

FY21 Naval Research Laboratory Report on Omega Laser Facility Experiments

NRL Transmission Grating Spectrometer Obtains X-Ray Spectra from High-Z Coatings Used for Imprint Mitigation on OMEGA EP

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During FY21, NRL in collaboration with LLE completed a shot day on OMEGA EP to further study the spectra of soft x rays emitted by high-Z (Au and Pd) coatings that are highly effective for imprint mitigation.^{1,2} Soft x-ray spectra of the indirect–direct hybrid drive with high-Z coatings were obtained using the NRL transmission grating spectrometer³ (NRL TGS) installed on OMEGA EP (see Fig. 1). A new higher-dispersion grating allowed us to measure the spectra to shorter wavelengths. The measurements show that the spectra are dominated by soft x-ray emission as expected and can be used to put a bound on target preheat. Additionally, excellent VISAR (velocity interferometer for any reflector), streaked optical pyrometry, and 4ω probe data were acquired to aid in the understanding of high-Z coating dynamics.

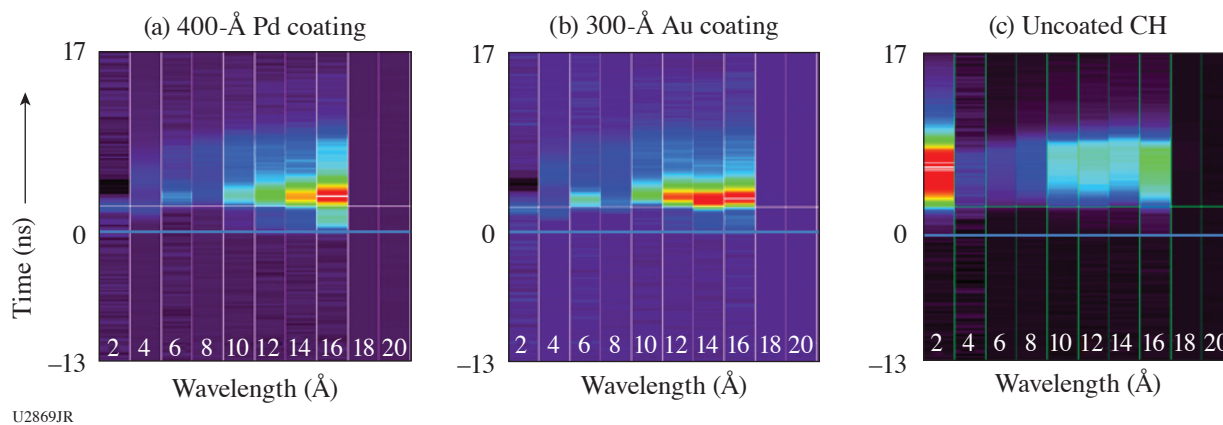


Figure 1

Examples of x-ray spectra obtained using the NRL TGS. Individual time-resolved spectral bins from diodes are combined to form spectra “streaked” in time. For coated targets, strong emission was seen early in the pulse consistent with initial x-ray drive. The measurements show that the spectra are dominated by soft x-ray emission, as expected. The data can be used to put a bound on x-ray preheat of a given ablator thickness. Note that the signal in the uncoated CH 2-Å bin is contaminated due to zero-order bleed.

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1. M. Karasik *et al.*, Phys. Plasmas **28**, 032710 (2021).
2. S. P. Obenschain *et al.*, Phys. Plasmas **9**, 2234 (2002).
3. J. L. Weaver *et al.*, Rev. Sci. Instrum. **72**, 108 (2001).