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Experimental results of astrophysical collisionless shock experiments from NIF[1] HYE-SOOK PARK, D. HIGGINSON, C. HUNTINGTON, B. POLLOCK, B. REMINGTON, H. RINDERKNECHT, J. ROSS, D. RYUTOV, G. SWADLING, S. WILKS, LLNL, F. FIUZA, SLAC, Y. SAKAWA, Osaka U., A. SPITKOVSKY, Princeton U., R. PETRASSO, C. LI, MIT, A. ZYLSTRA, LANL, D. LAMB, P. TZEFERACOS, U. Chicago, G. GREGORI, J. MEINECKE, Oxford, M. MANUEL, GA — We discuss our laboratory experiments using the Omega and NIF lasers to investigate the dynamics of high Mach number collisionless shock formation in two interpenetrating plasma streams. It is believed that in astrophysical environments such shocks are the sites where seed magnetic fields are generated on a cosmologically fast timescale via the Weibel instability. Particle-in-cell (PIC) numerical simulations generate magnetic fields whose magnitude and scale are consistent with this concept. We will present recent experimental results [1,2] as well as simulations and theoretical interpretations of these observations. The NIF experiments were able to observe the counter-streaming flow interactions through the transition from collisional to collisionless regimes. The latest proton radiography results will be presented. [1] C. M. Huntington, et al., Nature Physics, 11, 173 (2015). [2] J. S. Ross et al., Phys. Rev. Lett., 118, 185003 (2017).

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