Abstract Submitted
for the CAL11 Meeting of
The American Physical Society

High-Energy Neutron Source For Fusion Material Property Studies Using Short Pulse Lasers[1] D.P. HIGGINSON, J.M. MCNANEY, D.C. SWIFT, D. BLEUEL, A.J. MACKINNON, P.K. PATEL, LLNL, G.M. PETROV, J. DAVIS, NRL, V. YU GLEBOV, C. STOECKL, LLE, J. COBBLE, LANL, J.A. FRENJE, MIT, R. KODAMA, H. NAKAMURA, ILE, K.L. LANCASTER, RAL, L.C. JARROTT, G. TYNAN, F.N. BEG, UCSD — High-energy (>10 MeV) neutron generation is of interest to applications including fusion energy, material damage studies and nondestructive material detection. A novel technique to create high-energy neutrons was demonstrated using short pulse (10 ps), high-energy (350-1000 J) lasers at the Titan and Omega EP laser systems. In this method, the laser accelerates deuterons from a CD foil, which produce neutrons as they pass through a LiF block via the reaction ^{7}Li(d,xn), Q=15 MeV. The spectrum is forward peaked in both energy and number. The presence of proton contaminants on the CD foil dramatically inhibits the acceleration of deuterons, which reduces the neutron generation. Activation diagnostics and CR39 detectors recorded single shot neutron fluences of up to 3×10^{9} n sr^{-1}. Neutron time-of-flight spectrometer detectors indicate the production of neutrons with energies up to 18 MeV in the forward direction. Methods to improve neutron yield and directionality will be presented.

[1]This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory DE-AC52-07NA27344.

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Date submitted: 30 Sep 2011 Electronic form version 1.4