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Dielectric Function and Nonlocal Transport in Two Component Plasmas A.V. BRANTOV, University of Alberta, Edmonton, Alberta, Canada, V. YU. BYCHENKOV, P. N. Lebedev Physics Institute, Russian Academy of Sciences, Moscow, Russia, W. ROZMUS, Z. ZHENG, C.E. CAPJACK, University of Alberta, Edmonton, Alberta, Canada — A systematic procedure has been proposed [1] for finding the solution to a linearized kinetic equation for electrons with the Landau collision integral. Expressions for dielectric permittivity of a collisional plasma and nonlocal transport theory are obtained using this procedure for the entire range of frequencies, wave numbers, and the collision parameter. Our results reproduce well known limiting values in the strongly collisional and collisionless limits. In the present work we apply the method of Ref. [1] to the full set of linearized plasma kinetic equations which include ion dynamics and ion-ion, ion-electron collisions in the Landau form. The solution of the linearized ion kinetic equations parallels application of [1] to the low-Z plasmas as discussed in Ref. [2]. We have used this method to construct closure relations for ion transport theory and ion dielectric function. Thus we have derived the full set of nonlocal and nonstationary hydrodynamical equations in two component plasmas. They have been applied to study ion acoustic wave damping and dispersion. We have discussed ion effects on the zero frequency entropy mode. [1] A. V. Brantov, *et al.*, Phys. Rev. Lett., **93**, 125002 (2004). [2] V. Yu. Bychenkov *et al*, JETP **87**, 916 (1998).

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