

Abstract Submitted
for the DPP08 Meeting of
The American Physical Society

Calculation of the Nanbu-Trubnikov Kernel: Implications for Numerical Modeling of Coulomb Collisions* CHIAMING WANG, University of California, Los Angeles, ANDRIS DIMITS, Lawrence Livermore National Laboratory, RUSSEL CAFLISCH, University of California, Los Angeles, BRUCE COHEN, Lawrence Livermore National Laboratory, YANGHONG HUANG, University of California, Los Angeles — We investigate the accuracy of and assumptions underlying the numerical binary Monte-Carlo collision operator due to Nanbu [K. Nanbu, Phys. Rev. **E 55** (1997)]. The numerical experiments that resulted in Nanbu's parameterized collision kernel are approximate realizations of the Coulomb-Lorentz pitch-angle scattering process, for which an analytical solution is available. It is demonstrated empirically that Nanbu's collision operator quite accurately recovers the effects of Coulomb-Lorentz pitch-angle collisions, or processes that approximate these even for very large values of the collisional time step. An investigation of the analytical solution shows that Nanbu's parameterized kernel is highly accurate for small values of the normalized collision time step, but loses some of its accuracy for larger values of the time step. Finally, a practical collision algorithm is proposed that for small-mass-ratio Coulomb collisions improves on the accuracy of Nanbu's algorithm. *Work performed for US DOE by UCLA under grant DE-FG02-05ER25710 and by LLNL under Contract DE-AC52-07NA27344.

Chiaming Wang
University of California, Los Angeles

Date submitted: 14 Aug 2008

Electronic form version 1.4