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Measurements of Fast Magnetic Reconnection Driven by Relativistic Electrons ANTHONY RAYMOND, ANDREW MCKELVEY, CALVIN ZULICK, DONG CHUANFEI, ANATOLY MAKSIMCHUK, ALEXANDER THOMAS, VICTOR YANOVSKY, KARL KRUSHELNICK, LOUISE WILLINGALE, University of Michigan, VLADIMIR CHYKOV, ELI-ALPS, PHIL NILSON, LLE, HUI CHEN, GERALD WILLIAMS, LLNL, AMITAVA BHATTACHARJEE, WILL FOX, PPL — Magnetic reconnection is a process whereby opposing magnetic field lines are forced together and topologically rearrange, resulting in lower magnetic potential energy and in corresponding plasma heating. Such occurrences are ubiquitous in astrophysics as well as appearing in laboratory plasmas such as in ICF in the form of instabilities. We report measurements in the domain of ultra-fast, ultra-intense lasers, in which the mechanism responsible follows from radially expanding surface electrons with $v \approx c$. Results are compared from two laser facilities (HERCULES and Omega EP), both of which produced two relativistic intensity pulses focused within close proximity onto copper foils. A spherical X-ray crystal was used to image the K_α radiation induced by electron currents, revealing the midplane diffusion region wherein electrons are accelerated into the target by the electric field generated during reconnection. The characteristics of this signal are studied as a function of the focal spot separation, laser energy, and pulse duration. The results are then compared to 3D PIC simulations.

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