# High resolution, sub-picosecond x-ray spectroscopy of buried layers heated with high intensity, short pulse lasers*+

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Short pulse, laser (SPL) heated matter has opened an avenue to studying matter at conditions previously unobtainable. While SPLs can generate matter at extreme densities and temperatures, characterization of the heated matter can be extremely challenging. The conditions are extremely dynamic in nature, requirement a careful monitoring of the plasma evolution.

High temporal and spectral resolution spectroscopy can play an important role in understanding the heating dynamics of buried layers. At the onset of heating, the laser deposits energy into non-thermal electrons at the laser-target interaction plane. Some fraction of the non-thermals escapes the target, producing a charge imbalance and a return current. The spectral features during this heating phase result from thermal and non-thermal electron distributions. Temporally resolving the Li-like satellites along with the $He_\alpha$ complex provides an avenue for studying the plasma temperature as it transitions from a relatively low temperature to a high temperature. We look at the impact of the non-thermal electrons on the sulfur $He_\alpha$ and Li-like dielectronic complex using the LLNL sub-picosecond, high resolution-STreaked Orion High REsolution treX (STOHREX). The targets were 50 μm diameter "dots", made from 160nm of FeS and 60 nm KCl, tamped by 3 μm of parylene. The experiments were performed at the Orion laser facility using ~700 fs, 532 nm, 150 J focused to a 100 μm spot. The impact of non-thermal electrons on the inferred temperature rise is studied using recent adaptations to the Cretin code to account for non-Maxwellian electron distributions on spectral features. The preliminary results will be presented along with spectroscopic modeling.

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