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Interplay between the Weibel instability and the Biermann battery in realistic laser-solid interactions NITIN SHUKLA, KEVIN SCHOEFFLER, Instituto Superior Tecnico, ELISABETTA BOELLA, Department of Physics, Lancaster University, Lancaster, United Kingdom, JORGE VIEIRA, Instituto Superior Tecnico, RICARDO FONSECA, Instituto Superior Tecnico; DCTI/ISCTE, Instituto Universitario de Lisboa, Lisbon, Portugal, LUIS SILVA, Instituto Superior Tecnico, GOLP TEAM — In this work, we investigate the interplay between the Weibel (driven by temperature anisotropies) and Biermann (caused by non-parallel density and temperature gradients) magnetic fields in realistic laser-plasma experiments. With ab initio multi-dimensional particle-in-cell simulations, we model the interaction between a short ($\leq$ ps) intense ($a_0 \geq 1$) laser and a solid-density target. We show that Weibel magnetic fields can be observed alongside the Biermann fields usually dominant in experiments. The expanding hot energetic electron population generated by the laser produces an anisotropy in the velocity distribution. This anisotropy supplies the free energy that drives the Weibel instability, consisting of an intense filamentary field growing on the target surface. This field can dominate over the Biermann battery field, provided that the pre-plasma scale length is much larger than the local electron inertial length.

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