UNIQORN

Affordable Quantum Communication for Everyone

The second Quantum Revolution will only happen when it follows a similar road to success as pioneered by the miniaturisation and integration of electronics. UNIQORN's mission is therefore to provide the enabling photonic technology to accommodate quantum communications, by integrating 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. This is not possible without:

REVOLUTIONIZING THE QUANTUM ECOSYSTEM FROM FABRICATION TO APPLICATION

Starting with advanced components optimized for quantum applications, UNIQORN will shoehorn entire quantum-optic systems into system-on-chip (SoC) realizations, leading to highly miniaturized solutions for further system- and network-level integration. Selected quantum applications beyond quantum key distribution will build on UNIQORN's highly integrated and yet cost-effective technology and will be evaluated in lab and field.

THE CONSORTIUM

- AIT Austrian Institute of Technology
- Paderborn University
- Technical University of Denmark
- SMART Photonics BV
- University of Vienna
- Mellanox Technologies Ltd
- Fraunhofer - Heinrich Hertz Institute
- Institute of Communications & Computer Systems, National Technical University of Athens
- University of Innsbruck
- Micro Photon Devices S.r.l.
- Eindhoven University of Technology
- VPIphotonics GmbH
- Politecnico di Milano
- University of Bristol
- COSMOTE Mobile Telecommunications S.A.
- imec - Interuniversity Microelectronics Centre
- Cordon Electronics Italia Srl

PROJECT METADATA

Topic: FET Flagship on Quantum Technologies
Type of Action: Research and Innovation Action
Start Date: 01/10/2018
Duration: 36 months
EU Contribution: 9,979,905 €

CONTACT

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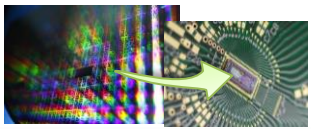
UNIQORN Quantum

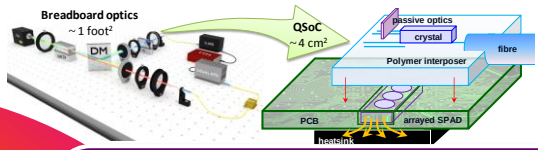
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 820474.

5 Objectives that drive innovation along the value chain



I. Develop value-added InP, CMOS and polymer quantum-optic communication components.

Quantum Fab



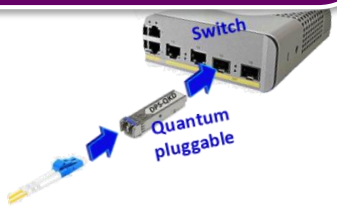
II. Shoehorning breadboards into chips – Develop a quantum System-on-Chip methodology.

Quantum App

V. Demonstration of low-cost quantum links and novel end-user quantum applications beyond QKD in lab and field.

III. Demonstrate the power of the technological food-chain: Realize feature-rich, scalable key sub-systems for quantum comms.

IV. Deployable system performance and novel network functionalities.



UNIQORN addresses 4 levels of quantum communication, covering the entire value chain

Components

- Differential Phase Shift DV Transmitter
- Homo-/Heterodyne CV Receiver

Quantum System-on-Chips

- Quantum Random Number Generator
- Heralded and polarization / time-bin entangled photon pair sources
- 1550 nm up-conversion receiver
- Entangled squeezed light source

Quantum Protocols and Applications

- One-Time Programs for cloud-based quantum processing
- Oblivious Transfer securing data base access
- QRNG as seed for NIC-integrated randomness engine
- Quantum-Secured IoT for Smart City and 5G

System Integration

- Low-Cost DPS QKD
- Quantum FPGA
- Programmable EPR Node
- Quantum ROADM

Network Integration

- Co-Existence:
  - Exploit the spectrally clean O-band
  - Electrically duplexed quantum signals
  - Machine-learning assisted allocations
  - Isolation through spatial multiplexing
- Quantum Networking:
  - Reconfigurable quantum overlay: the Quantum Whitebox
  - Quantum-aware SDN platform
  - Programmable EPR

QUANTUM Communication

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