



QUANTIC PHASE 2: YEAR 1 ROUND UP

Making the invisible, visible

Thanks to the support and engagement of our industry partners, academic teams, and wider stakeholders, QuantIC has successfully delivered the first year of Phase 2 of the UK National Quantum Technologies Programme (NQTP) for quantum imaging, despite the enormous challenges we have faced with COVID-19.

Collaboration remains at the heart of all our activities and our industry partners continue to explore the real-world application of our transformative technology across multiple markets. QuantIC's scientific excellence continues to focus on finding solutions to industrial and societal challenges, advancing healthcare and environmental protection, providing defence and security capabilities, developing affordable autonomous vehicles, and improving consumer electronics.

Quantum imaging and quantum technologies are in a strong position with the UK Government aspiring to create a quantum enabled economy. In November, the NQTP announced its strategic intent to focus on developing Quantum technology applications through commercialisation and industrialisation, making it clear that its work is shifting to focus on moving the UK towards the real-world application of Quantum technologies.

Innovation

Throughout the last year QuantIC has continued to forge ahead with its mission to commercialise quantum imaging technology.

The programme continues to drive world-changing imaging systems such as the ability to see directly inside the human body, the ability to see through fog and smoke, to make microscopes with higher resolution and lower noise than classical physics allows, and quantum radars that cannot be jammed or confused by other radars around them.

Working with our industry partners, QuantIC has a range of demonstrators that exhibit our technology and demonstrate the potential applications of our research. Adding to the portfolio of prototypes developed over the last five years, new system demonstrators include:

- Real time 3D imaging for limited visibility
- Underwater imaging systems
- Non line of sight imaging (imaging around corners)
- Single-fibre endoscopes for minimally invasive imaging
- Imaging through the body as an alternative to MRI & X-ray
- Exploring high-speed LED arrays in covert imaging
- Extremely sensitive gas imaging devices

Collaboration

QuantIC's funding streams are designed to support both the commercial uptake of new imaging technology and drive the pipeline of new quantum imaging technology into the Hub.

This year saw the launch of Phase 2 of the £4m Partnership Resource Fund, designed to support both industry and academia in advancing quantum imaging technology.

QuantIC awarded its first Accelerated Development Fund grant of £187k to improve biological 3D imaging. The team, led by Dr Lucia Caspani from the University of Strathclyde, will be working with colleagues Dr Matteo Clerici and Dr Caroline Müllenbroich from the University of Glasgow to develop a new technique enabling 3D imaging of even the most fragile and delicate biological specimens.

Investing in talent continues to remain a strategic priority for the programme and 16 new PhD scholarships were awarded in year one. Ten of which were co-funded with industry partners who contributed more than £400k towards supporting the future of quantum innovation.



Commercialisation

The commercialisation of quantum technology is at the very heart of our mission.

This year's highlight was celebrating Thorlabs releasing to market a commercial, turnkey correlated photon-pair source tool; pioneered by the research and development of QuantIC start-up company, Raycal. Established in 2018, Raycal was founded by Quantum Technology Enterprise Centre (QTEC) fellow Mateusz Piekarek and QuantIC researcher Jonathan Matthews at the University of Bristol.

Dr Mateusz Piekarek, Director of Raycal Ltd said *"It is exciting to see this novel product reach the market and be available to customers globally. We are proud to have played an integral role in commercialising this technology. Single-photon sources are essential devices for quantum optics research. This turn-key solution will not only allow quantum photonics researchers to enhance their capabilities, but also lower the barriers for specialists from other disciplines"*

The product works by using spontaneous parametric down-conversion, to create a pair of energy-time entangled photons, resulting in a bright, high-efficiency heralded single-photon source – that is ideal for quantum optics applications.

Director of Thorlabs' Laser Division, Peter Fendel said *"This is an exciting addition to Thorlabs' line up of products for the Quantum Photonics community. The project started when a researcher from the University of Bristol reached out asking if we could expedite the efforts of those working in quantum optics labs by offering a compact, reliable single photon source. Prompted by that need, we engaged in a collaborative effort that led to the development of the SPDC source"*

Stakeholder Engagement

Raising awareness of Quantum Technologies is essential to attracting investment.

Despite an incredibly challenging year, QuantIC presented at 56 virtual conferences, events and workshops, many of which had a wider audience than normal due to their online presence.

The Hub itself organised a hugely successful webinar series in May 2020 that raised the profile of QuantIC's world-class research and demonstrators to an international audience. The webinar series ran across a full week with two-hour thematic sessions hosted by QuantIC Director, Professor Steve Beaumont, and chaired each day by one of our industrial strategic partners. Attendance ranged from 150-200 participants per session with an international audience of approx. 30%.

The UK National Quantum Technologies Showcase, in November, was another milestone event in the calendar and the sector saw the launch of the NQTP Strategic Intent for the next 10 years. The vision to create a UK wide quantum enabled economy.

Quantum City, the NQTP public engagement platform, launched a Twitter account @Quantum_City, and sponsored a Quantum Film Festival 'Quantum Shorts' out of the Centre for Quantum Technologies in Singapore.



World-Leading

QuantIC research is world-leading in its field and has been internationally recognised throughout the year.

Professor Doug Paul (University of Glasgow) was awarded a Chair in Emerging Technologies by the Royal Academy of Engineering for his work in quantum navigation. Professor Steve McLaughlin (Heriot-Watt University) was nominated for a EURASIP Fellowship for his outstanding achievements in signal processing for computational imaging and communications. Professor Miles Padgett (University of Glasgow) received an OBE for his services to scientific research and outreach.

QuantIC supported start-ups, QLM Technology and Photon Force both received an Institute of Physics Business Innovation Award.