  | Low voltage DC power will be provided from the electronics racks to support electronics in the detector.                                                                     |
| I-DET-INF-INT.069   | DET-ELEC    | DET-INF   | Electronics components on the carriage will require clean or transformer isolated power.                                                                                     |
| I-DET-INF-INT.070   | DET-ELEC    | DET-INF   | Critical systems, such as controls, will require sufficient UPS power to allow them to be shutdown graceful, or to tolerate transients.                                      |
| I-DET-INF-INT.071   | DET-ELEC    | DET-INF   | The electronics and computing systems will require a stable environment in terms of temperature and humidity.                                                                |
| I-DET-INF-INT.072   | DET-ELEC    | DET-INF   | The electronics and computing systems on the carriage may require some EMI shielding from detectors and other components.                                                    |
| I-DET-INF-INT.073   | DET-ELEC    | DET-INF   | Adequate space for cables and cable trays will be required to deliver low voltage and high voltage, fiber and signal cables from the carriage/platform to the sub-detectors. |
| I-DET-INF-INT.074   | DET-ELEC    | DET-INF   | Adequate space must be provided for computing enclosures (racks) on the south platform to support the electronics systems.                                                   |
| I-DET-ELEC.037      | DET-ELEC    | DET-MAG   | Bias voltage DC power will be provided from the electronics racks to support the magnet cryogenic systems.                                                                   |
| I-DET-ELEC.038      | DET-ELEC    | DET-MAG   | High voltage DC power will be provided from the electronics racks to support the magnet instrumentation and control systems.                                                 |
| I-DET-ELEC.039      | DET-ELEC    | DET-MAG   | Lower voltage DC power will be provided from the electronics racks to support the magnet cryogenic systems.                                                                  |

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| Interface ID   | From     | To      | Description                                                                                                                  |
|----------------|----------|---------|------------------------------------------------------------------------------------------------------------------------------|
| I-DET-ELEC.040 | DET-ELEC | DET-MAG | Bias voltage DC power will be provided from the electronics racks to support the magnet instrumentation and control systems. |
| I-DET-ELEC.041 | DET-ELEC | DET-MAG | High voltage DC power will be provided from the electronics racks to support the magnet power supply.                        |
| I-DET-ELEC.042 | DET-ELEC | DET-MAG | Low voltage DC power will be provided from the electronics racks to support the magnet instrumentation and control systems.  |
| I-DET-ELEC.043 | DET-ELEC | DET-MAG | Bias voltage DC power will be provided from the electronics racks to support the magnet power supply.                        |
| I-DET-ELEC.044 | DET-ELEC | DET-MAG | High voltage DC power will be provided from the electronics racks to support electronics in the detector.                    |
| I-DET-ELEC.045 | DET-ELEC | DET-MAG | Low voltage DC power will be provided from the electronics racks to support the magnet power supply.                         |
| I-DET-ELEC.046 | DET-ELEC | DET-PID | Bias voltage DC power will be provided from the electronics racks to support electronics the silicon photomultipliers.       |
| I-DET-ELEC.047 | DET-ELEC | DET-PID | High voltage DC power will be provided from the electronics racks to support silicon sensors and gas detectors.              |
| I-DET-ELEC.048 | DET-ELEC | DET-PID | Low voltage DC power will be provided from the electronics racks to support electronics in the detector.                     |
| I-DET-ELEC.049 | DET-ELEC | DET-PID | High voltage power will be delivered from the power supplies on the carriage to the photosensors in the DIRC.                |
| I-DET-ELEC.050 | DET-ELEC | DET-PID | Low voltage power will be delivered from the power supplies on the carriage to the DIRC electronics.                         |
| I-DET-ELEC.051 | DET-ELEC | DET-PID | High voltage power will be delivered from the power supplies on the carriage to the photosensors in the DIRC.                |
| I-DET-ELEC.052 | DET-ELEC | DET-PID | Low voltage power will be delivered from the power supplies on the carriage to the DIRC electronics.                         |
| I-DET-ELEC.053 | DET-ELEC | DET-PID | High voltage power will be delivered from the power supplies on the carriage to the photosensors in the pfRICH/mRICH.        |
| I-DET-ELEC.054 | DET-ELEC | DET-PID | Low voltage power will be delivered from the power supplies on the carriage to the pfRICH/mRICH electronics.                 |
| I-DET-ELEC.055 | DET-ELEC | DET-PID | Bias voltage DC power will be delivered from the power supplies on the carriage to the photosensors.                         |
| I-DET-ELEC.056 | DET-ELEC | DET-PID | Low voltage power will be delivered from the power supplies on the carriage to the dRICH electronics.                        |



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| Doc No. EIC-SEG-RSI-064                                                                           | Author: W. Akers | Effective Date: December 12, 2024 | Review Frequency: N/A |
| Requirements, Specifications, and Interfaces: Interface Requirements for the EIC Detector Systems |                  |                                   | Revision: 00          |

| Interface ID   | From     | To       | Description                                                                                                               |
|----------------|----------|----------|---------------------------------------------------------------------------------------------------------------------------|
| I-DET-ELEC.057 | DET-ELEC | DET-POL  | Bias voltage DC power will be provided from the electronics racks to support electronics the silicon photomultipliers.    |
| I-DET-ELEC.058 | DET-ELEC | DET-POL  | High voltage DC power will be provided from the electronics racks to support silicon sensors and gas detectors.           |
| I-DET-ELEC.059 | DET-ELEC | DET-POL  | Low voltage DC power will be provided from the electronics racks to support electronics in the detector.                  |
| I-DET-ELEC.060 | DET-ELEC | DET-POL  | Bias voltage DC power will be provided from the electronics racks to support electronics the silicon photomultipliers.    |
| I-DET-ELEC.061 | DET-ELEC | DET-POL  | High voltage DC power will be provided from the electronics racks to support silicon sensors and gas detectors.           |
| I-DET-ELEC.062 | DET-ELEC | DET-POL  | Low voltage DC power will be provided from the electronics racks to support electronics in the detector.                  |
| I-DET-ELEC.063 | DET-ELEC | DET-POL  | Bias voltage DC power will be provided from the electronics racks to support electronics the silicon photomultipliers.    |
| I-DET-ELEC.064 | DET-ELEC | DET-POL  | High voltage DC power will be provided from the electronics racks to support silicon sensors and gas detectors.           |
| I-DET-ELEC.065 | DET-ELEC | DET-POL  | Low voltage DC power will be provided from the electronics racks to support electronics in the detector.                  |
| I-DET-ELEC.066 | DET-ELEC | DET-POL  | Bias voltage DC power will be provided from the electronics racks to support electronics the silicon photomultipliers.    |
| I-DET-ELEC.067 | DET-ELEC | DET-POL  | High voltage DC power will be provided from the electronics racks to support silicon sensors and gas detectors.           |
| I-DET-ELEC.068 | DET-ELEC | DET-POL  | Low voltage DC power will be provided from the electronics racks to support electronics in the detector.                  |
| I-DET-ELEC.069 | DET-ELEC | DET-TRAK | Bias voltage DC power will be provided from the electronics racks to support electronics in the silicon photomultipliers. |
| I-DET-ELEC.070 | DET-ELEC | DET-TRAK | High voltage DC power will be provided from the electronics racks to support silicon sensors and gas detectors.           |
| I-DET-ELEC.071 | DET-ELEC | DET-TRAK | Low voltage DC power will be provided from the electronics racks to support electronics in the detector.                  |

#### 4.7. DET-COMP : Data Acquisition and Computing Systems (WBS 6.10.09)

Interfaces associated with the data acquisition and computing systems that service all central and ancillary detectors.

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| Doc No. EIC-SEG-RSI-064                                                                           | Author: W. Akers | Effective Date: December 12, 2024 | Review Frequency: N/A |
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| Interface ID          | From     | To      | Description                                                                                                                                                   |
|-----------------------|----------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-COMP-ONLINE.002 | DET-COMP | DET-ANC | A fiber connection will be provided from the DAQ system to the B0 detector's readout board to perform configuration, control, and data acquisition.           |
| I-DET-COMP-ONLINE.003 | DET-COMP | DET-ANC | A network connection will be provided from the DAQ system to the B0 detector's slow controls interface.                                                       |
| I-DET-COMP-ONLINE.004 | DET-COMP | DET-ANC | A fiber connection will be provided from the DAQ system to the B0 detector's readout board for timing synchronization.                                        |
| I-DET-COMP-ONLINE.005 | DET-COMP | DET-ANC | A fiber connection will be provided from the DAQ system to the Low Q2 detector's readout board to perform configuration, control, and data acquisition.       |
| I-DET-COMP-ONLINE.006 | DET-COMP | DET-ANC | A network connection will be provided from the DAQ system to the Low Q2 detector's slow controls interface.                                                   |
| I-DET-COMP-ONLINE.007 | DET-COMP | DET-ANC | A fiber connection will be provided from the DAQ system to the Low Q2 detector's readout board for timing synchronization.                                    |
| I-DET-COMP-ONLINE.008 | DET-COMP | DET-ANC | Fiber connection from the DAQ system to the detector's RDO to perform configuration, control, and data acquisition.                                           |
| I-DET-COMP-ONLINE.009 | DET-COMP | DET-ANC | Network connection from the DAQ system to the detector's slow controls interface.                                                                             |
| I-DET-COMP-ONLINE.010 | DET-COMP | DET-ANC | Fiber connection from the DAQ system to the detector's RDO used for timing synchronization.                                                                   |
| I-DET-COMP-ONLINE.011 | DET-COMP | DET-ANC | A fiber connection will be provided from the DAQ system to the Off-Momentum detector's readout board to perform configuration, control, and data acquisition. |
| I-DET-COMP-ONLINE.012 | DET-COMP | DET-ANC | A network connection will be provided from the DAQ system to the Off-Momentum slow controls interface.                                                        |
| I-DET-COMP-ONLINE.013 | DET-COMP | DET-ANC | A fiber connection will be provided from the DAQ system to the Off-Momentum detector's readout board for timing synchronization.                              |
| I-DET-COMP-ONLINE.014 | DET-COMP | DET-ANC | A fiber connection will be provided from the DAQ system to the Roman Pot's readout board to perform configuration, control, and data acquisition.             |
| I-DET-COMP-ONLINE.015 | DET-COMP | DET-ANC | Network connection from the DAQ system to the detector's slow controls interface.                                                                             |
| I-DET-COMP-ONLINE.016 | DET-COMP | DET-ANC | A fiber connection will be provided from the DAQ system to the Roman Pot's readout board for timing synchronization.                                          |

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| <b>Doc No.</b> EIC-SEG-RSI-064                                                                           | <b>Author:</b> W. Akers | <b>Effective Date:</b> December 12, 2024 | <b>Review Frequency:</b> N/A |
| <b>Requirements, Specifications, and Interfaces:</b> Interface Requirements for the EIC Detector Systems |                         |                                          | <b>Revision:</b> 00          |

| Interface ID          | From     | To       | Description                                                                                                                                                     |
|-----------------------|----------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-COMP-ONLINE.017 | DET-COMP | DET-ANC  | A fiber connection will be provided from the DAQ system to the Zero-Degree Calorimeter's readout board to perform configuration, control, and data acquisition. |
| I-DET-COMP-ONLINE.018 | DET-COMP | DET-ANC  | A network connection will be provided from the DAQ system to the Zero-Degree Calorimeter's slow controls interface.                                             |
| I-DET-COMP-ONLINE.019 | DET-COMP | DET-ANC  | A fiber connection will be provided from the DAQ system to the Zero-Degree Calorimeter's readout board for timing synchronization.                              |
| I-DET-COMP-ONLINE.020 | DET-COMP | DET-ECAL | A fiber connection will be provided from the DAQ system to the barrel ECAL's readout board to perform configuration, control, and data acquisition.             |
| I-DET-COMP-ONLINE.021 | DET-COMP | DET-ECAL | A network connection will be provided from the DAQ system to the barrel ECAL's slow controls interface.                                                         |
| I-DET-COMP-ONLINE.022 | DET-COMP | DET-ECAL | A fiber connection will be provided from the DAQ system to the barrel ECAL's readout board for timing synchronization.                                          |
| I-DET-COMP-ONLINE.023 | DET-COMP | DET-ECAL | A fiber connection will be provided from the DAQ system to the backward ECAL's readout board to perform configuration, control, and data acquisition.           |
| I-DET-COMP-ONLINE.024 | DET-COMP | DET-ECAL | A network connection will be provided from the DAQ system to the backward ECAL's slow controls interface.                                                       |
| I-DET-COMP-ONLINE.025 | DET-COMP | DET-ECAL | A fiber connection will be provided from the DAQ system to the backward ECAL's readout board for timing synchronization.                                        |
| I-DET-COMP-ONLINE.026 | DET-COMP | DET-ECAL | A fiber connection will be provided from the DAQ system to the forward ECAL's readout board to perform configuration, control, and data acquisition.            |
| I-DET-COMP-ONLINE.027 | DET-COMP | DET-ECAL | A network connection will be provided from the DAQ system to the forward ECAL's slow controls interface.                                                        |
| I-DET-COMP-ONLINE.028 | DET-COMP | DET-ECAL | A fiber connection will be provided from the DAQ system to the forward ECAL's readout board for timing synchronization.                                         |
| I-DET-COMP-ONLINE.029 | DET-COMP | DET-ELEC | Monitoring system cables will run from the south platform to the DAQ control room to allow monitoring of the power supplies and the electronics.                |
| I-DET-COMP-ONLINE.030 | DET-COMP | DET-ELEC | Controls cables allowing fast shutdown and machine interlocks will run from the south platform to the DAQ control room.                                         |

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| <b>Requirements, Specifications, and Interfaces:</b> Interface Requirements for the EIC Detector Systems |                         |                                          | <b>Revision:</b> 00          |

| <b>Interface ID</b>   | <b>From</b> | <b>To</b> | <b>Description</b>                                                                                                                                                                                   |
|-----------------------|-------------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-COMP-ONLINE.031 | DET-COMP    | DET-HCAL  | A fiber connection will be provided from the DAQ system to the barrel HCAL's readout board to perform configuration, control, and data acquisition.                                                  |
| I-DET-COMP-ONLINE.032 | DET-COMP    | DET-HCAL  | A connection from the DAQ system to the barrel HCAL's slow controls interface. CLARIFY with Data acquisition whether a slow control interface will be independent of the regular control interface.  |
| I-DET-COMP-ONLINE.033 | DET-COMP    | DET-HCAL  | A fiber connection will be provided from the DAQ system to the barrel HCAL's readout board for timing synchronization.                                                                               |
| I-DET-COMP-ONLINE.034 | DET-COMP    | DET-HCAL  | A fiber connection will be provided from the DAQ system to the backward HCAL's readout board to perform configuration, control, and data acquisition.                                                |
| I-DET-COMP-ONLINE.035 | DET-COMP    | DET-HCAL  | A connection from the DAQ system to the barrel HCAL's slow controls interface. CLARIFY with Data acquisition whether a slow control interface will be independent of the regular control interface.  |
| I-DET-COMP-ONLINE.036 | DET-COMP    | DET-HCAL  | A fiber connection will be provided from the DAQ system to the backward HCAL's readout board for timing synchronization.                                                                             |
| I-DET-COMP-ONLINE.037 | DET-COMP    | DET-HCAL  | A fiber connection will be provided from the DAQ system to the forward HCAL's readout board to perform configuration, control, and data acquisition.                                                 |
| I-DET-COMP-ONLINE.038 | DET-COMP    | DET-HCAL  | A connection from the DAQ system to the forward HCAL's slow controls interface. CLARIFY with Data acquisition whether a slow control interface will be independent of the regular control interface. |
| I-DET-COMP-ONLINE.039 | DET-COMP    | DET-HCAL  | A fiber connection will be provided from the DAQ system to the forward HCAL's readout board for timing synchronization.                                                                              |
| I-DET-INF-BAR.013     | DET-COMP    | DET-INF   | A fiber support system must be provided that allows the communications cabling to remain connected while the detector is moved from the experimental hall to the assembly area.                      |
| I-DET-INF-INT.050     | DET-COMP    | DET-INF   | HVAC systems must be provided to maintain stable temperature and humidity in the computer room.                                                                                                      |
| I-DET-INF-INT.051     | DET-COMP    | DET-INF   | General HVAC systems must be provided to maintain a normal operating temperature in locations where DAQ systems are in use.                                                                          |

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| Interface ID          | From     | To      | Description                                                                                                                                                                     |
|-----------------------|----------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-INT.052     | DET-COMP | DET-INF | UPS systems must be provided to support critical systems in order to tolerate transient conditions and to allow for controlled shutdown.                                        |
| I-DET-INF-INT.053     | DET-COMP | DET-INF | Adequate power must be provided to support the DAQ systems and computing infrastructure.                                                                                        |
| I-DET-INF-INT.054     | DET-COMP | DET-INF | Standard electrical service to support consoles and systems in the control room.                                                                                                |
| I-DET-INF-INT.055     | DET-COMP | DET-INF | Clean power (either transformer or source isolated) should be provided for all DAQ, computing and network equipment.                                                            |
| I-DET-INF-INT.056     | DET-COMP | DET-INF | Adequate rack space for the DAQ system will be required on the detector carriages.                                                                                              |
| I-DET-INF-INT.057     | DET-COMP | DET-INF | Adequate raised-floor space with racks will be required to support DAQ computers, communications systems, and computing infrastructure.                                         |
| I-DET-INF-INT.058     | DET-COMP | DET-INF | Space for computing consoles and furniture adequate to manage the system during operation will be required. Consoles and furniture will be provided by DET-INF.                 |
| I-DET-INF-INT.059     | DET-COMP | DET-INF | Adequate space to route fiberoptic cables from the racks to the detector readout boards will be required.                                                                       |
| I-DET-INF-INT.060     | DET-COMP | DET-INF | Adequate conduits and cableways must be provided to deliver cabling to the racks on the fixed platforms.                                                                        |
| I-DET-INF-INT.061     | DET-COMP | DET-INF | Adequate rack space for the DAQ system must be provided on the fixed platforms, tunnels, and in the experimental hall.                                                          |
| I-DET-INF-INT.062     | DET-COMP | DET-INF | DAQ systems that are sensitive to magnetism or radiation must be placed at a sufficient distance from sources OR shielding must be provided to protect the equipment.           |
| I-DET-INF-INT.063     | DET-COMP | DET-INF | Conduits must be provided in the west and east tunnels to connect the detectors to the DAQ system.                                                                              |
| I-DET-INF-INT.064     | DET-COMP | DET-INF | A fiber support system must be provided that allows the communications cabling to remain connected while the detector is moved from the experimental hall to the assembly area. |
| I-DET-COMP-ONLINE.040 | DET-COMP | DET-MAG | Control cabling for the magnet instrumentation will be run from the solenoid to the instrumentation rack on the carriage.                                                       |
| I-DET-COMP-ONLINE.041 | DET-COMP | DET-MAG | Live monitoring data from the solenoid's operation must be recorded and maintained for diagnostic purposes.                                                                     |

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| <b>Interface ID</b>   | <b>From</b> | <b>To</b> | <b>Description</b>                                                                                                                                          |
|-----------------------|-------------|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-COMP-ONLINE.042 | DET-COMP    | DET-MAG   | A network connection will be provided from the DAQ system to the solenoid cryogenic's slow controls interface.                                              |
| I-DET-COMP-ONLINE.043 | DET-COMP    | DET-MAG   | A network connection will be provided from the DAQ system to the solenoid's slow controls interface.                                                        |
| I-DET-COMP-ONLINE.044 | DET-COMP    | DET-MAG   | A network connection will be provided from the DAQ system to the slow controls interface of the solenoid's power supply.                                    |
| I-DET-COMP-ONLINE.045 | DET-COMP    | DET-PID   | A fiber connection will be provided from the DAQ system to the barrel PID detector's readout board to perform configuration, control, and data acquisition. |
| I-DET-COMP-ONLINE.046 | DET-COMP    | DET-PID   | A network connection will be provided from the DAQ system to the barrel PID detector's slow controls interface.                                             |
| I-DET-COMP-ONLINE.047 | DET-COMP    | DET-PID   | A fiber connection will be provided from the DAQ system to the barrel PID detector's readout board for timing synchronization.                              |
| I-DET-COMP-ONLINE.048 | DET-COMP    | DET-PID   | Signal cables will run from the DIRC electronics to the DAQ system.                                                                                         |
| I-DET-COMP-ONLINE.049 | DET-COMP    | DET-PID   | Signal cables from environmental sensors will run from the DIRC electronics to the DAQ system to provide detector shutdown/protection system.               |
| I-DET-COMP-ONLINE.050 | DET-COMP    | DET-PID   | Signal cables will run from the DIRC electronics to the DAQ system.                                                                                         |
| I-DET-COMP-ONLINE.051 | DET-COMP    | DET-PID   | Signal cables from environmental sensors will run from the DIRC electronics to the DAQ system to provide detector shutdown/protection system.               |
| I-DET-COMP-ONLINE.052 | DET-COMP    | DET-PID   | Signal cables will run from the pfRICH/mRICH electronics to the DAQ system.                                                                                 |
| I-DET-COMP-ONLINE.053 | DET-COMP    | DET-PID   | Signal cables from environmental sensors will run from the pfRICH/mRICH electronics to the DAQ system to provide a detector shutdown/protection system.     |
| I-DET-COMP-ONLINE.054 | DET-COMP    | DET-PID   | Signal cables will run from the dRICH electronics to the DAQ system.                                                                                        |
| I-DET-COMP-ONLINE.055 | DET-COMP    | DET-PID   | Signal cables from environmental sensors will run from the cold photosensors to the DAQ system to provide a detector shutdown/protection system.            |
| I-DET-COMP-ONLINE.056 | DET-COMP    | DET-POL   | A fiber connection will be provided from the DAQ system to the ESR Polarimeter's readout board to perform configuration, control, and data acquisition.     |

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| Interface ID          | From     | To      | Description                                                                                                                                              |
|-----------------------|----------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-COMP-ONLINE.057 | DET-COMP | DET-POL | Data transfer lines will be run from the electron detector to a DAQ system.                                                                              |
| I-DET-COMP-ONLINE.058 | DET-COMP | DET-POL | Data transfer lines will be run from the laser enclosure on the beamline to a DAQ system.                                                                |
| I-DET-COMP-ONLINE.059 | DET-COMP | DET-POL | Data transfer lines will be run from the photon detector to a DAQ system.                                                                                |
| I-DET-COMP-ONLINE.060 | DET-COMP | DET-POL | A network connection will be provided from the DAQ system to the ESR Polarimeter's slow controls interface.                                              |
| I-DET-COMP-ONLINE.061 | DET-COMP | DET-POL | A fiber connection will be provided from the DAQ system to the ESR Polarimeter's readout board for timing synchronization.                               |
| I-DET-COMP-ONLINE.062 | DET-COMP | DET-POL | A fiber connection will be provided from the DAQ system to the RCS polarimeter's readout board to perform configuration, control, and data acquisition.  |
| I-DET-COMP-ONLINE.063 | DET-COMP | DET-POL | Data transfer lines will be run from the laser enclosure on the beamline to a DAQ system.                                                                |
| I-DET-COMP-ONLINE.064 | DET-COMP | DET-POL | Data transfer lines will be run from the photon detector to a DAQ system.                                                                                |
| I-DET-COMP-ONLINE.065 | DET-COMP | DET-POL | A network connection will be provided from the DAQ system to the RCS polarimeter's slow controls interface.                                              |
| I-DET-COMP-ONLINE.066 | DET-COMP | DET-POL | A fiber connection will be provided from the DAQ system to the RCS polarimeter's readout board for timing synchronization.                               |
| I-DET-COMP-ONLINE.067 | DET-COMP | DET-POL | Readout cables need to run from the polarimeter detectors to the data acquisition system at IR-4.                                                        |
| I-DET-COMP-ONLINE.068 | DET-COMP | DET-POL | Slow control information should be written to the HSR database (5 second intervals)                                                                      |
| I-DET-COMP-ONLINE.069 | DET-COMP | DET-POL | A fiber connection will be provided from the DAQ system to the HJET polarimeter's readout board to perform configuration, control, and data acquisition. |
| I-DET-COMP-ONLINE.070 | DET-COMP | DET-POL | Slow control cables for the HJET target system need to run from the hall at IR-4 to the polarimeter in the tunnel.                                       |
| I-DET-COMP-ONLINE.071 | DET-COMP | DET-POL | A network connection will be provided from the DAQ system to the HJET polarimeter's slow controls interface.                                             |
| I-DET-COMP-ONLINE.072 | DET-COMP | DET-POL | A fiber connection will be provided from the DAQ system to the HJET polarimeter's readout board for timing synchronization.                              |

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| <b>Requirements, Specifications, and Interfaces:</b> Interface Requirements for the EIC Detector Systems |                         |                                          | <b>Revision:</b> 00          |

| Interface ID           | From     | To       | Description                                                                                                                                                       |
|------------------------|----------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-COMP-ONLINE.073  | DET-COMP | DET-POL  | A fiber connection will be provided from the DAQ system to the proton-carbon polarimeter's readout board to perform configuration, control, and data acquisition. |
| I-DET-COMP-ONLINE.074  | DET-COMP | DET-POL  | Results from the target scan polarimeter runs should be written to the HSR database                                                                               |
| I-DET-COMP-ONLINE.075  | DET-COMP | DET-POL  | A network connection will be provided from the DAQ system to the proton-carbon polarimeter's slow controls interface.                                             |
| I-DET-COMP-ONLINE.076  | DET-COMP | DET-POL  | A fiber connection will be provided from the DAQ system to the proton-carbon polarimeter's readout board for timing synchronization.                              |
| I-DET-COMP-ONLINE.077  | DET-COMP | DET-POL  | Slow control cables for the target motion need to run from the hall at IR-4 to the polarimeter.                                                                   |
| I-DET-COMP-ONLINE.078  | DET-COMP | DET-POL  | Fiber target operation should be controlled from the HSR main control room                                                                                        |
| I-DET-COMP-ONLINE.079  | DET-COMP | DET-POL  | Slow control cables for the target motion need to run from the DAQ room at IR-6 to the polarimeter.                                                               |
| I-DET-COMP-ONLINE.080  | DET-COMP | DET-POL  | Fiber target operation should be controlled from the EPIC control room                                                                                            |
| I-DET-COMP-ONLINE.081  | DET-COMP | DET-TRAK | Cables required to transfer data from the detector to the online data acquisition system.                                                                         |
| I-DET-COMP-ONLINE.082  | DET-COMP | DET-TRAK | A fiber connection will be provided from the DAQ system to the barrel tracking system's readout board to perform configuration, control, and data acquisition.    |
| I-DET-COMP-ONLINE.083  | DET-COMP | DET-TRAK | A network connection will be provided from the DAQ system to the barrel tracking system's slow controls interface.                                                |
| I-DET-COMP-ONLINE.084  | DET-COMP | DET-TRAK | A fiber connection will be provided from the DAQ system to the barrel tracking system's readout board for timing synchronization.                                 |
| I-DET-COMP-OFFLINE.001 | DET-COMP | TBD      | The DAQ system must have a network interface that is adequate to transfer collected data from the local systems to an offline storage facility.                   |
| I-DET-COMP-ONLINE.085  | DET-COMP | TBD      | An interface to the accelerator beam databases must be provided that allows the DAQ to read data, and on a limited basis, write data.                             |
| I-DET-COMP-ONLINE.086  | DET-COMP | TBD      | A beam synchronization signal must be provided to the DAQ system that provides beam bunch information.                                                            |



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| Doc No. EIC-SEG-RSI-064                                                                           | Author: W. Akers | Effective Date: December 12, 2024 | Review Frequency: N/A |
| Requirements, Specifications, and Interfaces: Interface Requirements for the EIC Detector Systems |                  |                                   | Revision: 00          |

| Interface ID          | From     | To  | Description                                                                                                                         |
|-----------------------|----------|-----|-------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-COMP-ONLINE.087 | DET-COMP | TBD | An interface should be provided that allows the accelerator control system to read the condition and state of the detector systems. |

#### 4.8. DET-INF : Detector Infrastructure Systems (WBS 6.10.10)

Infrastructure systems required to support all detectors located in the central detector, experimental hall, and the upstream and downstream interaction region.

| Interface ID      | From    | To      | Description                                                                                                                                                                                              |
|-------------------|---------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-INT.001 | DET-INF | DET     | No detectors or components constructed with magnetic material may be added to the detector without prior consultation with the magnet group.                                                             |
| I-DET-INF-INT.002 | DET-INF | DET     | All subordinate detectors are dependent on the continuous operation of the solenoid and on the delivery of a consistent, stable magnetic field.                                                          |
| I-DET-INF-INT.003 | DET-INF | DET     | The DIRC structure will provide integrated pathways for cabling and services to be delivered from the interior detectors (pf RICH/mRICH and silicon trackers) to the exterior infrastructure.            |
| I-DET-INF-BCK.004 | DET-INF | DET-ANC | The LowQ2 detector is supported by a freestanding platform that is adjacent to the outgoing electron beam.                                                                                               |
| I-DET-INF-BCK.005 | DET-INF | DET-ANC | The luminosity detector will be supported by an independent support system.                                                                                                                              |
| I-DET-INF-FWD.001 | DET-INF | DET-ANC | The detector will be supported by an integrated support stand that is fully integrated with the vacuum system and allows the position of the detector to be adjusted.                                    |
| I-DET-INF-FWD.002 | DET-INF | DET-ANC | The detector will be supported by an integrated support stand that is fully integrated with the vacuum system and allows the position of the detector to be adjusted.                                    |
| I-DET-INF-FWD.006 | DET-INF | DET-ANC | The B0 detector will be supported in the interior of the B0 magnet and will be dependent on the B0 magnet design, and must be adequate to support the weight of the crystals and the tracking detectors. |
| I-DET-INF-FWD.007 | DET-INF | DET-ANC | The detector will be supported on a free standing structure.                                                                                                                                             |
| I-DET-INF-INT.004 | DET-INF | DET-ANC | B0 detector must fit entirely within the bore of the B0 magnet.                                                                                                                                          |

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| Interface ID      | From    | To       | Description                                                                                                                                                                                                                  |
|-------------------|---------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-INT.005 | DET-INF | DET-ANC  | The position of the forward HCAL is bounded by the B0 magnet in the forward direction. Changes to the size or position of either must be coordinated with the other.                                                         |
| I-DET-INF-INT.006 | DET-INF | DET-ANC  | The position of and accessibility of the B0 detector in the backward direction is limited by the cryostat containing the final focusing magnets.                                                                             |
| I-DET-INF-INT.007 | DET-INF | DET-ANC  | Access to the B0 detector is constrained by the vacuum valve in front of the B0 magnet. A minimum of 15 centimeters of free space will be required on the IP-side of the B0-dipole for the installation of the B0 detectors. |
| I-DET-INF-INT.008 | DET-INF | DET-ANC  | The electron and hadron beam pipes must be contained within the B0 detector.                                                                                                                                                 |
| I-DET-INF-INT.009 | DET-INF | DET-ANC  | The LowQ2 detector must be upstream in the electron direction from the Q3ER magnet.                                                                                                                                          |
| I-DET-INF-INT.010 | DET-INF | DET-ANC  | The LowQ2 detector must be downstream in the electron direction from the B2ER magnet.                                                                                                                                        |
| I-DET-INF-INT.011 | DET-INF | DET-ANC  | The LOWQ2 detector must be at the same level as the electron beamline.                                                                                                                                                       |
| I-DET-INF-INT.043 | DET-INF | DET-ANC  | A cooling system will be required to remove heat from the calorimeter and electronics readouts, to maintain an acceptable temperature.                                                                                       |
| I-DET-INF-INT.044 | DET-INF | DET-ANC  | Either a liquid or gas cooling system will be required to remove heat from the calorimeter, tracking and readout electronics, to maintain them at room temperature.                                                          |
| I-DET-INF-INT.045 | DET-INF | DET-ANC  | The two dipoles in front of the detector will require an infrastructure power source.                                                                                                                                        |
| I-DET-INF-INT.046 | DET-INF | DET-ANC  | The beamline between the two luminosity detector dipoles must be under vacuum.                                                                                                                                               |
| I-DET-INF-INT.047 | DET-INF | DET-ANC  | A cooling system will be required to remove heat from the tracking and readout electronics to prevent heat buildup.                                                                                                          |
| I-DET-INF-INT.048 | DET-INF | DET-ANC  | A cooling system will be required to remove heat from the tracking and readout electronics to prevent heat buildup.                                                                                                          |
| I-DET-INF-INT.049 | DET-INF | DET-ANC  | A cooling system will be required to remove heat from the calorimeter and readout electronics to prevent heat buildup.                                                                                                       |
| I-DET-INF-BAR.013 | DET-INF | DET-COMP | A fiber support system must be provided that allows the communications cabling to remain connected while the detector is moved from the experimental hall to the assembly area.                                              |

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| Interface ID      | From    | To       | Description                                                                                                                                                                     |
|-------------------|---------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-INT.050 | DET-INF | DET-COMP | HVAC systems must be provided to maintain stable temperature and humidity in the computer room.                                                                                 |
| I-DET-INF-INT.051 | DET-INF | DET-COMP | General HVAC systems must be provided to maintain a normal operating temperature in locations where DAQ systems are in use.                                                     |
| I-DET-INF-INT.052 | DET-INF | DET-COMP | UPS systems must be provided to support critical systems in order to tolerate transient conditions and to allow for controlled shutdown.                                        |
| I-DET-INF-INT.053 | DET-INF | DET-COMP | Adequate power must be provided to support the DAQ systems and computing infrastructure.                                                                                        |
| I-DET-INF-INT.054 | DET-INF | DET-COMP | Standard electrical service to support consoles and systems in the control room.                                                                                                |
| I-DET-INF-INT.055 | DET-INF | DET-COMP | Clean power (either transformer or source isolated) should be provided for all DAQ, computing and network equipment.                                                            |
| I-DET-INF-INT.056 | DET-INF | DET-COMP | Adequate rack space for the DAQ system will be required on the detector carriages.                                                                                              |
| I-DET-INF-INT.057 | DET-INF | DET-COMP | Adequate raised-floor space with racks will be required to support DAQ computers, communications systems, and computing infrastructure.                                         |
| I-DET-INF-INT.058 | DET-INF | DET-COMP | Space for computing consoles and furniture adequate to manage the system during operation will be required. Consoles and furniture will be provided by DET-INT.                 |
| I-DET-INF-INT.059 | DET-INF | DET-COMP | Adequate space to route fiberoptic cables from the racks to the detector readout boards will be required.                                                                       |
| I-DET-INF-INT.060 | DET-INF | DET-COMP | Adequate conduits and cableways must be provided to deliver cabling to the racks on the fixed platforms.                                                                        |
| I-DET-INF-INT.061 | DET-INF | DET-COMP | Adequate rack space for the DAQ system must be provided on the fixed platforms, tunnels, and in the experimental hall.                                                          |
| I-DET-INF-INT.062 | DET-INF | DET-COMP | DAQ systems that are sensitive to magnetism or radiation must be placed at a sufficient distance from sources OR shielding must be provided to protect the equipment.           |
| I-DET-INF-INT.063 | DET-INF | DET-COMP | Conduits must be provided in the west and east tunnels to connect the detectors to the DAQ system.                                                                              |
| I-DET-INF-INT.064 | DET-INF | DET-COMP | A fiber support system must be provided that allows the communications cabling to remain connected while the detector is moved from the experimental hall to the assembly area. |

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| Interface ID      | From    | To       | Description                                                                                                                                                                                                                                |
|-------------------|---------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-BAR.001 | DET-INF | DET-ECAL | The barrel ECAL will be supported by a structural support system that extends through the bore of the solenoid magnet and is supported by the barrel Hadron Calorimeter.                                                                   |
| I-DET-INF-BAR.002 | DET-INF | DET-ECAL | The weight of the barrel ECAL will be transferred to the barrel Hadron Calorimeter and must be accommodated by all intermediate and subsequent support systems.                                                                            |
| I-DET-INF-BAR.003 | DET-INF | DET-ECAL | The DIRC bar boxes will be supported by a frame inside the barrel Electromagnetic Calorimeter, that allows the boxes to be extracted using a system of rollers.                                                                            |
| I-DET-INF-BAR.004 | DET-INF | DET-ECAL | The backward ECAL will be supported by an integrated support structure that is attached to the DIRC support frame.                                                                                                                         |
| I-DET-INF-BAR.005 | DET-INF | DET-ECAL | The weight of the backward ECAL will be transferred to the DIRC detector support and must be accommodated by all subsequent support systems.                                                                                               |
| I-DET-INF-BAR.006 | DET-INF | DET-ECAL | The DIRC support system will provide support for the backward electromagnetic calorimeter.                                                                                                                                                 |
| I-DET-INF-BAR.007 | DET-INF | DET-ECAL | The forward ECAL will be supported by the forward Hadron Calorimeter endcap. Because the forward ECAL must split into two parts to provide access to the barrel, each half must be independently affixed to the Hadron Calorimeter halves. |
| I-DET-INF-BAR.008 | DET-INF | DET-ECAL | The weight of the forward ECAL will be transferred to the forward Hadron Calorimeter endcap and must be accommodated by all subsequent support systems.                                                                                    |
| I-DET-INF-BAR.014 | DET-INF | DET-ECAL | Each half of the forward ECAL must be continuously supported and stabilized while it is moved between the opened and closed positions.                                                                                                     |
| I-DET-INF-FWD.004 | DET-INF | DET-ECAL | The forward HCAL will support the weight of the forward electromagnetic calorimeter that is embedded within it.                                                                                                                            |
| I-DET-INF-FWD.008 | DET-INF | DET-ECAL | Each half of the forward ECAL must be continuously supported and stabilized while it is moved between the opened and closed positions.                                                                                                     |
| I-DET-INF-INT.012 | DET-INF | DET-ECAL | The exterior radius of the barrel ECAL (and its support system) is limited by the interior bore of the solenoid magnet. Modifications to either must be coordinated.                                                                       |
| I-DET-INF-INT.013 | DET-INF | DET-ECAL | The backward position and shape of the barrel EMCAL is limited by the size and shape of the DIRC readout supports. Changes to the size or position of either must be coordinated with the other.                                           |

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| Interface ID      | From    | To       | Description                                                                                                                                                                                                                                 |
|-------------------|---------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-INT.014 | DET-INF | DET-ECAL | The maximum size of the DIRC is limited to the interior bore of the barrel ECAL (and its support structures). Modifications to either must be coordinated.                                                                                  |
| I-DET-INF-INT.015 | DET-INF | DET-ECAL | The forward position and shape of the barrel ECAL is limited by the backward face of the Dual RICH detector and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated. |
| I-DET-INF-INT.016 | DET-INF | DET-ECAL | The backward position of the backward ECAL is limited by the backward Hadron Calorimeter and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated.                    |
| I-DET-INF-INT.017 | DET-INF | DET-ECAL | The maximum backward location for the DIRC is limited by the position of the backward electromagnetic calorimeter. Modifications to either must be coordinated.                                                                             |
| I-DET-INF-INT.018 | DET-INF | DET-ECAL | The exterior radius of the backward ECAL is limited by the interior bore of the DIRC support system. Modifications to either must be coordinated.                                                                                           |
| I-DET-INF-INT.019 | DET-INF | DET-ECAL | The backward ECAL must mitigate the heat generated by the backward RICH detector.                                                                                                                                                           |
| I-DET-INF-INT.020 | DET-INF | DET-ECAL | The position of the backward ECAL in the forward direction is limited by the backward face of the pRICH/mRICH detector. Modifications to either must be coordinated.                                                                        |
| I-DET-INF-INT.021 | DET-INF | DET-ECAL | The bore of the backward ECAL must be designed to allow it to be inserted/removed over the existing beamline flanges.                                                                                                                       |
| I-DET-INF-INT.022 | DET-INF | DET-ECAL | The interior radius of the backward ECAL is governed by the size of the beamline.                                                                                                                                                           |
| I-DET-INF-INT.023 | DET-INF | DET-ECAL | The exterior radius of the forward ECAL is limited by the interior bore of the barrel Hadron Calorimeter. Modifications to either must be coordinated.                                                                                      |
| I-DET-INF-INT.024 | DET-INF | DET-ECAL | The forward position of the forward ECAL is limited by the forward Hadron Calorimeter. Modifications to either must be coordinated.                                                                                                         |
| I-DET-INF-INT.025 | DET-INF | DET-ECAL | The maximum forward location for the dRICH is limited by the forward ECAL and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated.                                   |

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|-------------------|---------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-INT.026 | DET-INF | DET-ECAL | The interior radius of the forward ECAL is governed by the size of the beamline. Modifications to either must be coordinated.                                                |
| I-DET-INF-INT.065 | DET-INF | DET-ECAL | The imaging layers must be cooled with an independent system (TBD).                                                                                                          |
| I-DET-INF-INT.066 | DET-INF | DET-ECAL | The barrel ECAL will require chilled water or LCW cooling to maintain a safe operating temperature.                                                                          |
| I-DET-INF-INT.067 | DET-INF | DET-ECAL | The backward ECAL will require chilled water or LCW cooling to maintain the temperature of the silicon photomultipliers, the electronics, and the crystals.                  |
| I-DET-INF-INT.068 | DET-INF | DET-ECAL | The forward ECAL will require chilled water or LCW cooling to maintain a safe operating temperature.                                                                         |
| I-DET-INF-INT.069 | DET-INF | DET-ELEC | Electronics components on the carriage will require clean or transformer isolated power.                                                                                     |
| I-DET-INF-INT.070 | DET-INF | DET-ELEC | Critical systems, such as controls, will require sufficient UPS power to allow them to be shutdown graceful, or to tolerate transients.                                      |
| I-DET-INF-INT.071 | DET-INF | DET-ELEC | The electronics and computing systems will require a stable environment in terms of temperature and humidity.                                                                |
| I-DET-INF-INT.072 | DET-INF | DET-ELEC | The electronics and computing systems on the carriage may require some EMI shielding from detectors and other components.                                                    |
| I-DET-INF-INT.073 | DET-INF | DET-ELEC | Adequate space for cables and cable trays will be required to deliver low voltage and high voltage, fiber and signal cables from the carriage/platform to the sub-detectors. |
| I-DET-INF-INT.074 | DET-INF | DET-ELEC | Adequate space must be provided for computing enclosures (racks) on the south platform to support the electronics systems.                                                   |
| I-DET-INF-BAR.001 | DET-INF | DET-HCAL | The barrel ECAL will be supported by a structural support system that extends through the bore of the solenoid magnet and is supported by the barrel Hadron Calorimeter.     |
| I-DET-INF-BAR.002 | DET-INF | DET-HCAL | The weight of the barrel ECAL will be transferred to the barrel Hadron Calorimeter and must be accommodated by all intermediate and subsequent support systems.              |
| I-DET-INF-BAR.004 | DET-INF | DET-HCAL | The backward ECAL will be supported by an integrated support structure that is attached to the DIRC support frame.                                                           |
| I-DET-INF-BAR.007 | DET-INF | DET-HCAL | The forward ECAL will be supported by the forward Hadron Calorimeter endcap. Because the forward ECAL must split                                                             |

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|                   |         |          | into two parts to provide access to the barrel, each half must be independently affixed to the Hadron Calorimeter halves.                                            |
| I-DET-INF-BAR.008 | DET-INF | DET-HCAL | The weight of the forward ECAL will be transferred to the forward Hadron Calorimeter endcap and must be accommodated by all subsequent support systems.              |
| I-DET-INF-BAR.009 | DET-INF | DET-HCAL | The barrel HCAL will be supported by a rolling carriage that allows the central detector to be moved between the assembly area and the experimental hall.            |
| I-DET-INF-BAR.010 | DET-INF | DET-HCAL | The barrel HCAL will support the weight of all of the sub-detectors and components within the central detector.                                                      |
| I-DET-INF-BAR.011 | DET-INF | DET-HCAL | The cumulative weight of the HCAL and all of the sub-detectors it supports will be transferred to the detector carriage.                                             |
| I-DET-INF-BAR.012 | DET-INF | DET-HCAL | The Dual RICH will be supported by a structural system within the barrel hadron calorimeter.                                                                         |
| I-DET-INF-BCK.001 | DET-INF | DET-HCAL | Adequate clearance must be provided for either of the detector carriages to be rolled aside to allow access to sub-detectors within the barrel.                      |
| I-DET-INF-BCK.002 | DET-INF | DET-HCAL | The backward HCAL consists of two halves, each of which are support by an independent carriage.                                                                      |
| I-DET-INF-BCK.003 | DET-INF | DET-HCAL | The weight of each half of the backward HCAL will be transferred to the carriage that is supporting it.                                                              |
| I-DET-INF-FWD.003 | DET-INF | DET-HCAL | The forward HCAL consists of two halves, each of which are support by an independent carriage.                                                                       |
| I-DET-INF-FWD.004 | DET-INF | DET-HCAL | The forward HCAL will support the weight of the forward electromagnetic calorimeter that is embedded within it.                                                      |
| I-DET-INF-FWD.005 | DET-INF | DET-HCAL | The weight of each half of the forward HCAL, and its embedded subdetectors, will be transferred to the associated carriage.                                          |
| I-DET-INF-FWD.009 | DET-INF | DET-HCAL | Adequate clearance must be provided for either of the detector carriages to be rolled aside to allow access to sub-detectors within the barrel.                      |
| I-DET-INF-INT.005 | DET-INF | DET-HCAL | The position of the forward HCAL is bounded by the B0 magnet in the forward direction. Changes to the size or position of either must be coordinated with the other. |
| I-DET-INF-INT.016 | DET-INF | DET-HCAL | The backward position of the backward ECAL is limited by the backward Hadron Calorimeter and the adjacent cabling                                                    |

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|                   |         |          | pathway that provides services to the interior detectors. Modifications to either must be coordinated.                                                                                                                |
| I-DET-INF-INT.023 | DET-INF | DET-HCAL | The exterior radius of the forward ECAL is limited by the interior bore of the barrel Hadron Calorimeter. Modifications to either must be coordinated.                                                                |
| I-DET-INF-INT.024 | DET-INF | DET-HCAL | The forward position of the forward ECAL is limited by the forward Hadron Calorimeter. Modifications to either must be coordinated.                                                                                   |
| I-DET-INF-INT.027 | DET-INF | DET-HCAL | The forward position of the backward HCAL is limited by the barrel HCAL and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated.               |
| I-DET-INF-INT.028 | DET-INF | DET-HCAL | The exterior radius of the backward HCAL should be consistent with the radius of the barrel HCAL.                                                                                                                     |
| I-DET-INF-INT.029 | DET-INF | DET-HCAL | The exterior radius of the forward HCAL should be consistent with the radius of the barrel HCAL.                                                                                                                      |
| I-DET-INF-INT.030 | DET-INF | DET-HCAL | The backward position of the forward HCAL is limited by the barrel HCAL and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated.               |
| I-DET-INF-INT.031 | DET-INF | DET-HCAL | The exterior radius of the solenoid magnet is limited by the interior bore of the barrel HCAL and necessary support structures. Modifications to either must be coordinated.                                          |
| I-DET-INF-INT.032 | DET-INF | DET-HCAL | The size of the dRICH is limited by the interior bore of the barrel HCAL, and must provide adequate space for cables and services to itself and the interior detectors. Modifications to either must be coordinated.  |
| I-DET-INF-INT.034 | DET-INF | DET-HCAL | The forward position of the backward HCAL is limited by the barrel HCAL and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated.               |
| I-DET-INF-INT.035 | DET-INF | DET-HCAL | The maximum backward location for the solenoid magnet is limited by the backward HCAL and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated. |
| I-DET-INF-INT.036 | DET-INF | DET-HCAL | The maximum backward location for the DIRC is limited by the backward HCAL and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated.            |



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| I-DET-INF-INT.038 | DET-INF | DET-HCAL | The position of the backward HCAL is limited in the backward direction by the adjacent accelerator magnets.                                                                  |
| I-DET-INF-INT.039 | DET-INF | DET-HCAL | The interior radius of the backward HCAL is governed by the size of the beamline.                                                                                            |
| I-DET-INF-INT.041 | DET-INF | DET-HCAL | The interior radius of the forward HCAL is governed by the size of the beamline.                                                                                             |
| I-DET-INF-INT.075 | DET-INF | DET-HCAL | Heat from the silicon photomultipliers and front end electronics will be rejected into the outside room via forced air.                                                      |
| I-DET-INF-INT.076 | DET-INF | DET-HCAL | The exterior radius of the barrel HCAL is limited by the detector carriage, the electronics platforms, and other Hall infrastructure.                                        |
| I-DET-INF-INT.077 | DET-INF | DET-HCAL | Heat from the silicon photomultipliers and front end electronics will be rejected into the outside room via forced air.                                                      |
| I-DET-INF-INT.078 | DET-INF | DET-HCAL | Heat from the silicon photomultipliers and front end electronics will be rejected into the outside room via forced air. DO WE NEED CW FOR COOLING HERE?                      |
| I-DET-INF-BAR.015 | DET-INF | DET-MAG  | Total weight of the solenoid and all embedded components must be supported.                                                                                                  |
| I-DET-INF-BAR.017 | DET-INF | DET-MAG  | The DIRC prism box containing the photosensor readouts, will be supported by an external structure supporting the ECAL within the solenoid magnet.                           |
| I-DET-INF-INT.001 | DET-INF | DET-MAG  | No detectors or components constructed with magnetic material may be added to the detector without prior consultation with the magnet group.                                 |
| I-DET-INF-INT.002 | DET-INF | DET-MAG  | All subordinate detectors are dependent on the continuous operation of the solenoid and on the delivery of a consistent, stable magnetic field.                              |
| I-DET-INF-INT.012 | DET-INF | DET-MAG  | The exterior radius of the barrel ECAL (and its support system) is limited by the interior bore of the solenoid magnet. Modifications to either must be coordinated.         |
| I-DET-INF-INT.031 | DET-INF | DET-MAG  | The exterior radius of the solenoid magnet is limited by the interior bore of the barrel HCAL and necessary support structures. Modifications to either must be coordinated. |
| I-DET-INF-INT.035 | DET-INF | DET-MAG  | The maximum backward location for the solenoid magnet is limited by the backward HCAL and the adjacent cabling                                                               |

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| Electron-Ion Collider, Brookhaven National Laboratory                                             |                  |                                   |                       |
|---------------------------------------------------------------------------------------------------|------------------|-----------------------------------|-----------------------|
| Doc No. EIC-SEG-RSI-064                                                                           | Author: W. Akers | Effective Date: December 12, 2024 | Review Frequency: N/A |
| Requirements, Specifications, and Interfaces: Interface Requirements for the EIC Detector Systems |                  |                                   | Revision: 00          |

| Interface ID      | From    | To      | Description                                                                                                                                                                                    |
|-------------------|---------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                   |         |         | pathway that provides services to the interior detectors. Modifications to either must be coordinated.                                                                                         |
| I-DET-INF-INT.042 | DET-INF | DET-MAG | The solenoid will require a continuous flow of cryogenics to maintain temperature in both the experimental hall and the maintenance area. Interface includes cryogenic source and warm return. |
| I-DET-INF-INT.079 | DET-INF | DET-MAG | The power supply, located in an adjacent electrical room, will need to be cooled with low conductivity water.                                                                                  |
| I-DET-INF-INT.080 | DET-INF | DET-MAG | The solenoid will require a continuous flow of cryogenics to maintain temperature in both the experimental hall and the maintenance area. Interface includes cryogenic source and warm return. |
| I-DET-INF-INT.081 | DET-INF | DET-MAG | Solenoid will be provided power via the power supply located in an adjacent room.                                                                                                              |
| I-DET-INF-INT.082 | DET-INF | DET-MAG | The instrumentation rack for the solenoid will require backup/UPS power adequate to safely shutdown the system in the event of a power failure.                                                |
| I-DET-INF-INT.084 | DET-INF | DET-MAG | A boundary must be established to identify the extent of the magnet's stray field during operations.                                                                                           |
| I-DET-INF-INT.085 | DET-INF | DET-MAG | An ice management system will be required to melt accumulated ice on the chimney. (Water should evaporate and will not require drainage)                                                       |
| I-DET-INF-INT.086 | DET-INF | DET-MAG | The cryogenic connection must be as close as possible to the source.                                                                                                                           |
| I-DET-INF-INT.087 | DET-INF | DET-MAG | The LCW water cooled leads must be fully supported along their path between the electrical room and the magnet.                                                                                |
| I-DET-INF-INT.101 | DET-INF | DET-MAG | The maximum forward location for the solenoid is limited by the position of the Dual RICH detector and the cabling plenum (gap) between them. Modifications to either must be coordinated.     |
| I-DET-INF-INT.118 | DET-INF | DET-MAG | A supply and return of liquid nitrogen must be provided to the experimental hall for cooling the solenoid magnet during operation.                                                             |
| I-DET-INF-INT.119 | DET-INF | DET-MAG | A supply and return of liquid helium must be provided to the experimental hall for cooling the solenoid magnet during operation.                                                               |

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| Interface ID      | From    | To      | Description                                                                                                                                                                                   |
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| I-DET-INF-INT.120 | DET-INF | DET-MAG | A supply and return of liquid nitrogen must be provided to the assembly hall for cooling the solenoid magnet during maintenance.                                                              |
| I-DET-INF-INT.121 | DET-INF | DET-MAG | A supply and return of liquid helium must be provided to the assembly hall for cooling the solenoid magnet during maintenance.                                                                |
| I-DET-INF-BAR.003 | DET-INF | DET-PID | The DIRC bar boxes will be supported by a frame inside the barrel Electromagnetic Calorimeter, that allows the boxes to be extracted using a system of rollers.                               |
| I-DET-INF-BAR.005 | DET-INF | DET-PID | The weight of the backward ECAL will be transferred to the DIRC detector support and must be accommodated by all subsequent support systems.                                                  |
| I-DET-INF-BAR.006 | DET-INF | DET-PID | The DIRC support system will provide support for the backward electromagnetic calorimeter.                                                                                                    |
| I-DET-INF-BAR.012 | DET-INF | DET-PID | The Dual RICH will be supported by a structural system within the barrel hadron calorimeter.                                                                                                  |
| I-DET-INF-BAR.017 | DET-INF | DET-PID | The DIRC prism box containing the photosensor readouts, will be supported by an external structure supporting the ECAL within the solenoid magnet.                                            |
| I-DET-INF-BAR.018 | DET-INF | DET-PID | The pFRICH/mRICH will be supported by the DIRC bar box support system.                                                                                                                        |
| I-DET-INF-BAR.019 | DET-INF | DET-PID | The barrel Time of Flight will be supported by the DIRC bar box assembly.                                                                                                                     |
| I-DET-INF-BAR.020 | DET-INF | DET-PID | The DIRC support system will provide support for the upstream PID detector system.                                                                                                            |
| I-DET-INF-BAR.021 | DET-INF | DET-PID | The DIRC support system will provide support for the silicon trackers in the detector barrel.                                                                                                 |
| I-DET-INF-BAR.022 | DET-INF | DET-PID | The weight of the barrel tracking systems will be transferred to the DIRC support system.                                                                                                     |
| I-DET-INF-FWD.011 | DET-INF | DET-PID | The interior radius of the dRICH is governed by the size of the beamline and its associated flanges and support system.                                                                       |
| I-DET-INF-FWD.012 | DET-INF | DET-PID | The maximum forward location for the tracking system is limited by the position of the AC LGAD Time of Flight Detector. Modifications to either must be coordinated.                          |
| I-DET-INF-INT.003 | DET-INF | DET-PID | The DIRC structure will provide integrated pathways for cabling and services to be delivered from the interior detectors (pf RICH/mRICH and silicon trackers) to the exterior infrastructure. |

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| Doc No. EIC-SEG-RSI-064                                                                           | Author: W. Akers | Effective Date: December 12, 2024 | Review Frequency: N/A |
| Requirements, Specifications, and Interfaces: Interface Requirements for the EIC Detector Systems |                  |                                   | Revision: 00          |

| Interface ID      | From    | To      | Description                                                                                                                                                                                                                                 |
|-------------------|---------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-INT.013 | DET-INF | DET-PID | The backward position and shape of the barrel EMCAL is limited by the size and shape of the DIRC readout supports. Changes to the size or position of either must be coordinated with the other.                                            |
| I-DET-INF-INT.014 | DET-INF | DET-PID | The maximum size of the DIRC is limited to the interior bore of the barrel ECAL (and its support structures). Modifications to either must be coordinated.                                                                                  |
| I-DET-INF-INT.015 | DET-INF | DET-PID | The forward position and shape of the barrel ECAL is limited by the backward face of the Dual RICH detector and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated. |
| I-DET-INF-INT.017 | DET-INF | DET-PID | The maximum backward location for the DIRC is limited by the position of the backward electromagnetic calorimeter. Modifications to either must be coordinated.                                                                             |
| I-DET-INF-INT.018 | DET-INF | DET-PID | The exterior radius of the backward ECAL is limited by the interior bore of the DIRC support system. Modifications to either must be coordinated.                                                                                           |
| I-DET-INF-INT.019 | DET-INF | DET-PID | The backward ECAL must mitigate the heat generated by the backward RICH detector.                                                                                                                                                           |
| I-DET-INF-INT.020 | DET-INF | DET-PID | The position of the backward ECAL in the forward direction is limited by the backward face of the pfRICH/mRICH detector. Modifications to either must be coordinated.                                                                       |
| I-DET-INF-INT.025 | DET-INF | DET-PID | The maximum forward location for the dRICH is limited by the forward ECAL and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated.                                   |
| I-DET-INF-INT.032 | DET-INF | DET-PID | The size of the dRICH is limited by the interior bore of the barrel HCAL, and must provide adequate space for cables and services to itself and the interior detectors. Modifications to either must be coordinated.                        |
| I-DET-INF-INT.036 | DET-INF | DET-PID | The maximum backward location for the DIRC is limited by the backward HCAL and the adjacent cabling pathway that provides services to the interior detectors. Modifications to either must be coordinated.                                  |
| I-DET-INF-INT.088 | DET-INF | DET-PID | The heat generated by the photo-multiplier tubes and associated electronics must be removed using a process cooling system.                                                                                                                 |

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| <b>Doc No.</b> EIC-SEG-RSI-064                                                                           | <b>Author:</b> W. Akers | <b>Effective Date:</b> December 12, 2024 | <b>Review Frequency:</b> N/A |
| <b>Requirements, Specifications, and Interfaces:</b> Interface Requirements for the EIC Detector Systems |                         |                                          | <b>Revision:</b> 00          |

| Interface ID      | From    | To      | Description                                                                                                                                                                                |
|-------------------|---------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-INT.089 | DET-INF | DET-PID | The heat generated by the detector and its electronics must be removed using a process cooling system.                                                                                     |
| I-DET-INF-INT.090 | DET-INF | DET-PID | The heat generated by the photomultipliers and associated electronics must be removed using a process cooling system.                                                                      |
| I-DET-INF-INT.091 | DET-INF | DET-PID | A continuous flow of dry nitrogen will be required to protect the aerogel radiator.                                                                                                        |
| I-DET-INF-INT.092 | DET-INF | DET-PID | A fluid cooling system will be required to keep the operating temperature of the photosensors at -30 degrees Celsius.                                                                      |
| I-DET-INF-INT.093 | DET-INF | DET-PID | A recovery system will need to be included for the radiator gas used by the dRICH to prevent accidental release.                                                                           |
| I-DET-INF-INT.094 | DET-INF | DET-PID | Sufficient insulation will need to be added around all coolant lines to prevent condensation and ensure that ice doesn't form.                                                             |
| I-DET-INF-INT.095 | DET-INF | DET-PID | A continuous flow of dry nitrogen will be required to protect the aerogel radiator.                                                                                                        |
| I-DET-INF-INT.096 | DET-INF | DET-PID | This gas will be required to create a protective atmosphere for the cold photosensors and to prevent condensation and freezing.                                                            |
| I-DET-INF-INT.097 | DET-INF | DET-PID | A continuous recirculating flow of radiator gas will be required.                                                                                                                          |
| I-DET-INF-INT.101 | DET-INF | DET-PID | The maximum forward location for the solenoid is limited by the position of the Dual RICH detector and the cabling plenum (gap) between them. Modifications to either must be coordinated. |
| I-DET-INF-INT.102 | DET-INF | DET-PID | The maximum diameter of the barrel Time of Flight detector is limited by the interior bore of the DIRC detector. Modifications to either must be coordinated.                              |
| I-DET-INF-INT.103 | DET-INF | DET-PID | The exterior radius of the pfRICH/mRICH is limited by the interior bore of the DIRC support system. Modifications to either must be coordinated.                                           |
| I-DET-INF-INT.104 | DET-INF | DET-PID | The maximum forward location for the DIRC is limited by the position of the dRICH detector and the cabling plenum between them. Modifications to either must be coordinated.               |
| I-DET-INF-INT.105 | DET-INF | DET-PID | Conduits must be provided within the DIRC support system that are adequate to deliver services (power, signal, cooling) to the barrel tracking detectors.                                  |

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| Doc No. EIC-SEG-RSI-064                                                                           | Author: W. Akers | Effective Date: December 12, 2024 | Review Frequency: N/A |
| Requirements, Specifications, and Interfaces: Interface Requirements for the EIC Detector Systems |                  |                                   | Revision: 00          |

| Interface ID      | From    | To       | Description                                                                                                                                                                                                          |
|-------------------|---------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-INT.106 | DET-INF | DET-PID  | The exterior radius of the silicon trackers is limited by the interior bore of the DIRC support system. Modifications to either must be coordinated.                                                                 |
| I-DET-INF-INT.107 | DET-INF | DET-PID  | The maximum forward location for the DIRC is limited by the position of the silicon trackers.                                                                                                                        |
| I-DET-INF-INT.108 | DET-INF | DET-PID  | The maximum backward location for the barrel Time of Flight detector is limited by the position of the pfRICH/mRICH detector and the adjacent cabling pathway. Modifications to either must be coordinated.          |
| I-DET-INF-INT.109 | DET-INF | DET-PID  | The maximum forward location for the barrel Time of Flight detector is limited by the position of the forward Time of Flight detector and the adjacent cabling pathway. Modifications to either must be coordinated. |
| I-DET-INF-INT.110 | DET-INF | DET-PID  | The maximum size of the silicon trackers is limited by the interior radius of the barrel Time of Flight detector. Modifications to either must be coordinated.                                                       |
| I-DET-INF-INT.111 | DET-INF | DET-PID  | The maximum backward location for the tracking system is limited by the position of the pfRICH/mRICH. Modifications to either must be coordinated.                                                                   |
| I-DET-INF-INT.112 | DET-INF | DET-PID  | The interior radius of the pfRICH/mRICH is governed by the size of the beamline and its associated flanges and support system.                                                                                       |
| I-DET-INF-BAR.016 | DET-INF | DET-TRAK | A single structural support system will support the silicon detectors and the micro-pattern gaseous detectors within the DIRC detector.                                                                              |
| I-DET-INF-BAR.021 | DET-INF | DET-TRAK | The DIRC support system will provide support for the silicon trackers in the detector barrel.                                                                                                                        |
| I-DET-INF-BAR.022 | DET-INF | DET-TRAK | The weight of the barrel tracking systems will be transferred to the DIRC support system.                                                                                                                            |
| I-DET-INF-FWD.012 | DET-INF | DET-TRAK | The maximum forward location for the tracking system is limited by the position of the AC LGAD Time of Flight Detector. Modifications to either must be coordinated.                                                 |
| I-DET-INF-FWD.013 | DET-INF | DET-TRAK | The interior radius of the tracking detectors is governed by the size of the beamline.                                                                                                                               |
| I-DET-INF-INT.098 | DET-INF | DET-TRAK | Air, liquid or other cooling technology will be required for the tracking detectors.                                                                                                                                 |
| I-DET-INF-INT.099 | DET-INF | DET-TRAK | Gas will need to be provided to the trackers for detector operation.                                                                                                                                                 |

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| Doc No. EIC-SEG-RSI-064                                                                           | Author: W. Akers | Effective Date: December 12, 2024 | Review Frequency: N/A |
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| Interface ID      | From    | To       | Description                                                                                                                                                                                                                  |
|-------------------|---------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-INT.100 | DET-INF | DET-TRAK | A single structural support system will support the silicon detectors and the micro-pattern gaseous detectors within the DIRC detector.                                                                                      |
| I-DET-INF-INT.105 | DET-INF | DET-TRAK | Conduits must be provided within the DIRC support system that are adequate to deliver services (power, signal, cooling) to the barrel tracking detectors.                                                                    |
| I-DET-INF-INT.106 | DET-INF | DET-TRAK | The exterior radius of the silicon trackers is limited by the interior bore of the DIRC support system. Modifications to either must be coordinated.                                                                         |
| I-DET-INF-INT.107 | DET-INF | DET-TRAK | The maximum forward location for the DIRC is limited by the position of the silicon trackers.                                                                                                                                |
| I-DET-INF-INT.110 | DET-INF | DET-TRAK | The maximum size of the silicon trackers is limited by the interior radius of the barrel Time of Flight detector. Modifications to either must be coordinated.                                                               |
| I-DET-INF-INT.111 | DET-INF | DET-TRAK | The maximum backward location for the tracking system is limited by the position of the pRICH/mRICH. Modifications to either must be coordinated.                                                                            |
| I-DET-INF-FWD.001 | DET-INF | TBD      | The detector will be supported by an integrated support stand that is fully integrated with the vacuum system and allows the position of the detector to be adjusted.                                                        |
| I-DET-INF-FWD.002 | DET-INF | TBD      | The detector will be supported by an integrated support stand that is fully integrated with the vacuum system and allows the position of the detector to be adjusted.                                                        |
| I-DET-INF-FWD.011 | DET-INF | TBD      | The interior radius of the dRICH is governed by the size of the beamline and its associated flanges and support system.                                                                                                      |
| I-DET-INF-FWD.013 | DET-INF | TBD      | The interior radius of the tracking detectors is governed by the size of the beamline.                                                                                                                                       |
| I-DET-INF-INT.006 | DET-INF | TBD      | The position of and accessibility of the B0 detector in the backward direction is limited by the cryostat containing the final focusing magnets.                                                                             |
| I-DET-INF-INT.007 | DET-INF | TBD      | Access to the B0 detector is constrained by the vacuum valve in front of the B0 magnet. A minimum of 15 centimeters of free space will be required on the IP-side of the B0-dipole for the installation of the B0 detectors. |
| I-DET-INF-INT.008 | DET-INF | TBD      | The electron and hadron beam pipes must be contained within the B0 detector.                                                                                                                                                 |
| I-DET-INF-INT.009 | DET-INF | TBD      | The LowQ2 detector must be upstream in the electron direction from the Q3ER magnet.                                                                                                                                          |

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| <b>Doc No.</b> EIC-SEG-RSI-064                                                                           | <b>Author:</b> W. Akers | <b>Effective Date:</b> December 12, 2024 | <b>Review Frequency:</b> N/A |
| <b>Requirements, Specifications, and Interfaces:</b> Interface Requirements for the EIC Detector Systems |                         |                                          | <b>Revision:</b> 00          |

| <b>Interface ID</b> | <b>From</b> | <b>To</b> | <b>Description</b>                                                                                                                                                            |
|---------------------|-------------|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-INT.010   | DET-INF     | TBD       | The LowQ2 detector must be downstream in the electron direction from the B2ER magnet.                                                                                         |
| I-DET-INF-INT.011   | DET-INF     | TBD       | The LOWQ2 detector must be at the same level as the electron beamline.                                                                                                        |
| I-DET-INF-INT.021   | DET-INF     | TBD       | The bore of the backward ECAL must be designed to allow it to be inserted/removed over the existing beamline flanges.                                                         |
| I-DET-INF-INT.022   | DET-INF     | TBD       | The interior radius of the backward ECAL is governed by the size of the beamline.                                                                                             |
| I-DET-INF-INT.026   | DET-INF     | TBD       | The interior radius of the forward ECAL is governed by the size of the beamline. Modifications to either must be coordinated.                                                 |
| I-DET-INF-INT.038   | DET-INF     | TBD       | The position of the backward HCAL is limited in the backward direction by the adjacent accelerator magnets.                                                                   |
| I-DET-INF-INT.039   | DET-INF     | TBD       | The interior radius of the backward HCAL is governed by the size of the beamline.                                                                                             |
| I-DET-INF-INT.041   | DET-INF     | TBD       | The interior radius of the forward HCAL is governed by the size of the beamline.                                                                                              |
| I-DET-INF-INT.112   | DET-INF     | TBD       | The interior radius of the pfRICH/mRICH is governed by the size of the beamline and its associated flanges and support system.                                                |
| I-DET-INF-INT.113   | DET-INF     | TBD       | Temperature and humidity control must be provided in the Assembly Hall and IR as detectors need i) cooling by ambient air, ii) temperature stability, and iii) low dew point. |
| I-DET-INF-INT.114   | DET-INF     | TBD       | A supply and return of deionized cooling water will need to be provided to remove heat from water cooled detectors.                                                           |
| I-DET-INF-INT.115   | DET-INF     | TBD       | A supply and return of specialized, non-corrosive cooling water will be needed to cool detectors using aluminum heatsinks and manifolds.                                      |
| I-DET-INF-INT.116   | DET-INF     | TBD       | A supply of dry nitrogen will be needed to purge gas detectors or to cool humidity sensitive detectors (as needed).                                                           |
| I-DET-INF-INT.117   | DET-INF     | TBD       | A compressed air source must be provided for the ancillary detectors and to maintain vacuum on other detector sub-systems.                                                    |
| I-DET-INF-INT.118   | DET-INF     | TBD       | A supply and return of liquid nitrogen must be provided to the experimental hall for cooling the solenoid magnet during operation.                                            |



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| Interface ID      | From    | To  | Description                                                                                                                                                                 |
|-------------------|---------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-INT.119 | DET-INF | TBD | A supply and return of liquid helium must be provided to the experimental hall for cooling the solenoid magnet during operation.                                            |
| I-DET-INF-INT.120 | DET-INF | TBD | A supply and return of liquid nitrogen must be provided to the assembly hall for cooling the solenoid magnet during maintenance.                                            |
| I-DET-INF-INT.121 | DET-INF | TBD | A supply and return of liquid helium must be provided to the assembly hall for cooling the solenoid magnet during maintenance.                                              |
| I-DET-INF-INT.122 | DET-INF | TBD | A utility power source must be provided to support the cooling systems on the north platform and for other facility needs.                                                  |
| I-DET-INF-INT.123 | DET-INF | TBD | A clean power source must be provided to support the operation of magnet, detectors, detector electronics, and other sensitive equipment.                                   |
| I-DET-INF-INT.124 | DET-INF | TBD | A source of generator-backed, emergency power must be provided for critical systems that cannot tolerate power outages.                                                     |
| I-DET-INF-INT.125 | DET-INF | TBD | An oxygen deficiency hazard (ODH) analysis must be performed to determine the impacts and precautions that are necessary in the event of a cryogen leak.                    |
| I-DET-INF-INT.126 | DET-INF | TBD | An ODH detection and alarm system must be installed that addresses any concerns identified in the ODH analysis.                                                             |
| I-DET-INF-INT.127 | DET-INF | TBD | A leak trace alarm interface will be installed that notifies Facilities Operations of any liquid leaks that are detected in the experimental hall.                          |
| I-DET-INF-INT.128 | DET-INF | TBD | A flammable gas leak detection alarm interface will be installed that notifies Facilities Operations of any flammable gas leaks that are detected in the experimental hall. |
| I-DET-INF-INT.129 | DET-INF | TBD | A forward magnet platform must be provided to support the B0 magnet, its detectors and installation tooling, and the supporting vacuum valve and bellows.                   |
| I-DET-INF-INT.130 | DET-INF | TBD | A rear magnet platform must be provided to support the rear magnets, valves and bellows                                                                                     |
| I-DET-INF-INT.131 | DET-INF | TBD | A cryogenic service platform must be provided in the experimental hall to support the detector cryogenics interface cryostat that services the interaction region.          |

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| Interface ID      | From    | To  | Description                                                                                                                                                             |
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| I-DET-INF-INT.132 | DET-INF | TBD | A cryogenic service platform must be provided in the assembly hall to support the detector cryogenics interface cryostat that services the maintenance area.            |
| I-DET-INF-INT.133 | DET-INF | TBD | A central rail system must be provided to allow the ePIC Barrel to be moved between the experimental hall and the assembly area. Existing rails will be used.           |
| I-DET-INF-INT.134 | DET-INF | TBD | An independent rail system will be required for opening the forward endcap halves. New rails will be needed.                                                            |
| I-DET-INF-INT.135 | DET-INF | TBD | An independent rail system will be required for opening the backward endcap halves. New rails will be needed.                                                           |
| I-DET-INF-INT.136 | DET-INF | TBD | Specified clearances must be maintained between the forward detectors and the accelerator magnets.                                                                      |
| I-DET-INF-INT.137 | DET-INF | TBD | Specified clearances must be maintained between the backward detectors and the accelerator magnets.                                                                     |
| I-DET-INF-INT.138 | DET-INF | TBD | The opening size of the door that adjoins the experimental hall and the assembly area must remain large enough to accommodate movement of the ePIC barrel assembly.     |
| I-DET-INF-INT.139 | DET-INF | TBD | Adequate space must be provided in the interaction region to support the hadron polarimetry components and facility.                                                    |
| I-DET-INF-INT.140 | DET-INF | TBD | The size, configuration, and clearances of the beampipe, valves and connectors in the ePIC barrel must be coordinated with the design of the interior detector systems. |
| I-DET-INF-INT.141 | DET-INF | TBD | The size, configuration, and clearances of the beampipe, valves and connectors through the forward endcap must be coordinated with the design of the detector systems.  |
| I-DET-INF-INT.142 | DET-INF | TBD | The size, configuration, and clearances of the beampipe, valves and connectors through the backward endcap must be coordinated with the design of the detector systems. |

#### 4.9. DET-ANC : Ancillary Detector Systems (WBS 6.10.11)

Interfaces associated with the ancillary detectors located in the upstream and downstream interaction region.

| Interface ID          | From    | To       | Description                                                                                                                                         |
|-----------------------|---------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-COMP-ONLINE.002 | DET-ANC | DET-COMP | A fiber connection will be provided from the DAQ system to the B0 detector's readout board to perform configuration, control, and data acquisition. |

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| Requirements, Specifications, and Interfaces: Interface Requirements for the EIC Detector Systems |                  |                                   | Revision: 00          |

| Interface ID          | From    | To       | Description                                                                                                                                                     |
|-----------------------|---------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-COMP-ONLINE.003 | DET-ANC | DET-COMP | A network connection will be provided from the DAQ system to the B0 detector's slow controls interface.                                                         |
| I-DET-COMP-ONLINE.004 | DET-ANC | DET-COMP | A fiber connection will be provided from the DAQ system to the B0 detector's readout board for timing synchronization.                                          |
| I-DET-COMP-ONLINE.005 | DET-ANC | DET-COMP | A fiber connection will be provided from the DAQ system to the Low Q2 detector's readout board to perform configuration, control, and data acquisition.         |
| I-DET-COMP-ONLINE.006 | DET-ANC | DET-COMP | A network connection will be provided from the DAQ system to the Low Q2 detector's slow controls interface.                                                     |
| I-DET-COMP-ONLINE.007 | DET-ANC | DET-COMP | A fiber connection will be provided from the DAQ system to the Low Q2 detector's readout board for timing synchronization.                                      |
| I-DET-COMP-ONLINE.008 | DET-ANC | DET-COMP | Fiber connection from the DAQ system to the detector's RDO to perform configuration, control, and data acquisition.                                             |
| I-DET-COMP-ONLINE.009 | DET-ANC | DET-COMP | Network connection from the DAQ system to the detector's slow controls interface.                                                                               |
| I-DET-COMP-ONLINE.010 | DET-ANC | DET-COMP | Fiber connection from the DAQ system to the detector's RDO used for timing synchronization.                                                                     |
| I-DET-COMP-ONLINE.011 | DET-ANC | DET-COMP | A fiber connection will be provided from the DAQ system to the Off-Momentum detector's readout board to perform configuration, control, and data acquisition.   |
| I-DET-COMP-ONLINE.012 | DET-ANC | DET-COMP | A network connection will be provided from the DAQ system to the Off-Momentum slow controls interface.                                                          |
| I-DET-COMP-ONLINE.013 | DET-ANC | DET-COMP | A fiber connection will be provided from the DAQ system to the Off-Momentum detector's readout board for timing synchronization.                                |
| I-DET-COMP-ONLINE.014 | DET-ANC | DET-COMP | A fiber connection will be provided from the DAQ system to the Roman Pot's readout board to perform configuration, control, and data acquisition.               |
| I-DET-COMP-ONLINE.015 | DET-ANC | DET-COMP | Network connection from the DAQ system to the detector's slow controls interface.                                                                               |
| I-DET-COMP-ONLINE.016 | DET-ANC | DET-COMP | A fiber connection will be provided from the DAQ system to the Roman Pot's readout board for timing synchronization.                                            |
| I-DET-COMP-ONLINE.017 | DET-ANC | DET-COMP | A fiber connection will be provided from the DAQ system to the Zero-Degree Calorimeter's readout board to perform configuration, control, and data acquisition. |

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| Requirements, Specifications, and Interfaces: Interface Requirements for the EIC Detector Systems |                  |                                   | Revision: 00          |

| Interface ID          | From    | To       | Description                                                                                                                            |
|-----------------------|---------|----------|----------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-COMP-ONLINE.018 | DET-ANC | DET-COMP | A network connection will be provided from the DAQ system to the Zero-Degree Calorimeter's slow controls interface.                    |
| I-DET-COMP-ONLINE.019 | DET-ANC | DET-COMP | A fiber connection will be provided from the DAQ system to the Zero-Degree Calorimeter's readout board for timing synchronization.     |
| I-DET-ELEC.001        | DET-ANC | DET-ELEC | The detector will receive bias voltage DC power provided from the electronics racks to support electronics.                            |
| I-DET-ELEC.002        | DET-ANC | DET-ELEC | The detector will receive high voltage DC power provided by the Detector Electronics group to support silicon sensors and calorimeter. |
| I-DET-ELEC.003        | DET-ANC | DET-ELEC | The detector will receive low voltage DC power provided by the Detector Electronics group.                                             |
| I-DET-ELEC.004        | DET-ANC | DET-ELEC | The detector will receive bias voltage DC power provided by the Detector Electronics group to support electronics.                     |
| I-DET-ELEC.005        | DET-ANC | DET-ELEC | The detector will receive high voltage DC power provided by the Detector Electronics group to support silicon sensors and calorimeter. |
| I-DET-ELEC.006        | DET-ANC | DET-ELEC | The detector will receive low voltage DC power provided by the Detector Electronics group.                                             |
| I-DET-ELEC.007        | DET-ANC | DET-ELEC | The detector will receive bias voltage DC power provided by the Detector Electronics group to support electronics.                     |
| I-DET-ELEC.008        | DET-ANC | DET-ELEC | The detector will receive high voltage DC power provided by the Detector Electronics group to support silicon sensors and calorimeter. |
| I-DET-ELEC.009        | DET-ANC | DET-ELEC | The detector will receive low voltage DC power provided by the Detector Electronics group.                                             |
| I-DET-ELEC.010        | DET-ANC | DET-ELEC | The detector will receive bias voltage DC power provided by the Detector Electronics group to support electronics.                     |
| I-DET-ELEC.011        | DET-ANC | DET-ELEC | The detector will receive high voltage DC power provided by the Detector Electronics group to support silicon sensors and calorimeter. |
| I-DET-ELEC.012        | DET-ANC | DET-ELEC | The detector will receive low voltage DC power provided by the Detector Electronics group.                                             |
| I-DET-ELEC.013        | DET-ANC | DET-ELEC | The detector will receive bias voltage DC power provided by the Detector Electronics group to support electronics.                     |

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| Interface ID      | From    | To       | Description                                                                                                                                                                                              |
|-------------------|---------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-ELEC.014    | DET-ANC | DET-ELEC | The detector will receive high voltage DC power provided by the Detector Electronics group to support silicon sensors and calorimeter.                                                                   |
| I-DET-ELEC.015    | DET-ANC | DET-ELEC | The detector will receive low voltage DC power provided by the Detector Electronics group.                                                                                                               |
| I-DET-ELEC.016    | DET-ANC | DET-ELEC | The detector will receive bias voltage DC power provided by the Detector Electronics group to support electronics.                                                                                       |
| I-DET-ELEC.017    | DET-ANC | DET-ELEC | The detector will receive high voltage DC power provided by the Detector Electronics group to support silicon sensors and calorimeter.                                                                   |
| I-DET-ELEC.018    | DET-ANC | DET-ELEC | The detector will receive low voltage DC power provided by the Detector Electronics group.                                                                                                               |
| I-DET-INF-INT.005 | DET-ANC | DET-HCAL | The position of the forward HCAL is bounded by the B0 magnet in the forward direction. Changes to the size or position of either must be coordinated with the other.                                     |
| I-DET-INF-BCK.004 | DET-ANC | DET-INF  | The LowQ2 detector is supported by a freestanding platform that is adjacent to the outgoing electron beam.                                                                                               |
| I-DET-INF-BCK.005 | DET-ANC | DET-INF  | The luminosity detector will be supported by an independent support system.                                                                                                                              |
| I-DET-INF-FWD.001 | DET-ANC | DET-INF  | The detector will be supported by an integrated support stand that is fully integrated with the vacuum system and allows the position of the detector to be adjusted.                                    |
| I-DET-INF-FWD.002 | DET-ANC | DET-INF  | The detector will be supported by an integrated support stand that is fully integrated with the vacuum system and allows the position of the detector to be adjusted.                                    |
| I-DET-INF-FWD.006 | DET-ANC | DET-INF  | The B0 detector will be supported in the interior of the B0 magnet and will be dependent on the B0 magnet design, and must be adequate to support the weight of the crystals and the tracking detectors. |
| I-DET-INF-FWD.007 | DET-ANC | DET-INF  | The detector will be supported on a free standing structure.                                                                                                                                             |
| I-DET-INF-INT.004 | DET-ANC | DET-INF  | B0 detector must fit entirely within the bore of the B0 magnet.                                                                                                                                          |
| I-DET-INF-INT.005 | DET-ANC | DET-INF  | The position of the forward HCAL is bounded by the B0 magnet in the forward direction. Changes to the size or position of either must be coordinated with the other.                                     |
| I-DET-INF-INT.006 | DET-ANC | DET-INF  | The position of and accessibility of the B0 detector in the backward direction is limited by the cryostat containing the final focusing magnets.                                                         |

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| <b>Requirements, Specifications, and Interfaces:</b> Interface Requirements for the EIC Detector Systems |                         |                                          | <b>Revision:</b> 00          |

| <b>Interface ID</b> | <b>From</b> | <b>To</b> | <b>Description</b>                                                                                                                                                                                                           |
|---------------------|-------------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-INF-INT.007   | DET-ANC     | DET-INF   | Access to the B0 detector is constrained by the vacuum valve in front of the B0 magnet. A minimum of 15 centimeters of free space will be required on the IP-side of the B0-dipole for the installation of the B0 detectors. |
| I-DET-INF-INT.008   | DET-ANC     | DET-INF   | The electron and hadron beam pipes must be contained within the B0 detector.                                                                                                                                                 |
| I-DET-INF-INT.009   | DET-ANC     | DET-INF   | The LowQ2 detector must be upstream in the electron direction from the Q3ER magnet.                                                                                                                                          |
| I-DET-INF-INT.010   | DET-ANC     | DET-INF   | The LowQ2 detector must be downstream in the electron direction from the B2ER magnet.                                                                                                                                        |
| I-DET-INF-INT.011   | DET-ANC     | DET-INF   | The LOWQ2 detector must be at the same level as the electron beamline.                                                                                                                                                       |
| I-DET-INF-INT.043   | DET-ANC     | DET-INF   | A cooling system will be required to remove heat from the calorimeter and electronics readouts, to maintain an acceptable temperature.                                                                                       |
| I-DET-INF-INT.044   | DET-ANC     | DET-INF   | Either a liquid or gas cooling system will be required to remove heat from the calorimeter, tracking and readout electronics, to maintain them at room temperature.                                                          |
| I-DET-INF-INT.045   | DET-ANC     | DET-INF   | The two dipoles in front of the detector will require an infrastructure power source.                                                                                                                                        |
| I-DET-INF-INT.046   | DET-ANC     | DET-INF   | The beamline between the two luminosity detector dipoles must be under vacuum.                                                                                                                                               |
| I-DET-INF-INT.047   | DET-ANC     | DET-INF   | A cooling system will be required to remove heat from the tracking and readout electronics to prevent heat buildup.                                                                                                          |
| I-DET-INF-INT.048   | DET-ANC     | DET-INF   | A cooling system will be required to remove heat from the tracking and readout electronics to prevent heat buildup.                                                                                                          |
| I-DET-INF-INT.049   | DET-ANC     | DET-INF   | A cooling system will be required to remove heat from the calorimeter and readout electronics to prevent heat buildup.                                                                                                       |
| I-DET-ANC-LOWQ2.001 | DET-ANC     | INF-IR    | Either a liquid or gas cooling system will be required to remove heat from the calorimeter, tracking and readout electronics, to maintain them at room temperature.                                                          |
| I-DET-ANC-LUMI.001  | DET-ANC     | INF-IR    | A cooling system will be required to remove heat from the tracking and readout electronics to prevent heat buildup.                                                                                                          |
| I-DET-ANC-OFFMO.001 | DET-ANC     | INF-IR    | A cooling system will be required to remove heat from the tracking and readout electronics to prevent heat buildup.                                                                                                          |
| I-DET-ANC-ROMAN.001 | DET-ANC     | INF-IR    | A cooling system will be required to remove heat from the tracking and readout electronics to prevent heat buildup.                                                                                                          |

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| Requirements, Specifications, and Interfaces: Interface Requirements for the EIC Detector Systems |                  |                                   | Revision: 00          |

| Interface ID        | From    | To     | Description                                                                                                                                                                                |
|---------------------|---------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-ANC-ZDC.001   | DET-ANC | INF-IR | A cooling system will be required to remove heat from the calorimeter and readout electronics to prevent heat buildup.                                                                     |
| I-DET-ANC-LOWQ2.002 | DET-ANC | TBD    | The performance of the LowQ2 detector will depend on the thickness and shape of the electron beam pipe exit window.                                                                        |
| I-DET-ANC-LOWQ2.003 | DET-ANC | TBD    | The LowQ2 detector must be positioned as close as possible electron beam pipe in order to detector particles at a shallow angle from the electron beam.                                    |
| I-DET-ANC-LOWQ2.004 | DET-ANC | TBD    | The LowQ2 detector should be position such that it receives minimal magnetic interference from the Lumi-Dipole.                                                                            |
| I-DET-ANC-LUMI.002  | DET-ANC | TBD    | The luminosity detector will provide fast feedback to the accelerator control system, allowing them to monitor conditions at the interaction point.                                        |
| I-DET-ANC-LUMI.003  | DET-ANC | TBD    | Detector must be positioned between the electron and hadron beamlines in the far backward area, and it's size and position are governed by the adjacent accelerator components.            |
| I-DET-ANC-LUMI.004  | DET-ANC | TBD    | The center of the luminosity detector must be positioned along the centerline of the incoming electron beam as it passes through the interaction point.                                    |
| I-DET-ANC-LUMI.005  | DET-ANC | TBD    | The detector must be positioned to avoid magnetic interference from adjacent beamline magnets.                                                                                             |
| I-DET-ANC-LUMI.006  | DET-ANC | TBD    | The two dipoles in front of the detector will need LCW cooling. (Confirm this)                                                                                                             |
| I-DET-ANC-LUMI.007  | DET-ANC | TBD    | The detector electronics enclosures must be positioned near the detector and must be shielded from radiation.                                                                              |
| I-DET-ANC-LUMI.008  | DET-ANC | TBD    | The luminosity detector must be positioned between 30 and 100 meters from the interaction point in the backward direction, and the detectors centerpoint must be positioned at beam level. |
| I-DET-ANC-OFFMO.002 | DET-ANC | TBD    | The detector must be positioned after the B1APF dipole in the hadron going direction.                                                                                                      |
| I-DET-ANC-OFFMO.003 | DET-ANC | TBD    | These detectors will be integrated with the outgoing hadron beamline and will be enclosed within it's vacuum system.                                                                       |
| I-DET-ANC-OFFMO.004 | DET-ANC | TBD    | The detector must be positioned before the Roman Pots in the hadron going direction.                                                                                                       |
| I-DET-ANC-OFFMO.005 | DET-ANC | TBD    | This detector will generate RF radiation that the accelerator beamline must be shielded from.                                                                                              |

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| <b>Requirements, Specifications, and Interfaces:</b> Interface Requirements for the EIC Detector Systems |                         |                                          | <b>Revision:</b> 00          |

| Interface ID        | From    | To  | Description                                                                                                                                                                                                                  |
|---------------------|---------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-ANC-OFFMO.006 | DET-ANC | TBD | The size and placement of the detector should be designed to have minimal interference with the 4 milliradian neutron cone required by the zero-degree calorimeter.                                                          |
| I-DET-ANC-ROMAN.002 | DET-ANC | TBD | The Roman Pot detectors will come within 10 sigma of the center of the beam, and will impact the beam characteristics in a way that must be compensated for.                                                                 |
| I-DET-ANC-ROMAN.003 | DET-ANC | TBD | The detector must be positioned after the off-momentum detectors in the hadron going direction.                                                                                                                              |
| I-DET-ANC-ROMAN.004 | DET-ANC | TBD | These detectors will be integrated with the outgoing hadron beamline and will be enclosed within it's vacuum system.                                                                                                         |
| I-DET-ANC-ROMAN.005 | DET-ANC | TBD | The detector must be positioned before the B2PF magnet in the hadron going direction.                                                                                                                                        |
| I-DET-ANC-ROMAN.006 | DET-ANC | TBD | This detector will generate RF radiation that the accelerator beamline must be shielded from.                                                                                                                                |
| I-DET-ANC-ZDC.002   | DET-ANC | TBD | The placement of the Zero Degree Calorimeter is dependent on the neutron cone and should be positioned to optimize detector performance and resolution.                                                                      |
| I-DET-ANC-ZDC.003   | DET-ANC | TBD | There should minimal interference within the 4 milliradian neutron cone in front of the Zero Degree Calorimeter detector.                                                                                                    |
| I-DET-ANC-ZDC.004   | DET-ANC | TBD | The Zero Degree Calorimeter will be positioned between the outgoing hadron and incoming electron beamlines.                                                                                                                  |
| I-DET-INF-FWD.001   | DET-ANC | TBD | The detector will be supported by an integrated support stand that is fully integrated with the vacuum system and allows the position of the detector to be adjusted.                                                        |
| I-DET-INF-FWD.002   | DET-ANC | TBD | The detector will be supported by an integrated support stand that is fully integrated with the vacuum system and allows the position of the detector to be adjusted.                                                        |
| I-DET-INF-INT.006   | DET-ANC | TBD | The position of and accessibility of the B0 detector in the backward direction is limited by the cryostat containing the final focusing magnets.                                                                             |
| I-DET-INF-INT.007   | DET-ANC | TBD | Access to the B0 detector is constrained by the vacuum valve in front of the B0 magnet. A minimum of 15 centimeters of free space will be required on the IP-side of the B0-dipole for the installation of the B0 detectors. |
| I-DET-INF-INT.008   | DET-ANC | TBD | The electron and hadron beam pipes must be contained within the B0 detector.                                                                                                                                                 |



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| Interface ID      | From    | To  | Description                                                                           |
|-------------------|---------|-----|---------------------------------------------------------------------------------------|
| I-DET-INF-INT.009 | DET-ANC | TBD | The LowQ2 detector must be upstream in the electron direction from the Q3ER magnet.   |
| I-DET-INF-INT.010 | DET-ANC | TBD | The LowQ2 detector must be downstream in the electron direction from the B2ER magnet. |
| I-DET-INF-INT.011 | DET-ANC | TBD | The LOWQ2 detector must be at the same level as the electron beamline.                |

#### 4.10. DET-POL-EPOL : Electron Polarimetry Systems (WBS 6.10.14.01)

Interfaces associated with electron polarimetry systems located in the interaction region and surrounding areas.

| Interface ID          | From         | To       | Description                                                                                                                                             |
|-----------------------|--------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-COMP-ONLINE.056 | DET-POL-EPOL | DET-COMP | A fiber connection will be provided from the DAQ system to the ESR Polarimeter's readout board to perform configuration, control, and data acquisition. |
| I-DET-COMP-ONLINE.057 | DET-POL-EPOL | DET-COMP | Data transfer lines will be run from the electron detector to a DAQ system.                                                                             |
| I-DET-COMP-ONLINE.058 | DET-POL-EPOL | DET-COMP | Data transfer lines will be run from the laser enclosure on the beamline to a DAQ system.                                                               |
| I-DET-COMP-ONLINE.059 | DET-POL-EPOL | DET-COMP | Data transfer lines will be run from the photon detector to a DAQ system.                                                                               |
| I-DET-COMP-ONLINE.060 | DET-POL-EPOL | DET-COMP | A network connection will be provided from the DAQ system to the ESR Polarimeter's slow controls interface.                                             |
| I-DET-COMP-ONLINE.061 | DET-POL-EPOL | DET-COMP | A fiber connection will be provided from the DAQ system to the ESR Polarimeter's readout board for timing synchronization.                              |
| I-DET-COMP-ONLINE.062 | DET-POL-EPOL | DET-COMP | A fiber connection will be provided from the DAQ system to the RCS polarimeter's readout board to perform configuration, control, and data acquisition. |
| I-DET-COMP-ONLINE.063 | DET-POL-EPOL | DET-COMP | Data transfer lines will be run from the laser enclosure on the beamline to a DAQ system.                                                               |
| I-DET-COMP-ONLINE.064 | DET-POL-EPOL | DET-COMP | Data transfer lines will be run from the photon detector to a DAQ system.                                                                               |
| I-DET-COMP-ONLINE.065 | DET-POL-EPOL | DET-COMP | A network connection will be provided from the DAQ system to the RCS polarimeter's slow controls interface.                                             |

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| Interface ID           | From         | To       | Description                                                                                                                                                       |
|------------------------|--------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-COMP-ONLINE.066  | DET-POL-EPOL | DET-COMP | A fiber connection will be provided from the DAQ system to the RCS polarimeter's readout board for timing synchronization.                                        |
| I-DET-ELEC.057         | DET-POL-EPOL | DET-ELEC | Bias voltage DC power will be provided from the electronics racks to support electronics the silicon photomultipliers.                                            |
| I-DET-ELEC.058         | DET-POL-EPOL | DET-ELEC | High voltage DC power will be provided from the electronics racks to support silicon sensors and gas detectors.                                                   |
| I-DET-ELEC.059         | DET-POL-EPOL | DET-ELEC | Low voltage DC power will be provided from the electronics racks to support electronics in the detector.                                                          |
| I-DET-ELEC.060         | DET-POL-EPOL | DET-ELEC | Bias voltage DC power will be provided from the electronics racks to support electronics the silicon photomultipliers.                                            |
| I-DET-ELEC.061         | DET-POL-EPOL | DET-ELEC | High voltage DC power will be provided from the electronics racks to support silicon sensors and gas detectors.                                                   |
| I-DET-ELEC.062         | DET-POL-EPOL | DET-ELEC | Low voltage DC power will be provided from the electronics racks to support electronics in the detector.                                                          |
| I-DET-POL-EPOL-RCS.001 | DET-POL-EPOL | EIS-RCS  | A single dipole magnet must be installed between the Compton laser and the photon detector to deflect unscattered electrons from the Compton scattered particles. |
| I-DET-POL-EPOL-RCS.002 | DET-POL-EPOL | EIS-RCS  | A protective enclosure will need to be installed in the area to protect personnel from laser radiation.                                                           |
| I-DET-POL-EPOL-RCS.003 | DET-POL-EPOL | EIS-RCS  | The RCS Compton Laser must be integrated with the rapid cycling synchrotron in a location that is upstream from the RCS Compton photon detectors                  |
| I-DET-POL-EPOL-RCS.004 | DET-POL-EPOL | EIS-RCS  | The RCS Compton photon detector must be integrated with the RCS beamline and be positioned downstream from the Compton laser.                                     |
| I-DET-POL-EPOL-RCS.005 | DET-POL-EPOL | EIS-RCS  | The RCS Compton polarimeter must fit within the available space at the chosen location on the RCS beamline.                                                       |
| I-DET-POL-EPOL-ESR.001 | DET-POL-EPOL | ESR      | If the background radiation is too high it could damage the polarimeter or render its results unusable.                                                           |
| I-DET-POL-EPOL-ESR.002 | DET-POL-EPOL | ESR      | Beam size and repetition rate must be consistent with the capabilities of the laser and the detectors.                                                            |
| I-DET-POL-EPOL-ESR.003 | DET-POL-EPOL | ESR      | THE ESR Compton electron detector must be integrated with the ESR beamline and be positioned downstream from the Compton laser.                                   |
| I-DET-POL-EPOL-ESR.004 | DET-POL-EPOL | ESR      | The ESR Compton Laser must be integrated with the electron storage ring in a location that is upstream from the                                                   |

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| Doc No. EIC-SEG-RSI-064                                                                           | Author: W. Akers | Effective Date: December 12, 2024 | Review Frequency: N/A |
| Requirements, Specifications, and Interfaces: Interface Requirements for the EIC Detector Systems |                  |                                   | Revision: 00          |

| Interface ID           | From         | To     | Description                                                                                                                                                                     |
|------------------------|--------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                        |              |        | Compton electron and photon detectors, all of which are upstream from IP-6 in the electron going direction.                                                                     |
| I-DET-POL-EPOL-ESR.005 | DET-POL-EPOL | ESR    | THE ESR Compton photon detector must be integrated with the ESR beamline and be positioned downstream from the Compton laser.                                                   |
| I-DET-POL-EPOL-ESR.006 | DET-POL-EPOL | ESR    | The ESR Compton Polarimeter should be located as close as practical to the main detector in IP-6.                                                                               |
| I-DET-POL-EPOL-ESR.007 | DET-POL-EPOL | ESR    | A single dipole magnet must be installed between the Compton laser and the electron and photon detectors to deflect unscattered electrons from the Compton scattered particles. |
| I-DET-POL-EPOL-ESR.008 | DET-POL-EPOL | ESR    | A protective enclosure will need to be installed in the area to protect personnel from laser radiation.                                                                         |
| I-DET-POL-EPOL-ESR.009 | DET-POL-EPOL | ESR    | The ESR Compton polarimeter must fit within the available space at the chosen location on the ESR beamline.                                                                     |
| I-DET-POL-EPOL-RCS.006 | DET-POL-EPOL | ESR    | If the background radiation is too high it could damage the polarimeter or render its results unusable.                                                                         |
| I-DET-POL-EPOL-RCS.007 | DET-POL-EPOL | ESR    | Beam size and repetition rate must be consistent with the capabilities of the laser and the detectors.                                                                          |
| I-DET-POL-EPOL-ESR.010 | DET-POL-EPOL | INF-IR | Control lines for the electron detector will be run from the laser lab to the electron detector on the ESR beamline.                                                            |
| I-DET-POL-EPOL-ESR.011 | DET-POL-EPOL | INF-IR | The laser lab should have a protected pathway that allows it to be accessed during beam operations.                                                                             |
| I-DET-POL-EPOL-ESR.012 | DET-POL-EPOL | INF-IR | A laser lab will need to be provided to house the primary lasers for the Compton and RCS polarimeters, and must be within 300 meters of the ESR and RCS Compton lasers.         |
| I-DET-POL-EPOL-ESR.013 | DET-POL-EPOL | INF-IR | The laser lab should be shielded adequately that it can be accessed during normal beam operations.                                                                              |
| I-DET-POL-EPOL-ESR.014 | DET-POL-EPOL | INF-IR | The electron detector is installed in a vacuum and must be actively cooled using either LCW or process cooling water.                                                           |
| I-DET-POL-EPOL-ESR.015 | DET-POL-EPOL | INF-IR | High voltage cabling will deliver power to the electron and photon detectors from a high power supply located in a shielded area.                                               |
| I-DET-POL-EPOL-ESR.016 | DET-POL-EPOL | INF-IR | Controls lines for the slow control system will be run from the laser lab to the laser enclosure on the beamline.                                                               |
| I-DET-POL-EPOL-ESR.017 | DET-POL-EPOL | INF-IR | The laser lab should have an HVAC system that maintains a comfortable temperature.                                                                                              |

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| Interface ID           | From         | To     | Description                                                                                                                                                             |
|------------------------|--------------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-POL-EPOL-ESR.018 | DET-POL-EPOL | INF-IR | The laser lab must have an safety interlock system to control access to the room during operation.                                                                      |
| I-DET-POL-EPOL-ESR.019 | DET-POL-EPOL | INF-IR | The equipment in the laser lab will require standard single phase power.                                                                                                |
| I-DET-POL-EPOL-ESR.020 | DET-POL-EPOL | INF-IR | The lasers should be provided with UPS power to allow them to be shutdown gracefully in the event of a power failure or electrical transient.                           |
| I-DET-POL-EPOL-ESR.021 | DET-POL-EPOL | INF-IR | Low voltage cabling will deliver power to the ASIC from a low noise power supply located in a shielded area.                                                            |
| I-DET-POL-EPOL-ESR.022 | DET-POL-EPOL | INF-IR | The photon detector will need to be cooled by either a forced air system, or a fluid cooling system.                                                                    |
| I-DET-POL-EPOL-ESR.023 | DET-POL-EPOL | INF-IR | The slow controls located in the laser enclosure on the ESR beamline will be powered using standard single phase power.                                                 |
| I-DET-POL-EPOL-RCS.008 | DET-POL-EPOL | INF-IR | The laser lab should have a protected pathway that allows it to be accessed during beam operations.                                                                     |
| I-DET-POL-EPOL-RCS.009 | DET-POL-EPOL | INF-IR | A laser lab will need to be provided to house the primary lasers for the Compton and RCS polarimeters, and must be within 300 meters of the ESR and RCS Compton lasers. |
| I-DET-POL-EPOL-RCS.010 | DET-POL-EPOL | INF-IR | The laser lab should be shielded adequately that it can be accessed during normal beam operations.                                                                      |
| I-DET-POL-EPOL-RCS.011 | DET-POL-EPOL | INF-IR | High voltage cabling will deliver power to the photon detectors from a high power supply located in a shielded area.                                                    |
| I-DET-POL-EPOL-RCS.012 | DET-POL-EPOL | INF-IR | Controls lines for the slow control system will be run from the laser lab to the laser enclosure on the beamline.                                                       |
| I-DET-POL-EPOL-RCS.013 | DET-POL-EPOL | INF-IR | The laser lab should have an HVAC system that maintains a comfortable temperature.                                                                                      |
| I-DET-POL-EPOL-RCS.014 | DET-POL-EPOL | INF-IR | The laser lab must have an safety interlock system to control access to the room during operation.                                                                      |
| I-DET-POL-EPOL-RCS.015 | DET-POL-EPOL | INF-IR | The equipment in the laser lab will require standard single phase power.                                                                                                |
| I-DET-POL-EPOL-RCS.016 | DET-POL-EPOL | INF-IR | The lasers should be provided with UPS power to allow them to be shutdown gracefully in the event of a power failure or electrical transient.                           |
| I-DET-POL-EPOL-RCS.017 | DET-POL-EPOL | INF-IR | Low voltage cabling will deliver power to the ASIC from a low noise power supply located in a shielded area.                                                            |

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| Interface ID           | From         | To     | Description                                                                                                             |
|------------------------|--------------|--------|-------------------------------------------------------------------------------------------------------------------------|
| I-DET-POL-EPOL-RCS.018 | DET-POL-EPOL | INF-IR | The photon detector will need to be cooled by either a forced air system, or a fluid cooling system.                    |
| I-DET-POL-EPOL-RCS.019 | DET-POL-EPOL | INF-IR | The slow controls located in the laser enclosure on the RCS beamline will be powered using standard single phase power. |

#### 4.11. DET-POL-HPOL : Hadron Polarimetry Systems (WBS 6.10.14.02)

Interfaces associated with hadron polarimetry systems located in the interaction region and surrounding areas.

| Interface ID          | From         | To       | Description                                                                                                                                                       |
|-----------------------|--------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-COMP-ONLINE.067 | DET-POL-HPOL | DET-COMP | Readout cables need to run from the polarimeter detectors to the data acquisition system at IR-4.                                                                 |
| I-DET-COMP-ONLINE.068 | DET-POL-HPOL | DET-COMP | Slow control information should be written to the HSR database (5 second intervals)                                                                               |
| I-DET-COMP-ONLINE.069 | DET-POL-HPOL | DET-COMP | A fiber connection will be provided from the DAQ system to the HJET polarimeter's readout board to perform configuration, control, and data acquisition.          |
| I-DET-COMP-ONLINE.070 | DET-POL-HPOL | DET-COMP | Slow control cables for the HJET target system need to run from the hall at IR-4 to the polarimeter in the tunnel.                                                |
| I-DET-COMP-ONLINE.071 | DET-POL-HPOL | DET-COMP | A network connection will be provided from the DAQ system to the HJET polarimeter's slow controls interface.                                                      |
| I-DET-COMP-ONLINE.072 | DET-POL-HPOL | DET-COMP | A fiber connection will be provided from the DAQ system to the HJET polarimeter's readout board for timing synchronization.                                       |
| I-DET-COMP-ONLINE.073 | DET-POL-HPOL | DET-COMP | A fiber connection will be provided from the DAQ system to the proton-carbon polarimeter's readout board to perform configuration, control, and data acquisition. |
| I-DET-COMP-ONLINE.074 | DET-POL-HPOL | DET-COMP | Results from the target scan polarimeter runs should be written to the HSR database                                                                               |
| I-DET-COMP-ONLINE.075 | DET-POL-HPOL | DET-COMP | A network connection will be provided from the DAQ system to the proton-carbon polarimeter's slow controls interface.                                             |
| I-DET-COMP-ONLINE.076 | DET-POL-HPOL | DET-COMP | A fiber connection will be provided from the DAQ system to the proton-carbon polarimeter's readout board for timing synchronization.                              |
| I-DET-COMP-ONLINE.077 | DET-POL-HPOL | DET-COMP | Slow control cables for the target motion need to run from the hall at IR-4 to the polarimeter.                                                                   |

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| Interface ID              | From         | To       | Description                                                                                                                                          |
|---------------------------|--------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-COMP-ONLINE.078     | DET-POL-HPOL | DET-COMP | Fiber target operation should be controlled from the HSR main control room                                                                           |
| I-DET-COMP-ONLINE.079     | DET-POL-HPOL | DET-COMP | Slow control cables for the target motion need to run from the DAQ room at IR-6 to the polarimeter.                                                  |
| I-DET-COMP-ONLINE.080     | DET-POL-HPOL | DET-COMP | Fiber target operation should be controlled from the EPIC control room                                                                               |
| I-DET-ELEC.063            | DET-POL-HPOL | DET-ELEC | Bias voltage DC power will be provided from the electronics racks to support electronics the silicon photomultipliers.                               |
| I-DET-ELEC.064            | DET-POL-HPOL | DET-ELEC | High voltage DC power will be provided from the electronics racks to support silicon sensors and gas detectors.                                      |
| I-DET-ELEC.065            | DET-POL-HPOL | DET-ELEC | Low voltage DC power will be provided from the electronics racks to support electronics in the detector.                                             |
| I-DET-ELEC.066            | DET-POL-HPOL | DET-ELEC | Bias voltage DC power will be provided from the electronics racks to support electronics the silicon photomultipliers.                               |
| I-DET-ELEC.067            | DET-POL-HPOL | DET-ELEC | High voltage DC power will be provided from the electronics racks to support silicon sensors and gas detectors.                                      |
| I-DET-ELEC.068            | DET-POL-HPOL | DET-ELEC | Low voltage DC power will be provided from the electronics racks to support electronics in the detector.                                             |
| I-DET-POL-HPOL.001        | DET-POL-HPOL | INF-IR   | Beam background may affect the detector performance (absorber installation)                                                                          |
| I-DET-POL-HPOL.002        | DET-POL-HPOL | INF-IR   | Low voltage cabling for electronics and detectors needs to run from the hall at IR-4 to the location of the polarimeters.                            |
| I-DET-POL-HPOL.003        | DET-POL-HPOL | INF-IR   | Space for the data acquisition and electronics is needed in the hall at IR-4.                                                                        |
| I-DET-POL-HPOL-HJET.001   | DET-POL-HPOL | INF-IR   | The HJET must fit at the location at IR-4 between the HSR triplet and D0 magnet.                                                                     |
| I-DET-POL-HPOL-HJET.002   | DET-POL-HPOL | INF-IR   | The ZDC must be located downstream of the HJET target and the D0 magnet with sufficient drift space to allow separation of 3He and breakup products. |
| I-DET-POL-HPOL-HJET.003   | DET-POL-HPOL | INF-IR   | The HJET target system needs to be integrated into the HSR vacuum interlock system.                                                                  |
| I-DET-POL-HPOL-HJET.004   | DET-POL-HPOL | INF-IR   | HJET target must be able to be closed off from HSR vacuum during warm-up of cold nozzle (regular maintenance operation)                              |
| I-DET-POL-HPOL-PC-IR4.001 | DET-POL-HPOL | INF-IR   | The target chamber for the fiber target at IR-4 shall be upstream of the HJET and there shall be no magnet between the HJET and the fiber target.    |

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| <b>Doc No.</b> EIC-SEG-RSI-064                                                                           | <b>Author:</b> W. Akers | <b>Effective Date:</b> December 12, 2024 | <b>Review Frequency:</b> N/A |
| <b>Requirements, Specifications, and Interfaces:</b> Interface Requirements for the EIC Detector Systems |                         |                                          | <b>Revision:</b> 00          |

| Interface ID              | From         | To     | Description                                                                                                                        |
|---------------------------|--------------|--------|------------------------------------------------------------------------------------------------------------------------------------|
| I-DET-POL-HPOL-PC-IR4.002 | DET-POL-HPOL | INF-IR | Accessibility for target replacement during maintenance time (vacuum separation)                                                   |
| I-DET-POL-HPOL-PC-IR6.001 | DET-POL-HPOL | INF-IR | The target chamber for the local polarimeter shall be located near the backward detectors at IR-4 in the incoming hadron beamline. |
| I-DET-POL-HPOL-PC-IR6.002 | DET-POL-HPOL | INF-IR | The data acquisition for the local polarimeter shall be integrated into the experimental readout.                                  |
| I-DET-POL-HPOL-PC-IR6.003 | DET-POL-HPOL | INF-IR | Accessibility for target replacement during maintenance time (vacuum separation)                                                   |

## 5. REFERENCES

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- EIC-SEG-PLN-022, *Systems Engineering Management Plan*
- EIC-SEG-PLN-020, *EIC Interface Management Plan*