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Particle Acceleration via Colliding Electromagnetic Pulses

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Using multi-dimensional PIC simulations, we demonstrate a new mechanism for the sustained in-phase acceleration of electron-positron and low-density electron-ion plasmas using two ultra-intense (UL) laser pulses irradiating a thin plasma slab from both sides. At late times the accelerated particle phase distribution strongly resembles that of the Diamagnetic Relativistic Pulse Accelerator (DRPA), which in turn shows remarkable similarity to cosmic gamma-ray bursts in their light curves, spectra and spectral evolution. We will discuss specific laboratory experiments to demonstrate this new phenomenon using ULs currently under construction. Scaling issues and astrophysics applications will be highlighted.