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A head-on collision between collisionless shock waves leads to strong magnetic fields and significant slowdown ELISABETTA BOELLA, Lancaster University, KEVIN SCHOEFFLER, NITIN SHUKLA, Instituto Superior Tecnico, GIOVANNI LAPENTA, KU Leuven, RICARDO FONSECA, LUIS SILVA, Instituto Superior Tecnico — The interaction between multiple collisionless shocks is a fundamental process in plasma physics, playing a prominent role in recent observations [1]. However, to date, no detailed theoretical, numerical, or experimental studies exploring this interaction exist. Leveraging multi-dimensional particle-in-cell simulations, we identify a novel experimental setup that allows for investigating the process in the laboratory exploiting laser-driven electrostatic shocks. In order to study the microphysics of the interaction, we model the head-on collision of these nonlinear waves. Results indicate that the collision is highly inelastic, with the velocity of the shocks decreasing up to 50% of the initial value. The slowdown is mainly due to magnetic fields generated by the Weibel instability, which is driven by a strong longitudinal electron heating occurring while the shocks approach. This setup could thus be also used to probe the Weibel instability and magnetic field generation in unmagnetized plasmas in the laboratory. [1] Meyer et al. Nature 2015

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