Industry engagement and innovation

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Introduction

This article highlights the industrial user engagement, industry partnerships, and innovation activities of the Central Laser Facility for the reporting period April 2020 to March 2021.

Industrial users and engagement

The COVID-19 lockdowns of 2020 directly affected the facility delivery, with an initial complete shutdown of all of our facilities. With safe working practices in place, and the majority of our staff working from home, our operational delivery was significantly reduced during the year. Prioritisation of academic operations had a significant impact on our industry user programme and we anticipate this to continue through 2021 and 2022.

The CLF delivered 14 facility access weeks with industrial users this year, delivering experimental access to Gemini, Octopus and Ultra facilities, and access to CLF scientific expertise. With the effect of COVID, we prioritised the utilisation of the CLF's expertise in combination with the world-class facilities. The CLF has continued to drive impact across a wide variety of industrial sectors and to contribute advanced characterisation in industrial R&D, despite the reduced operational delivery.

Over the past year, the CLF's Industry Partnerships and Innovation (IPI) group have delivered multiple expertise consultations with industry partners. In the food technology sector, we have shared our expertise in spectroscopy and microscopy with companies such as Quorn, Intellidigest and PepsiCo; some in further collaboration with STFC's Food Network. We have also worked with the biotechnology and pharmaceutical sectors, and chemical and manufacturing industry.

During 2020, the Lasers for Science division provided a COVID-19 Rapid Access mechanism for facility access for R&D related to the fight against COVID-19. A large proportion of the successful projects were led by or included an industry partner. The rapid nature of this unique call enabled the laser facilities to respond quickly to the needs of COVID-19 research, both diagnostic and R&D. The rapid access worked with SMEs that utilised an additional six weeks facility access to look at everything from drug delivery mechanisms to improving fluorescence markers for increased sensitivity of lateral flow testing.

This year saw the close of the STFC Bridging for Innovators (B4I) programme – an ISCF-funded scheme that was introduced to boost industrial collaboration with national facilities. The programme was highly successful for the CLF, with the laser facilities delivering the most funded projects across any of the facilities at Harwell.

Despite the effects of COVID, the construction of EPAC, our new application based facility, continued with only minor delays. The critical and extensive concrete pour was completed to schedule in November 2020. EPAC will drive the development and application of a completely new class of compact accelerators and advanced sources of laser-based radiation. This will lead to a step change in a number of fields, for example the rapid, 3D imaging of complex or moving structures, or systems under load like engines or turbines.

Industry Partnerships

The CLF's Dr Andy Ward has become a facilities ambassador for the STFC Air Quality Network (SAQN). This network facilitates the exploitation of currently untapped STFC capabilities to enhance and progress

research into air pollution, particularly with relevance to its impact on human health and the environment. Dr Ward's expertise in pollution, micro-plastics and studying droplets using the CLF's state-of-the-art optical trapping capabilities. are an excellent addition to the SAQN.

The CLF's long-standing laser fellowship programme with Johnson Matthey (JM) continued during this year, successfully delivering industrial access to both Ultra and the Octopus facilities. UKRI-EPSRC Innovation Fellow Dr Chris Thornton in partnership with JM, Manufacturing Technology Centre and Warwick Manufacturing Group successfully finished their fellowship, with the additional award of LaserNET US experimental facility access. The fellowship highlighted the importance of the work that the CLF does as a knowledge transfer body for technology innovation.

Innovation

The CLF's IPI group continue to scan for innovative concepts and technology transfer opportunities, to capture and drive forward the most impactful ideas and inventions.

This year the CLF filed two new patent families, giving a current total of 23 active patent families, and eight invention disclosure forms were submitted for consideration for future patent filing. Additionally, four proof-of-concept projects were funded or ongoing, and two CLASP projects have been advanced.

A proof-of-concept project with the CLF's CALTA division was awarded to develop a simple and low cost pulse compression scheme for the CALTA DiPOLE laser technology. The design has the potential to offer a more compact amplifier stage that will reduce the current laser system footprint by half. This reduction in size is an important phase to commercialisation of the novel DiPOLE laser.

Another of our Innovation Projects is looking to develop a prototype super-resolution fluorescence microscope, which will enable cryo correlative light-electron microscopy for a wide range of science applications across the life sciences. This commercialisation opportunity is being carried out in collaboration with the CLF's Target Fabrication group, who are assisting with the manufacture.

This past year, the operations of CLF spinout company Scitech Precision Ltd (SPL) were heavily hit by COVID-19, with many of its core customers experiencing a reduction in operations, subsequently leading to a reduction in orders and turnover. Some 21 institutions engaged with SPL for a total of 63 individual contracts, with a turnover of £182k. During this time SPL moved to a new, dedicated laser machining laboratory on the RAL site, offering improved infrastructure. SPL also engaged in a programme of upgrades to its laser, adding a femto-second laser machining system and upgraded control systems and stages, which will allow it to carry out more processes at a higher level of accuracy.

International Impact

IMPULSE (Integrated Management and Reliable Operations for User-based Laser Scientific Excellence), an ambitious project financed under Horizon 2020 kicked off on 16 December 2020. The project aims to support organisational development, sustainability and excellent science at ELI. Representatives of 15 Consortium partners from 10 European countries plus the UK are participating in this 42-month project, and the CLF is a key advisory partner in the consortium. Initial meetings have been scoping out the collaborations between STFC and the ELI partners.

The hub for innovation called the Extreme Photonics Innovation Centre (EPIC) in India, jointly-funded by the CLF and the Tata Institute of Fundamental Research (TIFR), was also affected by COVID-19. Whilst working remotely, the team focused on setting specifications for the tape-drive coating system in collaboration with the CLF's Target Fabrication group. The EPIC team also developed detailed project plans. Project teams have since been set up, allowing initial collaborations to develop.