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Accelerated Monte Carlo Methods for Coulomb Collisions¹ RUSSEL CAFLISCH, C.M. WANG, TUNGYOU LIN, University of California, Los Angeles, BRUCE COHEN, ANDRIS DIMITS, Lawrence Livermore National Laboratory — A Monte Carlo particle simulation method for Coulomb collisions in a plasma was derived by Takizuka and Abe (J. Comp. Phys, 1977) based on the Landau-Fokker-Planck equation. We investigate two accelerated methods for Coulomb collisions. The first method, developed by Nanbu (PRE 1997), combines many Coulomb collisions into a single step. We present results from a comparative study of the accuracy and computational time for the methods of Takizuka and Abe and of Nanbu. The second method relies on a thermalization approximation, developed in the context of rarefied gas dynamics by Pareschi and Caflisch (J. Comp. Phys, 1999). We apply this approximation to Nanbu's method. For both methods, the simulations are performed for several simple spatially homogeneous problems.

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