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Vlasov-Poisson model and it's reduction for laser-plasma 2D simulation.

One of the common ways to model collisionless plasma-laser interaction is to consider Vlasov-Poisson system. Since modeling of plasma dynamics by solving Vlasov equation directly in 2 (and especially 3) spatial dimensions is computationally very challenging task we consider the reduced model that we call Vlasov Multi-Dimensional model (VMD).

VMD model is specifically designed to take advantage of solution properties in regimes when plasma waves are confined to a narrow cone. Linear stability analysis of VMD model is done in order to understand some limitations that this reduction imposes on the system. Simulations of 2D plasma-laser interaction are performed with VMD model and the results are compared to full 2D Vlasov simulations performed using PIC codes and finite volume methods. (Received February 18, 2013)