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A next generation, integrated community toolset for the modeling of colliders

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The design of the next generation of colliders demands a renewed, high-performance, integrated set of simulation codes. We present the Beam, pLasma & Accelerator Simulation Toolkit (BLAST), which includes legacy accelerator codes such as Impact-T, Impact-Z, Warp and Posinst, as well as a renewed generation of accelerator codes such as ImpactX, WarpX and HiPACE++. The new codes, born out of the US DOE Exascale Computing Project (ECP), all share a common foundation based on the AMReX library that gives native support for mesh refinement and high performance on both CPU-based and GPU-based computer architectures. The integrated set also includes python-driven workflows for efficient parametric optimization and coupling with machine learning frameworks. We will present the latest of the toolkit and new codes, with discussion on their applications to start-to-end modeling of colliders from the source to the interaction point including beam-beam crossing effects.

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