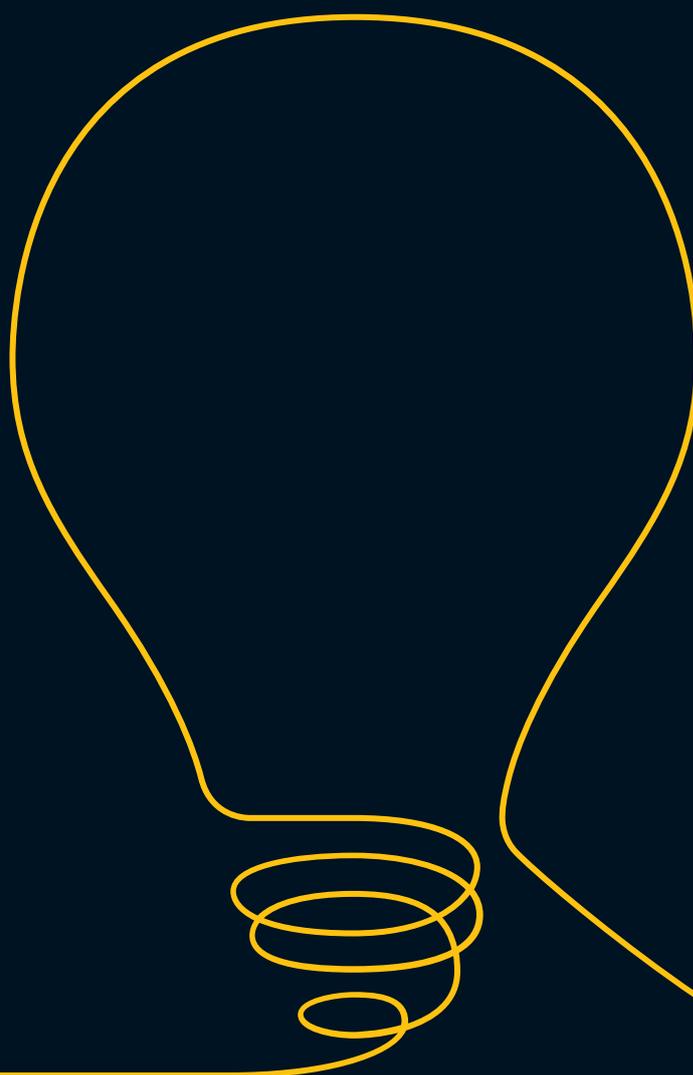


IOP Institute of Physics

IOP Business Awards **2021**



IOP Institute of Physics

www.iop.org

IOP Business Awards

The Institute of Physics (IOP) is the professional body and learned society for physics in the UK and Ireland. It seeks to raise public awareness and understanding of physics, inspire people to develop their knowledge, understanding and enjoyment of physics and support the development of a diverse and inclusive physics community. As a charity, it has a mission to ensure that physics delivers on its exceptional potential to benefit society.

IOP members come from across the physics community, whether in industry, academia, the classroom, technician roles or in training programmes as an apprentice or a student. However, IOP's reach goes well beyond our membership to all who have an interest in physics and the contribution it makes to our culture, our society and the economy. We are a world-leading science publisher and we are proud to be a trusted and valued voice for the physics community.

The IOP's Business Awards recognise the significant contribution that physics and physicists make in industry across all sectors and at all stages, celebrating entrepreneurship, excellence in innovation and the successful implementation of physics into a product or service.

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Welcome



John Bagshaw MA (Oxon), PhD, CEng, CPhys,
FInstP, FRAeS

IOP Vice-president for Business

I am delighted to see so many worthy winners of our Business Awards in 2021. This year has put the challenges posed by healthcare and climate change in stark relief and it is gratifying to see award winners tackling these issues directly, for instance through developments in robot-assisted surgery and cancer diagnosis. But it is also fantastic to see physics being used to create entirely new solutions to emerging problems like digital information security. This underlines the fact that creative minds can find uses for physics in fields which a few years ago might have seemed entirely unconnected to our discipline. However, I know from personal experience how hard it can be to bring great new ideas to practical fruition in the form of products and services people want to buy. These awards celebrate and encourage this innovation and achievement and I am delighted we received such a strong field of applications in such a difficult year.

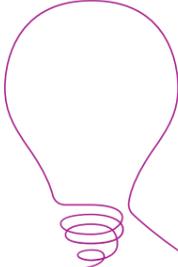
A message from IOP's president



Professor Sheila Rowan CBE

President of the Institute of Physics

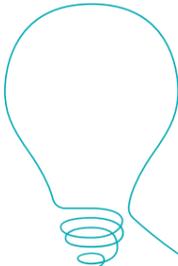
The IOP Business Awards emphasise the vital role physics and physicists play in our economy, creating jobs and growth by powering innovation to meet challenges ranging from climate change to healthcare for an ageing population, and food security for a growing global population. The individuals and companies recognised by our awards are putting physics into practice to create ground-breaking products and processes which will shape the world around us for decades to come, and their work has never been more important. I am delighted to congratulate these pioneers and entrepreneurs, and all those who use physics in their work.



Business Innovation Award 2021

IOP Institute of Physics

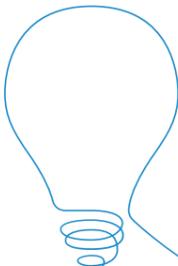
Awarded to small, medium and large companies that have excelled in innovation and delivered significant economic and / or societal impact through the application of physics.



Business Start-up Award 2021

IOP Institute of Physics

Awarded to businesses that have been incorporated for less than five years with a great business idea founded on a physics invention, with a great growth potential and / or the potential of significant societal impact.



Lee Lucas Award 2021

IOP Institute of Physics

The Lee Lucas Award recognises and celebrates very early stage companies taking innovative products into the medical and healthcare sector.

Winners

Toshiba Europe

Lightpoint Medical

Winners

AEGIQ

Quantum Dice

Winner

CanSense

Business Innovation Award Winners

“ We’re delighted to receive this IOP Business Award for of our pioneering Quantum Key Distribution system, which is paving the way towards a quantum future. The need for quantum-secured communications is essential in order to safely negate the threat - and subsequently maximise the potential - of quantum computers. It’s great to see the IOP recognise the value of Toshiba QKD in addressing this threat. ”

Dr Andrew Shields, Head of Quantum Technology Division, Toshiba Europe Ltd.

Business Innovation Award Winners

“ Lightpoint Medical is honoured to win this IOP Business Innovation Award for our innovative surgical cancer detection tools. We are driven by the mission to improve the lives of people with cancer by transforming the efficacy of cancer surgery and we value this recognition by the IOP of our work. ”

Graeme Smith, CEO

Business Start-up Award Winners

“ AEGIQ are honoured to receive this IOP award in recognition of the approach we are taking to accelerate the scalable deployment of quantum photonic technology. ”

Dr Maksym Sich, Co-founder and CEO

Business Start-up Award Winners

“ The Quantum Dice team is honoured to receive the IOP business start-up award. By introducing us to a wider audience, this recognition will undoubtedly be of invaluable benefit to our efforts to bring the advantages of the innovative technology of our quantum random number generator to the ever-growing cybersecurity market. ”

Dr Ramy Shelbaya, Co-founder & CEO

Lee Lucas Award Winners

“ CanSense are delighted to be recognised by the IOP and thrilled in winning the prestigious Lee Lucas Award. This award recognises the passion and drive of the CanSense team, combining the very best of physics and medicine to help deliver our cancer diagnostic to market for maximum societal impact.

This award drives us on - CanSense is committed to changing the landscape of bowel cancer detection. Recognition and support from the IOP makes us more resolute and focused on delivering our products into the NHS & world wide healthcare providers - saving lives and saving money. ”

Adam Bryant, PhD, Chief Executive Officer

Toshiba Europe



For pioneering technology developed over two decades of research, protecting communication infrastructure from present and future cyber-threats, and commercialising UK-manufactured products which pave the road to the quantum internet..

TOSHIBA

The Company

Toshiba started research into quantum cryptography in 2003 at its Cambridge Research Laboratory. Since then, it has been at the forefront of quantum information research and development (R&D), and this year, commercially launched the world's leading system for quantum cryptography - Quantum Key Distribution - which is live on networks across UK, Europe, the US and Japan.

The development and commercialisation of Toshiba's quantum cryptography system redefines the concept of data security, using quantum physics to protect today's data from tomorrow's cyber threats.

Toshiba has successfully commercialised quantum cryptography, leveraging decades of pioneering research in quantum information to develop new technologies and products, already being deployed around the world.

Just as digital electronics transformed societies and economies over the last century, a new wave of technologies exploiting the curious properties of quantum physics is poised to unleash new opportunities and global benefits.

Toshiba has been at the frontier of research in quantum information and its applications for over two decades, particularly the development of quantum communications and cryptography. By harnessing the unique behaviour of quantum light, Toshiba has demonstrated long-distance, high-bit-rate communications where security is guaranteed by the laws of nature. This approach is a paradigm shift from current communication security, which relies on assumptions about the limited computational resources of an attacker.

Toshiba's technology, known as Quantum Key Distribution, integrates years of R&D into a compact product which can be seamlessly integrated into existing communication infrastructures to provide quantum-secured communication. This has already been deployed in networks around the world, protecting medical data moving between hospitals, sensitive IP between manufacturing sites, and even to secure government communications.

Such advances pave the way to the "quantum internet" which will not only redefine secure communications, but also create a cloud of networked quantum computers for massively parallel information processing. Toshiba's innovations also benefit UK plc as the devices are manufactured wholly within its Cambridge facility, stimulating high-value job creation and the growth of a UK quantum ecosystem.

Lightpoint Medical



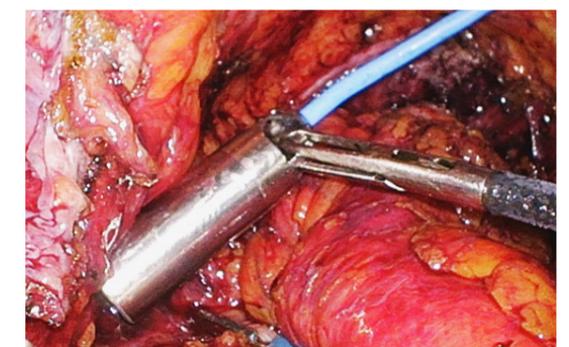
For developing leading technology for targeted cancer surgery. From concept to commercialisation, they develop miniaturised imaging and sensing tools for accurate intra-operative cancer detection in real time.



The Company

Lightpoint Medical is a technology leader in targeted cancer surgery. They develop and market miniaturised imaging and sensing tools for accurate intra-operative cancer detection, enhancing a surgeon's ability to detect cancer in real time. Their mission is to improve the lives of people with cancer by improving surgical precision.

Lightpoint Medical's miniaturised robotic probe, SENSEI®, aims to transform cancer surgery by aiding intra-operative decision making, improving patient outcomes and saving costs for healthcare systems.



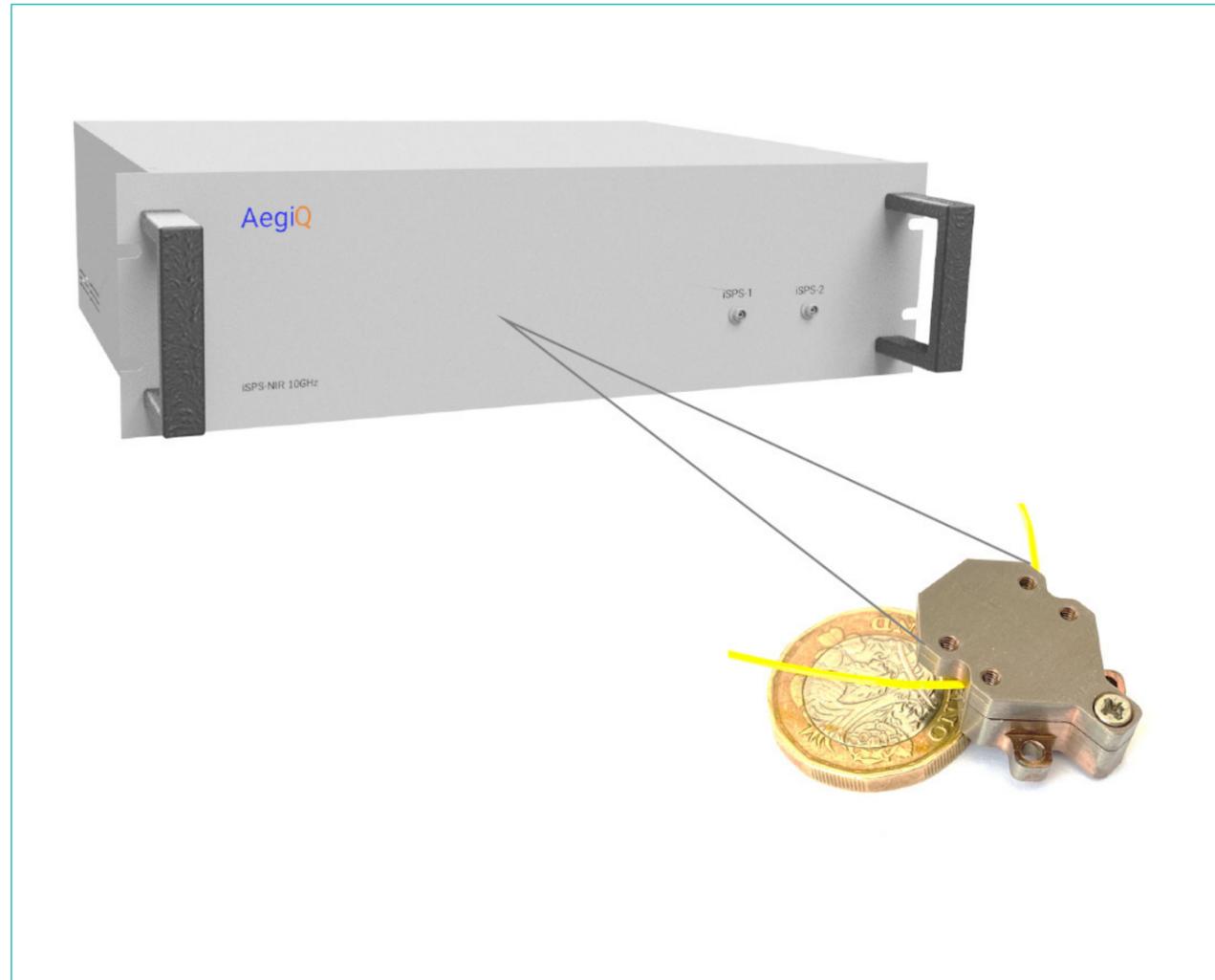
Lightpoint Medical is a technology leader in targeted cancer surgery, developing miniaturised imaging and sensing tools for advanced intra-operative cancer detection. Their mission is to improve the lives of people with cancer by improving surgical precision.

Over recent decades, robots have transformed cancer surgery, growing rapidly to dominate the market. However, despite technological advances in robotic platforms, surgeons remain completely dependent on their sight to detect cancer intra-operatively. Consequently, the cancer may not be completely removed or in contrast, healthy tissue is cautiously removed. For example, one in four prostate cancer patients have cancer left behind. Residual disease increases the need for further drug treatment, radiotherapy, and surgery. Similarly, removing healthy, functional tissue increases post-surgical complications and escalates healthcare costs.

By exploiting advances in miniaturised sensor technologies and the development of cancer-targeted diagnostic imaging agents, Lightpoint is developing miniaturised imaging and sensing tools to accurately detect cancer intra-operatively during robot-assisted surgery. The tools aim to aid surgical decision making, improve patient outcomes and save costs to the healthcare system.

Since its founding in the UK, Lightpoint has secured over \$27M in non-dilutive grants and private investment. The company has two miniaturised robotic probe technologies in development which form a complementary toolset to address the complex challenges and demands of robot-assisted cancer surgery. The first, SENSEI®, has regulatory approval with CE Mark and successful registration with the FDA. Applicable to a wide range of major cancer types, the first commercial focus for the technologies is prostate cancer surgery.

AEGIQ



For the development of a breakthrough quantum photonics platform enabling new applications in quantum communications, computing, and imaging utilising high-performance sources of indistinguishable single photons.

AegiQ

The Company

AEGIQ is a spin-out company building on over two decades of quantum photonics research at the University of Sheffield. Its proprietary iSPS technology offers a deterministic source of indistinguishable single photons which enables new capabilities across quantum secure communications, photonic quantum computing and imaging.

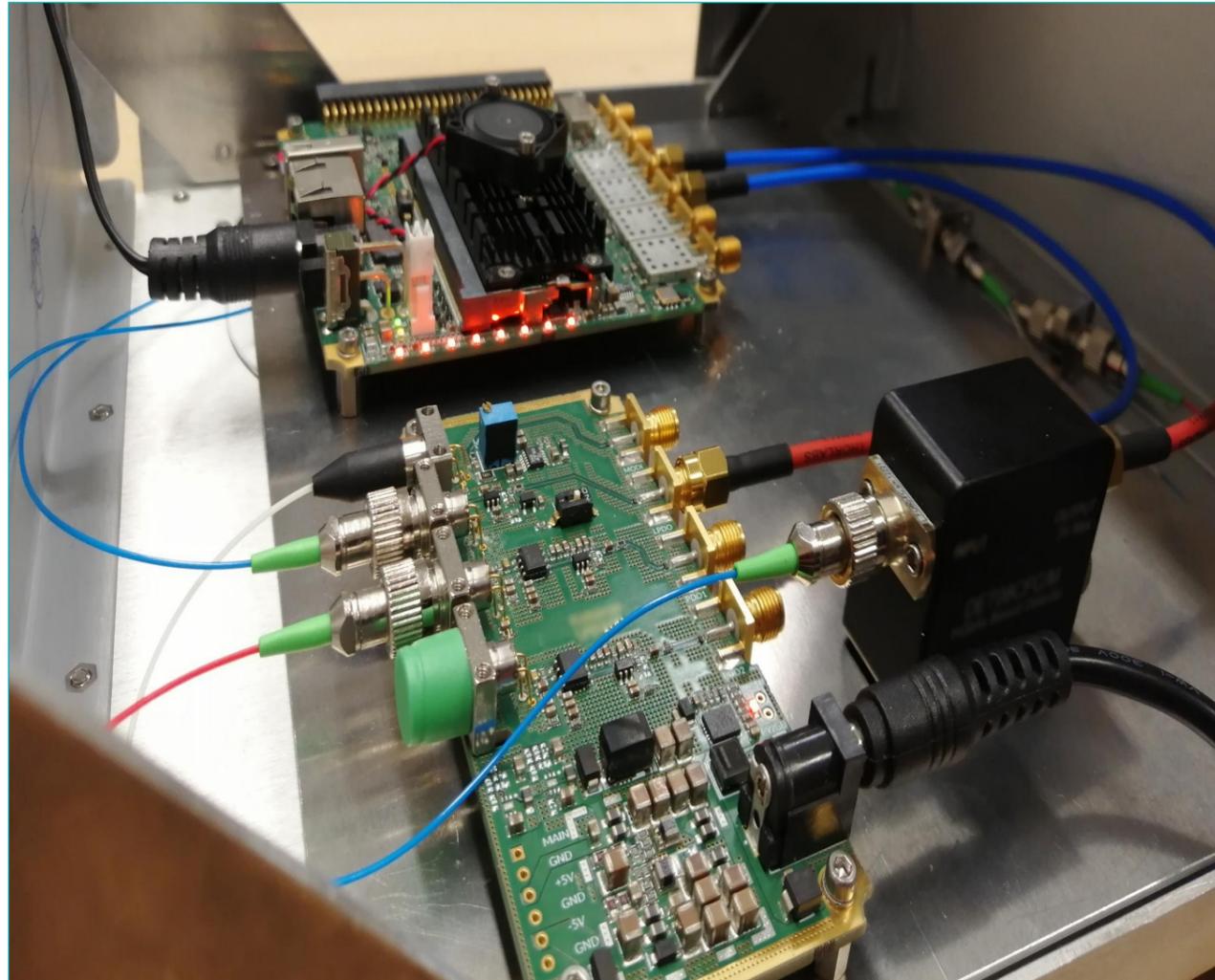
AEGIQ's propriety iSPS technology is a turn-key source of true quantum light offering world leading performance. The system architecture is based on the incorporation of an artificial atom, known as a quantum dot, in an on-chip optical resonator. Through careful engineering of the nanophotonic circuitry around the resonator the system is capable of operating at 10s of GHz speeds, delivering a train of single photon pulses to the output of an optical fibre with deterministic operation.

This simple turn-key operation of an iSPS system and world leading single photon performance enables new avenues of applications across a wide range of R&D areas including optical quantum computing, quantum imaging, microscopy and metrology.

The pioneering performance of the iSPS technology combined with the ability to operate at telecommunication wavelengths offers huge potential for the development of quantum secure communication networks based upon deterministic source of quantum light. Here, the technology can be deployed without major infrastructure changes and in the window of minimum atmospheric losses for free space quantum communication via satellites.

The company is actively engaged with several early adopters with a wide range of applications for their sources. AEGIQ is rapidly developing the systems around the technology with the aim of embedding their systems at the heart of the emerging global quantum networks.

Quantum Dice



For the development of verifiable and secure photonics to advance key industrial applications in security, simulation and AI.



The Company

Quantum Dice is an award-winning photonics technology spin-out from the University of Oxford. They are commercialising a source device-independent, self-certifying (DISC) quantum random number generator (QRNG) which generates unbiased, true random numbers.

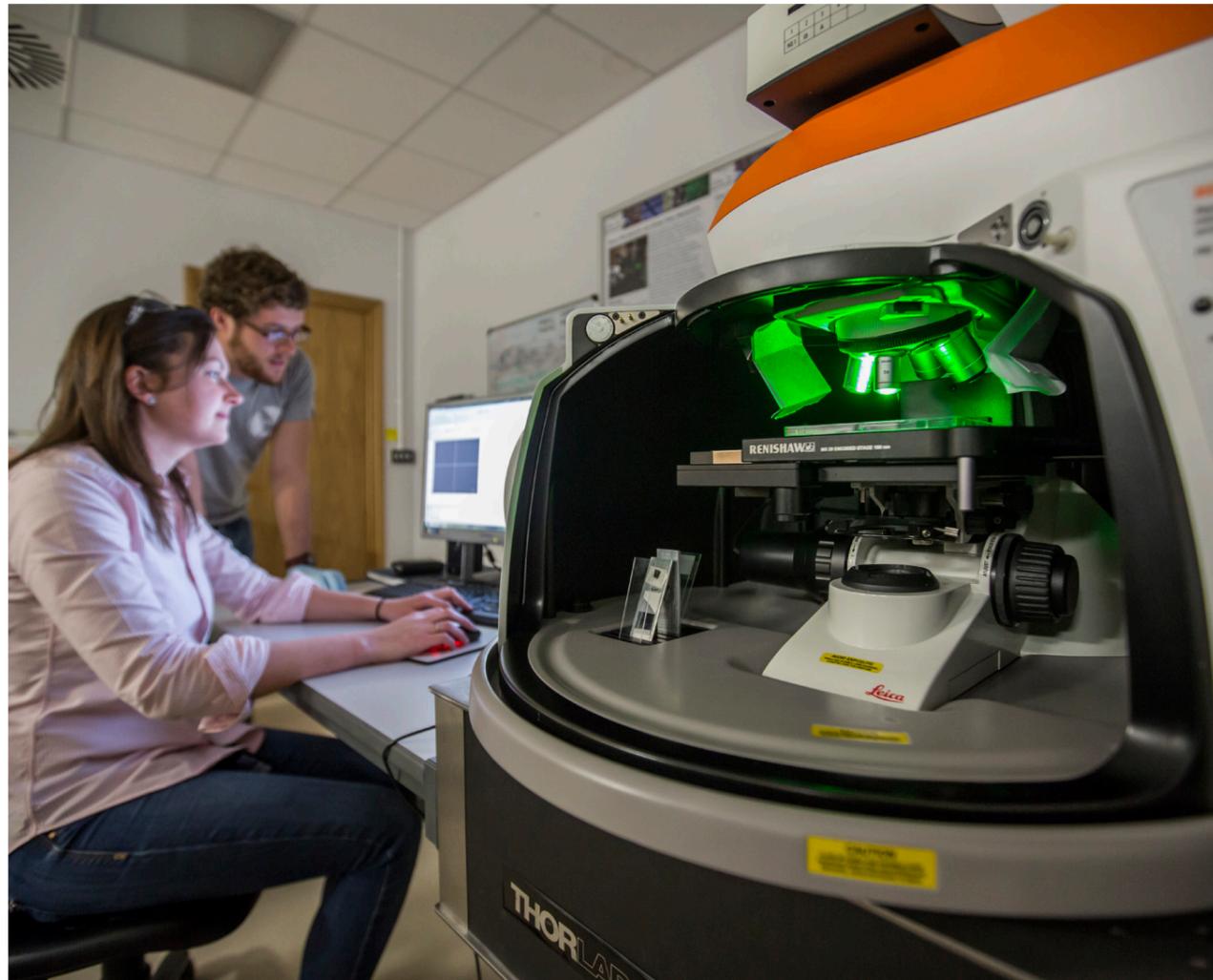
Quantum Dice is developing an innovative, device-independent and self-certifying, true (quantum) random number generator. The technology is focused on securing the key generation in the encryption market, to future proof the security of information.

A quantum random number generator (QRNG) uses the principles of quantum mechanics to generate truly random numbers. Source device independence in QRNGs means that the randomness assurance protocol considers all the physical components of the device may be imperfect and accounts for their varying reliability when assessing the amount of randomness that can be extracted from the quantum mechanical process.

The innovation that Quantum Dice brings is a self-certification routine that continuously assesses the available randomness, thereby guaranteeing that the output numbers have the maximum amount of randomness that could be extracted. The patented technology is the product of research conducted at the University of Oxford's Department of Physics, in the quantum optics group led by Professor Ian Walmsley, who is now Provost of Imperial College London.

The company uses advanced integrated photonics technology to produce high-quality randomness all from an on-chip laser source. The self-certification procedure offers higher security. It guarantees against the common problem of silent failure and external interference, while also significantly simplifying the complexity of the components required. This allows for a truly scalable device that offers a unique combination of speed, security and versatility of integration.

CanSense



For the early detection of bowel cancer, CanSense is developing an accurate, rapid, non-invasive, blood test combining Raman Spectroscopy and AI-based technologies to identify cancer metabolite activity in the blood.



The Company

CanSense is developing a non-invasive, blood-based diagnostic for the early detection of cancer. Using innovations in spectroscopy and AI-based analytics the test analyses cancer-driven metabolic activity in blood that our AI software is trained to interpret and diagnose. Our first test is a bowel cancer test for use by primary care practitioners.



CanSense are translating impactful academic and clinical research results to meet the growing global market in cancer diagnostics. CanSense is a start-up med tech company focused on developing blood-based assays that meet the need for accurate, fast, inexpensive and scalable tests for cancer using technology that has platform potential. Initial development is targeted towards the detection of bowel cancer. Additional cancers have been identified to maximise the utility and commercial potential.

CanSense seeks to significantly improve the accuracy of early-stage bowel cancer diagnosis and therefore patient outcomes.

CanSense's blood test could be widely used in primary care settings. The test produces a spectral 'fingerprint' from cancer activity in blood that their AI-software interprets using pattern recognition to diagnose cancer. Early results indicate that the blood test is very accurate in detecting bowel cancer. It is based upon Raman-spectroscopy applied to a blood sample and uses a trained AI algorithm to recognise the spectral response from patients with bowel cancer.

Unlike competitor technologies, its label-free method translates into a cost effective, scalable diagnostic which has been clinically tested in the UK and found to be highly accurate at detecting and ruling out bowel cancer and the polyps that precede cancer changes. Uniquely, the blood test can also detect pre-invasive polyps with a high level of accuracy. Introducing this disruptive technology for cancer prevention through earlier stage detection allows less invasive procedures, reduced treatment costs and shorter length of hospital stay, which are all important factors for prudent healthcare.

Ten years of IOP Business Award winners

Active Needle Technology

Advanced Hall Sensors

AEGIQ

Aeristech

Airbus Defence and Space

Aqua Cooling Solutions

Aurox

CanSense

Causeway Sensors

Cellular Highways

Coherent Scotland

Creavo Medical Technologies

Displaydata

e2v

Elekta

Endomag

FeTu

FFEI

Gas Sensing Solutions

Geotopic Infrastructure Investigations

Gooch & Housego

Hallmarq Veterinary Imaging

Hirst Magnetic Instruments

Horiba

ICEoxford

Ikon Science

Innovative Physics

Jaguar Land Rover

Kromek

Leonard

Lightpoint Medical

Lynkeos

M Squared

Magnox

Matoha Instrumentation

MBDA

Metrasens

MR Solutions

Naneum

Nebu-Flow

Novosound

Opsydia

Ossila

ON

ORCA Computing

Oxford HighQ

Oxford Space Systems

OxMet Technologies

PepsiC

Photon Force

Plastipack

Promethean Particles

pureLiFi

QLM Technology

Quantum Dice

Reaction Engines

Rolls-Royce

Silixa

Simpleware

Sonobex

Stream Bio

Tesla Engineering

The Technology Partnership

Thornton Tomasetti Defence

Toshiba Europe

Tracerco

Ultra Electronics

VeriVin

York Instruments

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