

Collisionless shockwaves formed by counter-streaming laser-produced plasmas

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Abstract

Most astronomical and astrophysical shock waves are collisionless, which means that the shocks are not formed by coulomb collisions. This paper presents our experimental as well as theoretical investigations of collisionless shock waves with high-power laser facility, Shenguang II, in China. The collisionless shockwaves are observed during the interaction between two counter-streaming laser-produced plasmas. Numerical simulations indicate that the shockwaves are excited by electrostatic instability. The comparison of the dimensionless parameters of our experiment with those of SNRs indicates that it is feasible to scale our measurements to the astrophysical objects by transformation and similarity criteria.