

eeFACT 2025 - 70th ICFA Advanced Beam Dynamics Workshop on High Luminosity Circular e⁺e⁻ Colliders



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Recent Advances in Beam-Related Background Studies at the Electron-Ion Collider

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The Electron-Ion Collider (EIC), under construction at BNL, is a groundbreaking facility designed to explore the fundamental structure of matter. By colliding high-luminosity polarized electron and ion beams, the EIC will probe the spin, mass, and spatial distributions of quarks and gluons, addressing key questions in QCD. However, mitigating beam-induced backgrounds remains a critical challenge for preserving detector performance and physics measurements.

This talk will present recent progress in understanding and addressing these challenges. Key background mechanisms, including beam-gas scattering, synchrotron radiation, and Touschek scattering, are studied using advanced tools such as SynradG4 for synchrotron radiation modeling and Xsuite-based frameworks for multi-turn particle tracking. Findings on synchrotron radiation loads, electron beam losses, and mitigation strategies will be discussed. Lessons from other operated colliders guide efforts to ensure the EIC achieves its ambitious scientific goals.

Footnotes

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Yes

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