Beam-Beam Collaboration and Plans

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Collaboration on Beam-Beam Interactions

SLAC
- Tim Barklow – CAIN
- Cho-Kuen Ng – WarpX
- Spencer Gessner – Osiris

Oslo
- Gevy Cao – GUINEA-PIG

LBNL
- Arianna Formenti – WarpX
- Remi Lehi – WarpX
- Jean-Luc Vay – WarpX

CEA
- Luca Fedeli
- Henri Vincenti

Introduce Particle-in-Cell simulations as a tool for beamstrahlung calculations to the HEP Linear Collider Community.

Goals

Near-Term
- Run Warp-X running with existing QED packages and compare to GUINEA-PIG and CAIN.
- Start implementing and testing additional QED packages (Bethe-Heitler, coherent processes, etc).

Mid-Term
- Validate Warp-X beam-beam collision physics against previous ILC work.
- Opportunity to contribute to Linear Collider research by providing new tools for beamstrahlung simulations.

Long-Term
- Extend Warp-X capabilities to multi-TeV, large-Upsilon regime.
- Test new hypotheses and methods for reducing beamstrahlung and preserving luminosity spectrum.

Connections and Cross-Checks

Electron-Positron Collisions

- Gevy Cao – GUINEA-PIG
- Cho-Kuen Ng – WarpX
- Spencer Gessner – Osiris
- Arianna Formenti – WarpX

Gamma-Gamma Collisions

- Tim Barklow – CAIN
- Arianna Formenti – WarpX

Upcoming

Submit results of Snowmass Studies to JINST.
- Include discussions of the plans of this collaboration.
- https://www.overleaf.com/project/63c8f92ae0b7e269ceeff649

LCWS workshop will be hosted at SLAC in May.
- Submit abstracts and prepare to engage with LC community.

Beam Delivery and Beamstrahlung Considerations for Ultra-High Energy Linear Colliders

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ABSTRACT: As part of the Snowmass'21 community planning excercise, the Advanced Accelerator Concepts (AAC) community proposed future linear colliders with center-of-mass energies up to 15 TeV and luminosities up to $50{\times}10^{34}$ $cm^{-2}s^{-1}$ in a compact footprint. In addition to being compact, these machines must also be energy efficient. We identify two challenges that must be addressed in the design of these machines. First, the Beam Delivery System (BDS) must not add significant length to the accelerator complex. Second, beam parameters must be chosen to mitigate beamstrahlung effects and maximize the luminosity-per-power of the machine. In this paper, we review advances in plasma lens technology that will help to reduce the length of the BDS system and we detail new particle-in-cell simulation studies that will provide insight into beamstrahlung mitigation techniques.