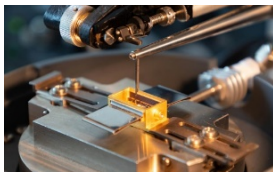


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Upscaling component manufacture using standard semiconductor manufacturing techniques and addressing barriers to adoption of quantum systems:



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### Q-Manufacturability

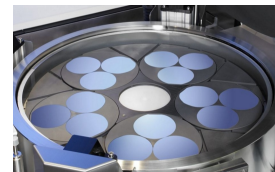
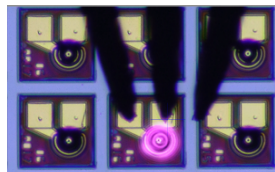
- On-wafer and wafer-to-wafer process reproducibility
- Parametric design optimisation
- Testing/characterisation capability & protocols
- Upscaling of manufacturing capability

### Q-Reliability

- Baselining devices against industry standards
- Understanding reliability drivers for quantum applications
- Defining new test protocols

### Q- Supply chains

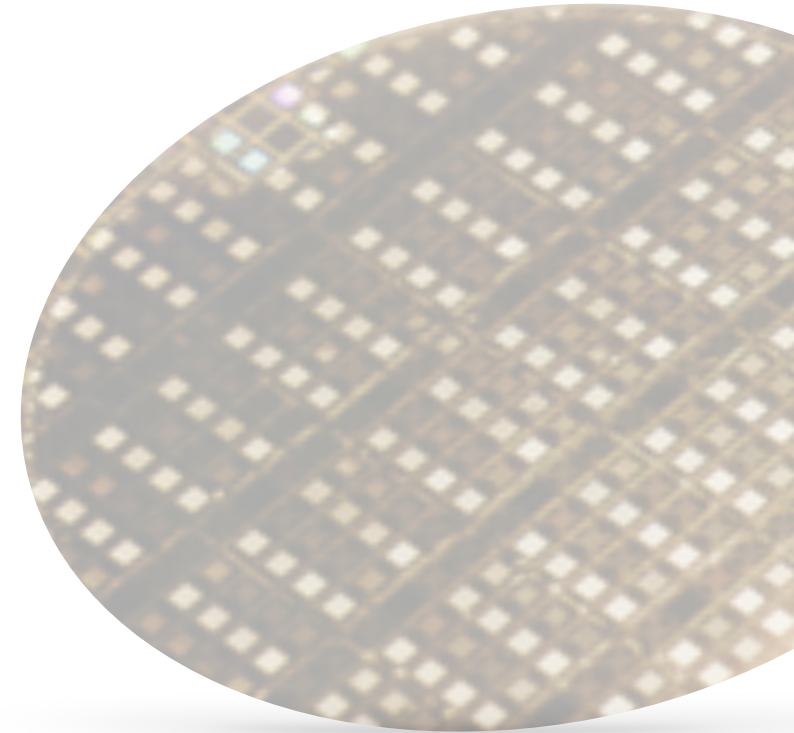
- Customised quantum photonic components via foundry platforms
- Commercial viability through proven expertise and existing assets within established supply chains



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# QFoundry

UK National Foundry for Quantum Components



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## The Challenge

Lack of robust, reliable and volume supply of Quantum Photonic Components (QPCs) present a major barrier to commercialisation of quantum technologies in applications such as computing, communications, imaging, sensing, metrology and timing. There is a pressing need for proven foundry platform technologies due to:

- Cost of prototyping – majority of new quantum technology applications need to include the development of highly customised semiconductor device, as off-the-shelf components often lack the performance suitable for quantum applications.
- Cost of upscaling – significant R&D is required to improve reliability and reproducibility of quantum components. The upfront scale-up costs prevent market traction for QPCs.
- Lack of data – there is insufficient data to carry out statistical analysis for understanding material and process related parameters that influence performance and reliability.

**QFoundry brings together the UK's most established supply chains to address critical challenges in device manufacturing and deliver a National, and World's first Quantum Photonic Component Foundry. Developing key technology platforms for accelerating the uptake of quantum applications**

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## Single-mode, high-stability Vertical Cavity Surface Emitting Lasers (VCSELs)

The supply of single-mode VCSELs operating at the absorption transitions of Caesium (Cs) and Rubidium (Rb) is critical to realising a commercial grade supply chain for atomic clock, magnetometer, gas sensing and coherent LiDar markets. Key activities:

- Rapid prototyping of custom specifications such as polarization- and mode-stability enhancement, side-mode suppression, linewidth-reduction etc,
- Routes to VCSEL reliability improvement, temperature and current coefficient reduction and research into failure modes affecting yield.

## Single-photon emitters and detectors

Gallium Arsenide and Indium Phosphide-based Single Photon Avalanche Diode/ Quantum Dot/ Multiple Quantum Well platforms offer the potential for high-volume scale-up of discrete components, monolithic integration and a pathway for multi-functional Quantum Photonic Integrated Circuits (QPICs). Key activities:

- Source/detector matching (spectral bandwidth, pulse width, polarisation, mode-profile),
- Improving epitaxial material deposition, fabrication uniformity and reliability.

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## Sponsors



## Partners



Get in touch with the team at **[projects@csconnected.com](mailto:projects@csconnected.com)** to find out how QFoundry can support your commercialisation activities in quantum technologies