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Theories and Particle-In-Cell Simulations of Emittance Growth Due to Coulomb Collision in Plasma-based Accelerators[1] YINJIAN ZHAO, REMI LEHE, ANDREW MYERS, MAXENCE THEVENET, AXEL HUEBL, CARL SCHROEDER, JEAN-LUC VAY, Lawrence Berkeley National Laboratory, LAWRENCE BERKELEY NATIONAL LABORATORY COLLABORATION —
In plasma-based accelerators, a crucial requirement for many applications is to keep the beam emittance from degrading. One source of emittance degradation is through Coulomb collision. This paper shows that the emittance growth due to Coulomb collision can be correctly captured in particle-in-cell simulations, with a proper Monte Carlo binary collision module implemented. In addition, the theory of the emittance growth due to Coulomb collision is extended from a monoenergetic matched beam to a mismatched beam with energy spread.

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