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X-Ray Imaging of Ultrafast Magnetic Reconnection Driven by Relativistic Electrons ANTHONY RAYMOND, ANDREW MCKELVEY, CALVIN ZULICK, ANATOLY MAKSIMCHUK, ALEXANDER THOMAS, LOUISE WILLINGALE, VLADIMIR CHVYKOV[1], VICTOR YANOVSKY, KARL KRUSHELNICK, CUOS, University of Michigan — Magnetic reconnection events driven by relativistic electrons are observed between two high intensity laser/plasma interaction sites. The two laser focuses were on average 20μm FWHM containing 50TW of power each, delivered with a split f/3 paraboloid onto copper foil targets at a focused intensity of 4x10^{18} W/cm^2. A spherically bent k-alpha X-ray Bragg crystal was utilized to image the interactions, and by motorizing one half of the paraboloid vertically the focal separation was varied between 0-200μm. While these k-alpha images demonstrated a ring structure surrounding a single focus (due to electrons returning from vacuum to the rear of the target surface), splitting the focuses revealed the rings of either spot interacting and enhancing between the focuses, evidencing magnetic reconnection driven by the relativistic electron currents. Imaging the transversely propagating electrons with a filtered LANEX screen demonstrated relativistic currents with spatial nonuniformities potentially directly originating from reconnection events, and varying target geometries were used to investigate the resulting effects on the spatial electron profiles. At present PIC simulations are being conducted to better understand and attempt to reproduce the measured electron outflow dynamics.

[1]Currently at: ELI Attosecond Light Pulse Source

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