Large-scale implosions using HDC ablators for the Frustraum driven at 2ω

D. D.-M. Ho and P. A. Amendt,

*Lawrence Livermore National Laboratory, Livermore, USA*

A diamond-shaped hohlraum ("Frustraum") proposed by Amendt *et al.*\(^1\) may provide adequate radiation symmetry for large capsules (1500 µm radius) while requiring < 1.8 MJ of laser energy using 3ω light and is capable of providing peak radiation temperature in the 290 – 300 eV range. The capsule size can be increased to 1900 µm or larger if 2ω light is used at 2.8 MJ of driver energy and 600 TW of power. The implosion physics and designs for these large capsules are presented here and compared to nominal scale (1100 µm radius) HDC implosions. The fuel adiabat \(\alpha\) for the large-scale capsules ranges from 2.5 to 6 multiples of the Fermi degenerate limit. Large scale has high 1D margin or Generalized Lawson Criterion e.g., the \(\alpha = 4\) design gives a 2D yield of 20 MJ while the nominal-scale \(\alpha = 4\) design has a 2D yield of only about 0.5 MJ. Lower hard x-ray fraction (14%) from the Frustraum with DU wall results in a neutral Atwood number on the fuel-ablator interface at peak velocity. This reduces mix and gives a high clean fuel fraction of 95%. Large-scale capsules are also robust to fuel pre-heat, hotspot contamination, and tent and fill-tube perturbations. The improved robustness allows the use of liquid-DT foam as a viable fielding option for a 2ω driver. The disadvantage of large-scale is that the ablation-front growth factor increases with capsule size. Therefore, it is advantageous to use a lower-Z ablator, e.g., boron, to reduce the growth factor. The modeling method used for the large-scale designs is the same for recent large Al capsules in a rugby-shaped hohlraum,\(^2\) which gives close agreement with the data.

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2. Ping, Smalyuk, Amendt *et al.*, Nature Phys. ([https://doi.org/10.1038/s41567-018-0331-5](https://doi.org/10.1038/s41567-018-0331-5))