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Particle Energization in 3D Magnetic Reconnection of Relativistic Pair Plasmas[1] HUI LI, Los Alamos National Lab, WEI LIU, MD Anderson, LIN YIN, BRIAN ALBRIGHT, KEVIN BOWERS, EDISON LIANG — We present large scale 3D particle-in-cell (PIC) simulations to examine particle energization in magnetic reconnection of relativistic electron-positron (pair) plasmas. The initial configuration is set up as a relativistic Harris equilibrium without a guide field. These simulations are large enough to accommodate a sufficient number of tearing and kink modes. Contrary to the non-relativistic limit, the linear tearing in- stability is faster than the linear kink instability, at least in our specific parameters. We find that the magnetic energy dissipation is first facilitated by the tearing instability and followed by the secondary kink instability. Particles are mostly energized inside the magnetic islands during the tearing stage due to the spatially varying electric fields produced by the outflows from reconnection. Secondary kink instability leads to additional particle acceleration. Accelerated particles are, however, observed to be thermalized quickly. The large amplitude of the vertical magnetic field resulting from the tearing modes by the secondary kink modes further help thermalizing the non-thermal particles generated from the secondary kink instability. Implications of these results for astrophysics are briefly discussed.

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