Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Weibel magnetic field competes with Biermann fields in laser-solid interactions NITIN SHUKLA, KEVIN SCHOEFFLER, JORGE VIEIRA, GoLP/Instituto de Plasmas e Fus ao Nuclear Instituto Superior Tecnico, Universidade de Lisboa, Lisbon, Portugal, RICARDO FONSECA, DCTI/ISCTE - Instituto Universit ario de Lisboa, 1649-026 Lisboa, Portugal, LUIS SILVA, GoLP/Instituto de Plasmas e Fus ao Nuclear Instituto Superior Tecnico, Universidade de Lisboa, Lisbon, Portugal — Biermann battery induced magnetic fields caused by non-parallel density and temperature gradients, first investigated experimentally [J. A. Stamper et al, PRL 26, 1012 (1971)], continue to be measured in many current experiments. A detailed study of Biermann generated magnetic fields in collisionless systems has been carried out [K. M. Schoeffler et al, POP 23, 056304 (2016)], showing that for large system sizes ($L/d_e \geq 100$), where de is the electron inertial length, the Weibel instability dominates as the major source of magnetic field. In this work, we demonstrate the possibility of experimentally generating this strong Weibel magnetic field. We model, using ab initio PIC [R. A Fonseca et al, Lec. Notes Comput. Sci. 2331, 342 (2002)] simulations, the interaction of a short (ps) high intensity ($a_0 \geq 1$) laser pulse, with a target of sufficiently large gradient scale length, L. The expanding hot energetic electron population generated by the laser produces an anisotropy in the velocity distribution. This anisotropy provides the free energy that drives the Weibel instability that appears on the surfaces of the target and dominates over the Biermann battery field.

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Date submitted: 14 Jul 2016 Electronic form version 1.4