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Thermonuclear and Beam-Target Fusion in Deuterium Gas-Puff Z-Pinch Implosions: Theory and Modeling[1] R.W. CLARK, A.L. VELIKOVICH, J. DAVIS, Y.K. CHONG, Naval Research Laboratory, C. DEENEY, C.A. COVERDALE, C. RUIZ, Sandia National Laboratories, G. COOPER, University of New Mexico, J. FRANKLIN, Ktech Corporation, L.I. RUDAKOV, Icarus Research, Inc. — Recent experiments with 8 cm diameter deuterium gas puff implosions on the Z accelerator at currents from 13 to 17 MA demonstrated reproducible production of high neutron yields, up to $\sim 3 \times 10^{13}$. We report the results of 1-D and 2-D radiation-hydrodynamic simulations of these experiments. The simulations predict relatively low, ~10-fold, radial compression ratios, and rapid bouncing of the imploded plasma due to small radiative energy losses. Simulated spectra with argon and freon R12 dopants in the deuterium agree with the observations. Calculated temperature, density, and inertial confinement time of the stagnated plasma are consistent with the hypothesis of thermonuclear origin of the observed neutrons. The alternative assumption of beam-target neutron generation in these experiments implies an unusually high, ~10% efficiency of energy conversion into non-thermal deuterium ions, and multi-MA levels of the ion beam current.

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