Technology Strategy Board
Driving Innovation

Results of competition: Technology Inspired - CR&D - Electronics, sensors and photonics

Total available funding for this competition was £7.4m from the Technology Strategy Board and EPSRC.

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Fianium Limited (lead) University of Bath	NANOLASE - Novel photonic devices enabling ultra-compact, ultrafast fibre lasers for cost-effective industrial processing	£410,530	£293,478

Project description (provided by applicants)

Ultrafast lasers are fast becoming an essential tool within high-precision manufacturing processes. Fibre lasers, with their compactness and reduced cost of ownership over bulk solid-state systems, have been an enabling technology within high-end markets including consumer-electronics and photo-voltaics manufacture. However, in the vast majority of low-end manufacturing applications where tight production margins are a barrier to high CAPEX, penetration of ultrafast technology is minimal.

The existing low-end solution of longer-pulse (Q-switched) lasers delivers lower precision in manufacturing. Establishing a cost-reduced ultrafast fibre laser technology will drive technology up-take for improved manufacturing in new areas. NANOLASE will address this by developing a novel ultrafast fibre laser oscillator and high power amplifier system which eliminates more than 50% of the high-cost components of existing state-of-art ultrafast fibre lasers.

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Fianium Limited (lead) Optoelectronics Research Centre University of Southampton	FEMTOPLANE - FEMTOsecond fibre oscillator PLANar waveguide amplifiEr laser system to enable advanced industrial materials processing	£459,447	£321,695

Project description (provided by applicants)

Femtosecond lasers have become an established tool for ophthalmic laser refractive surgery but their potential for use within industrial materials processing has yet to be realised owing to the laser complexity, lack of robustness for industrial environments, size and cost.

Compact, cost-effective femtosecond fibre lasers based on simple, direct amplification architectures have recently started to replace conventional solid-state laser technology within applications requiring modest pulse energy. However, the technology has fundamental limitations in the pulse energy they deliver; a maximum of 5uJ is the commercial state-of-art. FEMTOPLANE will address this limitation, bringing together leading ultrafast fibre laser manufacturers (Fianium Ltd) and world-renowned researchers at Southampton's Optoelectronics Research Centre to develop a highly novel ultrafast laser platform.

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Plastic Logic Limited (lead) Alphasense Limited University of Cambridge	Flexible Logic for Autonomous Gas sensing (FLAGS)	£556,301	£220,397

Project description (provided by applicants)

Tightening industrial safety standards across the globe combined with large-scale economic and industrial growth in the developing world and increasing risks from air pollution in higher density cities has greatly increased the demand for low cost monitoring of the air we breathe for both safety and good health. Current gas detectors fulfil the legal requirements, but at a cost that limits widespread use, especially in the third world, there is therefore a significant gap in the market. The cost barrier cannot be broken with current PCB and silicon chip solutions, especially when combined with the multi-part and complex assembly of the sensors themselves. A radical rethink is therefore required.

Hybrid plastic electronics and dedicated silicon chips along with integrated gas sensors represent a solution that is now possible and will be developed by combining the knowledge of a polymer electronics company, a gas detector company and dedicated silicon chip suppliers with the support of a leading academic group. This new system will offer a radical new change in design whose cost advantages will allow a wider acceptance of the product initially in the industrial/mining safety market.

Further development building on the success of this low-cost gas detector would then lead to a family of personal safety monitors, air quality cards and homeland security/first responder protection alarms. The success of this product and adoption of the products produced will lead to a substantial improvement in the safety and work conditions of many industrial workers across the globe and in the long term could also have an impact on the general population through general environmental monitoring.

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Plessey Semiconductors Limited (lead) Digital Projection Service Limited University of Bath	High Intensity Light Emitting diodes for Advanced Projection Systems (HI-LEAPS)	£499,503	£347,495
Project description (provided by applicants)			
Existing light emitting diodes (LEDs) do not emit light directionally, so in many applications not all photons are coupled into the optical system and result in wasted energy. This is notably true in image projection systems (a US$3B annual market) which require bigger, much brighter LEDs to replace inefficient discharge lamps. The aim of this project is to advance the development of new large area, high brightness InGaN LEDs with highly directional emission and capable of operating at high electrical power density to achieve the high on-screen lumens needed for advanced digital projectors. The innovation will involve realising such LEDs on silicon substrates, the incorporation of novel nanostructures by cost effective methods to direct the light output, and wafer bonding to thermally conducting substrates to address the heat extraction problem. The new LEDs will also be tested in a novel projector design that requires multiple highly directional LEDs, to expand market opportunities.			

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Smith & Nephew UK Ltd (lead) Strain Measurement Devices Limited University College London	SmartFix - A fully automated 6-degree-of-freedom measuring fixator for optimised control of bone healing	£374,576	£259,173

Project description (provided by applicants)

This applied research study provides an opportunity to develop the world's first intelligent orthopaedic External Fixator (Ex Fix) suitable for mass production using enabling technology, which addresses a pressing healthcare need in terms of improved patient outcomes through promoting the growth of stronger bone tissue, and reduced healthcare costs by decreasing treatment time. It also targets both key technical and economic barriers for both S&N and SMD potentially reducing the cost of implementation, while increasing the realisable potential of the technology.

Although the project is aligned with more than one technology priority area, it predominantly involves the use of advanced wireless sensor/actuator technology, and computer aided solution (CAS) software for improved control of limb distraction, and monitoring and diagnosis of fracture healing through development of an automated External Fixator (Taylor Spatial Frame).

The vertically integrated collaboration between S&N, SMD and UCL is requesting £259k to support an 18-month study using 4.5FTE's resources to address the key technical, and economic challenges. The platform technology is applicable in other industry sectors given its high level of innovation, however, the partners will initially focus on commercialising SmartFix through S&N sales channels given its anticipated value and impact in the marketplace. Collaboration with an SME will create supply chains and ensure exploitation of the platform sensor technology in a range of markets, which extends to custom sensor solutions, e.g. wireless thin film strain gauges for a variety of products.

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SPI Lasers UK Ltd (lead) 600 UK Limited	"UltraLITE": A breakthrough project in low-cost nanosecond pulsed lasers and marking systems for widespread industrial application	£533,936	£265,000
Project description (provided by applicants)			
SPI Lasers and Electrox have teamed together to research and develop a new laser marking system based on a radically cost-reduced fibre laser. The fibre laser design is based on concepts demonstrated at SPI's advanced laser laboratory in the Optoelectronics Research Centre at the University of Southampton. These will be further developed, and combined with SPI's lean manufacturing technology to ensure a low-cost product that has all the reliability and low cost of ownership advantages of fibre laser technology. Electrox will develop a highly configurable front end providing a new software user experience, greatly simplifying laser usage for both experienced and novice customers by including features for materials selection and parametric control. The result will be a radically cost-reduced product that will provide customers with maintenance-free operation at vastly improved efficiencies.			