Abstract Submitted
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Kr Z-Pinch Simulations Using Different Models for Radiation Transport[1] J.L. GIULIANI, J.W. THORNHILL, A. DASGUPTA, NRL, J.P. APRUZESE, L3 Communications, D.J. AMPLEFORD, B. JONES, SNL — In a Z pinch of moderate to high atomic number material, the radiation can control the dynamics of the plasma during stagnation on axis. In this work we study the power and yield from a Kr gas puff on the refurbished Z generator using the MACH2-TCRE simulation code in R-Z coupled to four different models for the radiation transport of bound-bound transitions within the probability-of-escape formalism: optically thin, strictly local, on-the-spot approximation, and non-local which includes absorption in distant zones. In the thin case the K-shell yield is about twice the 14 kJ yield seen for the non-local transport and the total peak power varies by an order of magnitude. Moreover the density, temperatures, and velocity vary significantly with the model employed. In particular, the thin approach leads to large velocity gradients at implosion not found with the non-local model. This result suggests that the reduced line opacity due to the inclusion of Doppler shifts could significantly affect the plasma dynamics and Kr K-shell emission. Consequently we extend the non-local transport model to a fifth one that is multi-frequency and can thereby, for the first time, account for Doppler shifts in an R-Z time-dependent simulation of a Z-pinch.

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