Neutron production from interactions of high-intensity ultra-short pulse laser with a planar deuterated polyethylene target$^1$ GEORGE PETROV, JACK DAVIS, Naval Research Laboratory — The neutron production from D(d,n)$^3$He nuclear fusion reactions was studied with a two-dimensional electromagnetic particle-in-cell method combined with a three-dimensional Monte Carlo ion beam-target deposition model. The precursor for nuclear fusion reactions is high-energy (MeV) deuterons generated from a double-layer or uniform deuterated polyethylene target in the ultra-relativistic regime for peak laser intensities between $10^{19}$ and $10^{21}$ W/cm$^2$. The angular scattering of neutrons is found to be non-isotropic having a significant component in the forward (laser propagation) direction. A neutron yield of $10^5$ - $10^7$ neutrons per Joule laser energy is inferred from simulations.

$^1$This work was supported by the Defense Threat Reduction Agency (DTRA) and the Naval Research Laboratory (NRL) under the ONR 6.1 program.