

Technology transfer roundtable @IQIS 2017

Transferring Second Generation Quantum Technology to Daily Life

Florence - September 13, 2017

Agenda

- Introduction
 - Why Quantum Technology
 - The second quantum revolution
 - The EU Quantum Manifesto & initiative
 - IQIS 2017
 - ScienceConvey
- Workshops
 - Quantum Sensors
 - Quantum TelCo & Security

Quantum Technology

**Not science fiction
any more!**

**But a business and
funding opportunity
to jump ahead of
competition and
create new markets**



Why Quantum Technology

- A new era of technology
- Previously untapped aspects of quantum theory **are ready to be used as a resource in technologies and industrial applications.** These could result in **revolutionary improvements** in terms of capacity, sensitivity and speed, and will be the **decisive factor for success** in many industries and markets
- Benefit from advances in quantum technologies can provide **better solutions to grand challenges** in such fields as energy, healthcare, security and the environment

Quantum Technology to-date

- The first quantum revolution – understanding and applying physical laws in the microscopic realm – resulted in groundbreaking technologies such as the transistor, solid-state lighting and lasers, and GPS
- We are now required to **look at the world in a fundamentally new way**: objects can be in different states at the same time (superposition) and can be deeply connected without any direct physical interaction (entanglement)

The second Quantum revolution

- There are **many transformative applications**, in four main areas:
 - **Communication**: based on quantum coherence, data can be protected in a completely secure way that makes eavesdropping impossible
 - **Simulators**: design of chemical processes, new materials, such as higher temperature superconductors
 - **Sensors**: higher sensitivity and accuracy with applications , among others, in healthcare and detection of defects in metals
 - **Computers** are expected to be able to solve, in a few minutes, problems that are unsolvable by the supercomputers of today and tomorrow
- **Strong shared interest** by Research & Industry
- Availability of institutional, public & private **funding**

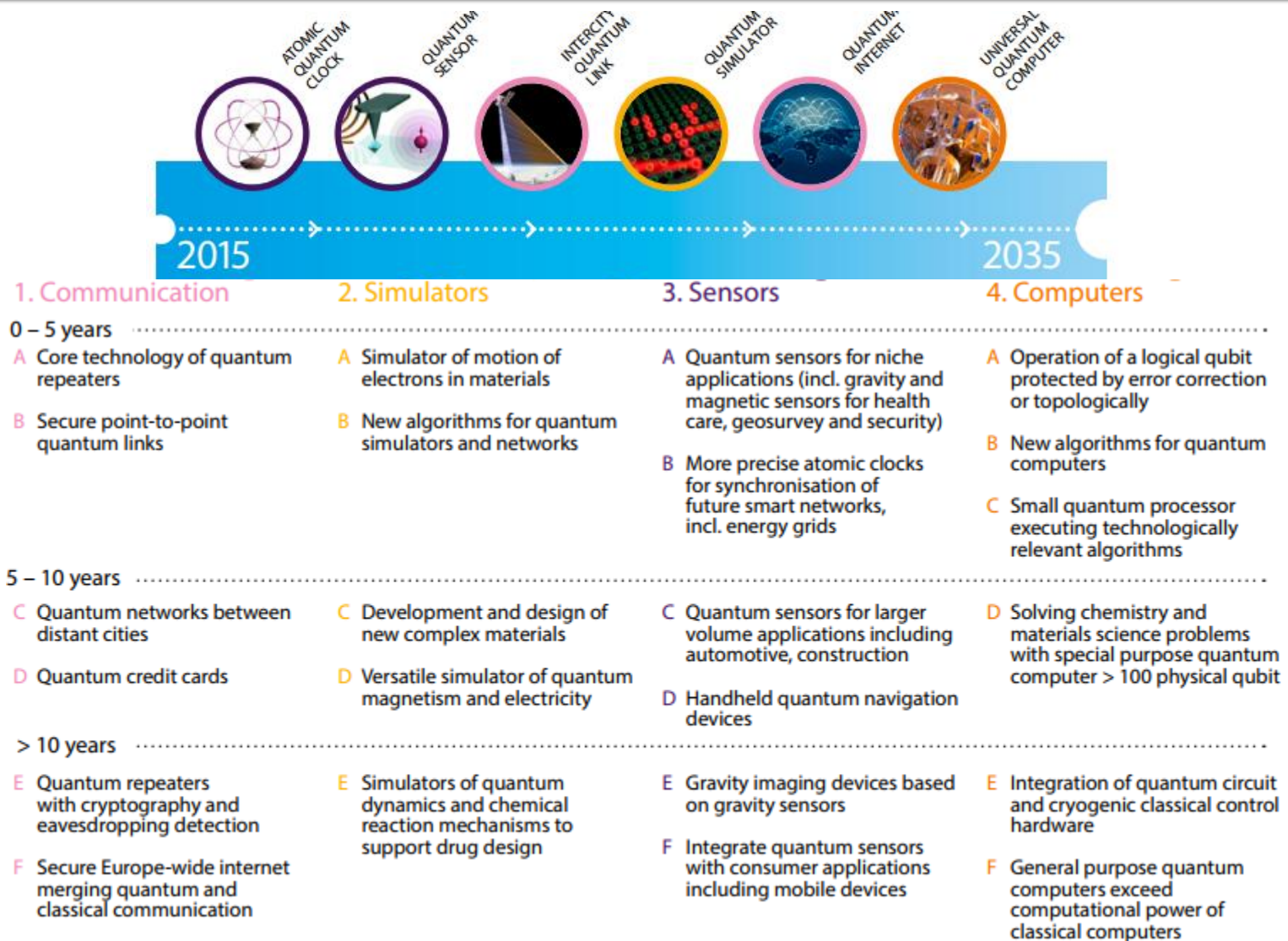
The EU Quantum Manifesto

- A call to launch an **ambitious European initiative in quantum technologies**
- To ensure Europe's leading role in a **technological revolution** now under way
- Endorsed by a broad community of industries, research institutes and scientists in Europe
- **Start in 2018** within the European H2020 research and innovation framework program

The EU quantum initiative

- Bringing **transformative advances** from science, industry and society
- **€1 billion** flagshipscale initiative in Quantum Technology
- Create new **commercial opportunities** addressing **global challenges**, provide **strategic capabilities** for security and seed as yet unimagined capabilities for the future
- Create a **lucrative knowledge-based industry**

Quantum tech EU timeline



IQIS 2017

10th Italian Quantum Information Science Conference

Florence 12-15 September, 2017

<http://iqis2017.qdab.org/iqis2017.html>

Forthcoming event that aims to bring together researchers from around Italy and the world

Academia will have the opportunity to meet Industry and **establish collaborations**

On September 13th IQIS will host a plenary session plus two dedicated workshops to give the first flavor of **potential QT industrial projects**

Workshop A on **Quantum Sensors** and Workshop B on **TelCo and Security**, each with dedicated invited speakers. Representation is already confirmed by Leonardo, Ericsson, ID Quantique, SeeQC, ST Microelectronics, Unicredit, and more.

ScienceConvey

ScienceConvey is managing the Industrial Sessions organization together with the Academic representatives. ScienceConvey is an initiative whose general aims are:

- Facilitating a new level of coordination between **Academia** and **Industry**
- Moving advances in quantum technologies **from laboratory to industry** by fostering **technology transfer**
- Managing **funding**

ScienceConvey

- **Mentoring** entrepreneurs
- Facilitating and act in **high potential** start-ups & spin-offs
- Supplying **competences** and **networking**

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Workshop A

Quantum Sensors

Workshop A: q-Sensors

- Superposition states are naturally very sensitive to the environment, and can therefore be used to make **very accurate sensors**
- As a result of steady progress in material quality and control, cost reduction and the miniaturization of components such as lasers. These devices are now ready to be carried over into numerous commercial applications
- Solid-state quantum sensors are useful for measuring very small magnetic fields. This in turn may help with **multiple applications**, from biosensors to magnetic resonance imaging and the detection of defects in metals
- Superconducting quantum interference devices are one example of an early quantum technology now in widespread use, in fields as diverse as brain imaging and particle detection

WS A: Opportunities & Applications

Opportunities

- Gravity and magnetic sensors
- Higher synchronization of systems
- Higher sensitivity and resolution
- ...

Applications

- Healthcare
- Geosurvey
- Security
- More precise atomic clocks for smart networks (including energy grids)
- Gravity imaging

... what do YOU imagine?

Workshop B

Quantum Telecommunications & Security

Workshop B: q-TelCo & Security

- A secure **intercity quantum link** between a number of European capitals will allow **transmission of highly sensitive data without any risk of interception**. It may contain ground or satellite-based protected nodes derived from the development of trusted nodes and quantum repeaters
- A global **quantum-safe communication network** – a quantum internet combining quantum with classical information and encryption – offers **security for internet transactions against the threat of a quantum computer**, breaking purely classical encryption schemes

WS B: Opportunities & Applications

Opportunities

- Transmission of highly sensitive data without any risk of interception
- Secure point-to-point communications
- Financial transactions security
- ...

Applications

- Data communications
- New internet
- Small quantum processor executing technologically relevant algorithms
- Quantum credit cards
- Mobile devices

... what do YOU imagine?