

EUGENE CLARK

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SUMMARY

Senior experimental plasma physicist with a h-index of 35 and 26 years of experience. Has worked at major laboratories in the UK and the USA. Expert in measuring radiations from the optical regime to high-energy particles produced in laser-plasma interactions. Competent, computational physicist, capable of simulations radiation transport and laser-plasma-interactions. Excellent communicator and award winning physicist.

PERSONAL DETAILS

Date of Birth: *30th December 1968*

Place of Birth: *Southport, Lancashire, United Kingdom*

EDUCATION & QUALIFICATIONS

2002: Imperial College, London, UK

Doctor of Philosophy. Thesis title: “Measurements of Energetic Particles from Ultra Intense Laser Plasma Interactions”. The thesis detailed the measurements of laser accelerated protons and ions and resulted in the publication of 8 papers in referred journals. Awarded 30th of April 2002

2002: Imperial College, London, UK

Diploma of Imperial College: Plasma Physics

1990: The University of Manchester, Manchester, UK

Bachelor of Science with Honours in Physics. Classification: 2ii

1987: Christ the King High School, Southport, Lancashire, UK

A levels, Subject (Grade): Mathematics (A), Physics (A), Chemistry (A), General Studies (B)

1986: Christ the King High School, Southport, Lancashire, UK

O/A level, Subject (Grade): Business Studies (A)

1985: Christ the King High School, Southport, Lancashire, UK

O Levels, Subject (Grade): Mathematics (A), Physics (A), Chemistry (A), Biology (A), Geography (A), French (A), English Language (B), English Literature (B), Religious Studies (B)

EXPERIENCE

March 2012 – present: CPPL, TEI Crete, Chania, Crete

- * A member of the Center for Plasma Physics and Lasers (CPPL) at TEI of Crete. Collaborating in pulsed power and laser experiments.
- * Developing in house laser plasma simulation capability for CPPL and formulating experimental ideas for the CPPL 50 TW laser system
- * A developer for the EPOCH particle in cell plasma simulation code for modelling laser plasma interaction
- * Currently leading research into the acceleration of electrons and protons using high power lasers for medical applications

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March 2007 – February 2012: Department of Electronics, TEI Crete, Chania, Crete

- * Worked at TEI Crete, Department of Electronics at Chania as a contract assistant professor teaching optoelectronics, electricity and magnetism and basic electronics courses and as a Marie Curie fellow.
- * Conducted research into X-pinch produced plasmas as a source of X-rays and XUV radiation for lithography applications
- * Collaborated on high power laser experiments using the VULCAN laser at the Rutherford Appleton Laboratory with RAL staff and with Queens University, Belfast.
- * Developed expertise in attosecond science using the new femtosecond laser based at TEI Rethymno
- * Participated in the HiPER project through participation in experiments on the VULCAN laser and the HiPER workpackage 12 for fundamental science
- * Modelled the radiation shielding requirements for the fundamental science target area using the FLUKA radiation transport code.

April 1992 – February 2007: AWE plc, Aldermaston, Reading, Berkshire RG7 4PR

- * Originally at AWE as member of a team involved in making prompt radiation measurements of gamma rays and neutrons in high technology experiments. Responsibilities included the development, procurement and calibration of radiation detectors, liaison with engineers and physicists to finalise the overall design of the measurement, supervision of the fielding of the diagnostics and the final analysis of the results.
- * Previously a Senior Scientist in the Plasma Physics Department at AWE. This department is responsible for the development and use of high power lasers to undertake high energy density physics experiments. In particular I provided the direction for AWE's short pulse laser plasma interaction programme for experiments conducted at AWE and RAL. Research topics focussed on the propagation and generation of high-energy electrons and protons through hot dense plasmas.
- * Experience has included work at SNLA, Albuquerque, USA fielding time resolved soft X-ray diagnostics to measure the temperature of wire array Z pinch vacuum hohlraums on the "SATURN" pulsed power machine.
- * Knowledge of Z pinch physics from experiments undertaken on the 150 kA Z pinch generator IMP at Imperial College.
- * Experience of high energy density physics experiments using long pulse, high energy lasers. This work has been conducted at the HELEN laser at AWE and the OMEGA laser at the University of Rochester, USA. The work has included hohlraum characterisation and spectroscopy of hot dense plasmas.
- * Expertise in the physics of short pulse laser plasma interactions. Ph.D thesis was based on the measurements of ions and protons emitted from the interaction of a short pulse laser with solid and gas jet targets. Other experiments included

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measurements of electrons experiments were undertaken with the 100 TW VULCAN laser at the Rutherford Appleton Laboratory.

- * I use the radiation transport codes MCNPX, FLUKA and ITS to simulate particle transport through targets simulate detectors and to simulate radiation shielding of high power laser facilities.
- * Modelled the radiation shielding for the € 225 m ORION laser facility using the MCNPX code. The modelling was vital in gaining approval from the UK NII (Nuclear installations and Inspectorate) prior to construction of the facility.
- * Other facility work has included the commissioning of the HELEN short pulse CPA laser including the modelling of the radiation shielding, assessment of radioactive discharges to the environment and performing the first laser plasma interaction on the facility to make the facility fully operational.
- * Highly computer literate with substantial experience using IDL (Interactive Data Language) to develop code to track particles through electric and magnetic fields to unfold data from diagnostics and to perform image analysis. Extensive use of Windows, MacOS and Unix on desktops to IBM and Cray supercomputers.
- * Extensive knowledge of C/C++ and its application to computer vision applications for the MacOS and iOS platforms.
- * Diagnostics experience and development has included the used of high speed optical and X-ray streak cameras, optical and X-ray framing cameras, crystal spectrometers, optical probing, X-ray diodes, Thomson parabola spectrometers for ions and protons, electron spectrometers, CR39 nuclear track detectors, image plates, MeV X-ray detectors, nuclear activation techniques and optical spectrometers, neutron diagnostics.
- * Winner of the Institute of Physics Culham Thesis Prize for the best thesis in plasma physics in the United Kingdom and the Republic of Ireland in 2002.
- * Winner of the AWE J. C. "Charlie" Martin prize for the best internal AWE report in 2003

REFERENCES

Prof. M. Tatarakis,
Department of Electronics,
TEI Crete,
Chania,
Crete,
Greece
Dr. M. Zepf
Department of Physics and Astronomy
Queen's University Belfast
University Road
Belfast BT7 1NN

PUBLICATIONS

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My current “h index” is equal to 35 and the papers on which I am an author have almost 5000 citations (Source: Google Scholar). The papers in my PhD thesis have over 1000 citations.

E. Kaselouris et al, The influence of the solid to plasma phase transition on the generation and the dynamics of plasma instabilities, *Nature Communications*, 8, 1713 (2017)

J. Chatzakis et al, A novel trigger generator for a pseudospark switch, *Rev. Sci. Instrum.* 86, 016108 (2015)

J. Chatzakis et al, Improved detection of fast neutrons with solid-state electronics, *Int. J. Mod. Phys. Conf. Ser.* 27, 1460138 (2014)

A. Skoulakis et al, A portable pulsed neutron generator, *t. J. Mod. Phys. Conf. Ser.* 27, 1460127 (2014)

Scott, RHH et al, Fast electron beam measurements from relativistically intense, frequency-doubled laser-solid interactions, *NEW JOURNAL OF PHYSICS*, 15, 093021 (2013)

Scott, RHH et al, Measuring fast electron spectra and laser absorption in relativistic laser-solid interactions using differential bremsstrahlung photon detectors, *REVIEW OF SCIENTIFIC INSTRUMENTS*, 84, 083505 (2013)

Hassan, SM et al, Filamentary Structure of Current Sheath in Miniature Plasma Focus, *IEEE TRANSACTIONS ON PLASMA SCIENCE*, 39, 2432 (2011)

Sarri, G et al, Creation of persistent, straight, 2 mm long laser driven channels in underdense plasmas, *PHYSICS OF PLASMAS*, 113303 (2010)

Sarri, G et al, Observation of Postsoliton Expansion Following Laser Propagation through an underdense plasma, *PHYSICAL REVIEW LETTERS*, 175007 (2010)

Hassan, SM et al, *IEEE 35th International Conference on Plasma Science*, (2008)

Gopal, A et al, Temporally and spatially resolved measurements of multi-megagauss magnetic fields in high intensity laser-produced plasmas, *PHYSICS OF PLASMAS*, 122701 (2008)

Gumbrell, ET et al, Laser heating of large noble gas clusters: from the resonant to the relativistic interaction regimes, *NEW JOURNAL OF PHYSICS*, 10, 1367 (2008)

Chatzakis, J et al, High repetition rate pseudospark trigger generator, *REVIEW OF SCIENTIFIC INSTRUMENTS*, 79, 34 (2008)

Krushelnick, K et al, Effect of relativistic plasma on extreme-ultraviolet harmonic emission from intense laser-matter interactions, *PHYSICAL REVIEW LETTERS*, 100, 125005 (2008)

Kar, S et al, Dynamic control of laser-produced proton beams, *PHYSICAL REVIEW LETTERS*, 100, 105004, (2008)

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Hoarty, DJ et al, Measurements of niobium absorption spectra in plasmas with nearly full M-shell configurations, *High Energy Density Physics*, 3, 325 (2007)

Wei, MS et al, Reduction of proton acceleration in high-intensity laser interaction with solid two-layer targets, *PHYSICS OF PLASMAS*, 13, 123101 (2006)

Clark, EL et al, Comment on "Measurements of energetic proton transport through magnetized plasma from intense laser interactions with solids" – Clark et al. reply, *PHYSICAL REVIEW LETTERS*, 96, 249202 (2006)

Norreys, PA et al, Observation of annular electron beam transport in multi-TeraWatt laser-solid interactions, *PLASMA PHYSICS AND CONTROLLED FUSION*, 48 (2006)

Eagleton RT, Clark EL, Davies HM, et al. Target diagnostics for commissioning the AWE HELEN Laser Facility 100 TW chirped pulse amplification beam, *REVIEW OF SCIENTIFIC INSTRUMENTS* 77, 10F522 OCT 2006

Krushelnick K, Clark EL, Beg FN, et al., High intensity laser-plasma sources of ions- physics and future applications, *PLASMA PHYSICS AND CONTROLLED FUSION* 47: B451-B463 Sp. Iss. SI Suppl. 12B DEC 2005

Evans RG, Clark EL, Eagleton RT, et al., Rapid heating of solid density material by a Petawatt laser
APPLIED PHYSICS LETTERS 86 (19): Art. No. 191505 MAY 9 2005

Krushelnick K, Najmudin Z, Mangles SPD, et al., Laser plasma acceleration of electrons: Towards the production of monoenergetic beams, *PHYSICS OF PLASMAS* 12 (5): Art. No. 056711 MAY 2005

M. S. Wei, F. N. Beg, E. L. Clark et al, Observations of the filamentation of high intensity laser produced electron beams, *Physical Review E*, 056412, 2004

D. J. Hoarty, C. C. Smith, E. L. Clark et al, Fluorescence spectroscopy as a diagnostic of the radiation environment in high energy density experiments (invited), *Review of Scientific Instruments*, 75, 3655, 2004

M. S. Wei et al, Ion acceleration by collisionless shocks in high intensity laser underdense plasma interaction, *Physical Review Letters*, 93, 155003, 2004

U. Wagner et al, Laboratory measurements of 0.7 GG magnetic fields generated during high intensity laser interactions with dense plasmas, *Physical Review E*, 70, 026401, 2004

P. Gibbon, F. N. Beg, E. L. Clark et al, Tree code simulations of proton acceleration from laser irradiated wire targets, *Physics of Plasmas*, 11, 4032, 2004

K. L. Lancaster, et al, Characterisation of Li-7(p,n)Be-7 neutron yields from laser produced ions beams for fast neutron radiography, *Physics of Plasmas*, 11, 3408, 2004

F. N. Beg et al, M. S. Wei, E. L. Clark et al, Return Current and proton emission from short pulse laser interactions with wire targets, *Physics of Plasmas*, 11, 2806, 2004

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F. N. Beg, et al, Target charging effects on proton acceleration during high intensity short pulse laser solid interactions, *Applied Physics Letters*, 84, 2766, 2004

F. N. Beg, E. L. Clark, et al, High intensity laser driven Z pinch, *Physical Review Letters*, 92, 095001, 2004

P McKenna et al, Effect of target heating on ion induced reactions in high intensity laser plasma interactions, *Applied Physics Letters*, 83, 2763, 2003

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Spencer I, Ledingham KWD, McKenna P, et al. Experimental study of proton emission from 60-fs, 200-mJ high-repetition-rate tabletop-laser pulses interacting with solid targets *PHYS REV E* 67 (4): art. no. 046402 Part 2 APR 2003

Tatarakis M, Beg FN, Clark EL, et al. Propagation instabilities of high-intensity laser-produced electron beams *PHYS REV LETT* 90 (17): art. no. 175001 MAY 2 2003

Najmudin Z, Krushelnick K, Clark EL, et al. Self-modulated wakefield and forced laser wakefield acceleration of electrons *PHYS PLASMAS* 10 (5): 2071-2077 Part 2 MAY 2003

Najmudin Z, Krushelnick K, Clark EL, et al. The production of high-energy electrons from the interaction of an intense laser pulse with an underdense plasma *J MOD OPTIC* 50 (3-4): 673-681 JAN 2003

Zepf M, Clark EL, Beg FN, et al. Proton acceleration from high-intensity laser interactions with thin foil targets *PHYS REV LETT* 90 (6): art. no. 064801 FEB 14 2003

Najmudin Z, Krushelnick K, Tatarakis M, et al, The effect of high intensity laser propagation instabilities on channel formation in underdense plasmas, *Physics of Plasmas*, 10, 438 (2003)

Krushelnick K, Watts I, Tatarakis M, et al.

Using self-generated harmonics as a diagnostic of high intensity laser-produced plasmas *PLASMA PHYS CONTR F* 44: B233-B245 Suppl. 12B DEC 2002

McKenna P, Ledingham KWD, Spencer I, et al. Characterization of multiterawatt laser-solid interactions for proton acceleration *REV SCI INSTRUM* 73 (12): 4176-4184 DEC 2002

Spencer I, Ledingham KWD, Singhal RP, et al. A nearly real-time high temperature laser plasma diagnostic using photonuclear reactions in tantalum *REV SCI INSTRUM* 73 (11): 3801-3805 NOV 2002

Watts I, Zepf M, Clark EL, et al. Measurements of relativistic self-phase-modulation in plasma *PHYS REV E* 66 (3): art. no. 036409 Part 2B SEP 2002

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Tatarakis M, Gopal A, Watts I, et al. Measurements of ultrastrong magnetic fields during relativistic laser-plasma interactions (vol 9, pg 2244, 2002) PHYS PLASMAS 9 (8): 3642-3642 AUG 2002

Najmudin Z, Tatarakis M, Krushelnick K, et al. Ultra-high-intensity laser propagation through underdense plasma IEEE T PLASMA SCI 30 (1): 44-45 Part 1 FEB 2002

Tatarakis M, Gopal A, Watts I, et al. Measurements of ultrastrong magnetic fields during relativistic laser-plasma interactions PHYS PLASMAS 9 (5): 2244-2250 Part 2 MAY 2002

Watts I, Zepf M, Clark EL, et al. Dynamics of the critical surface in high-intensity laser solid interactions: Modulation of the XUV harmonic spectra PHYS REV LETT 88 (15): art. no. 155001 APR 15 2002

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Najmudin Z, Tatarakis M, Pukhov A, et al. Measurements of the inverse Faraday effect from relativistic laser interactions with an underdense plasma PHYS REV LETT 87 (21): art. no. 215004 NOV 19 2001

Spencer I, Ledingham KWD, Singhal RP, et al. Laser generation of proton beams for the production of short-lived positron emitting radioisotopes NUCL INSTRUM METH B 183 (3-4): 449-458 OCT 2001

Zepf M, Clark EL, Krushelnick K, et al. Fast particle generation and energy transport in laser-solid interactions PHYS PLASMAS 8 (5): 2323-2330 Part 2 MAY 2001

Santala MIK, Najmudin Z, Clark EL, et al. Observation of a hot high-current electron beam from a self-modulated laser wakefield accelerator PHYS REV LETT 86 (7): 1227-1230 FEB 12 2001

Najmudin Z, Allott R, Amiranoff F, et al. Measurement of forward Raman scattering and electron acceleration from high-intensity laser-plasma interactions at 527 nm IEEE T PLASMA SCI 28 (4): 1084-1089 AUG 2000

Krushelnick K, Clark EL, Allott R, et al. Ultrahigh-intensity laser-produced plasmas as a compact heavy ion injection source IEEE T PLASMA SCI 28 (4): 1184-1189 AUG 2000

Santala MIK, Zepf M, Beg FN, et al.
Production of radioactive nuclides by energetic protons generated from intense laser-plasma interactions APPL PHYS LETT 78 (1): 19-21 JAN 1 2001

Clark EL, Krushelnick K, Zepf M, et al. Energetic heavy-ion and proton generation from ultraintense laser-plasma interactions with solids PHYS REV LETT 85 (8): 1654-1657 AUG 21 2000

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Krushelnick K, Clark EL, Zepf M, et al. Energetic proton production from relativistic laser interaction with high density plasmas PHYS PLASMAS 7 (5): 2055-2061 Part 2 MAY 2000

Clark EL, Krushelnick K, Davies JR, et al. Measurements of energetic proton transport through magnetized plasma from intense laser interactions with solids PHYS REV LETT 84 (4): 670-673 JAN 24 2000

Krushelnick K, Clark EL, Najmudin Z, et al. Multi-MeV ion production from high-intensity laser interactions with underdense plasmas PHYS REV LETT 83 (4): 737-740 JUL 26 1999

Ruiz-Camacho J, Beg FN, Dangor AE, et al. Z-pinch discharges in aluminum and tungsten wires PHYS PLASMAS 6 (6): 2579-2587 JUN 1999

Krushelnick K, Clark E, Najmudin Z, et al. Diagnosis of peak laser intensity from high-energy ion measurements during intense laser interactions with underdense plasmas LASER PART BEAMS 18 (4): 595-600 DEC 2000

Santala MIK, Zepf M, Watts I, et al. Effect of the plasma density scale length on the direction of fast electrons in relativistic laser-solid interactions PHYS REV LETT 84 (7): 1459-1462 FEB 14 2000

Ledingham KWD, Spencer I, McCanny T, et al. Photonuclear physics when a multiterawatt laser pulse interacts with solid targets PHYS REV LETT 84 (5): 899-902 JAN 31 2000

Norreys PA, Santala M, Clark E, et al. Observation of a highly directional gamma-ray beam from ultrashort, ultraintense laser pulse interactions with solids PHYS PLASMAS 6 (5): 2150-2156 Part 2 MAY 1999

My work has been featured in the following magazine articles:

“Lasers feel the Z-pinch”, *Physics World*, May 2004

“Nuclear physics merely using a light source” *Contemporary physics*, **40**, 367, 1999

“Plasma Accelerators at the Energy Frontier and on Tabletops”, *Physics Today*, June 2003

“Physics update: Laser light in, streams of protons out”, *Physics Today*, Jan 2000

“Physics in action: Nuclear physics with lasers”, *Physics World*, Jan 2000

“Physics Watch: Lasers accelerate particle production”, *Cern Courier*, Jan 2000

“High energy protons”, *American Physical Society News*, Jan 2000

“Photo nuclear physics: Lasers split the atom” *Nature*, 404, 239 (2000)

List of relevant previous projects or activities:

<<Ενίσχυση ανταγωνιστικότητας Περιφέρειας Κρήτης σε ιατρικές εφαρμογές αιχμής με τη χρήση δευτερογενούς ακτινοβολίας πλάσματος – υπερισχυρών λέιζερ>> 11/10/2017 έως 31/05/2018. **2 μήνες** στο TEI Κρήτης.

<<Συμμετοχή στο σχεδιασμό και την ανάπτυξη οπτοηλεκτρονικών διαγνωστικών διατάξεων δευτερογενών πηγών ακτινοβολίας (ηλεκτρομαγνητικής ή/ και σωματιδιακής) και σε υπολογιστικές προσομοιώσεις>> 01/09/2016 έως 31/10/2016. **2 μήνες** στο TEI Κρήτης.

<<Συμμετοχή σε πειράματα αλληλεπίδρασης παλμών laser με την ύλη και την ανάπτυξη οπτοηλεκτρονικών διαγνωστικών διατάξεων για τις ανάγκες της υποδομής, για μελέτη θεμάτων σχετιζόμενων με το πρόγραμμα HiPE'i (όπως π.χ. παραγωγή δευτερογενών πηγών ακτινοβολίας - Ηλεκτρομαγνητικής ή/ και σωματιδιακής| παλμικές πηγές πλάσματος π.χ. plasma focus , Z-pinch διαγνωστική πυκνού πλάσματος, υπολογιστικές προσομοιώσεις)>> 02/01/2015 έως 31/12/2015. **12 μήνες** στο TEI Κρήτης.

«Βιβλιογραφική αναζήτηση και επιλογή των υλικών που βοηθούν στην ανίχνευση νετρονίων, αξιολόγηση της λειτουργίας των βαθμίδων και των αποτελεσμάτων και προσδιορισμός των διορθώσεων. Συγγραφή επιστημονικών δημοσιεύσεων. 1. Δ.1: Μελέτη υλικών κατάλληλων για τη δημιουργία οθόνης μετατροπέα (scintillator) για την ανίχνευση των νετρονίων, 2. Δ.2: Αναζήτηση μεθόδου υλοποίησης οπτικού αισθητήρα με δυνατότητα ανεξάρτητου συγχρονισμού σε κάθε εικονοστοιχείο (pixel), 3. Δ.3: Ανάπτυξη μονάδας προσαρμογής (interface) του οπτικού αισθητήρα με τον υπολογιστή, 4. Δ.4: Ανάπτυξη Λογισμικού ελέγχου και επικοινωνίας με Η/Υ. — Παραδοτέο: το λογισμικό ελέγχου και επικοινωνίας με τον Η/Υ, 5. Δ.5: Έλεγχος της λειτουργίας του ανιχνευτή και δοκιμές και 6. Δ.6: Διάχυση των δράσεων της ομάδας» 01/09/2012 έως 30/11/2015. **39 μήνες** στο TEI Κρήτης.

«Ανάπτυξη του μαθήματος "Radiation and Laser safety"» 01/04/2012 έως 30/09/2012. **6 μήνες** στο TEI Κρήτης.

«Διεξαγωγή πειραμάτων και προσομοιώσεων αλληλεπίδρασης laser με ύλη» 01/07/2011 έως 30/11/2011. **5 μήνες** στο TEI Κρήτης.

«Διεξαγωγή έρευνας στα πλαίσια του πακέτου εργασίας WP12 "Fundamental Science Programme" του έργου HIPER» 01/03/2011 έως 28/04/2011. **2 μήνες** στο TEI Κρήτης.

«Διεξαγωγή έρευνας στα πλαίσια των πακέτων εργασίας WP10 "Fusion Experimental Programme" και WP12 "Fundamental Science Programme"» 01/03/2010 έως 28/02/2011. **12 μήνες** στο TEI Κρήτης.

«Διεξαγωγή έρευνας στα πλαίσια των πακέτων εργασίας WP10 "Fusion Experimental Programme" και WP12 "Fundamental Science Programme"» 03/03/2009 έως 28/02/2010. **12 μήνες** στο TEI Κρήτης.

«Ανάπτυξη Παλμικής Πηγής Ακτινών X και τα διαγνωστικά αυτής, καθώς επίσης και συμμετοχή σε σχετικά πειράματα» στο πλαίσιο του έργου «Marie Curie Host Fellowships for Transfer Of Knowledge» 01/03/2007 έως 28/02/2009. **24 μήνες** στο TEI Κρήτης.

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