High Resolution Shock Front Measurements*

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Abstract. In the National Ignition Campaign (NIC) there is a need for to probe the two-dimensional structure of a shock front at spatial scales of a few μm and velocity resolution of a few parts in 10^4. Current NIC target designs contain the DT fuel inside spherical capsules of either Cu-doped Be, high density C (HDC) or Be-doped CH. The former two candidate materials are polycrystalline, and are expected to respond anisotropically. In the case of Be the non-uniformities seeded during the initial compression will be suppressed by shock-melting the ablator on the first shock, while in the HDC case significant spatial averaging is expected to operate over the nm-scale length of the grain structure. Capsule stability studies suggest that the capsule should remain stable during the implosion if the initial (first shock) velocity non-uniformities are kept to a level of a few parts in 10^4 for modes with wavelengths from a few μm to a few 100 μm.

Traditional methods such as point VISARs†, streaked shock breakout, or line-imaging VISARs cannot measure non-uniformities at these scales. To characterize the ablators we have fielded a new instrument, a high resolution two-dimensional imaging VISAR at the OMEGA laser facility. Over an 800 μm field of view this instrument captures spatial variations in the velocity across the shock front transmitted through the ablator with relative velocity sensitivity $\delta V/V \sim 10^{-4}$. The instrument is sensitive to mode wavelengths in the ranging from 2 μm to 100 μm.

†VISAR: Velocity Interferometer from the Surface of Any Reflector

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