Quantum Technologies foster a new initiative in Europe

- ***The Quantum Flagship, a 1b€ and 10yr initiative will be launched in Vienna, Austria on October 29th***
- ***The overall initiative will involve the quantum community at large, with over 5000 European researchers in academia and industry searching to place Europe at the forefront of Quantum innovation.***
- ***20 projects have been selected out of 140 submitted proposals for the ramp-up phase of the initiative.***

Vienna, October 29, 2018

On October 29th, Europe will witness the start of a new and promising initiative known as the Quantum Flagship. This initiative is already positioning itself as one of the most ambitious of the European Union with a 1b€ budget funded by the European Commission. It will support large-scale and long-term research and innovation projects that will have the main goal of transferring quantum physics research from the lab to the market by means of commercial applications.

Over these next 10 years, the initiative intends on placing Europe at the forefront of the second quantum revolution, which is now unfolding worldwide. It aims to bring disruptive quantum technologies to the scientific arena and to society in general by bringing forward new commercial opportunities addressing global challenges, providing strategic capabilities for security and seeding yet unimagined applications for the future. It will build a network of European Quantum Technologies programs that will foster an ecosystem capable of delivering the knowledge, technologies and open research infrastructures and testbeds necessary for the development of a world-leading knowledge-based industry in Europe.

Prof. Tommaso Calarco, from the Institute for Quantum Control of Forschungszentrum Jülich and coordinator of the *Quantum Coordination and Support Action* in charge of successfully launching the Quantum Flagship mentions, "*The European Quantum Technologies community has worked long and hard towards realizing this initiative. We are very happy that the first research and innovation actions are now ready to start with high momentum. Together, we will further strengthen Europe's leading role in quantum research and transfer the insights from this into relevant applications for the benefit of all European citizens.*"

The kick-off meeting of this initiative will take place in Vienna on October 29th, 2018 and will summon many of the most relevant quantum physicists and technologists in Europe. The European quantum community is very large and diverse, and throughout its 10-year lifespan, the Flagship will count with the commitment and involvement of over 5000 researchers from the academia and industry communities.

The initiative has divided all topics in five main areas of study: ***Quantum Communication (QComm), Quantum Computing (QComp), Quantum Simulation (QSim), Quantum Metrology and Sensing (QMS), and finally, Basic Science (BSci)***. The first 3-year phase of the Quantum Flagship, named the ramp-up phase, will run through October 2018 – September 2021. It will fund projects with an overall budget of 132 million euros with the goal of pushing the field to its farthest frontiers. From the 140 submitted proposals, 10 were for QComm, 11 for QComp, 6 for QSim, 22 for QMS, 90 for BSci, and one for a Coordination and Support Action. After a thorough peer-review evaluation, 20 projects, involving over 500 researchers, have been selected to be executed during these first three years.

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Additional Information

Link to the Streaming of the Kick-off event (Monday): https://bit.ly/2R65bNV

Institutional launch in Vienna on 29th 2018

The launch of the Quantum Flagship will take place in the historical site of the ***Hofburg*** in Vienna, and will combine institutional sessions in which the initiative will be presented, with networking and technical sessions, to help network the different parties, including researchers from academia and industry, educators and decision makers.

Different segments of the quantum community will be present:

- Policy makers
- Researchers in quantum technologies
- Educators in quantum technologies
- Representatives of industry related to the quantum flagship
- Members of governing bodies

The event is organized by the Quantum Support Action (QSA) on behalf of the European Commission and the Austrian Presidency of the Council of the European Union. Professor Frank Wilhelm-Mauch of Saarland University is the head of the organizing committee. The core event has been divided in two distinct sessions; the morning one will be devoted to project presentations and networking, and in the afternoon, the institutional will entail the Festive opening of the Quantum Flagship, where distinguished academic, industrial, and political leaders will talk about the vision and the potential of quantum technologies.

It is expected that several Ministries, State Secretaries or other representatives related to research, science, innovation areas from different countries will participate in the event.

Satellite events on 30 October will take place in the Austrian Academy of Sciences devoted to working sessions to further the foreseen agenda for the Flagship and constitute the SEB and the SRA and Innovation working groups.

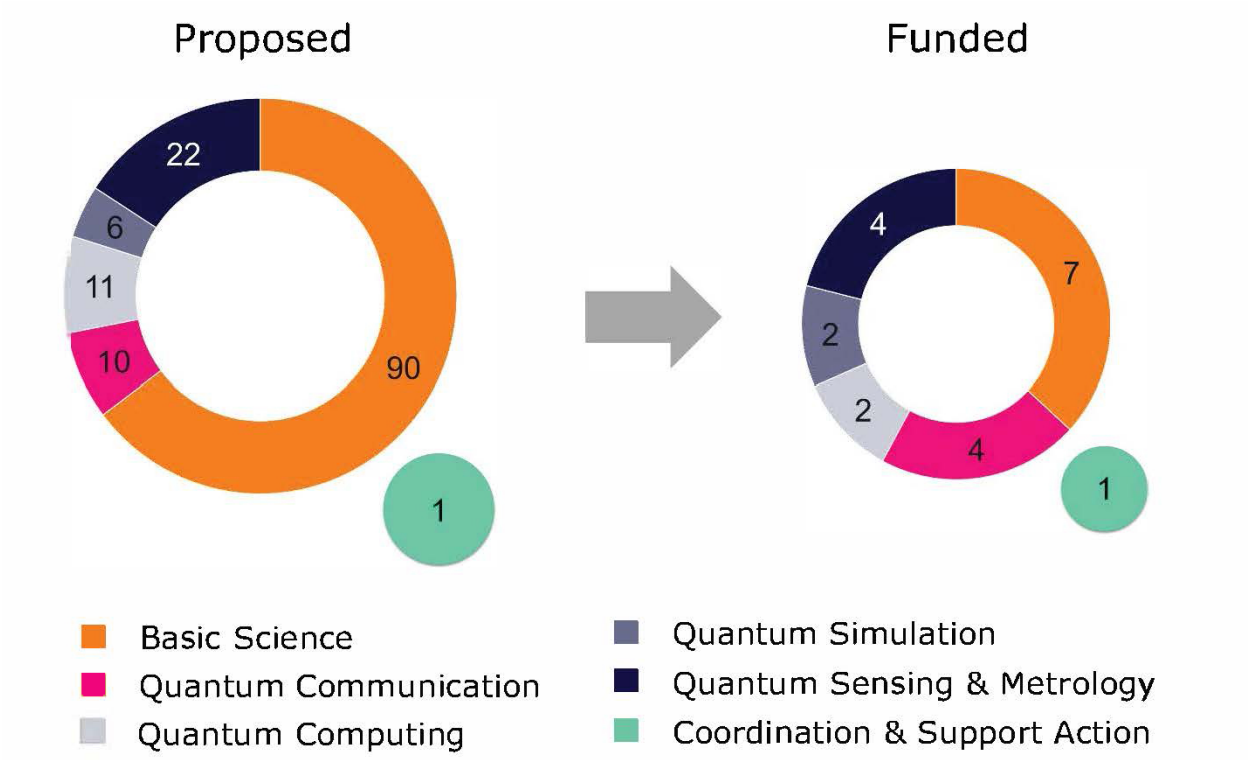
Governance of Quantum Flagship

The Quantum Flagship aims at a coordinated effort to bundle complementing efforts. This is reflected in its governance: A *Strategic Advisory Board (SAB)* monitors the Flagship progress and recommends to the EC appropriate measures. Prof. Dr. Jürgen Mlynek, former president of the Helmholtz Association of German Research Centers and chairman of the Falling Walls Foundation has been appointed as its chair. The *Science and Engineering Board (SEB),* with representatives from all funded projects plus four representatives of the Quant-Era projects, ensures a steady flow of information between the projects and foster synergies, such as joint use of fabrication facilities, and exploitation of project results in other projects. The *Quantum Community Network (QCN)* with representatives from the QT community of each EU member state and associated country is responsible for involving the broader QT community and helps to coordinate the interaction with national initiatives. Additionally, a *Coordination and Support Action (CSA)*

has been called for to act as a support organization and to coordinate all non-scientific collaboration and public outreach.

Submitted/Approved Projects per Area of Study

A total of 20 projects have been selected for the ramp-up phase (first three years) of the Flagship out of a total of 140 proposals. A list of all selected projects and leader coordinating institutions, with a brief overall view description of the project's goals, is included at the end of the document.



Number of project proposals (left) and accepted projects (right) per area in the first Quantum Flagship call

About the Quantum Flagship

The Quantum Flagship was launched in 2018 as one of the largest and most ambitious research initiatives of the European Union. With a budget of €1 billion and a duration of 10 years, the flagship brings together research institutions, academia, industry, enterprises, and policy makers, in a joint and collaborative initiative on an unprecedented scale. The main objective of the Flagship is to consolidate and expand European scientific leadership and excellence in this research area as well as to transfer quantum physics research from the lab to the market by means of commercial applications and disruptive technologies. With over 5000 researchers from

academia and industry involved in this initiative throughout its lifetime, it aims to create the next generation of disruptive technologies that will impact Europe's society, placing the region as a worldwide knowledge-based industry and technological leader in this field.

List of Selected Projects and Leader Coordinating Institution

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Title	Acronym	Coordinator name	Coordinator organisation	Description of the Project
Basic **Science**				
Two-dimensional quantum materials and devices for scalable integrated photonic circuits	2D-SIPC	Dmitri Efetov	ICFO, Spain	The goal of 2D-SIPC is to engineer quantum networks, based on scalable on-chip integration of novel 2D materials into integrated photonic circuits (IPC). Such quantum processors will facilitate the development of quantum computers and will provide a new platform for secure quantum communication protocols.
Microwave driven ion trap quantum computing	MicroQC	Nikolay Vitanov	Foundation for Theoretical and Computational Physics and Astrophysics, Bulgaria	MicroQC aims to demonstrate, through state-of-art quantum engineering, fast and fault-tolerant two-qubit and multi-qubit gates in microwave-controlled microfabricated ion traps and to design scalable technology components for multi-qubit quantum processors.
Sub-Poissonian Photon Gun by Coherent Diffusive Photonics	PhoG	Natalia Korolkova	The University Court of the University of St Andrews, United Kingdom	The goal of the project is to deliver a compact, versatile, deterministic source of quantum light, PhoG, based on integrated waveguide networks with engineered loss, and to develop its applications in metrology and other quantum technology tasks.
Photons for Quantum Simulation	PhoQuS	Alberto Bramati	Sorbonne Universite, France	The aim of PhoQus is to develop a novel platform for quantum simulation, based on photonic quantum fluids, realised in different photonic systems with suitable nonlinearities, allowing to engineer an effective photon-photon interaction. In such platform, we will simulate systems of very different nature, ranging from astrophysics to condensed matter.
Quantum Microwave Communication and Sensing	QMiCS	Frank Deppe	Bayerische Akademie der Wissenschaften, Germany	QMiCS sets up a quantum microwave local area network cable connecting two superconducting quantum nodes over a distance of several meters. Using this architecture, key steps towards

				quantum communication, distributed quantum computing and quantum sensing with microwaves are taken.
Scalable Two-Dimensional Quantum Integrated Photonics	S2QUIP	Klaus Jöns	Kungliga Tekniska Hoegskolan, Sweden	S2QUIP will develop scalable cost-effective quantum photonic hybrid microsystems by integrating 2D semiconductor materials in CMOS compatible photonic circuits. S2QUIP will provide the community with on-chip quantum light sources for quantum simulation, communication, metrology and sensing.
Scalable Rare Earth Ion Quantum Computing Nodes	SQUARE	David Hunger	Karlsruher Institut fuer Technologie, Germany	SQUARE aims at establishing individually addressable rare earth ions as a fundamental building block of a quantum processor node, where multiple qubits can be used for quantum storage, quantum gates, and optical interfacing.
Quantum Communication				
Continuous Variable Quantum Communications	CiViQ	Valerio Pruneri	ICFO, Spain	The goal of the CiViQ project is to provide optical telecommunication networks with unconditional security by developing quantum key distribution technologies with an unprecedented level of flexibility and cost-effective integration into current infrastructures.
Quantum Internet Alliance	QIA	Stephanie Wehner	Technische Universiteit Delft, Netherlands	The Quantum Internet Alliance will create a Blueprint for a pan-European Quantum Internet by developing all essential subsystems - quantum repeaters, end nodes as well as the first quantum network stack - culminating in the first experimental demonstration of a fully integrated stack running on a multi-node quantum network.
Quantum Random Number Generators: cheaper, faster and more secure	QRANGE	Hugo Zbinden	Universite de Geneve, Switzerland	Based on new concepts, QRANGE will develop prototypes of quantum random number generators that are cheap and compact or faster and more secure. We complement these technical advancements with use-case specifications and a certification framework.
Affordable Quantum Communication for Everyone: Revolutionizing the Quantum Ecosystem from Fabrication to Application	UNIQORN	Hannes Hübel	AIT Austrian Institute of Technology GmbH, Austria	UNIQORN develops cost-effective physical-layer technology to drive quantum communication applications and bolster future volume production. The focus lies on the shoehorning of quantum components towards system-on-chip implementations that will ultimately enrich global communication networks.
Quantum Computing				
Advanced quantum computing with trapped ions	AQTION	Thomas Monz	Universität Innsbruck, Austria	The aqtion consortium will realize a fully-automated ion-trap quantum computer to solve scientific and commercially

				interesting problems beyond the capabilities of classical computers.
An Open Superconducting Quantum Computer	OpenSuperQ	Frank Wilhelm-Mauch	Universität des Saarlandes, Germany	OpenSuperQ will build a quantum computer with up to 100 qubits that cannot be simulated on current classical supercomputers. One system will be installed in a central quantum computing laboratory and be accessible for the community. Its technology will be as open as possible.
Quantum Simulation				
Programmable Atomic Large-Scale Quantum Simulation	PASQuanS	Immanuel Bloch	Max-Planck-Gesellschaft zur Forderung der Wissenschaften eV, Germany	The goal of PASQuanS is to push the already well-advanced neutral atom and ion-based quantum simulation platforms far beyond both the state-of-the-art and the reach of classical computation. Full programmability will make it possible to address quantum annealing or optimization problems.
Quantum simulation and entanglement engineering in quantum cascade laser frequency combs	Qombs	Augusto Smerzi	Consiglio Nazionale delle Ricerche, Italy	The Qombs project aims to create a quantum simulator platform made of ultracold atoms for engineering a new generation of quantum cascade laser frequency combs characterized by non-classical emission and entanglement among the comb modes, to be exploited for quantum communication and detection.
Quantum Sensing & Metrology				
Advancing Science and TEchnology thRough dIamond Quantum Sensing	ASTERIQS	Thierry Debuisschert	Thales SA, France	ASTERIQS will exploit atom-like defects in diamond to 1) develop magnetic field sensors for car industry, biology or communications, 2) measure high pressure or temperature or 3) investigate the structure of single molecules or spintronics devices.
Integrated Quantum Clock	iqClock	Florian Schreck	Universiteit van Amsterdam, Netherlands	iqClock will develop novel and compact atomic clocks. This will have a large impact on telecommunication, navigation, fundamental physics, and other fields. Our goal will be achieved by developing a “superradiant” optical clock and by building an industrialized version of laboratory clocks.
Miniature Atomic vapor-Cells Quantum devices for SensIng and Metrology AppLications	MACQSIMAL	Jacques Haesler	CSEM Centre Suisse d'Electronique et de Microtechnique SA - Recherche et Developpement, Switzerland	macQsimal will bring new sensors, with greatly improved performances, closer than ever to industrial applications. To achieve this, it will combine state-of-the-art quantum sensor physics with MEMS atomic vapor cells, allowing for high-volume, high-reliability and low-cost deployment.

Leveraging room temperature diamond quantum dynamics to enable safe, first-of-its-kind, multimodal cardiac imaging	MetaboliQs	Christoph Nebel	Fraunhofer Gesellschaft zur Foerderung der Angewandten Forschung eV, Germany	The MetaboliQs project combines diamond-based quantum technology with medical imaging to improve the detection of cardiovascular diseases. It is based on hyperpolarization of marker molecules like pyruvate used for magnetic resonance imaging (MRI) to improve the sensitivity of diagnostics and the treatment of cardiovascular diseases and other related pathologies.
CSA				
Quantum Technology Flagship Coordination and Support Action	QFlag	Markus Wilkens	VDI Technologiezentrum GmbH, Germany	QFLAG will build upon the work of the Quantum Support Action (QSA), supporting the governance of the Quantum Flagship and monitoring its progress while coordinating the stakeholders to set conditions to foster innovation, education and training, and increase awareness of QT in Europe.

Table: List of accepted projects in the Quantum Flagship ramp-up phase

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