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Onset of magnetic turbulence in non-relativistic collisionless shocks[1] FREDERICO FIUZA, CHARLES RUYER, SAMUEL TOTORICA, SLAC National Accelerator Laboratory — Collisionless shocks are ubiquitous in astrophysical environments. In relativistic weakly magnetized environments, the Weibel or current filamentation instability is believed to be the dominant mechanism for magnetic field amplification and shock formation. Using 3D particle-in-cell simulations and analytic theory, we show that in the non-relativistic regime, the shock formation process is more complex. It first involves the B-field amplification by the Weibel instability (linear regime) and later the competition between filament merging and kink-like deformation of current filaments (longitudinal instability). The kink-instability dominates the slow down of the flows, shock formation, and onset of magnetic turbulence. We will discuss the implication of these results for particle acceleration and the ability of laser-driven counter-streaming plasma experiments to probe this microphysics.

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