

Quantitative Radiography: Submicron Dimension Calibration and ICF Target Characterization*

H. Huang, B. Kozioziemski,¹ R.B. Stephens, A. Nikroo, S.A. Eddinger, H.W. Xu, K.C. Chen, and K.A. Moreno

General Atomics, P.O. Box 85608, San Diego, California 92186-5608

¹Lawrence Livermore National Laboratory, P.O. Box 808, Livermore, California 94551

NIF specifications require submicron dimension measurement accuracy for the capsule. Photolithography based calibration standard allows a 2D object to be measured to $\sim 0.5 \mu\text{m}$ accuracy despite $\sim \pm 3 \mu\text{m}$ lens distortion. The size and shape of a 3D capsule, however, is distorted on a film plate by up to $3 \mu\text{m}$ due to x-ray refraction and the point source projection geometry. In this work, we developed a phase contrast model and the physical dimension standards that enabled measurement accuracies of $<1 \mu\text{m}$ for capsule diameter, $<0.3 \mu\text{m}$ for OOR, $<0.5 \mu\text{m}$ wall thickness (including each sub-layer), and $\sim 0.1 \mu\text{m}$ for wall thickness profile.

*Work supported by U.S. Department of Energy under Contracts DE-AC03-01SF22260 and W-7405-ENG-48.