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Neutron Production in Deuterium Gas-Puff Z-Pinch Implosions on Refurbished Z[1] R.W. CLARK, Berkeley Research Associates, A.L. VELIKOVICH, J. DAVIS, J.L. GIULIANI, Plasma Physics Division, Naval Research Laboratory, C.A. COVERDALE, D. FLICKER, Sandia National Laboratories — Earlier experiments with deuterium gas puff implosions on Z [Coverdale et al., Phys. Plasmas **14**, 022706 and 056309 (2007)] demonstrated reproducible production of high neutron yields, up to $\sim 3\times 10^{13}$, a large part of which might be of thermonuclear origin. We report a scoping study for such experiments on refurbished Z which can implode deuterium gas-puff loads at high-current, longer pulse ($\sim$250 ns) regime. Significantly higher thermal DD neutron yields are predicted for ZR. We discuss the relative roles of kinetic-to-thermal energy conversion and adiabatic compression in heating the central deuterium column to the fusion temperature. We quantify the effect on the thermal neutron yield produced by loading the outer shells of the multi-shell gas-puff with a heavier gas to improve matching of the implosion to the current pulse, by additional heating of the central jet area with a Z-Beamlet laser and by applying an axial magnetic field in order to stabilize the implosion from a large initial radius.

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