Abstract Submitted
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Shell Interaction Physics of Multi-Material Gas Puff Z-Pinches for the Neutron Production on the Refurbished Z[1] Y.K. CHONG, A.L. VELIKOVICH, J.W. THORNHILL, J. GIULIANI, Naval Research Laboratory, C.A. COVERDALE, Sandia National Laboratories — Deuterium (D) double-shell gas-puff Z-pinch loads driven by the SNL Z accelerator has proven to be a proficient source of thermal fusion neutrons. RMHD simulations studies of the Z-pinches with the outer shell D replaced by a dense high-Z better radiating element have predicated a substantial increase in thermal fusion neutron yield. The neutron yield depends on not only the development of multidimensional structures and nonuniform gradients due to the RT instabilities but also on the complex interaction physics of the shells wherein the break-through & penetration of the outer shell material and subsequent push-out of the interior D matter adversely affects the yield. Our investigation focuses on the understanding the interaction physics & dynamics of the outer argon and inner D shells toward the optimization of the neutron yield using the multi-material version of the Mach2+DDTCRE 2D RMHD code. We will establish various performance metrics, in particular the neutron yields, of the Z-pinch loads as a function of mass ratio and/or radius for different load elements toward the mapping of the optimal operation parameter regime & design of multimaterial gas-puff loads as a pulsed neutron source. A comparison of the results with 1D predictions and with pure D loads is made as well.

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