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Particle Acceleration in Magnetic Reconnection Using Laser-Powered Capacitor Coils[1] ABRAHAM CHIEN, LAN GAO, HANTAO JI, KENNETH HILL, Princeton Plasma Physics Laboratory, WILLIAM DAUGHTON, ARI LE, ADAM STANIER, Los Alamos National Laboratory, ERIC BLACKMAN, University of Rochester — Magnetic reconnection is a ubiquitous astrophysical phenomenon at low plasma β that rapidly converts magnetic energy into some combination of flow energy, thermal energy, and non-thermal energetic particles. The latter is often an observational signature of magnetic reconnection environments, which can be more efficient accelerators than competing processes such as isolated collisionless shocks. Experimental diagnostics capabilities have long limited most reconnection experiments to focus on the generation of plasma flow or thermal energy, leaving the acceleration of non-thermal particles unknown. To overcome this limitation, we have developed a robust platform for generating and measuring non-thermal energetic electrons from magnetically driven, quasi-axisymmetric reconnection using laser-powered capacitor coils and demonstrated this setup on the OMEGA EP laser facility at the Laboratory for Laser Energetics. The experimental conditions were simulated using a 2D particle-in-cell code (VPIC). Detailed experimental and numerical results will be presented, including their comparisons in both reconnection electromagnetic fields and the resulting accelerated particle spectrum. Implications to the acceleration mechanisms and observations will be discussed.

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