



## **BOOK OF ABSTRACTS**

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PRODUCTION AND CHARACTERIZATION OF  
LONG-SCALE-LENGTH EXPANDING PLASMAS  
FOR ICF CORONAL STUDIES

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The experiment was performed at the SERC Central Laser Facility. Four 600 ps. 1.053  $\mu\text{m}$  beams of the Vulcan laser were used to preform the plasma. They were focused f/10 in two opposite pairs and superimposed on target in a 600  $\mu\text{m}$  spot providing a total irradiance on target of typically  $6 \cdot 10^{13} \text{ W/cm}^2$ . Either Al or Bi dot targets coated on 0.1  $\mu\text{m}$  plastic stripes were used. Dots were 400  $\mu\text{m}$  in diameter in order to be uniformly irradiated in the centre of the laser spot. A fifth beam was delayed by 2.5 ns and focused f/15 to interact with the underdense preformed plasma along the symmetry axis at an irradiance from  $10^{13} \text{ W/cm}^2$  to  $5 \cdot 10^{14} \text{ W/cm}^2$ . This beam was either unsmoothed or smoothed with three different devices, namely random phase plates, induced spatial incoherence, spectral dispersion. Both narrow-band and broad-band regimes were tested. Specially designed phase plates were used on the interaction beam in order to induce controlled intensity modulations in the focal region.

Time-resolved X-ray spectroscopy of K-shell Al emission was employed in order to characterize the plasma in terms of electron temperature evolution before and during the interaction. To this purpose intensity ratios between Hydrogenic and He-like lines was measured as a function of time and compared with the prediction of atomic numerical code RATION. Electron density distribution was measured by means of Normansky interferometry technique using a 100 ps green laser pulse. Abel inversion of the fringe pattern allowed to measure both longitudinal and transversal scale-length of the plasma. The large amount of laser shots successfully fired on target in a variety of conditions will provide a wide set of measurements useful to further design ICF directed experiments. Results obtained by the study of second harmonic emission and stimulated Brillouin scattering will be presented in another paper to this Conference(\*).

(\*). A. Giulietti *et Al.* : "Interaction of smoothed or modulated laser beams with long-scale-length expanding plasmas"