



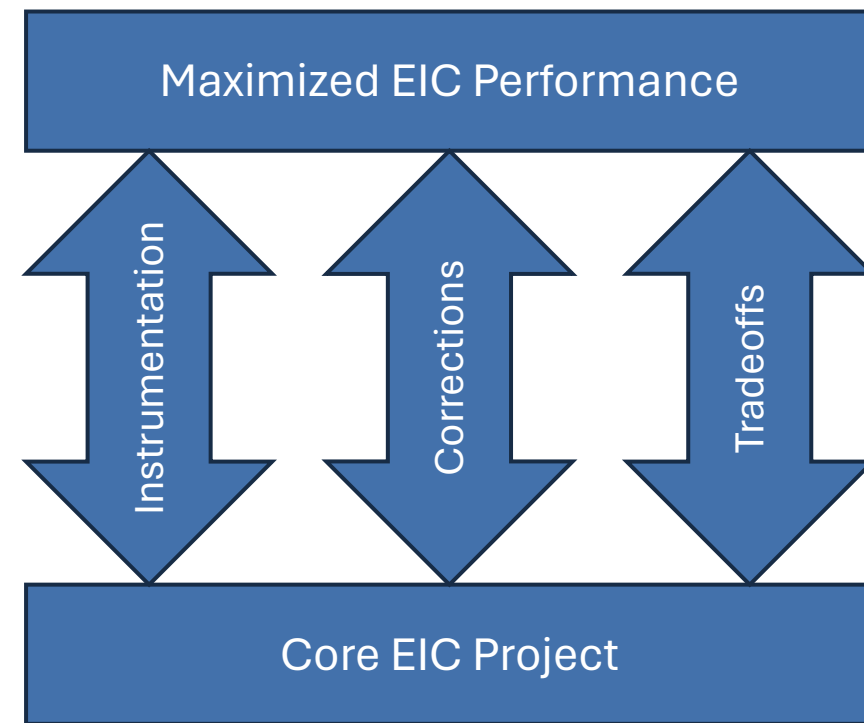
EIC Interaction Regions WG Kickoff

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Overview of Scope

- EIC Accelerator Collaboration
 - **Complement** core project
 - In close **exchange** with core project
- **Aim:** Maximize realistic performance
 - **Improve** realistic **performance** of **primary IR**
 - Building on baseline project design
 - **Develop** and maintain design for possible **second IR**





Flight Simulator

- Realistic **high fidelity simulation** backbone of efforts
- Evaluating **performance**
 - Luminosity, lifetime, polarization
 - Under detector background and protection, and operational constraints
- Applying **perturbations**
 - Inherent e.g. detector magnets
 - Errors e.g. magnet and alignment
- Realistic measurements corrections





IR Measurements and Corrections

- Establish **measurement** performance
 - **Test techniques** e.g. beam sizes and dispersion in IP, emittance, polarization
 - Establish **resolutions** and **tolerances** (and work arounds)
- Develop **corrections**
 - Implement and test **individual correction** methods
 - Orbit, optics, tuning knobs, non-linear corrections
 - Develop **integrated correction strategy**
 - Possible AI driven approach
- Prepare for **operation**
 - Practice techniques for operation
 - Build digital twin for online corrections



Instrumentation

- Hardware extremely **constrained**
 - Baseline **layout** of interaction region set
 - **Congested** real estate needs of **accelerator** and **detector**
- Open questions remain on **placement instrumentation**
 - Monitors, correctors, magnet trims, lumi-meter...
- Purposeful placement based on **maximized utility**
 - Evaluate full performance under **different configurations**
 - Consider hardware performance and establish needs
 - Possible **co-design approach** using machine learning



Performance Targets and Trade-offs

- Tie in **nuclear physics** community to establish targets
 - Raw **luminosity**
 - **Reliability** and fluctuations
 - **Spin** requirements
 - Special requirements e.g. luminosity calibration via van-der-Meer
- Understand **limits** and **trade-offs** and communicate to stakeholders
 - Nuclear physics community
 - Core accelerator project
- Ensure efforts **align with expectations** of community



Second Interaction Region

- Second IR **outside of core** EIC project
 - Upgrade option to realize **full performance potential**
- **Baseline** design exists for IR 8
 - **Substantial differences** to first IR e.g. second low beta
- Project optimization leads to **move to IR 12**
 - **New geometry** and timing requirements etc.
- Larger freedom to **redesign second IR**
 - Possible **co-design** powered by flight simulator
- Eventually apply **same correction strategy** as first IR