A new PIC noise reduction technique D.C. BARNES, Coronado Consulting — Numerical solution of the Vlasov equation is considered in a general situation in which there is an underlying static solution (equilibrium). There are no further assumptions about dimensionality, smallenss of orbits, or disparate time scales. The semi-characteristic (SC) method for Vlasov solution is described. The usual characteristics of the equation, which are the single particle orbits, are modified in such a way that the equilibrium phase-space flow is removed. In this way, the shot noise introduced by the usual discrete particle representation of the equilibrium is static in time and can be removed completely by subtraction. An almost exact algorithm for this is based on the observation that a (infinitesimal or) discrete time step of any equilibrium MC realization is again a realization of the equilibrium, building up strings of associated simulation particles. In this way, the only added discretization error arises from the need to extrapolate backward in time the chain end points one dt using a canonical transformation. Previously developed energy-conserving time-implicit methods are applied without modification. 1D ES examples of Landau damping and velocity-space instability are given to illustrate the method.

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