

## P2.2028 Laser-plasma instabilities in the shock ignition regime at the Vulcan TAW facility

*Tuesday, 9 July 2019 14:00 (2 hours)*

See the full abstract here

<http://ocs.ciemat.es/EPS2019ABS/pdf/P2.2028.pdf>

In the Shock Ignition (SI) approach to Inertial Confinement Fusion (ICF), an intense laser spike is used to launch a high pressure converging shock in the spherical capsule at the end of the compression phase. In this way the compression and the ignition phases are separated and can be optimized independently. The shock driving laser pulse propagates at high intensity ( $\sim 10^{16}$  W/cm<sup>2</sup>) in a long scale-length plasma and is therefore prone to parametric instabilities, mainly Stimulated Brillouin Scattering (SBS), Stimulated Raman Scattering (SRS) and Two Plasmon Decay (TPD) that may affect laser-plasma interaction (LPI), possibly yielding hot electrons (HE) which impact on the shock pressure and heat the fuel capsule. While LPI was extensively investigated at lower intensities for both direct and indirect drive ICF, it is poorly known at the SI conditions. It is therefore crucial to carry out dedicated experimental investigations. We carried out an experiment at the Vulcan TAW laser facility using high energy long pulse beams for the production of a hot and long scale-length plasma and a separate high intensity beam for mimicking the SI laser spike. The effect of interaction conditions on LPI was investigated by varying the interaction beam intensity, the delay between drivers and interaction beam and the chirp and bandwidth of the interaction beam. X-ray spectroscopy of K-shell emission from He-like and H-like chlorine dopant of the target is used to infer plasma temperature which is then compared with hydrodynamic DUEP simulations, while calorimetry of backscattered light reveals a significant SBS/laser and SRS reflectivity, where SRS strongly depends on the steepness of plasma density profile. Time-resolved spectroscopy of backscattered light shows that SRS is driven at surprisingly low plasma densities (0.03-0.12 nc), suggesting a significant suppression of Landau damping of SRS driven electron plasma waves. Modification of laser bandwidth from a narrow band to a chirped 2 nm broad band also yields a dramatic variation of SRS spectral evolution and a shift of the coupling region. Finally, Cu K and Bremsstrahlung continuum spectra give information on the generation of hot electrons. An overview of the experimental results will be given in the poster presentation.

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