High Power Laser Science

Femtosecond Pulse Physics
1. An assessment of the reproducibility of the Gemini retro focusing system
2. Coherent control of high harmonic generation from relativistically oscillating plasmas via elliptically polarized laser pulses
3. TLD measurements of electron and X-ray emission from different materials irradiated by the Gemini laser
4. The Petatron: A high-rep rate combination diagnostic for laser-plasma experiments
5. Measurement of laser-generated electron slope temperature using electron stopping
6. Relativistic high-order harmonics from gas jets and their power scaling
7. Characterisation of temporal contrast following a double plasma mirror system

High Energy Laser Interactions
8. Characterisation of collisionless shocks in tenuous Plasmas
10. Implications of primary and secondary sources of debris for ultrathin targets on Vulcan Petawatt
11. Effects of laser pulse parameters on TN SA proton acceleration
12. Features of ion acceleration from ultra-thin foils on Vulcan Petawatt
13. Effects of density scale length on critical surface morphology Via measurements of laser specular reflectivity
14. Scaling of ion spectral peaks in a hybrid RPA-TNSA regime
15. Reflectivity measurements in ultraintense laser-plasma interactions
16. Lattice structure effects on energetic electron transport in solids
17. High-energy proton acceleration using an innovative plasma-based fast (f/0.6) focusing optic
18. Measurement of Rayleigh-Taylor instability growth in a layered target heated by a high power short pulse laser
19. Proton beam steering from ultra-thin foils irradiated by intense laser pulses
20. Formation of plasma channel with Long pulse interaction
21. Characterisation of debris emission from PW laser solid interactions
22. Exotic x-ray spectra from ultra-intense laser-driven hollow atom transitions

Theory and Computation
23. Super-Gaussian transport theory and field generating instability in laser-plasmas
24. High-field electrodynamics in plasmas
25. 2D hydrodynamic code development and simulations relevant to fast ignition fusion targets
26. Evolution of a short pulse via ray tracing
27. Calculation of Siegert states of molecules in electric field: an H\textsubscript{2}\textsuperscript{+} study
28. Radiation reaction in ultra-intense laser fields
29. Time-dependent R-matrix theory for ultra-fast processes
30. Molecular dynamics simulations for the viscosity of non-ideal plasmas
31. Kinetic theory of radiation reaction
32. Simulating prolific pair-production in 10PW laser-plasma interactions
33. The magnetic switchyard: Guiding fast electrons for fast ignition ICF
34. Production of high energy protons with hole-boring radiation pressure acceleration
35. The effect of density scale length on the fast electron beam generated by ultra-intense laser-solid interactions
An analytical model for the energy of relativistic electrons escaping a plasma

Numerical simulation of plasma-based laser pulse compression to petawatt powers via Raman amplification

Use of the Debye-Waller factor as a temperature diagnostic in strongly coupled non-equilibrium plasmas

A new VFP-PIC hybrid code to model fast electron transport with hydrodynamic response

Ultrafast and XUV Science

Time-domain dual pulse coherent control with few-cycle strong-field laser pulses

Redistribution of vibrational population with few-cycle strong-field laser pulses

KEIRA-CHIMERA: a new method in high resolution femtosecond laser mass spectrometry

Fragmentation of allene by intense femtosecond lasers

Beam-transport diffraction in near-infrared few-cycle strong-field experiments

Dissecting charge and lattice order in 1T-TaS$_2$ with ultrafast XUV ARPES

Double slit interferometry to measure the EUV refractive indices of solids using high harmonics

Probing the microscopic origin of laser-induced ultrafast spin dynamics using time resolved photoemission/VOKE

Lasers for Science Facility Programme

Biology

Two-photon excited fluorescence lifetime imaging of the intracellular uptake of (E)-combretastatin derivatives

The plant secretoryome: protein-protein interactions in the higher plant secretory pathway

Probing the mechanism of blue light sensing BLUF domain proteins: A study through transient Infra-red spectroscopy, isotope editing and mutagenesis

Kinetically stable metal complexes for multimodality PET/SPECT and optical fluorescence microscopy probed in vitro by FLIM

Chemistry

LIAD-fs: A novel method for studies of neutral biomolecules in the gas phase

Photoacoustic stimulated raman spectroscopy (PARS) for trace detection of molecular hydrogen

Dynamics of chemical and photochemical reactions in solution

Picosecond time-resolved infrared spectroscopy of arylpentazole

Isotopic hydration of cellobiose: vibrational spectroscopy and dynamical simulations

Optical trapping of sub-micron liquid aerosol droplets

Physics

Ultrafast manipulation of photon transport and molecular beams

Laser for Science and Development

Artemis

Velocity map imaging spectrometer for the study of atomic and molecular physics in the gas phase

Astra

An assessment of the reproducibility of the Gemini retro focusing system

Modelling of relative delay for scattered rays in a grating stretcher

Characterisation and correction of the Gemini wavefront

Improving the contrast of Astra Gemini

Spatial overlap measurement of two F/2 parabolas on Astra-Gemini

Measuring and optimizing the pulse front tilt for Astra-Gemini Laser
Lasers for Science Facility
70 The Lasers for Science Facility in the Research Complex at Harwell

71 Developments in sample management in the ULTRA laboratory

72 Signal dependence on depth in transmission Raman spectroscopy

73 Improvement of laser tweezer experiments using kHz-rate feedback control

74 Molecular structure & dynamics in the Research Complex at Harwell

75 Cross-facility research activities in the Lasers for Science Facility

Vulcan
76 10PW short pulse laser diagnostics

77 Fighting chromatic aberration in 10PW

78 10PW compressor requirement analysis

79 Influence of the deuteration level on DKDP OPCPA amplifier

80 Study of self frequency shifting solitons in photonic crystal fibre to generate a synchronised 1053nm for the 10PW upgrade project

81 Study of the 10PW front-end contrast

82 Two beam spatial phasing with CW laser

83 Improvements in the Vulcan picosecond OPCPA

84 Vulcan 10PW project : Design of the long pulse pump laser

85 Rectangular slab amplifier development

86 Vulcan 10PW upgrade: Development of metallic 900 lines/mm pulse compression gratings

87 Pre-pulse generator for controllable picoseconds pre-pulses in TAP

Astra
88 Current status of the DiPOLE project

Target Fabrication
89 Production of novel Gaussian-shaped micro-bump targets

90 Overview of the Target Fabrication new chemistry laboratory

91 Novel micro-focusing cone target fabrication

92 Production of novel thin-walled cone micro targets for an astrophysical jet experiment

Instrumentation and Plasma Diagnostics
93 Characterisation of plastic scintillators for detection of laser-accelerated protons

94 Maximising the dynamic range of radiochromic film through novel scanning techniques

Engineering
95 Nitrogen usage and Nitrogen generation

96 Environmental and equipment monitoring

97 Motion control system development

98 Pulsed power developments

99 Flash lamp test facility pulsed power and control upgrade

100 Research Complex laser interlocks system

101 Developments of the laser interlocks

102 Vulcan TAW vacuum system under experimental loading conditions