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Power-law index of energy spectrum in magnetically dominated systems XIAOCAN LI, Dartmouth Coll, FAN GUO, Los Alamos National Laboratory, YI-HSIN LIU, Dartmouth Coll, PATRICK KILIAN, HUI LI, Los Alamos National Laboratory — Fermi mechanisms accelerate particles to develop power-law energy spectra when the system is sufficiently large for the regions of particle injection, acceleration, and escape to be well separated from each other. This model has successfully explained the power-law formation in diffusive shock acceleration. Using a series of kinetic simulations, we demonstrate that this model can also explain the power-law spectra formed during magnetic energy dissipation by magnetic reconnection or turbulence in magnetically dominated plasmas. The simulations use periodic domains but particles can still escape from the acceleration regions, which only occupies a fraction of a large system. Using tracer particles, particle acceleration and escape rates are accurately calculated. The modeled power-law index obtained from a transport equation in energy matches well with the simulation results. This shows that the classical Fermi-type acceleration theory is still providing new insights into the results of kinetic simulations.

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