Scattering and Modified scattering of the Vlasov-Poisson system

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We study the asymptotic behavior of dispersing solutions to the Vlasov-Poisson system. Due to a long range interaction, we do not expect linear scattering. Instead, we prove a modified scattering result of small and dispersing global solutions. We provide a quasi free forward trajectory and construct its corresponding profile for a given dispersive solution to the Vlasov-Poisson system. The quasi free trajectory consist of two parts. One is linear motion of each particle, and other one is a solution of an ordinary differential equation which represent error correction of long range interaction. The time growth rate of the error correction term is log(t+1) at most.