

Contents

	Page
Foreword	1
<i>M Dunne</i>	
Overview of the Central Laser Facility	2
<i>M Dunne</i>	
 High Power Laser Science	
 1 Short Pulse Plasma Physics	
Analysis on a Wedge-shaped Thomson spectrometer for ion studies	7
<i>S. Bandyopadhyay, D. Neely, G. Gregori, D. C. Carroll, P. McKenna, M. Borghesi, F. Lindau, O. Lundh, C.-G. Wahlström and A. Higginbotham</i>	
Optical emission from the rear side of solid targets irradiated with the Vulcan Petawatt laser	11
<i>C. Bellei, S. R. Nagel, L. Willingale, S. Kneip, A. E. Dangor, Z. Najmudin, K. Krushelnick, S. Kar, P. T. Simpson, B. Dromey, K. Markey, M. Zepf, J. S. Green, P. A. Norreys, R. J. Clark, D. Neely, D. C. Carroll, P. McKenna and W. Murphy</i>	
Investigation of transient electric and magnetic fields associated to the propagation of relativistic electron currents	13
<i>M. Borghesi, P. A. Wilson, C. A. Cecchetti, S. Kar, J. Fuchs, P. Antici, L. Romagnani, O. Willi, R. Jung, J. Osterholtz, C. A. Pipahl, M. Tampo, H. Nakamura, R. Kodama, W. Nazarov, S. Bandyopadhyay, M. Notley and M. Tolley</i>	
The design, development and use of a novel Thomson spectrometer for high resolution ion detection	16
<i>D. C. Carroll, K. Jones, L. Robson, P. McKenna, S. Bandyopadhyay, P. Brummitt, D. Neely, F. Lindau, O. Lundh and C.-G. Wahlström</i>	
Proton deflectometry measurements of self-generated magnetic fields in laser-produced plasmas	21
<i>C. A. Cecchetti, M. Borghesi, S. Kar, P. A. Wilson, J. Fuchs, P. Antici, L. Romagnani, O. Willi, R. Jung, J. Osterholtz, C. A. Pipahl, A. M. M. Schiavi, S. Bandyopadhyay, M. Notley and D. Neely</i>	
Hot dense matter creation in short-pulse laser interaction with tamped foils	24
<i>S. N. Chen, J. R. Pasley, F. N. Beg, G. Gregori, R. G. Evans, M. Notley, S. H. Glenzer, S. B. Hansen, J. A. King, A. J. Mackinnon, H.-K. Chung, S. C. Wilks, R. B. Stephens, R. R. Freeman, R. L. Weber, E. Garcia-Saiz, F. Y. Khattak and D. Riley</i>	
Evidence for surface heating of wire plasmas using laser irradiated cone geometries	27
<i>J. S. Green, K. Krushelnick, K. L. Lancaster, S. J. Hawkes, C. Hernandez-Gomez, R. Heathcote, I. O. Musgrave, P. A. Norreys, K. U. Akli, D. S. Hey, N. Patel, C. D. Gregori, N. C. Woolsey, M. H. Key, S. N. Chen, M. S. Wei, F. N. Beg, D. Clark, L. Van Woerkom, R. L. Weber, K. Highbarger, R. R. Freeman, H. Habara, M. Nakatsutsumi, H. Nakamura, M. Tampo, R. Kodama, R. B. Stephens, M. Storm and W. Theobald</i>	
Time-resolved THz emission from laser-accelerated electron bunches	30
<i>S. Karsch, Zs. Major, R. Hörlein, L. Veisz, K. Schmid, J. Schreiber, K. Witte, S. Jamison, J. G. Gallacher, D. A. Jaroszynski, C. D. Murphy, M. C. Kaluza, A. Debus, H. Schwoerer, R. Sauerbrey, U. Schramm, B. Hidding, S. Kiselev, R. Heathcote, P. S. Foster, D. Neely, E. J. Divall, C. J. Hooker, J. M. Smith, K. G. Ertel, A. J. Langley and J. L. Collier</i>	

X-ray radiation measurement from electrons accelerated in low-density plasma Petawatt laser interaction	34
<i>S. Kneip, S. R. Nagel, S. P. D. Mangles, L. Willingale, P. M. Nilson, A. E. Dangor, Z. Najmudin, K. Krushelnick, K. Ta Phuoc, N. Bourgeois, A. Rousse and J. R. Marquès</i>	
Effect of cone-guiding on energy transport in plastic targets containing an Al signature layer	38
<i>K. L. Lancaster, P. Hakel, S. J. Hawkes, C. Hernandez-Gomez, R. Heathcote, I. O. Musgrave, M. Sherlock, P. A. Norreys, J. S. Green, K. Krushelnick, K. U. Akli, D. S. Hey, N. Patel, C. D. Gregori, N. C. Woolsey, M. H. Key, S. N. Chen, M. S. Wei, F. N. Beg, D. Clark, L. Van Woerkom, R. L. Weber, K. Highbarger, R. R. Freeman, H. Habara, H. Nakamura, M. Nakatsutsumi, M. Tampo, R. Kodama, R. B. Stephens, M. Storm and W. Theobald</i>	
Proton scaling measurements using the Vulcan Petawatt laser	41
<i>P. McKenna, L. Robson, K. W. D. Ledingham, T. McCanny, P. T. Simpson, M. Zepf, F. Lindau, O. Lundh, C.-G. Wahlström, R. J. Clarke, D. Neely and P. Mora</i>	
Electron acceleration from underdense plasma with the Vulcan Petawatt laser	44
<i>S. R. Nagel, S. P. D. Mangles, P. M. Nilson, M. C. Kaluza, A. G. R. Thomas, L. Willingale, Z. Najmudin, A. E. Dangor, K. Krushelnick, R. J. Clarke, N. Lopes, K. Marsh and C. Joshi</i>	
Magnetic reconnection and plasma dynamics in two beam laser-solid interactions	47
<i>P. M. Nilson, L. Willingale, M. C. Kaluza, C. Kamberidis, M. S. Wei, P. Fernandes, R. J. Kingham, Z. Najmudin, M. G. Haines, A. E. Dangor, K. Krushelnick, M. Notley, S. Bandyopadhyay, M. Sherlock, R. G. Evans, S. Minardi, M. Tatarakis and W. Rozmus</i>	
Forward X-ray scatter from laser-shock compressed plasmas	55
<i>D. Riley, F. Y. Khattak, E. Garcia-Saiz, G. Gregori, S. Bandyopadhyay, M. Notley, D. Neely, D. Chambers, A. Moore and A. Comley</i>	
Opacity measurements of a hot iron plasma using an X-ray laser	58
<i>M. H. Edwards, D. Whittaker, P. Mistry, N. Booth, G. J. Pert, G. J. Tallents, B. Rus, T. Mocek, M. Kozlová, C. McKenna, A. Delsérieys, C. L. S. Lewis, M. Notley and D. Neely</i>	
Proton acceleration from near critical density foam targets using the Vulcan Petawatt laser	61
<i>L. Willingale, S. P. D. Mangles, S. R. Nagel, C. Bellei, A. E. Dangor, M. C. Kaluza, C. Kamberidis, S. Kneip, Z. Najmudin, P. M. Nilson, A. G. R. Thomas, K. Krushelnick, R. J. Clarke, R. Heathcote, W. Nazarov, N. Lopes and K. Marsh</i>	
Bright quasi-phaseshifted soft X-ray harmonic radiation from Argon ions	64
<i>M. Zepf, B. Dromey, M. Landreman, S. Hooker, P. S. Foster, C. J. Hooker and A. J. Langley</i>	

2 Femtosecond Pulse Physics

Non-recollisional diabatic electronic excitation of krypton in an ultrafast laser field	67
<i>W. A. Bryan, I. C. E. Turcu, J. M. Smith, E. J. Divall, C. J. Hooker, S. J. Hawkes, A. J. Langley, J. L. Collier, E. M. L. English, J. Wood, S. L. Stebbings, W. R. Newell, J. McKenna, C. R. Calvert and I. D. Williams</i>	
Tunnel ionization as a high-dynamic range at-focus ultrafast pulse measurement	71
<i>W. A. Bryan, I. C. E. Turcu, J. M. Smith, E. J. Divall, C. J. Hooker, S. J. Hawkes, A. J. Langley, J. L. Collier, E. M. L. English, J. Wood, S. L. Stebbings, W. R. Newell, J. McKenna, C. R. Calvert and I. D. Williams</i>	
Coulomb explosion imaging of a dissociating nuclear wavepacket	74
<i>C. R. Calvert, J. McKenna, I. D. Williams, J. Wood, E. M. L. English, W. R. Newell, W. A. Bryan, I. C. E. Turcu, J. M. Smith, E. J. Divall, K. Ertel, O. Chekhlov, C. J. Hooker, A. J. Langley and J. L. Collier</i>	

	Page
Revival of a rotational wavepacket initiated by ultrafast impulsive alignment	77
<i>E. M. L. English, J. Wood, W. R. Newell, J. McKenna, C. R. Calvert, I. D. Williams, W. A. Bryan, I. C. E. Turcu, J. M. Smith, K. G. Ertel, E. J. Divall, O. Chekhlov and R. Torres</i>	
High harmonic generation from laser aligned organic molecules	80
<i>N. Kajumba, R. Torres, S. Baker, J. S. Robinson, J. G. W. Tisch, J. P. Marangos, J. G. Underwood, R. de Nalda, C. Altucci, R. Velotta, W. A. Bryan and I. C. E. Turcu</i>	
Observing time-dependent rotational and vibrational quantum dynamics in deuterium	84
<i>J. McKenna, C. R. Calvert, D. S. Murphy, J. F. McCann, I. D. Williams, J. Wood, E. M. L. English, W. R. Newell, W. A. Bryan, I. C. E. Turcu, O. Chekhlov, K. G. Ertel, J. M. Smith, E. J. Divall and R. Torres</i>	
Defining the coherence and controlling the motion of a nuclear wavepacket	88
<i>J. Wood, E. M. L. English, W. R. Newell, C. R. Calvert, J. McKenna, I. D. Williams, W. A. Bryan, I. C. E. Turcu, K. G. Ertel, J. M. Smith, E. J. Divall and O. Chekhlov</i>	
3 Theory and Computation	
Raman amplification of short laser pulses	91
<i>R. A. Cairns, B. Ersfeld, D. A. Jaroszynski and R. M. G. M. Trines</i>	
Ion heating due to ionisation and recombination	95
<i>R. G. Evans</i>	
Study of electron and proton isochoric heating for fast ignition	97
<i>M. H. Key, M. H. Chen, H-K Chung, M. E. Foord, G. Gregori, S. P. Hatchett, J. A. Koch, B. F. Lasinski, B. Langdon, A. J. MacKinnon, R. Town, S. C. Wilks, M. Tabak, K. U. Akli, P. Gu, D. S. Hey, J. M. Hill, N. Patel, B. Zhang, R. R. Freeman, R. B. Stephens, J. R. Pasley, F. N. Beg, K. L. Lancaster, P. A. Norreys, C. D. Murphy, J. S. Green, R. Kodama, T. Yabuuchi, K. Tanaka, C. Stoeckl and W. Theobald</i>	
Atomic data for modelling of photo-pumped lasers	101
<i>K. McKeown, K. M. Aggarwal, F. P. Keenan, P. H. Norrington and S. J. Rose</i>	
Generating the ionisation for Ni-like X-ray lasers in the wavelength range 50-100Å	104
<i>G. J. Pert</i>	
Nanosecond time-scale Vlasov-Fokker-Planck laser-plasma simulation in a moving ion background	107
<i>C. P. Ridgers and R. J. Kingham</i>	
Effect of ion composition on the expansion of a finite-sized plasma	110
<i>A. P. L. Robinson and P. Gibbon</i>	
Non-Spitzer return currents in intense laser-plasma interactions	112
<i>M. Sherlock and R. Bingham</i>	
Trapped electron modes in laser backscatter experiments	114
<i>N. J. Sircombe, T. D. Arber and R. O. Dendy</i>	
Wave breaking limits for relativistic electrostatic waves in a warm plasma	118
<i>R. M. G. M. Trines and P. A. Norreys</i>	
Multiphoton processes involving laser-driven inner-shell electrons	122
<i>H. W. van der Hart and M. Madine</i>	

Lasers for Science Facility Programme

4 Biology

Page

Multiphoton excitation spectroscopy of serotonin	127
<i>R. H. Bisby, A. G. Crisostomo, S. W. Botchway and A. W. Parker</i>	
Picosecond processes in DNA monitored by transient infra-red absorption spectroscopy	129
<i>G. W. Doorley, J. M. Kelly, D. A. McGovern, S. Quinn, A. M. Whelan and K. L. Ronayne</i>	
Non-invasive Raman spectroscopy of human tissue in vivo	133
<i>P. Matousek, E. R. C. Draper, A. E. Goodship, I. P. Clark, K. L. Ronayne and A. W. Parker</i>	
The induction of DNA damage signalling/repair responses in mammalian cells by near infrared femtosecond laser pulses	136
<i>P. Lauder, S. W. Botchway, M. G. Berry, A. W. Parker, J. V. Harper and P. O'Neill</i>	

5 Chemistry

Deformation of oil drops with ultra-low interfacial tensions in an optical trap	139
<i>A. D. Ward, M. G. Berry, C. D. Mellor and C. D. Bain</i>	
Laying the foundation for a muon-laser spectroscopy	141
<i>K. Ghandi, I. P. Clark and J. S. Lord</i>	
Probing the surface chemistry of mineral particulates and organic matter	146
<i>M. D. King, A. D. Ward and C. Pfrang</i>	
Photon-stimulated processes in model interstellar ices	148
<i>M. P. Collings, F. Jamme, M. R. S. McCoustra, D. J. Burke, W. A. Brown, P. Kendall, P. D. Holtom, A. Dawes, N. J. Mason, H. J. Fraser, I. P. Clark and A. W. Parker</i>	
Transient infrared and emission spectroscopy of selective ion-sensors	151
<i>A.-K. Duhme-Klair, R. N. Perutz, N. Reddig, K. L. Ronayne and M. Towrie</i>	
Studies of mechanisms of intramolecular vibrational dynamics using time-resolved photoelectron spectroscopy	154
<i>C. J. Hammond, K. L. Reid and K. L. Ronayne</i>	
Manipulation of arrays of aerosol droplets and studies of aerosol coagulation dynamics	157
<i>J. P. Reid, L. Mitchem, J. Buajarern and A. D. Ward</i>	
Infra-red photodissociation of protonated amino-acids and peptides in the gas phase	160
<i>N. A. Macleod, T. de Boer, N. Minns, L. C. Snoek, J. P. Simons and E. Marzluff</i>	
DNA mediated energy transfer in dinuclear heterometallic dipyridophenazine complexes	162
<i>M. Towrie, A. W. Parker, S. P. Foxon and J. A. Thomas</i>	
MLCT Relaxation of $[\text{Re}^1(\text{CO})_3(\text{phen})(\text{HisX})]^+$ (X = 83, 109) <i>Pseudomonas aeruginosa</i> Azurins	165
<i>A. M. Blanco-Rodríguez, A. Vlček Jr., M. Towrie and K. L. Ronayne</i>	
Photoinduced electron transfer in Rel complexes with appended amino acid ligands	167
<i>A. M. Blanco-Rodríguez, A. Vlček Jr., M. Towrie and K. L. Ronayne</i>	

	Page
Excited state dynamics of metal-bipyrimidine complexes studied by Time-Resolved Infrared spectroscopy	169
<i>T. L. Easun, M. D. Ward, W. Z. Alsindi, X-Z. Sun and M. W. George</i>	
Radical anions of Pt(II) thiolates: Raman (spectro)electrochemical and isotopic substitution study	172
<i>J. A. Weinstein, E. S. Davies, I. P. Clark and S. M. Tavender</i>	

6 Physics

UV-induced decomposition and interrogation of novel metal-precursor films	175
<i>J. A. Cairns, G. J. Berry, R. A. G. Gibson, A. G. Fitzgerald, Y. Fan, I. P. Clark, S. M. Tavender and R. A. Moody</i>	
Imaging hot carrier dynamics in surface nanostructures	177
<i>S. A. Cavill, S. S. Dhesi and P. Steadman</i>	
Development of an optical imaging system for pressure and temperature mapping of aerodynamic flows	180
<i>K. Kontis</i>	
Light-induced domain engineering in ferroelectrics: a route to sub-micron poling	182
<i>C. L. Sones, I. T. Wellington, C. E. Valdivia, S. Mailis and R. W. Eason</i>	

7 Laser Science and Development

Astra

Automatic beam alignment system for Astra, first stage	187
<i>K. Ertel, E. J. Divall, C. J. Hooker and J. L. Collier</i>	
Ten femtosecond 1kHz Laser Facility for Astra Target Area 1	190
<i>I. C. E. Turcu, O. Chekhlov, E. J. Divall, C. J. Hooker, J. M. Smith, K. G. Ertel, S. J. Hawkes, A. J. Langley, J. L. Collier, W. A. Bryan, E. M. L. English, J. Wood, W. R. Newell, J. McKenna, C. R. Calvert, I. D. Williams, J. S. Robinson, C. A. Howarth, J. P. Marangos and J. W. G. Tisch</i>	
New front-end for the Astra Gemini Project	192
<i>A. J. Langley, K. Ertel, E. J. Divall, J. M. Smith, O. Chekhlov, C. J. Hooker and J. L. Collier</i>	

Lasers for Science Facility

Modelling of Spatially Offset Raman Spectroscopy effects	195
<i>P. Matousek, M. D. Morris, N. Everall, I. P. Clark, M. Towrie, E. Draper, A. Goodship and A. W. Parker</i>	

Vulcan

Development of an amplified variable shaped long pulse system for Vulcan	199
<i>W. Shaikh, I. O. Musgrave, A. S. Bhamra and C. Hernandez-Gomez</i>	

Instrumentation

Adaptive optics development in the EU OTTER programme	202
<i>C. J. Hooker, J. L. Collier, S. J. Hawkes and C. Spindloe</i>	
Elliptical focal spots for the Shenguang II (SG-II) Laser Facility, China	206
<i>D. A. Pepler, C. N. Danson and C. Mendes</i>	

Development of time resolved X-ray spectroscopy in high intensity laser-plasma interactions	208
--	-----

M. Notley, B. Fell, J. Jeffries, G. Gregori, R. L. Weber, R. R. Freeman, A. J. Mackinnon, R. Dickson, D. S. Hey, F. Y. Khattak and E. Garcia-Saiz

Design of Binary Phase Plates using LabView	211
--	-----

D. A. Pepler and S. Paradowski

8 Target Fabrication

New characterisation capabilities in target fabrication	217
--	-----

M. K. Tolley and C. Spindloe

Structured low density coating studies leading to a novel coating plant design	219
---	-----

C. Spindloe, P. Brummit, M. K. Tolley, F. Y. Khattak and D. Riley

Developing and manufacturing cone targets for the CLF	221
--	-----

M. Beardsley, J. Spencer, M. K. Tolley and C. Spindloe

Enhanced thin film production capabilities in the Target Fabrication Laboratory	223
--	-----

C. Spindloe and M. K. Tolley

9 Appendices

Schedules and Operational Statistics

Astra operational statistics 05/06	229
---	-----

S. J. Hawkes

LSF Operational Statistics	230
-----------------------------------	-----

E. Belcher, S. Tavender, M. Towrie and A. W. Parker

Vulcan Operational Statistics	234
--------------------------------------	-----

A. K. Kidd and C. N. Danson

Publications	237
---------------------	-----

Panel Membership and CLF Structure	249
---	-----

Author Index	253
---------------------	-----