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Laser-driven neutron production from bulk and pitcher-catcher targets ANATOLY MAKSIMCHUK, L. WILLINGALE, T. MATSUOKA, A.G.R. THOMAS, K. KRUSHELNICK, CUOS, University of Michigan, Ann Arbor, MI 48109, G.M. PETROV, J. DAVIS, Plasma Physics Division, NRL, Washington, DC 20375, V.M. OVCHINNIKOV, R.R. FREEMAN, A. JOGLEKAR, C.D. MURPHY, L.VAN WOERKOM, Department of Physics, Ohio State University, Columbus, OH 43210 — As an important step in the development of the highly directional compact neutron source from the reaction ^{7}Li(d,xn) [1] we have studied the laser-driven fusion neutron production d(d,n)^{3}He from bulk deuterated plastic targets and compared it to a pitcher-catcher target method using the same laser and detector arrangement. For laser intensities of up to I = 3.10^{19} Wcm^2 it was found that the bulk targets produced a high yield (5.10^4 neutrons/steradian) beamed preferentially in the laser propagation direction. The inhibition of the deuteron acceleration by a proton rich contamination layer is likely to significantly reduce the pitcher-catcher neutron production. Two-dimensional particle-in-cell simulations were performed to model the deuteron beam acceleration, the results of which were coupled to a Monte Carlo code to calculate the expected neutron beam properties. Numerical analysis suggests the pitcher-catcher targets would become more efficient at higher laser intensities. This work was supported by DTRA and the NRL. [1] J. Davis et al., PPCF 52, 045015 (2010).

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