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Examining Femtosecond Laser Induced Plasma Dynamics via Ultrafast Electron Shadow Imaging[1] JUNJIE LI, RICHARD CLINITE, XUAN WANG, JIM CAO, Physics Department/National High Magnetic Field Lab, Florida State University, ZHAOYANG CHEN, SAMUEL MAO, Department of Mechanical Engineering, University of California at Berkeley, JIM CAO TEAM, SAMUEL MAO COLLABORATION — We report a study of the dynamics of plasma creation and evolution in real time using a pulsed electron beam to create two-dimensional shadow images of the plasma plume. Due to the electron beam's sensitivity to charge, the dynamics of electric fields and charge motion during the earliest stage of laser ablation of Copper plate were directly measured by taking snapshots of the plasma shadow images. Based on a dipole field assumption, a multiplying magnitude of Q(total charge), d(average electrons' distance from surface), and t(duration time of field) is obtained, Q*d*t $\sim$ 12*10^{-8} e*m*s under 6.8*10^{12}W/cm^2 laser power on 0.3mm diameter area, moreover, most electrons which are initially emitted retract back in 1 to 2 ps after laser pulse. The results provide new information about multi-photon emission and charge motion during intense laser material interaction.

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