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Development of high-efficiency, non-cryogenic, direct-drive neutron sources on the National Ignition Facility laser[1] G. ELIJAH KEMP, C. B. YEAMANS, H. D. WHITLEY, Z. B. WALTERS, LLNL, S. CRAXTON, E. GARCIA, P. MCKENTY, Y. YANG, LLE, B. E. BLUE, LLNL — We discuss recent work on the development of high-efficiency, room-temperature, polar-direct-drive neutron sources on the National Ignition Facility laser. Thin-shell ($15-30\,\mu m$), $3-5\,mm$ OD glow-discharge plastic (GDP) capsules filled with $8\,atm$ of DT (65:35) gas are directly driven with $0.5-1.9\,MJ$ of laser energy in a polar direct drive geometry. To date, experimental laser-to-neutron-energy conversion efficiencies of up to $\approx 3\%$ have been demonstrated, corresponding to neutron yields in excess of 10^{16}. Radiation-hydrodynamics simulations with ARES and HYDRA suggest these interactions are neither true exploding-pushers (i.e. low-convergence with shock-driven ion temperatures and most of the shell is ablated away) nor within a traditional inertial confinement fusion regime (i.e. high-convergence with compression and α-heating driven ion temperatures). Rather, these experiments appear to exist somewhere in-between in a regime we dub “compressing-pushers.” Current experimental and modeling results will be presented along with plans for optimizing the platform under various target and facility constraints.

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