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Adapting a Collision Package in Particle-in-Cell Simulations on a GPU J. LI, C. REN, Laboratory for Laser Energetics, U. of Rochester, M.C. HUANG, Dept. of Electrical and Computer Engineering, U. of Rochester, W.B. MORI, U. of California, Los Angeles — A collision package is developed for a PIC (particle-in-cell) code on parallel graphics processing unit (GPU) with CUDA.[1] The collision package is based on the cumulative collision theory.[2] It uses the sorting cell (or cluster) in the GPU PIC code as the collision cell. The benchmarks show that this collision package has a performance of 0.07- to 0.09-ns particle/step—only a 5% increase to the performance of 2-ns particle/step without collisions. Test problems of beam-plasma scattering and electron plasma wave damping show that the collision frequencies calculated from the simulation results are consistent with theory. This material is based upon work supported by the Department of Energy National Nuclear Security Administration DE-NA0001944, the Office of Science under DE-FC02-04ER54789, NSF under Grant No. PHY-0903797, and NSCF under Grant No. 11129503.

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