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Weibel instability mediated collisionless shocks using intense laser-driven plasmas. SASI PALANIYAPPAN, CHENGKUN HUANG, DONALD GAUTIER, JUAN FERNANDEZ, Los Alamos National Laboratory, WENJUN MA, Peking University, JORG SCHREIBER, Ludwig Maximilian University, LANL COLLABORATION, LMU TEAM — The origin of cosmic rays remains a long-standing challenge in astrophysics and continues to fascinate physicists. It is believed that "collisionless shocks" – where the particle Coulomb mean free path is much larger that the shock transition – are a dominant source of energetic cosmic rays. These shocks are ubiquitous in astrophysical environments such as gamma-ray bursts, supernova remnants, pulsar wind nebula and coronal mass ejections from the sun. Several spacecraft observations have revealed acceleration of charged particles, mostly electrons, to very high energies with in the shock front. There is now also clear observational evidence that supernova remnant shocks accelerate both protons and electrons. The understanding of the microphysics behind collisionless shocks and their particle acceleration is tightly related with nonlinear basic plasma processes and remains a grand challenge. In this poster, we will present results from recent experiments at the LANL Trident laser facility studying collisionless shocks using intense ps laser (80J, 650 fs – peak intensity of 10^{20} W/cm^2) driven near-critical plasmas using carbon nanotube foam targets. A second short pulse laser driven protons from few microns thick aluminum foil is used to image the laser-driven plasma.

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