



# The Central Laser Facility

Leading lights - laser science provides the answers



Optics being aligned on a laser system at the CLF

The UK's Central Laser Facility (CLF) is where the very best scientists use world class laser systems to address today's most challenging problems.

Laser light in optical fibres carries the world's communications and internet traffic. Lasers manufacture the silicon chips in our computers, music players and games consoles. Lasers cut, weld and drill materials as diverse as steel, fibreglass and even chocolate. They can, in the hands of surgeons, even cut and weld us! Lasers scan the barcodes on our shopping, read the data from the DVDs we watch and even let us see molecules working in our cells. Around the globe scientists are working to find out if laser energy can be made to generate electricity to power industry and our homes in the future.

All of these applications and many, many more started life as ideas in laser research laboratories, driven by scientists working for our benefit. Lasers are used as powerful and versatile tools across all branches of science and engineering from the physical and chemical to the biological and medical, from the grand scale of the universe to the nanometer scale of molecular biology, from corrective eye surgery to the fundamental

processes that govern the Laws of Nature. STFC's world leading Central Laser Facility (CLF) has over 30 years of experience in laser research. Visiting scientists work with CLF staff on experiments spanning the full range of scientific disciplines.

Recent high-profile projects include:

- Novel Raman spectroscopy techniques to "see through" opaque materials (e.g. plastic, skin) for non-invasive detection of diseases, drugs and explosives
- Acceleration of subatomic particles to high energy in table-top, laser-driven machines for medical, security and other applications
- Understanding photosynthesis - Nature's elusive yet very efficient system for turning sunlight into energy
- Studying the chemistry inside cells for improving treatment of disease
- Climate-change chemistry measured on the surface of laser-trapped cloud droplets
- New concepts in laser fusion energy

# The Science and Technology Facilities Council

The CLF carries out its work using the world's most powerful, most intense and fastest lasers, together with large-scale, state-of-the-art laser clusters housed within the Research Complex at Harwell.

Our laser facilities include:

- Vulcan – for science in extreme conditions
- Gemini – for applications of intense lasers
- Artemis – for ultra short x-rays for chemistry and materials science
- Ultra – for ultrafast molecular dynamics
- Octopus – for advanced biological imaging

The CLF is at the heart of the Harwell Campus, co-located with the other major facilities including ISIS and Diamond to enable cross-fertilisation of science and technology. Access to all CLF facilities is independently peer reviewed and free at the point of delivery. Peer-to-peer collaboration is a hallmark of the CLF's activities, with many staff holding academic positions at top universities. The CLF leads the international HiPER project to develop laser-based technology for electric power generation. We are also key players in the European Extreme Light Infrastructure (ELI) programme and LaserLab-Europe – the consortium of EU large scale laser facilities.

The CLF has a long track record in intellectual property development and technology transfer, generating one third of STFC's patent portfolio and associated with 8 new companies. One of the facility's most important economic 'products' is a steady supply of very highly qualified PhD scientists into the UK economy.

## Key facts

- The CLF supports EPSRC, BBSRC, MRC, NERC and EU scientific communities plus industry
- In the last three years, the CLF has welcomed 381 individual researchers on 851 experiment visits
- Its total user community is estimated at more than 600 scientists
- The CLF provides more than 4,400 individual user access days a year to its facilities, 2,700 of which are for PhD students
- The CLF provides more than 500 user days a year in non-access based training for PhD students
- Every 2 working days, CLF science produces a peer reviewed publication
- Every 2 working weeks, CLF science produces a "high impact" publication – published in the world's top 3% of journals
- CLF science has produced more than 3600 peer reviewed publications
- 17% of papers from the major Harwell based facilities came from the CLF in the last three years
- 25% of "high impact" papers from the major Harwell based facilities come from the CLF
- 33% of STFC's patents originate from the CLF

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