Abstract Submitted
for the DPP12 Meeting of
The American Physical Society

Neutron Generation through Ultra-Intense Laser Plasma Interactions[1] C. ZULICK, F. DOLLAR, L. WILLINGALE, V. CHVYKOV, G. KALINTCHENKO, A. MAKSIMCHUK, A.G.R. THOMAS, V. YANOVSKY, K. KRUSHELNICK, University of Michigan, J. DAVIS, G.M. PETROV, NRL, V. GLEBOV, P.M. NILSON, T.C. SANGSTER, C. STOECKL, LLE, R.S. CRAXTON, P.A. NORREYS, STFC, Rutherford Appleton Laboratory, J. COBBLE, LANL, H. CHEN, LLNL — Fast neutrons (> 1 MeV) have important applications in biological imaging, materials testing, and active interrogation for homeland security. Experiments at the HERUCLES laser facility produced neutrons with energies up to 12 MeV in directional beams utilizing $^{7}_{3}$Li(p,n)$^{7}_{4}$Be, and $^{7}_{3}$Li(d,n)$^{8}_{4}$Be reactions. The neutrons were produced in a two-stage pitcher-catcher configuration by accelerating protons and deuterons from micron scale solid targets into bulk LiF. The neutron yield was measured to be up to $2.3(\pm 1.4) \times 10^{7}$ neutrons/sr with a flux 6 times higher in the forward direction than at 90°. Additionally, the kilojoule short-pulse OMEGA EP laser was used to investigate $^{2}_{1}$D(d,n)$^{3}_{2}$He reactions from an underdense deuterated plastic plume. Fast neutron spectra were observed via time-of-flight measurements as a result of deuteron acceleration during the channel formation.

[1]This work was supported by NSF through the FOCUS Physics Frontier Center PHY-0114336, by DHS and NSF through grant EECS-0833499 and DOE through NLUF DE-NA000874.

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Date submitted: 24 Jul 2012 Electronic form version 1.4