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Particle energization in magnetic reconnection in high-energy-density plasmas W. DENG, Princeton University & Princeton Plasma Physics Laboratory, W. FOX, Princeton Plasma Physics Laboratory, A. BHATTACHARJEE, Princeton University & Princeton Plasma Physics Laboratory — Significant particle energization is inferred to occur in many astrophysical environments and magnetic reconnection has been proposed to be the driver in many cases. Recent observation of magnetic reconnection in high-energy-density (HED) plasmas on the Vulcan, Omega and Shenguang laser facilities has opened up a new regime of reconnection study of great interest to laboratory and plasma astrophysics. In these experiments, plasma bubbles, excited by laser shots on solid targets and carrying magnetic fields, expand into one another, squeezing the opposite magnetic fields together to drive reconnection. 2D particle-in-cell (PIC) simulations have been performed to study the particle energization in such experiments. Two energization mechanisms have been identified. The first is a Fermi acceleration process between the expanding plasma bubbles, wherein the electromagnetic fields of the expanding plasma bounce particles, acting as moving walls. Particles can gain significant energy through multiple bounces between the bubbles. The second mechanism is a subsequent direct acceleration by electric field at the reconnection X-line when the bubbles collide into each other and drive reconnection.

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