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Hole boring velocity measurements in near critical density plasmas by a CO_2 laser pulse¹ CHAO GONG, SERGEI TOCHITSKY, JEREMY PIGEON, CHAN JOSHI, University of California, Los Angeles — Measurements of plasma dynamics during the interaction of a high-power laser pulse with an above critical density plasma is important for understanding absorption, transport and particle acceleration mechanisms. An important process that affects these mechanisms is hole boring occurring at the critical density because of the radiation pressure of the laser pulse. Yet, no systematic measurements of the hole boring velocity's (v_{hb}) dependence on laser intensity (I) have been made. In this talk, we present experimental results of v_{hb} in near critical density plasmas produced by CO₂ laser as a function of I in the range of $1*10^{15}$ to $1.6*10^{16}$ W/cm². A novel four frame Mach-Zehnder interferometer using a 1ps, 532nm probe laser pulse was developed to record the evolution of the plasma density profile and the motion of the near critical density layer. Using this diagnostic, we observed the motion of the steepened plasma profile due to the incident, time-structured CO_2 laser pulse. Experimental results show the hole boring velocity increases from 0.004c to 0.007c as the laser intensity is increased from 1^*10^{15} to 1.6^*10^{16} W/cm².

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