

Quantum Dice raises £2 million in pre-seed funding to revolutionise the security of encryption keys

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Oxford University Spinout, [Quantum Dice](#), announces the completion of its pre-seed fundraise, where a £1 million venture capital consortium was led by the notable venture capital fund, Elaia Partners, and includes IP Group plc, and the UK Innovation and Science Seed Fund (UKI2S) managed by Midven, part of the Future Planet Capital group. A further £1 million of non-dilutive grant funding was secured from the Quantum Investment Accelerator run by IP Group plc in partnership with Innovate UK, the United Kingdom's innovation agency.

Quantum Dice aims to secure a connected future by leveraging integrated photonics technology to develop the world's first compact and continuously self-certifying quantum random number generator (QRNG) for encryption and cybersecurity.

A vulnerability at the core of our security infrastructure

In a world that is expected to be connected through 75 billion IoT devices [by 2025](#), cybersecurity is quickly becoming one of the most critical priorities for governments and the private sector alike. However, incidents such as the [2013 Taiwan Smart Card breach](#) have shown that without a secure and reliable source of random numbers, even the best encryption systems can be vulnerable to attacks. Driven by their belief that our vital digital infrastructure is only as strong as its most vulnerable components, the team behind Quantum Dice is pioneering a solution for secure randomness based on quantum optics to address the flaws with the currently available technology.

“Despite multiple wide-reaching security failures, there is this widespread belief that current random number generators are good enough. This is because, so far, it's difficult to prove or quantify the security advantages of quantum random number generators. Quantum Dice's patented technology is here to change that, aiming to make quantum security accessible to all encryption applications.” - Dr Ramy Shelbaya, CEO and co-founder of Quantum Dice.

Leveraging the quantum nature of light

Current attempts to improve the security of random number generators rely on components that are either expensive, difficult to integrate or, more often than not, both. Using manufacturing-friendly optical circuits, Quantum Dice aims to directly address these shortcomings with its patented source-device independent self-certification (DISC™) protocol. DISC™ allows for live continuous verification of the security of the output numbers rather than simply relying on statistical analysis.

Founded in April 2020, Quantum Dice is a spinout from the University of Oxford's Department of Physics where the DISC™ protocol was originally developed in Oxford's world-leading Quantum Optics research group headed by Prof. Ian Walmsley. This initial QRNG prototype was already breaking records with its extremely fast generation rate of [8.05 Gbps](#) of quantum-secure randomness. Quantum Dice was co-founded by George Dunlop, Marko Mayr, Ramy Shelbaya, Zhanet Zaharieva and Wenmiao Yu, all from the winning team of the inaugural Student Entrepreneurs' Programme (StEP) organised by Oxford Science Innovation, the Oxford Foundry and Oxford University Innovation. Recognising the potential value to cybersecurity that existed in the research done by the quantum optics group, the five co-founders set out

a development and go-to-market plan which won them the competition leading to the birth of Quantum Dice.

Technology from the cutting edge of scientific research

In the short time since it was established, Quantum Dice has already gained international recognition: it graduated from the Creative Destruction Lab's world-renowned quantum accelerator in Toronto, was named one of Thames Valley 2021 gamechangers, and selected as one of fourteen international finalists with the most promising future technologies in OneWeb's 2021 Innovation Challenge, amongst other achievements. Quantum Dice is also the first company to be awarded funding through Innovate UK's Investor Partnership Programme.

Over the next few years, Quantum Dice aims to complete the development of its first commercial quantum random number generator device bringing the benefits of DISC™ to the frontlines of the quest for better information security.

Commercialising technology based on new innovations in Physics is never an easy task. To support this development, Quantum Dice is partnering with Elaia, IP Group plc and UKI2S (managed by Midven, now part of Future Planet Capital); three leading deep-tech venture capital firms with extensive expertise in supporting spinouts from academia and commercialising innovation. With this fundraising, Quantum Dice will have the necessary resources to expand the team and accelerate the miniaturisation of the DISC™ technology into a device that meets the needs of the market.

Anne-Sophie Carrese, partner at Elaia: *"We were convinced by the founders of Quantum Dice, some of whom had very strong relationships with one of the best Academics. We bring our experience in investing in quantum startups, our exclusive connections with the best research establishments, and our network of business partners, who have already expressed commercial interest, particularly in the areas of secure communications and financial models."*

Dr. Manjari Chandran-Ramesh, Investment Director at IP Group plc noted: *"We believe the technology and IP that we have seen in Quantum Dice is very differentiated. Given IP Group's decades of experience in building successful deep tech business, we are excited about this company joining other companies in IP Group's quantum portfolio benefiting from the ecosystem. Further, we are delighted that Quantum Dice is the first company to go through our Quantum Accelerator programme in partnership with Innovate UK."*

Additionally, due to the importance that the UK government places on ensuring the future of secure random number generation, Innovate UK is supporting Quantum Dice by funding multiple R&D projects aimed at developing a commercially ready QRNG for various applications as well as developing internationally recognised hardware standards for QRNGs. On the latter project, Quantum Dice is partnering up with a consortium of partners led by the National Physical Laboratory (NPL), an internationally renowned standards institute. The development of recognised standards for QRNGs that are testable by third parties will be an essential step for the wider adoption of this technology and for the recognition of the unique benefits that it brings.

Andrew Muir, Investment Director & Fund Principle, UKI2S, commented: *"Quantum Dice's new technology has the potential to transform information security. We're pleased to be part of such an experienced group of investors joining the funding round, providing vital guidance and expertise to the founders. The certification project with UKI2S's fund partner, the National Physical Laboratory (NPL) will be an important*

contribution to internationally recognised standards for this technology to drive adoption in our evermore global world.”

Notes to Editors

About Elaia

Elaia is a European top-tier VC firm with a strong tech DNA. It backs tech disruptors with global ambition from early stage to growth development. For the past 19 years, Elaia’s commitment has been to deliver high performance with values. We are proud to have been an active partner in over 100 startups including success stories such as Criteo (Nasdaq), Orchestra Networks (acquired by Tibco), Volterra (acquired by F5), Mirakl (valued \$3.5B in Series E) and Shift Technology.

Learn more <http://www.elaia.com> Twitter: [@Elaiia_Partners](https://twitter.com/Elaiia_Partners)

About IP Group

IP Group is a leading intellectual property commercialisation company which focuses on evolving great ideas, mainly from its partner universities, into world-changing businesses. The Group has pioneered a unique approach to developing these ideas and the resulting businesses by providing access to business building expertise, capital (through its 100%-owned FCA-authorised subsidiaries IP Capital and Parkwalk Advisors), networks, recruitment and business support. IP Group has a strong track record of success and its portfolio comprises holdings in early-stage to mature businesses across life sciences and technology. IP Group is listed on the Main Market of the London Stock Exchange under the code IPO.

About the UK Innovation & Science Seed Fund (UKI2S)

UKI2S is a national seed investment fund that nurtures innovative businesses from great UK science to leverage private investment and grow jobs. The Fund is independently managed by specialist venture capital firm Midven, part of Future Planet Capital <https://futureplanetcapital.com/>, the impact-led, global venture capital firm built to invest in high growth potential companies from the world's top research centres. We provide the patient, long-term committed capital and strategic advice these companies need to flourish. Over the past decade and more, UKI2S has built a substantial track record of companies that between them have attracted over £600m of later stage investment. Learn more <http://ukinnovationscienceseedfund.co.uk/>. Twitter: [@UKI2S](https://twitter.com/UKI2S)