AIT advances European technological development on next generation quantum communication systems

Austria demonstrated its international technological and scientific leadership in optical quantum technology in the recent highly competitive Quantum Flagship programme in Europe. The newly conceived initiative focuses on quantum technology development for the mass market.

Vienna, 27. June 2018 (AIT): Through its reputation as an expert in the field of quantum technology and renowned coordinator of European projects, the AIT Austrian Institute of Technology has scored highly with its latest proposal on the innovative European Quantum Technology Flagship project "UNIQORN – Affordable Quantum Communication for Everyone: Revolutionizing the Quantum Ecosystem from Fabrication to Application". This endeavour, which has been spearheaded by AIT scientist and photonics expert Bernhard Schrenk, was selected for funding by the European Commission within the first Flagship call of the Horizon 2020 framework. UNIQORN's goal is to link innovative yet user-oriented research on the quantum frontier with near-future exploitation of early prototype components and system-on-chip implementations in a growing market with vast potential. The project kick-off is planned for October 2018.

UNIQORN's mission is to provide the enabling photonic technology to accommodate quantum communications, by shoehorning complex systems, which are presently found on metre-size breadboards, into millimetre-size chips. These systems will not only reduce size and cost, but will also bring improvements in terms of robustness and reproducibility.

Bernhard Schrenk sees the continuous and successive advancement of photonic integration technology as one of the main drivers to address the big challenge that lies ahead: "The success of the second quantum revolution as foreseen through the European Quantum Flagship is only possible if it follows a similar success story to microelectronics, which led the world into the Information Age" he says. "Revolution through evolution!"

Key technologies for the quantum computer of the future

As a 3-year project UNIQORN will develop the key components for quantum communication systems such as true random number generation and highly secure key-distribution. This includes specialized optical sources and detector technology, which will be realized on mainstream fabrication platforms – similar to those used for the mass fabrication of microelectronics. System-on-chip integration will be an essential part of the research work and will lead to highly miniaturized quantum-optic systems that will unleash the potential of quantum mechanical features such as entanglement and light squeezing. The opto-electronic technology and assembly processes involved have been carefully selected in terms of cost

efficiency to deliver ultimate performance for the practical field deployment of quantum technology in the near future.

UNIQORN will be coordinated by Hannes Hübel, scientist and quantum expert at AIT. “There is no doubt that this project will help to bridge the Quantum Divide” he says. “By offering cost-optimized quantum technology, not only governments and big organisations but also the general public will benefit from the offerings of the Quantum Age.”

To this end UNIQORN will make the ambitious leap from quantum “fab” to quantum “app” as it evaluates its cutting-edge technology in novel protocols such as one-time programs or oblivious transfer, which one day will enable a wider range of end-users to exploit the power of quantum computing without investing directly in it. Experimental activities will include real-world testing in smart-city environments in tandem with a wide range of telecommunication applications.

Interdisciplinary consortium

The UNIQORN consortium includes 17 partners from all over Europe to address the multi-disciplinary research agenda and will be coordinated by AIT. Research & technology organizations (AIT Austrian Institute of Technology, Fraunhofer HHI, Interuniversity Microelectronics Centre) with extensive experience in turning basic science into applicable assets will work together with quantum engineers with strong roots in theory and experimentation (University of Vienna, Paderborn University, University of Innsbruck, Technical University of Denmark). Photonic and electronic design, integration and packaging activities will be supported by experts in the field (Eindhoven University of Technology, Micro-Photon-Devices, Politecnico Milano, Smart Photonics, Institute of Computer and Communication Systems Athens, VPI Photonics, Cordon Electronics). The industrial end-user perspective will be provided through a system vendor, Mellanox, and operator, Cosmote, whilst field evaluation activities will be conducted in the live smart-city test-bed run by the University of Bristol.

Quantum Technology Research @ AIT

The AIT Austrian Institute of Technology is Austria’s largest research and technology organisation and a specialist in the key infrastructure issues of the future. In the context of comprehensive and global networking and digitalisation, the Center for Digital Safety & Security is developing modern information and communication technologies (ICT) and systems designed to establish secure and reliable critical infrastructure.

AIT experts in the field of Optical Quantum Technologies focus on system design and integration of quantum cryptography solutions as well as product development using quantum inspired technologies to support research & development activities in quantum optics and other

applied research fields such as life sciences. The goal of this AIT core topic is to bring quantum technology from the laboratory to the customer. Further information:
https://www.ait.ac.at/quantum

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