Laser Accelerated Sources and Applications

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Understanding the mechanisms which control the spectral content of laser driven ion and electron beams is essential in many applications from penetrating X-ray imaging, probing electrostatic and magnetic fields through to studies of ion fast ignition and pulsed neutron production etc. Advances using multi-pulse illumination, ellipsoidal plasma mirrors and EMP generation help deliver improved experimental regimes and laser to ion conversion efficiencies of >15% have been achieved using the Target Normal Sheath acceleration scheme.

Using a recently developed cryogenic target system, an ultra thin layer of deuterium can be readily deposited as a pure low Z surface layer. By controlling the thickness of the deuterium layer it can act as a probe of the acceleration sheath dynamics and ion depletion can be studied. Measurements taken using the Vulcan ps laser of the range of accessible ion beam, X-ray and neutron beam properties deliverable will be given and the potential for this method for future experimental and application campaigns reviewed.