DESIGN OF MULTIPLE-SHELL GAS NOZZLES FOR REFURBISHED Z*

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This paper presents initial designs of multiple-shell gas puff imploding loads for the refurbished Z generator. The nozzle has three independent drivers for three independent plena. The outer and middle plena may be charged to 250psia whilst the central jet can be charged to 1000psia. 8-cm and 12-cm outer diameter nozzles have been built and tested on the bench. The unique valve design provides a very fast opening, hence the amount of stray gas outside the core nozzle flow is minimized. A similar 8-cm nozzle was characterized earlier using a fiber optic interferometer, but at lower pressures and without the central jet. Those data have been scaled to the higher pressures required for refurbished Z and used to estimate performance. The use of three independent plena allows variation of the pressure (hence mass distribution) in the nozzle flow, allowing optimization of implosion stability and the on-axis mass that most contributes to K-shell emission. Varying the outer/middle mass ratios influences the implosion time and should affect the details of the assembly on axis as well as the radiation physics[1]. Varying the central jet pressure will have a minor effect on implosion dynamics, but a strong effect on pinch conditions and radiation physics[2].

Optimum mass distributions for planned initial Ar shots on refurbished Z are described. Additional interferometer data including the central jet and at higher pressures will also be presented.

1. P.L. Coleman et.al., "Recent Results for Large Diameter (12 cm) Gas Puff Z-pinches at Peak Currents of >3 to <6 MA," 6th International Conference on Dense Z-Pinches, Oxford, UK 25-28 July 2005. (Invited) Also published in AIP Proceedings #808, edited by J. Chittenden, pp. 163-168, 2005.

2. J.S. Levine, et al., "Implosion dynamics and radiative characteristics of a high yield structured gas puff load," *Phys. Plasmas* **13**, 082702 (2006).

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