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Reconnection rates and particle acceleration in electron-positron plasmas NAOKI BESSHO, A. BHATTACHARJEE, Center for Integrated Computation and Analysis of Reconnection and Turbulence, University of New Hampshire — We have performed 2D particle-in-cell simulations of magnetic reconnection and particle acceleration in electron-positron plasmas with no guide field, in relativistic as well as non-relativistic regimes. In the low-density regime, we demonstrate that the reconnection rate is systematically higher than in the high-density regime, attaining values of the order of unity in the impulsive growth phase. Under these conditions, the inertial term in the generalized Ohm's law is the most dominant term that supports the large reconnection electric field. An effective collisionless resistivity tracks the extension of the diffusion region in the late stage of the reconnection dynamics, and significant broadening of the diffusion region is observed. Because of the broadening of the diffusion region, no secondary islands, which limit the extension of the diffusion region, are produced. In the relativistic regime, we have observed ultrarelativistic particles accelerated by reconnection. We show analytically that the energy spectrum of accelerated particles near an X-line is proportional to a product of a power-law and an exponential function of energy. Simulations show that the energy spectra are consistent with the analytical predictions.

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