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The dissipation of solar wind turbulent fluctuations at electron scales: Simulations

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We present results from two-dimensional fully-kinetic Particle-in-Cell (PIC) simulations of decaying electromagnetic fluctuations. The computational box is such that wavelengths ranging from electron to ion gyroradii are resolved. The parameters used are realistic for the solar wind, and the ion to electron mass ratio is physical. The understanding of the dissipation of turbulent fluctuations at small scales is thought to be a crucial mechanism for solar wind acceleration and coronal heating. The computational results suggest that a power law cascade of magnetic fluctuations could be sustained up to scales of the electron Larmor radius and smaller. We analyse the simulation results in the light of the Vlasov linear theory, and we comment on the particle heating. The dispersion curves of lightly damped modes in this regime suggest that a linear mechanism could be responsible for the observed steepening of power spectra at electron scales, but a straightforward identification of turbulent fluctuations as an ensemble of linear modes is not possible.