Abstract Submitted
for the DPP07 Meeting of
The American Physical Society

Nonstationary Nonlocal Transport Theory of Fully Ionized Two Component Plasma ZHEN ZHENG, W. ROZMUS, University of Alberta, Edmonton, Alberta, Canada, A. BRANTOV, V. YU. BYCHENKOV, P.N. Lebedev Physics Institute, RAS, Moscow, Russia — Linearized electron transport theory that is fully equivalent to the solution of a Fokker-Planck equation (Bychenkov *et.al.* Phys. Rev. Lett, 75, 4405 (1995)) has been generalized to include ion transport. Starting from the complete Lanadu collision operators expressed in terms of Rosenbluth potentials, electron and ion velocity distribution functions are expressed in terms of infinite series of angular harmonics. Hydrodynamical equations and transport closure relations are derived in response to initial perturbations. The complete set of frequency and k-number dependent transport coefficients has been discussed. Our results show reduction in ion thermal conductivity and ion viscosity for $k\lambda_{ii} > 10^{-2}$ (λ_{ii} - ion-ion collision mean free path, k – wave number related to the inhomogeneity scale length) as compared to standard Chapman-Enskog theory results. Applications of this theory to the calculations of the dynamical form factor, ion-acoustic and entropy modes dispersion relations have been presented. Our results provide an exact limit for the nonlinear transport calculations.

Wojciech Rozmus
University of Alberta

Date submitted: 23 Jul 2007 Electronic form version 1.4