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Phase contrast imaging of high-intensity laser hole boring of solid-density wires at LCLS-MEC[1] W SCHUMAKER, S BROWN, C CURRY, M GAUTHIER, E GAMBOA, S GOEDE, L. FLETCHER, J. KIM, M MACDONALD, R MISHRA, C ROEDEL, S GLENZER, F FIUZA, SLAC-HED, E GRANADOS, B NAGLER, Z ZHOU, A MACKINNON, SLAC-LCLS, L OBST, K ZIEL, HZDR, A PAK, LLNL, G WILLIAMS, M FAJARDO, IST-IPFN — High-intensity, relativistic ($a_0 > 1$) laser plasma interactions on solid surfaces produce a rich mix of dynamics on the laser timescale (Weibel instabilities, surface effects, sheath formation, etc.) and hydrodynamic timescale (hole-boring, shocks, etc.). Probing these interactions optically is difficult due to critical density layer obscuring the surface of the target, whereas probing with hard X-rays from K-alpha sources does not sufficiently resolve these interactions temporally as they are typically many ps in duration. Presented here are the first experimental measurements of laser hole-boring on a carbon wire surfaces performed at the LCLS-MEC facility. With laser intensities of up to $10^{19} W/cm^2$, we observe the dissociation of micron-sized wires over $100 ps$ timescale with peak hole boring velocities up to $0.001c$ using phase-contrast imaging.

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