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Weibel instability mediated collisionless shocks using intense laser-driven plasmas.[1] SASIKUMAR PALANIYAPPAN, Los Alamos Natl Lab, FEDERICO FIUZA, SLAC, CHENGKUN HUANG, DONALD GAUTIER, Los Alamos Natl Lab, WENJUN MA, Peking University, JORG SCHREIBER, LMU Germany, ABEL RAYMER, North Carolina AT State University, JUAN FERNANDEZ, TOM SHIMADA, RANDALL JOHNSON, Los Alamos Natl Lab — 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. A particular type of electromagnetic plasma instability known as Weibel instability is believed to be the dominant mechanism behind the formation of these collisionless shocks in the cosmos. 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 gold foil is used to radiograph the main laser-driven plasma.

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