

Foreword

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This annual report for the Central Laser Facility (CLF) at the STFC Rutherford Appleton Laboratory provides highlights of the scientific research which has been carried out by users of the Facility and its staff over the financial year 2008-09.

This year has seen the completion of the ULTRA laser facility – jointly funded by BBSRC and STFC to offer world leading capability in molecular dynamics spectroscopy. It has also seen the integration of imaging capabilities in the Lasers for Science Facility, combining techniques from the Daresbury and Rutherford-Appleton Laboratories. All these facilities will be moving into the Research Complex at Harwell over the course of the next year to provide a new integrated capability alongside the Diamond synchrotron light source. You will already see a marked increase in the number of bioscience articles in this Report compared to previous years as a result of these new facilities within the CLF.

In the ultrafast regime, the new Artemis facility has generated its first data, already achieving recognition in the media for work on photosynthesis. This development project will complete over the next few months, providing the CLF with high average power, few-femtosecond (and subsequently attosecond) capability for the first time – for a wide variety of atomic, molecular, surface and materials science studies.

On the high power lasers front, Vulcan has completed a major development to TA-West and seen many successful experiments in the Petawatt area, whilst the Astra-Gemini laser continues its commissioning towards offering the highest focused intensities and

dual beam studies. High repetition rate solid target provision is becoming available, allowing statistically meaningful studies at the very highest powers. Development work on a 10 Petawatt upgrade to Vulcan has progressed, with the full project expected to commence next year to ensure the CLF will continue to offer world leading capability through the next decade.

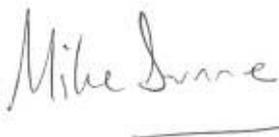
Looking to the long term, the CLF and the wider UK user community have been very active players in the pan-European ELI and HiPER projects. ELI is designed to deliver orders-of-magnitude increases in focused intensity, along with attosecond sources and high repetition beamlines for laser driven accelerator applications. This project is due to be taken forward by a partnership of 3 host countries (Czech Republic, Hungary and Romania), working with the leading capabilities being developed by the CLF and others. The HiPER project is a multi-national initiative led by the CLF to harness laser fusion as a



future source of power and to access wholly new regimes of high energy density science. Mid-way through its Preparatory Phase, we are now planning to enter an intensive period of high repetition technology development.

The high level of demand for access to the CLF both from UK and international scientists continues greatly to exceed the time available for the scheduling of experiments. It is not surprising then that the standard of the research presented in this report is first rate, demonstrating once again the internationally leading position of the CLF and its user community. It is important to remember also that the science performed at the CLF maps strongly onto real world problems that concern us all – from healthcare, to environmental studies, security applications and future energy sources. This marriage of investigator-led fundamental science with clear impact on the world at large stands the CLF in good stead as we look to the future.

Finally, I would once again like to record my sincere appreciation to the CLF staff for their outstanding effort, enthusiasm and commitment over the past year. The CLF has grown significantly over recent years, offering a much wider range of facilities and undertaking a number of large scale, concurrent development projects. The progress made across the board over the year is testament to the ability and dedication of our staff and the strong support of the CLF community in the UK and abroad.



Professor Mike Dunne
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