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Experimental investigation of interactions of long CO_2 laser pulse with plasma at ATF IRINA PETRUSHINA, State University of New York at Stony Brook, RAFAL ZGADZAJ, University of Texas at Austin, PRABHJOT KAUR, IGOR POGORELSKY, MARCUS BABZIEN, MIKHAIL FEDURIN, ROTEM KUPFER, KARL KUSCHE, MIKHAIL POLYANSKIY, MARK PALMER, Accelerator Test Facility, Brookhaven National Laboratory, PRABHAT KUMAR, ROMAN SAMULYAK, State University of New York at Stony Brook, JAMES WELCH, University of Texas at Austin, KYLE MILLER, CHAOJIE ZHANG, WARREN MORI, University of California Los Angeles, MICHAEL DOWNER, University of Texas at Austin, CHAN JOSHI, University of California Los Angeles, VLADIMIR LITVINENKO, NAVID VAFAEI-NAJAFABADI, State University of New York at Stony Brook — Laser wakefield accelerators (LWFAs) can sustain accelerating gradients that greatly surpass those of conventional accelerators. Long (~ps) and intense (>TW) laser pulses have been employed in LWFAs to generate bright, hard X-rays which are of interest for imaging and diagnosing warm-dense matter. The CO_2 laser at the ATF facility of the Brookhaven National Laboratory is a unique source, which can generate 2 ps-long, multi-TW laser pulses in the mid-IR (9.2 μm) regime. The properties of the laser-plasma interactions were characterized by imaging the plasma wakefields with the linac-produced short (150-250 fs) relativistic electron beam at ATF. The evolution of a self-modulated laser wake in an underdense plasma has been directly observed and analyzed. Experimental results as well as simulations exploring the properties of this regime will be presented.

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