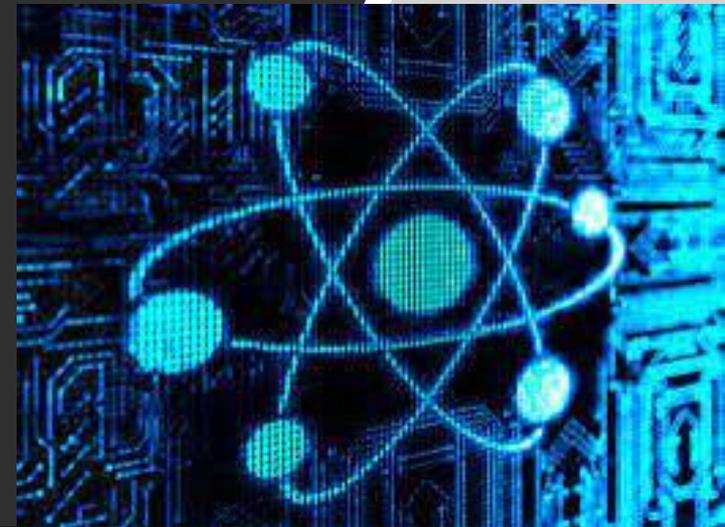


CZ-AT Photonics

Photonics Quantum
technologies –
Photonics Austria

Velké Pavlovice, 20.04.2023



Agenda

- Core working group & stakeholders
- Mission
- Focus areas
- Activities & cooperation

Core working group



Working group Lead

- **General**

- already courses established
- already lab established for teaching
- coming up: specialization quantum information in bachelor
- computer science

- **Main focus / research area**

- quantum computing: programming of algorithms
- Quantum cryptography
- Applications Quantum Information

- **Previous activities / projects**

- Summer School 2022
- CARLA Camp 2022

Activities Quantum Technologies



- General

- Approx. 50000 employees, 11 billion € turnover 2021
- Quantum technologies based on ions, Transmonen, Si Spins, color centers und Post Quanten Kryptografie
- QC Landing Page [Link](#)

- Focus / Research area

- 21 employees and quantum laboratory for trapped-ion
- QCChip development, manufacturing and quantum lab in Villach
- Goal: Hardware core of the first useful QC

- Activities to date

- TIQC F&E Projects with UIBK, ETHZ, JR, Leoben, SAL etc.
- TIQC Customer projects with eleQtron and Oxford Ionics

Activities Quantum Technologies



- General

- Non-profit, non-university research facility for the investigation of sensor technologies for non-destructive and non-contact material and process characterization.
- ~40 employees, ~4 M€ annual turnover, funded by grant projects (~85 %) and direct industry collaborations
- Application and method development around IR/Raman spectroscopy, optical coherence tomography (OCT), THz & laser ultrasound

- Focus / Research area

- Non-linear interferometer concepts ("Sensing with undetected photons")Application of optically pumped magnetometers

- Activities to date

- MIR OCT with undetected Photons (<https://doi.org/10.1364/OPTICA.400128>)
- Project „QUICK“ started with 1.1.2023

Activities Quantum Technologies



- General
 - Key enabling technologies for industrial innovation
 - Dossier: Quantum technologies
- Focus / Research area
 - Interface for networking, communication, dissemination, cross-border activities, ...
- Activities to date
 - Sherpa EuroQCI
 - AT Beirat QCI → QT
 - ...

Activities Quantum Technologies

 Bundesministerium
Klimaschutz, Umwelt,
Energie, Mobilität,
Innovation und Technologie

Further stakeholders in Austria

- **Basic research & Education:**

- Uni Innsbruck
 - PhD-College ALM
- Uni Wien, Uni/TU Wien
 - VCQ – Vienna Center for Quantum Science and Technology
 - PhD-College CoQus
- SFB FoQuS – Foundations and Applications of Quantum Science (Innsbruck/Wien)
- Austrian Institute of Technology (AIT)
- Uni Linz, Uni/TU Graz
- FH Technikum Wien
- Institut for Science and Technology Austria (IST Austria)

Further stakeholders in Austria

- **Networking multipliers:**

- Quantum network community
 - Jörg Schmidtmayer
 - Gregor Weihs
- ÖAW (Österreichische Akademie der Wissenschaften):
Erwin Schrödinger Center for Quantum Science &
Technology (ESQ)
- Photonics Austria – Working group QUANTEN

Further stakeholders in Austria

• Unternehmen

Research & Development

- Alpine Quantum Technologies (AQT)
- ID Quantique Europe
- Infineon
- ParityQC
- qtlabs
- Recendt
- SAL
- JOANNEUM RESEARCH

Supplier

- Atos Österreich
- Roithner Lasers
- Spectra-Physics (HighQ Lasers)
- Tulon Photonics

User

- Novarion Systems
- FragmentiX
- ASA

Further stakeholders in Austria

PHOTONICS
AUSTRIA

A photograph of Anton Zeilinger, an elderly man with white hair and a beard, wearing glasses and a blue suit. He is standing at a wooden podium with a microphone, looking down at a small object in his hands. The background is a dark blue wall with a grid pattern.

Anton Zeilinger

Nobelpreisträger für Physik 2022



Focus areas - Roadmap

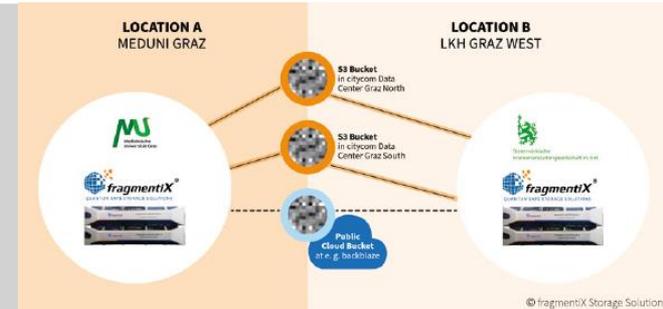
Quantum communication

Quantum key distribution, Quantum Optics



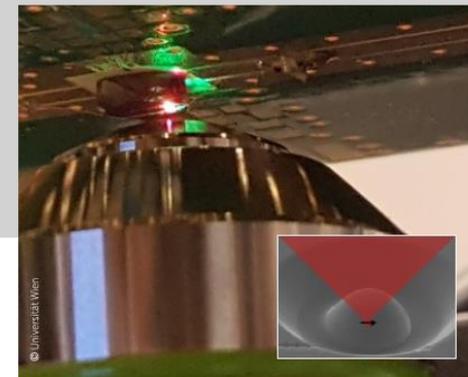
Quantum Sensing

magnetic field sensors, gravimeter and gradiometer, imaging



Quantum computing

Commercialization Quantum computer



Mission

- The working group QUANTUM is committed to strengthening the European quantum industry with a focus on photonics technologies.
- To this end, the networking of relevant companies & research institutions shall be promoted, thereby establishing the basis for a competitive European industry for quantum technology. In public, the European quantum industry shall be considered as a prime example for an innovative, dynamic and future-oriented network.
- Additionally, steps shall be taken by the working group to increase the visibility of quantum technology, to underline its relevance and to show its potentials.

Target groups

Industry
(PA-members)

BMK

Public

Activities & cooperation

The main goal is to promote innovation in quantum technology. Specifically, the goals are

- to coordinate Austrian quantum activities and to link companies located in this industry
- to organize events to provide information on quantum technologies
- to screen funding in the field of quantum technologies
- to strengthen Austria's position in the European and international environment
- to consolidate and expand Europe's scientific leadership and excellence

In addition, research in the fields of communication, sensors, simulators and computers will be supported. In order to be able to realize these developments, excellent, transformative and innovative basic research will be supported.

The new QUANTUM working group is intended to mobilize players in quantum research and help new technologies to achieve breakthroughs.

National funding

- Development and Resilience Plan (2020-2026), the FFG and FWF are implementing the Quantum Austria Funding Initiative
- 2021-2026 ~107 Mio €

BMBWF funding decisions (up to 31/12/2022)

| | | |
|---|----|-------------|
| Approved projects and funding | 20 | €64,130,553 |
| R&D Infrastructure | 10 | €49,639,911 |
| Individual Project (IR) | 4 | €2,319,045 |
| Cooperative R&D Project | 5 | €7,797,536 |
| Flagship Project | 1 | €4,374,061 |
| Participations (number of project partners) | 55 | |
| Universities | 29 | €53,204,264 |
| Research organisations | 9 | €4,275,430 |
| SMEs | 11 | €5,980,125 |
| Large enterprises | 5 | €586,854 |
| Other | 1 | €128,880 |
| Of which total international partners | 6 | €1,090,377 |



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NextGenerationEU



Bundesministerium
Bildung, Wissenschaft
und Forschung



FFG
Forschungsförderungsgesellschaft



FWF
Der Wissenschaftsfonds

$$i\hbar \frac{\partial}{\partial t} \psi(r,t) = \left(-\frac{\hbar^2}{2m} \Delta + V(r,t) \right) \psi(r,t)$$



QUANTUM AUSTRIA

Activities & cooperation

Advocacy

Goal:

- Associate Photonics with “Quantum”
- Establish topic in the mind of ministry
- Acquire funding for Quantum Photonics

Activities:

- Quantum – working group (10 Members)
- Roadmap chapter
- Events (CARLA Capsule, Delegation visit, projects)
- Cooperation with the ministry (Workshops)

WG Quantum technologies – Future development

- Further publications working group - Infolyer
- WS & PA association meeting with focus on Quantum
- Possible cooperation for EUREKA-program?

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