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Current Filaments, Plasma Flow and their Spontaneous Fields in Laser-Holhraum Interactions C.K. LI, F. SÉGUIN, J. FRENJE, M. GATU-JOHNSON, H. RINDERKNECHT, M. ROSENBERG, H. SIO, A. ZYLSTRA, R. PETRASSO, MIT, P. AMENDT, O. LANDEN, S. WILKS, LLNL, R. BETTI, J. KNAUER, D. MEYERHOPHER, J. SOURES, LLE, M. FARRELL, J. KILKENNY, A. NIKROO, GA — We present the first time-gated, side-on proton radiography data that reveals the structure and dynamics of current filaments, plasma flow, and their spontaneous electromagnetic fields occurring at the hohlraum laser-entrance holes. Plasma instabilities are shown to play a critical role in such dynamic structures. In the early phase, these instabilities show up as collisionless Weibel-induced current filaments resulting from expansion of low-density plasma into vacuum, and in the later phase as resistive MHD modes resulting from the adiabatic expansion of on-axis, stagnated wall plasma blowoff. Time-resolved observations of electromagnetic fields associated with these plasma instabilities have been made. The experiments demonstrate the dominance of magnetic fields over electric fields, consistent with self-emissions of charged fusion products observed from experiments at the NIF and OMEGA. This work was supported in part by the U.S. DOE, LLNL and LLE.

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