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Effects of EOS adiabat on hot spot dynamics[1] BAOLIAN CHENG, THOMAS KWAN, YI-MING WANG, STEVEN BATHA, Los Alamos National Laboratory — Equation of state (EOS) and adiabat of the pusher play significant roles in the dynamics and formation of the hot spot of an ignition capsule. For given imploding energy, they uniquely determine the partition of internal energy, mass, and volume between the pusher and the hot spot. In this work, we apply the new scaling laws [1] recently derived by Cheng et al to the National Ignition Campaign (NIC) ignition capsules and study the impacts of EOS and adiabat of the pusher on the hot spot dynamics by using the EOS adiabat index as an adjustable model parameter. We compare our analysis with the NIC data, specifically, for shots N120321 and N120205, and with the numerical simulations of these shots. The predictions from our theoretical model are in good agreements with the NIC data when a hot adiabat was used for the pusher, and with code simulations when a cold adiabat was used for the pusher. Our analysis indicates that the actual adiabat of the pusher in NIC experiments may well be higher than the adiabat assumed in the simulations. This analysis provides a physical and systematic explanation to the ongoing disagreements between the NIC experimental results and the multi-dimensional numerical simulations.

[1] B. Cheng, T. J.T. Kwan, Y.M. Wang, and S.H. Batha, LA-UR-13-22638, 2013.

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