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New simulation tools for beam-beam collisions at the interaction point

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Several collider technologies, including plasma-based technology, have been proposed for a future 10 TeV COM collider. A major challenge for these machines is maintaining the target luminosity while mitigating the adverse effects of disruption, beamstrahlung, and background generation. Therefore, comprehensive beam crossing simulation are essential to fully understand the physics at the interaction point. We show that WarpX, an Exascale open-source code Particle-In-Cell code, can be used for beam-beam studies. WarpX offers high performance, portability across different operating systems and multi-CPU/GPU architectures, flexibility with various options, algorithms, and diagnostics, and is supported by thorough documentation and regular maintenance from a large, active, and multi-disciplinary community. We provide benchmarks comparing WarpX to established codes like GUINEA-PIG and CAIN, and present initial simulation results for plasma-based colliders.

Working group

WG7 : Linear Colliders

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