Energetic particle dynamics in colliding laser-produced plasma

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The acceleration of charged particles to high-energies is ubiquitous in space. Several mechanisms are thought to play a role, with classical examples being magnetic reconnection and Fermi acceleration.

We present numerical simulations of experiments aimed at studying the acceleration of particles in colliding plasma flows. The plasma is generated by irradiating with a ns-laser, two oppositely facing solid targets. The expanding plumes are collimated into jets by an externally imposed magnetic field of 20 T and the collision of the two jets generates a region of strong shocks, turbulence and large scale field reversal. Measurements using a Thomson parabola indicate particles with energies up to ~ 0.1 MeV.

To understand the mechanisms leading to the acceleration of the particles, simulations are performed with the 3D resistive MHD code GORGON coupled with test-particles solver. The dynamics of the plasma and the energization of the particles will be presented.