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Laboratory High-velocity, Laser-Driven, Magnetized, Collision-less Flows HENRI PEPIN, INRS-EMT, Varennes, Québec, Canada, D. HIGGINSON, LULI, Ecole Polytechnique, 91128 Palaiseau, France, PH. KORNEEV, National Research Nuclear University MEPhI, Moscow, Russia, J. BEARD, LNCMI, 31400 Toulouse, France, S.N. CHEN, M. GRECH, L. GREMILLET, LULI, Ecole Polytechnique, 91128 Palaiseau, France, E. D'HUMIÈRES, Université de Bordeaux, Talence, France, S. PIKUZ, National Research Nuclear University MEPhI, Moscow, Russia, B. POLLOCK, Lawrence Livermore National Laboratory, Livermore, CA USA, C. RUYER, R. RIQUIER, J. FUCHS, LULI, Ecole Polytechnique, 91128 Palaiseau, France — Understanding the mechanism leading to the acceleration of cosmic-ray particles up to extremely high-energies is an outstanding problem in astrophysics. This acceleration is thought to be linked to the collision-less shocks formed by the collision of energetic magnetized astrophysical outflows such as supernovae remnants and gamma-ray bursts. To gain insight on these particle accelerators, we have performed experiments on the Titan laser (60J/beam, 650fs). By irradiating opposing targets we launch two counter-streaming beams, embedded in an external 20T B-field. We observe a density increase in the middle of the streams and a proton acceleration at double the energy without external field. Particle-in-cell simulations show that the expansion of the beams causes a compression of the external B-field up to 500T, which is strong enough to reflect electrons from the strong field region. This creates a charge-separation and causes the development of strong E-fields which accelerates the ions at large energies, consistent with the experiment.

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