

Potential areas of supporting photonics innovation from Innovate UK for 4 years, from April 2022

Based on combination of community inputs*

Starting point for discussion -nothing final or guaranteed

Programmes themes covering multiple projects*

Programme budgets £10-70million

Feeds into the 2021 Spending Review.

* Individual proposal have been recorded and will be used to both define and justify themes

Suggested Photonics Intervention topics

Title	Summary	Objectives
Photonics+ for made smarter	<p>Photonics+ to enhance UK industry manufacturing to industry 4.0.</p> <ul style="list-style-type: none"> Innovations in the laser joining, additive manufacture or related processing of dis-similar materials including ultrafast laser processing & development of relevant source / lasers leverage of machine learning & novel sensing in process control, monitoring and optimisation Machine vision / other automation routes to assess process quality in real time Flexible / adjustable processing with minimal human intervention Efficient integration of laser with machine tools & manufacturing systems 	<p>Support manufacturing as one of the pillars of the UK economy, reducing dependency on importing process & process machinery.</p> <ul style="list-style-type: none"> - support transition to UK e-vehicle manufacture, domestic microelectronics manufacture, defence & aerospace equipment - greater use of light weight & composite material supporting net zero -improved lifecycle management of products and systems
High speed 2d & 3d imaging	<p>Focus on reducing energy consumption footprint, cost & integration. Including development of focal plane arrays from novel materials enabling imaging at new wavelengths. Improved ROIC integration for increased performance / reduced costs. Time of flight modalities for 3d imaging</p>	<p>Reduce barriers to deployment of 3d & high speed imaging across health, manufacturing, environmental monitoring & autonomy.</p>
Resilient UK communications	<p>Support the scale-up of UK communications systems across photonics & RF technologies. Including optical, RF communications modalities in free space & fibre. Optimised for open interface & interoperability. Secure by design. Low latency</p>	<p>Resilience & huge growth global market. Enabled pathway to future quantum systems. Security & defence support</p>
Scaling photonics & MEMS to mass volumes	<p>Leverage of automation & wafer scale integration & techniques to provide rapid route to high volume low cost manufacture. Encouraging implementation of capex-heavy robotics collaboration and processes</p>	<p>Enable the UK to competitively manufacture for high volume applications at scale increasing resilience. For comms, health, consumer(AR/VR), transport, autonomy</p>
Enabling digital growth simultaneously with net zero	<p>Datacentre energy consumption, reduce IOT energy consumption, enable high performance low power computing, building AI algorithms into edge devices, efficient adaptable / re-purposable integrated systemsextending to ultimate biodegradable Photonics etc components...component innovation, systems design /in-principle</p>	<p>To enable digital growth, whilst meeting net zero & sustainable obligations.</p>
Photonics+ for extreme environments	<p>Sensors, actuators, power electronics & communication systems for harsh environments from nuclear, space sub-marine....high data rates, low latency. Test characterisation & proving in simulated environment. Components & sub-system</p>	<p>Support & maintenance & lifetime of critical infrastructure. Enabling operation in highest value segments with high entry barriers.</p>
Extreme wavelength Photonics	<p>UVC & Mid IR (4um plus) + hyperspectral sensing and analysis. Build on strength in individual components (Compound semi, materials, integration) into higher value integrated systems to accelerate adoption. Systems, sub-systems & components</p>	<p>Capture high level system value for applications in environmental monitoring, defence & Security, manufacturing process control, health/ med tech</p>

Photonics+ could include photonics, electronics, sensors and combinations.

Suggested Photonics Enabling topics

Title	Summary	Objectives
Enabling topics - inputs to wider UKRI - encourage incorporation into projects	Machine Learning in Photonics etc research design & manufacturing	Leverage external skill & knowledge into Photonics etc community
	Trusted data / data quality assurance	
	Unifying verification, test & qualifying to enable digital twinning / predicted performance of Photonics+ components & predictive performance in new applications. Leverage I4.0 in photonics design and manufacture	

- Tweaks and amendment for improvement welcome
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