Abstract Submitted
for the DPP12 Meeting of
The American Physical Society

Multi-temperature representation of electron velocity distribution functions JEAN-PIERRE MATTE, AMIR ABBAS HAJI ABOLHASSANI, INRS-Énergie, Matériaux et Télécommunications (Université du Québec), Varennes, QC, Canada — In kinetic simulations of plasmas, the velocity distribution function is represented on finite difference grids in space and energy. Using spherical harmonics for the angular distribution helps, but the energy grid is still a burden. We propose to replace it by an expansion using three Maxwellians each multiplied by a series of generalized Laguerre or Sonine polynomials, or by a simple sum of 6-12 Maxwellians, which turned out to be simpler and to work better. We have fitted distribution functions obtained with the finite difference code "FPI" [1] using these techniques. We show that it provides a convenient alternative to numerical integration for computing rates of ionization or excitation. We have also developed a moment method to simulate the F-P electron collision operator, and simulated the relaxation of a hot Maxwellian on a cold one, with initial temperature ratios as high as 1000. Comparisons with "FPI" simulations show good agreement.

[1] J.P. Matte and J. Virmont, Phys.Rev. Lett. 49, 1936 (1982).

Jean-Pierre Matte
INRS-Énergie, Matériaux et Télécommunications
(Université du Québec), Varennes, QC, Canada

Date submitted: 16 Jul 2012 Electronic form version 1.4