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Acceleration, beaming, and synchrotron radiation above the 160 MeV limit from relativistic pair reconnection[1] GREGORY WERNER, BENOIT CERUTTI, DMITRI UZDENSKY, MITCHELL BEGELMAN, University of Colorado — Magnetic reconnection converts magnetic field energy into particle kinetic energy, accelerating particles to sufficient energies to emit gamma-ray synchrotron radiation in astrophysical contexts, possibly including pulsar wind nebulae, Gamma-Ray Bursts, and blazar jets. A balance between acceleration (by the electric field E) and synchrotron braking (while orbiting a B-field line) limits particle energy so that synchrotron processes cannot emit photons above about 160 MeV, unless $E > B$. However, short, intense gamma-ray flares of much higher energies have recently been observed in the Crab nebula. This work demonstrates, using 2D simulations, that reconnection in relativistic electron-positron pair plasmas can accelerate particles in Speiser orbits around the magnetic null (where $E > B$) such that the particles can emit synchrotron photons above the 160 MeV limit. Furthermore, reconnection bunches particles and focuses them into beams; high-energy synchrotron radiation is also strongly beamed, and the sweeping of the beam across the observer's line of sight can explain the fast time variability of the flares.

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