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Weak turbulence simulations with the Hermite-Fourier spectral method[1] JURIS VENCELS, GIAN LUCA DELZANNO, GIANMARCO MANZINI, Los Alamos National Laboratory, USA, VADIM ROYTERSHTEYN, Space Science Institute, USA, STEFANO MARKIDIS, KTH Royal Institute of Technology, Sweden — Recently, a new (transform) method based on a Fourier-Hermite (FH) discretization of the Vlasov-Maxwell equations has been developed. The resulting set of moment equations is discretized implicitly in time with a Crank-Nicolson scheme and solved with a nonlinear Newton-Krylov technique. For periodic boundary conditions, this discretization delivers a scheme that conserves the total mass, momentum and energy of the system exactly. In this work, we apply the FH method to study a problem of Langmuir turbulence, where a low signal-to-noise ratio is important to follow the turbulent cascade and might require a lot of computational resources if studied with PIC. We simulate a weak (low density) electron beam moving in a Maxwellian plasma and subject to an instability that generates Langmuir waves and a weak turbulence field. We also discuss some optimization techniques to optimally select the Hermite basis in terms of its shift and scaling argument, and show that this technique improve the overall accuracy of the method. Finally, we discuss the applicability of the HF method for studying kinetic plasma turbulence.

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