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Theory Experiment

Effects of Preplasma in 10-ps Relativistic Laser Matter Interaction,* M.S. Wei, R.B. Stephens, *GA*; J. Peebles, C. McGuffey, B. Qiao, F. Beg, *UCSD*; Y. Sentoku, *UNR*; A. Link, H. Chen, H. McLean, *LLNL*; W. Theobald, D. Haberberger, A. Davies, *LLE* – Experiments were performed using the kJ 10-ps OMEGA EP laser to study the effect of preplasma on fast electron generation and energy coupling in relativistic laser plasma interaction (LPI) with a controlled preplasma at various scalelength created by a 1-ns UV laser. Targets were multilayered planar foil consisting of an Al substrate, a buried Cu layer and a thick conductive CH layer. Preplasma density profile and relativistic LPI generated fields were characterized using a 10-ps 4ω optical probe (angular filter refractometry and polarimetry) together with radiography using a high-energy proton beam produced by the second kJ 10-ps EP beam. Fast electrons were diagnosed by measuring Cu K-shell fluorescence emission and bremsstrahlung radiation. Electron energy spectrum was monitored by a magnetic spectrometer. Preliminary results showed nonlinear interaction instabilities and a reduced electron temperature with increasing preplasma scalelength. Dynamics of the relativistic LPI and the resultant fast electron beam characteristics and energy coupling will be presented.

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