Location: School of Physical Sciences Room N115

When: 1oc Wednesday 30th November

Speaker: Dr. Walter Perrie, Laser Group, University of Liverpool

Title: "Ultrafast laser-materials micro-machining with Structured Light"

Abstract: Ultrashort laser pulses ($\tau_p \leq 10$ps) are ideally suited for the study of light-matter interactions and for precise materials micro and nano structuring. Applications include selective thin film ablation for solar cells, control of surface reflectivity, and creation of Laser Induced Periodic Surface Structures (LIPSS). Ultrafast ablation avoids plasma absorption while also limiting heat diffusion and melting during the pulse. To speed fabrication, we use Liquid crystal Spatial Light Modulators to dynamically modifying Phase/Amplitude/Polarisation of an incident beam - the resulting optical fields can also have complex polarisation states with a helical phase, carrying Optical Angular Momentum (OAM), termed Vector Vortex Beams. Such states of Light are called " Structured Light". We will demonstrate simultaneous multi-beam ablation of materials with structured light - and when ablation spots are in close surface proximity, remarkable re-deposition patterns can be observed, with debris concentrated in filaments between spots – or at higher energy, with debris "jets" emanating along all axes of symmetry. These phenomena have been investigated and found to be connected with coalescing shock wave interactions, generated by the expanding plasmas in the ambient gas.