

Results of competition: Manufacturing electronic systems of the future - Collaborative R&D

Total available funding for this competition was £4m from Innovate UK.

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
Amfax Limited (lead) GE Aviation Systems Limited Rolls-Royce Controls and Data Services Limited South Wessex Electronics Limited The Manufacturing Technology Centre Limited	Automated quality verification for high density electronic assemblies - QuaVe	£499,495	£346,507
Project description - provided by applicants			
<p>Quality verification is a vital part of electronics manufacturing, allowing yields, product lifetimes and failure modes to be controlled. The most critical features are the thousands of solder joints on a typical assembly. However, as the sizes of components and solder joints shrink, verification of solder joint quality is becoming increasingly challenging. The major technology turned to by manufacturers, Automated Optical Inspection (AOI) is the subject of widespread dissatisfaction centred on its poor performance, with unacceptably high false call rates, onerous programming, and lack of reference to standards.</p> <p>The A3Di machine works on a fundamentally different principle of 3D shape measurement, allowing circumvention of the technical problems with AOI. This project will develop the A3Di machine into an effective, high throughput and accurate production tool by formulating algorithms to classify solder joint quality, validated using the first ever database of acceptable solder joint 3D shapes. Such a tool has potential to gain large market share and dramatically improve electronics assembly process control, leading to significant reductions in scrap, rework, and returns.</p>			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
ATEEDA Limited (lead) Lancaster University	BIST for Intelligent Self-Testing of Integrated Circuits at Manufacture and In-Life	£495,509	£335,381
Project description - provided by applicants			
<p>The global semiconductor industry faces major challenges in testing data converters – ADCs and DACs –occupying R&D resources and constraining release of highest specification products. ATEEDA has demonstrated (via a recently completed SMART feasibility study) a new approach to Built-In Self-Test (BIST) for ADCs and DACs in simulation.</p> <p>Two core innovations are now patent-pending, permitting high-precision (e.g. audio) converter BIST. ATEEDA will work with Lancaster University to mitigate technical risks and validate in silicon that this approach meets commercial requirements. The resultant demonstrator will give customers confidence that this will translate into a manufacturing environment, enabling commercial evaluation and purchase. High-precision Analogue BIST is a significant market opportunity ATEEDA is well positioned to exploit following successful completion of this project, but where the risks are too high to justify development otherwise.</p>			

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Biovici Limited (lead) Semefab (Scotland) Limited Swansea University	Integration of silicon and printed electronics for sensor applications	£327,227	£234,736
Project description - provided by applicants			
<p>The project will develop an innovative Silicon Nanowire (SiNW) based point-of-care multiplex sensor platform for the early detection of multiple disease biomarkers simultaneously, for the monitoring of chronic conditions. The generic POC platform will enable more efficient & effective healthcare delivery and improved health outcomes for patients. SiNW sensors will be fabricated on full wafers and functionalised using a novel multi-electrode array.</p> <p>The first SiNW immunosensors will detect the hormone cortisol for the fertility market. Multiplex sensors will detect serotonin and noradrenalin in addition to cortisol. SiNW sensor devices will be integrated with printed electronics to form a self contained packaged, single-use sensor. The sensor platform can be adapted for the detection of other disease markers including, stroke, heart disease, cancer and dementia. A complete disposable strip and electronic reader system, akin to blood glucose monitoring kits, will be developed.</p>			

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CPI Innovation Services Ltd (lead) Sandvik UK Ltd (T/A Sandvik Coromant) Advanced Manufacturing (Sheffield) Ltd BAE Systems (Operations) Ltd DMG Mori UK NPL Management Ltd (National Physical Printed Electronics Ltd University of Sheffield	Intelligent Tooling: Embedded Sensors for Machines and Cutting Tools	£500,000	£249,996
Project description - provided by applicants			
<p>Metals related manufacturing represents about 10% of all UK production activity and machining remains the most important manufacturing process. According to the Manufacturing Technologies Association, in 2012 the UK machine tools, cutting tools and tool/work-holding equipment output was estimated to be around £960 million (£835 million exported) and the sector is estimated to employ 6100 people.</p>			

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Element Six Limited (lead) Process Instruments (UK) Limited University of Warwick	Total Residual Oxidant Analyser for the Marine Environment	£472,217	£263,006
Project description - provided by applicants			
<p>Due to an international treaty, about to be ratified, the process of fitting all the world's large ships with ballast water treatment and sensing systems (BWTS) that both kill invasive species transported and dumped in ports/coastal waters and monitor treatment, will begin. This Innovate UK project enables Process Instruments (UK), a SME that specialises in water quality measuring technology, a world leading team of electrochemists at the University of Warwick, and Element Six, a synthetic diamond manufacturing company, to form a partnership to produce an entirely new type of oxidant sensor based on synthetic boron doped diamond electrodes, which can capture this "winner takes all market".</p> <p>The proposed diamond sensor will outperform all current sensors, which fail to meet market requirements, delivering greater accuracy, stability and reliability, enabling BWTS to be more efficient and safer to the ecology. With a focus on the development of innovative manufacturing and intelligent sensor technology for harsh environments, this project will also deliver manufacturing jobs and a sustainable export business worth millions of pounds pa to the NW regions of the UK economy.</p>			

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Intrinsic Materials Limited (lead) M-Solv Limited	AMPS - Additive Manufacturing for Packaging Semiconductors	£495,123	£276,592
Project description - provided by applicants			
<p>Mobile device market, e.g., smartphones & tablets, continues to grow rapidly and consumers are demanding ever increasing performance within smaller electronic footprints. To meet these demands the semiconductor industry requires process technology for novel IC packaging solutions using glass interposer technology.</p> <p>Forecasts show that by 2017, 2.5D interposers will reach a market value of \$1.35Bn. The AMPS project will provide the materials and laser process technology that enables high density electronic metallisation structures for 2.5D and 3D semiconductor packaging systems using glass interposers, therefore ensuring the UK plays a valuable role in the supply chain on the next generation of semiconductor packaging architectures.</p> <p>The consortium partners have IPR and a route to exploitation which, when combined, forms a technology ideal to meet the technological and economic needs of the industry. IML's nano-seed material, deposited and patterned by M-Solv's equipment allows copper to be plated in an additive process with low waste and high density of circuitisation. Atotech and Qualcomm provide access to industry level qualification and exploitation.</p>			

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Microsemi Semiconductor Limited (lead) Gwent Electronic Materials Limited National Physical Laboratory - NPL	Tamessa - Turning up the heat in electronics	£498,817	£265,585
Project description - provided by applicants			
<p>The Tamessa project represents a step change in harsh environment electronic assembly. Tamessa will develop a integrated system will eliminate the need to use expensive & heavy ceramic technologies in applications up to 225Deg C and allow the integration of bespoke through hole components.</p> <p>Typical applications benefiting from this system are aerospace, automotive, offshore & power management or other areas were electronics are subjected to high temperature, salt and hydrocarbons. OEMs will benefit from 30% reduction in board cost, 50% reduction in board weight and 95% reduction in tooling NRE cost. Energy costs associated with manufacture are significantly reduced.</p>			

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M-Solv Limited (lead) Touchnetix Limited	In Touch	£490,200	£260,093
Project description - provided by applicants			
<p>The In Touch project aims to develop robust, industrial-grade multi-touch capacitive touch sensors (MTCTS) and a fully digital (ie driven from CAD files with no, or minimal fixed tooling) manufacturing process. The process is designed to be suitable for short, high-product mix, production runs.</p> <p>The MTCTS product will be tolerant to extreme temperature variations, moisture and even corrosive gases in the atmosphere as well as insensitivity to electromagnetic interference and a design lifetime of 25 years. Such high-value, low volume sensors are not currently available and manufacturers of industrial controllers, military and aerospace systems and point of sale equipment are forced to use either poorly specified COTS products or non-touch alternatives.</p> <p>The technology and process developed in this project opens up a large (number) niche market that can be addressed by Touchnetix with cost-effective manufacturing on a small scale, flexible, production line developed from our existing in-house facility at M-Solv.</p>			

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MTG Research Ltd (lead) Chestech Limited C-Tech Innovation Limited Merlin Circuit Technology Ltd The Institute Of Circuit Technology Limited University of Leicester	Manufacturing Advanced Coatings for Future Electronic Systems (MACFEST)	£499,815	£351,744
Project description - provided by applicants			
<p>Electronics systems require the reliable attachment of large numbers of components on a printed circuit board. This is achieved using advanced soldering techniques to connect components to each other and to enable the device to function according to its design. Therefore, the quality and reliability of the solder joints is extremely important. Demands for increased electronic performance and reduced size have resulted in less area being available to connect components to the circuit board, so producing reliable joints has become a challenge.</p> <p>To achieve good solder joint reliability, a solderable coating is used on the circuit board, which also influences joint reliability. A new solderable coating, the subject of this project, uses nickel, palladium and gold (ENEPIG) based on the use of novel ionic liquids, which enable metal coatings to be deposited with markedly improved properties thereby ensuring long term electronic systems reliability, especially for those products used in harsh and challenging environments.</p> <p>The project will thus produce a new solderable coating that provides enhanced reliability and functionality to a wide range of electronic products, including several addressed in this call.</p>			

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Plastic Logic Limited (lead) Oxford Lasers Limited	Strategic and Customisable Ultrashort Laser Processing of Transistors (SCULPT)	£497,511	£298,506
Project description - provided by applicants			
<p>Today a clear market opportunity for low to medium volume but high value display applications is poorly served by high volume Far Eastern manufacturers. The development and production of new display designs using active matrix backplanes are inhibited by high up-front costs and long lead times, mainly due to the several photolithography masks required.</p> <p>In this proposal the consortium aims to replace these masks by patterning the active matrix backplanes using novel direct write laser technology benefiting from the recent advances in industrially robust ultrafast Diode-Pumped Solid-State lasers and associated fast beam scanning devices. In order to unlock this technical route, two major technical challenges will be addressed: high speed, high reliability via drilling technology and high resolution thin layer patterning for transistor electrodes.</p> <p>The integration of the two key processes within the Plastic Logic proprietary active matrix backplane technology will enable the flexibility and customisation of plastic electronics to specific applications such as truly flexible smart watch and interiors displays for automotive and aerospace.</p>			

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Plastic Logic Limited (lead) De La Rue PLC University of Cambridge	Security tags Enabled by near field Communications United with Robust Electronics (SECURE)	£489,068	£346,355
Project description - provided by applicants			
<p>This project seeks to develop intelligent tooling systems, which will improve the efficiency of machining processes. This project intends not only to support the UK machining sector, but in doing so will generate valuable knowhow for the UK.</p>			

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<p>Polyphotonix Limited (lead) LDT Design Limited Printed Electronics Limited QinetiQ Group PLC The Centre for Process Innovation University of Warwick</p>	<p>combining Printed Electronics And Conventional Electronics to simplify production of a phototherapy device (PEACE)</p>	<p>£486,441</p>	<p>£337,474</p>
<p>Project description - provided by applicants</p>			
<p>The project partners will integrate printed electronics (PE) and conventional (CE) solid state electronics in order to improve functionality, reduce cost and increase scalability of a photonics based medical device.</p> <p>New methods will be employed in order to produce luminaires, printed sensors and PE/PE or PE/CE interconnects. These will be combined with conventional electronics such as memory and processors to make the device smart and therefore ensure patient compliance with the treatment regime.</p>			

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Precision Varionic International Ltd (lead) Plasma Quest Limited	MAX-RESPONSE: MAgneto-RESistive Plasma deposited Non-contact Sensors	£499,133	£299,470
Project description - provided by applicants			
<p>High resolution Magneto-Resistive MEMS sensors offers substantial advantages for automotive position sensors in terms of signal response quality compared to inductive, Hall-effect and existing Magneto-Resistive systems.</p> <p>However, to realise these commercially for mass production requires the development of design, materials and processing technologies beyond the current state of the art. MAX-RESPONSE will develop novel MEMS sensors using existing designs and unique high precision manufacturing techniques to enable low cost, high volume manufacture of sensor products. In so doing the consortium will maximise the chances that the manufacture of these sensors will be undertaken within the UK, rather than being lost to the Far-East, as has been the case with electronics manufacture over recent years.</p> <p>MAX-RESPONSE is a business led consortium, with the two consortium memers PVI and PQL being highly innovative for-profit SMEs. They will be supported by Lotus Cars, an existing PVI customer, that will be involved in the project as a sub-contractor that will set end-user specification and validate the technology as well as being the initial route to market.</p>			