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Measurements of Optical Spectra in Short Pulse Laser-Solid Interactions at Moderately Relativistic and Relativistic Laser Intensities A.M. NILES, S. WILKS, H. CHEN, R. SHEPHERD, Y. PING, K. WIDMANN, S. MOON, K.B. FOURNIER, S.B. HANSEN, H-K. CHUNG, A. KEMP, LLNL, LLNL TEAM — We present a series of measured spectra, 300nm-950nm with 1nm resolution, for various target materials including: Al, Ti, Au, Si, Cu and Al coated Ti obtained during laser-solid interaction experiments performed at the ultra-intense short pulse laser facilities JanUSP (LLNL) and Vulcan (RAL). Laser intensities ranged from moderately relativistic, $\sim 10^{17} \mathrm{W/cm^2}$, to relativistic, $\sim 10^{20} \mathrm{W/cm^2}$. Measured spectra were sampled from within the specular reflection cone off of the target and delivered via discrete optics to a fiber coupled diffraction grating spectrometer. In addition to the expected higher integer harmonics, 2ω and 3ω , of the laser frequency, several shots measured high levels of $3/2\omega$, and $5/2\omega$. These are attributed to two plasmon decay in the underdense plasma blow-off caused by the prepulse interacting with the solid before the main pulse. Density profiles for several shots will also be presented, in an attempt to correlate the presence of the 1/2 harmonics with long scale pre-plasmas. The work was performed under the auspice of the Department of Energy under Contract No. W-7405-Eng-48 and Laboratory Directed Research and Development (LDRD) Programs 04-LW-020 and 04-ERD-023.

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