Quantum Technologies Flagship kicks off with first 20 projects

What are quantum technologies, and what is the second quantum revolution?

Quantum technologies use the properties of quantum effects – the interactions of molecules, atoms, and even smaller particles, known as quantum objects – to create practical applications in many different fields. The so-called first quantum revolution, which saw the creation of the field of quantum physics, happened in the first half of the twentieth century and shaped the world we live in today, For instance it led to the development of lasers and transistors,, two foundational technologies for building computers, telecommunications, satellite navigation, smartphones and modern medical diagnostics.

The second quantum revolution is now underway and involved the detection and manipulation of single quantum objects such as atoms, photons and electrons. We can for example now rotate an electron clockwise and anticlockwise at the same time, and can connect particles invisibly across space and time. In many cases, the level of our control has reached a point that allows the use of quantum systems for real-world applications in sensing, secure communications and for computing and simulation. This is the field of quantum technologies.

What is the EU's standing in the area of quantum technologies? What are the EU's biggest assets, and how are industry and business making use of them?

Europe has well-acknowledged excellent scientific and technical expertise and a long history in financing research in quantum. Europe's strength relies on the excellence of its scientists, but also on the high degree of collaboration of the scientists across the Union, maximizing the benefits of cooperative science in this highly interdisciplinary field.

From the very beginning, European industry participated in EU research and innovation programmes. However, twenty years ago, industry participation was highly speculative and essentially limited to telecommunication, laser and computing companies. Nowadays those companies no longer see quantum technologies as a scientific curiosity but are increasingly integrating them in their products or are actively turning towards academia in search of quantum solutions. The unprecedented developments are bringing more and more industrial payers into the field of quantum technologies.

Why is the Quantum Flagship needed?

Europe has a strong tradition in quantum research, which began with the creation of quantum physics in the first decades of the twentieth century. A key strength is Europe's focus on a range of different fields in quantum technologies, a major factor in attracting overseas researchers.

The Quantum Flagship will address so far unsolvable research challenges such

as those of building a functioning quantum computer, developing ultra-secure communication systems or making major advances in quantum sensing technologies.

For some of these technologies, we are now at a turning point where science is ready to transfer to industry the knowledge and technologies required for delivering first products and services such as secure quantum communications, extremely accurate sensors, and very first quantum computers. Currently, there is a global race to create and conquer the market of these key technologies of the future. The U.S. is investing more than US$1.2 billion in the period 2019 – 2028 and China is building a US$10 billion National Laboratory for Quantum Information Sciences.

The Flagship aims to create a European ecosystem that will deliver knowledge, technologies and open research infrastructures to develop a world-leading knowledge-based industry in Europe. The big advantage of the Flagship is that it has established a research agenda that has been widely agreed by all the involved stakeholders and will be supported by the Member States and by the private sector in a well-coordinated manner.

What is the vision and what are the goals of the Quantum Technologies Flagship?

The long-term vision of the Flagship is to develop in Europe a so-called quantum web, where quantum computers, simulators and sensors are interconnected via quantum communication networks. There are three goals underlying this vision:

- To consolidate and expand European scientific leadership and excellence in quantum research, including education and training for developing the relevant know-how and skills;

- To kick-start a competitive European industry in quantum technologies in order to position Europe as a leader in the future global industrial landscape;

- To make Europe a dynamic and attractive region for innovative research, business and investments in quantum technologies, thus accelerating their development and take-up by the market.

How is the Quantum Technologies Flagship organised?

The Flagship will provide €1 billion of funding for quantum research over the next ten years. In its ramp-up phase (2018-2021), it funds 20 projects from 21 countries under the Horizon 2020 research framework programme.

Negotiations are ongoing between the European Parliament, Council and Commission to ensure that quantum research and development will be funded in the EU’s multi-annual financial framework for 2021-2028. Quantum technologies

will be supported by the proposed Horizon Europe programme for research and space applications, as well as the proposed Digital Europe programme, which will develop and reinforce Europe's strategic digital capacities, supporting the development of Europe's first quantum computers and their integration with classical supercomputers, and of a pan-European quantum communication infrastructure.

The Flagship will ensure that there is close coordination between these projects and the ones funded by the Member States in their national quantum technologies programmes. The Flagship builds on the QuantERA initiative, co-funded by the Commission and funding agencies from 26 European countries. The Flagship also has a governance structure that will be set up in line with the recommendations provided by the Commission's High Level Steering Group on Quantum technologies.

The governance structure of the Flagship consists of:

- A Board of Funders, bringing together the Commission and the funding agencies of the Member States and Countries Associated to Horizon 2020, as a discussion forum to align national and European priorities and initiatives;

- A Strategic Advisory Board, a group of high level independent quantum experts. Their mandate will be to monitor the Flagship's progress and prepare, with the help of the research stakeholders, the next version of the Flagship's strategic research agenda that they will deliver, together with their recommendations, to the Board of Funders;

- A Science and Engineering Board, composed of the representatives of the Flagship's funded projects. Its mandate is that of coordinating the projects' common activities;

- A Coordination and Support Action, aiming to support the coordination of the different stakeholders who will be participating in the Flagship activities. One of such key players is the quantum community network, consisting of representatives of the national quantum communities.

What are the main research areas that the Flagship's projects address?

The 20 projects initially funded by the Flagship cover research and technology development in the following five complementary and interdependent areas:

- ***quantum computing***: using enormous computing power to solve otherwise insoluble problems, processing vast amounts of data faster than ever before to recognise patterns and train artificial intelligence systems, e.g. for digital assistants to help doctors to diagnose and treat

diseases or optimising traffic to reduce jams and emissions.

- ***Quantum simulation***: understanding the functioning of complex systems, which will be key to the design of new chemicals like drugs and fertilisers, and of new materials, such as high-temperature superconductors for energy distribution without losses.

- ***Quantum communication***: helping to protect data transmitted digitally, such as health records, financial transactions or other sensitive data sets by developing securest ways of communication, impossible to intercept without being perceived.

- ***Quantum metrology and sensing***: providing highly accurate measurements increasing the performance of devices and consumer services, such as medical imaging sensors, high-precision navigation and the Internet of Things.

- ***Fundamental quantum science***: complementing the projects in the four other areas and addressing related foundational scientific problems.

Who is participating in the Quantum Technologies Flagship?

In these first three years of the Flagship, the partners of the 20 funded projects come from EU Member States, associated countries to Horizon 2020, and Belarus (international partner).

What is the funding and duration of the Flagship's projects?

The duration of most of the projects funded by the Flagship is three years. Projects addressing quantum communication, quantum computing systems, quantum simulation, and quantum metrology and sensing will receive funding of up to €10 million, while projects in fundamental science are smaller and will receive funding of €2-3 million.

What advantages will future quantum technologies bring?

Within the next 10 years, the performance enhancements resulting from quantum technologies will yield unprecedented computing power, guarantee secure communications, and provide ultra-high precision measurements. Examples include the measurement of the tiniest variations of magnetic or electric fields for medical imaging below the cell level for less invasive diagnosis and treatments, or for searching raw materials (petroleum, minerals, etc.), ultra-precise atomic clocks in smart grids allowing energy savings, or yet quantum key distribution technologies to prevent eavesdropping in finance, banking and defence by establishing secure communication links, and supercomputers outperforming existing or future classical supercomputers and at a fraction of their energy consumption.

In the long term, quantum computing has the potential to solve computational problems that would take current supercomputers longer than the age of the universe. The scientific computing that this will enable could bring about breakthroughs in, for example, chemical process design, energy efficient materials, and energy harvesting, as well as machine learning and big data analysis.

What about quantum key distribution (QKD) – will the Flagship be able to provide ultra-secure data encryption for Europe?

The Flagship is currently funding, with a budget of about €34 million, four projects on quantum communication that include also research on faster and more secure quantum key distribution (QKD). The results of those projects will feed into the QKD pilot that will be funded by Horizon 2020 with €15 million, to test in real conditions the business cases for a telecommunication network with an additional layer of security provided by QKD. The expectation is that, after the Flagship's ramp up phase, this pilot will leads to an EU-wide deployment of a public QKD service. Such deployment is foreseen to be financed by the Digital Europe Programme in the period 2021 to 2028.

Will quantum computers replace current computers any time soon?

No. Initial prototypes of quantum computers are currently available in research labs, but they are only at a very early stage of development. They are built from up to a few dozen individual computing units (quantum bits of operation, or qubits), which are largely insufficient for resolving practical applications. In addition, the software and the algorithms that will exploit the computing capabilities of quantum computers are still in development. Larger quantum computers of up to 300 qubits are expected to be engineered by 2026-2027. Quantum computers with tens of thousands of individual computing units are expected to be operational only in 15-20 years.

For more information

Press release

The first 20 projects

Official website of the Quantum Flagship

Humanitarian aid: EU releases €58 million for the Sahel and the Central

African Republic

For 2018, the EU's total humanitarian response to the Sahel countries now stands at €270 million and €25.4 million for the Central African Republic.

"As the humanitarian situation in the Sahel continues to worsen, we are stepping up our assistance to address the major food crisis in the region. Ongoing violence and conflict, as well as the effects of climate change, are causing massive displacement, acute malnutrition and food insecurity that is affecting millions, especially children. We remain committed to show solidarity to the most vulnerable and to save lives," said Commissioner for Humanitarian Aid and Crisis Management Christos **Stylianides**. The EU funding will help provide food and nutrition to the most vulnerable and emergency assistance such as shelter, medical care and water.

Funding in the Central African Republic will enhance the EU's ongoing efforts to address the needs of the displaced populations. *"In the face of ongoing violence and displacement in the country, we must continue to do our outmost to cover the needs of all those forced to leave their homes,"* added Commissioner **Stylianides**.

The assistance announced today will go to seven countries in the Sahel region and to the Central African Republic: Nigeria (€10 million), Mali (€6 million), Niger (€6 million), Burkina Faso (€5 million), Mauritania (€5 million), Chad (€12 million) and Cameroon (€3 million), Central African Republic (€8 million). In addition, regional funding amounting to €3 million will be allocated to the Sahel to ensure life-saving malnutrition treatments. The EU is one of the largest contributors of humanitarian aid to the Sahel. The EU assists people in need of emergency food assistance and provides treatment for severely malnourished children as well as for conflict-affected populations.

Background

In the Sahel, 12 million people are estimated to be in need of emergency food assistance during the lean season, while 4.2 million children are in need of live-saving nutrition treatment. In addition, conflicts have forcibly displaced 3.1 million people throughout the region and created additional emergency needs. Thousands of newly displaced people have been recently recorded in Northeast Nigeria, with children showing alarming rates of acute malnutrition. Floods affecting Niger, Mali and Nigeria since mid-August, have further increased needs and pose serious health risks. A cholera epidemic has been spreading in Niger, Nigeria and Chad over the past few months.

In the Central African Republic, continuous insecurity and violence further increase humanitarian needs. About 2.5 million people, meaning half of the population, are in need of humanitarian aid and one in four – about 1.2 million people – has been forcibly displaced.

For more information

Sahel

Burkina Faso

Cameroon

Chad

Mali

Mauritania

Niger

Nigeria

Central African Republic

Mergers: Commission approves acquisition of sole control over EMI Music Publishing by Sony

EMI Music Publishing ("EMI MP"), a music publishing company, is since 2012 jointly owned and controlled by Sony Corporation of America ("Sony") and Mubadala Investment Company PJSC ("Mubadala"), an investment fund based in the United Arab Emirates. Under the proposed transaction, Sony would now acquire sole control and ownership over EMI MP.

Music publishers exploit the copyrights of authors by granting licences to users of music. The most common music publishing rights are mechanical rights (e.g. for recorded music), performance rights (e.g. for concerts and TV and radio broadcasting), online rights (e.g. for online music downloading or streaming) and synchronisation rights (e.g. for advertisements and film music).

Since 2016, the fully owned and controlled music publishing subsidiary of Sony, Sony/ATV, has been the exclusive administrator of EMI MP's entire catalogue, whereas EMI MP itself plays no role in licensing its catalogue to digital platforms, or in signing and retaining authors.

Commission investigation

Since Sony already has joint control of EMI MP, the transaction would not lead to any increase in market share in any of the markets where Sony and EMI MP are active. Therefore, the Commission focused its investigation on assessing whether Mubadala has acted as a constraint on Sony's ability to

leverage across both recording music and music publishing rights and, in particular, into the potential impact of the removal of this constraint on any hypothetical Sony strategy for EMI MP.

As regards the **provision of music publishing services to authors**, the Commission concluded that, as Sony/ATV and EMI MP have not competed to sign new authors since 2012, and as Mubadala did not constrain Sony's strategy before the merger, the merger would not raise competition concerns.

As regards the **exploitation of the copyrights offline**, the Commission excluded competition concerns because Sony/ATV already has the sole and exclusive right to license EMI MP's publishing rights offline. Moreover, in relation to mechanical and performance rights the Commission concluded that control over pricing and licensing terms is in any case in the hands of collecting societies.

Finally, as regards the **exploitation of publishing rights for online use**, although the merger would not lead to any increase in market shares, the Commission analysed whether the transaction could increase Sony's bargaining power vis-à-vis online music platforms in the market for online music licensing.

This is because Sony not only holds publishing rights for songs but also recording rights (via its recording division – Sony Music), and online platforms need a licence to both sets of rights to be able to offer their services. As the repertoire of songs over which Sony has publishing rights only overlaps partially with the one over which it holds recording rights, Sony has control over a larger set of songs than just the songs controlled by Sony/ATV and EMI MP.

The Commission looked into whether, after the transaction, Sony could threaten not to license its rights – publishing or recording – in order to extract better terms from online platforms. However, the Commission found that the transaction would not materially increase Sony's bargaining power vis-à-vis online platforms, in particular because:

a) Any strategy to extract better terms from online platforms to the benefit of both music publishing and recorded music would have also been in the interest of Mubadala before the merger, and therefore the merger would not change the current situation.

b) The Commission found that authors could credibly threaten to switch away from Sony if it attempted to degrade the value of their publishing rights to the benefit of its recording division.

c) Even assuming that this type of strategy would be possible and valuable for Sony, the Commission found that, on the market for the licensing of online rights in the European Economic Area, the transaction would not give rise to competition concerns, as Sony's position vis-à-vis digital music providers would not significantly increase compared to the current situation. In fact, as is already the case today, online platforms would continue to have access to both Sony's and third parties' repertoire to operate in the

EEA.

Therefore, following its phase I investigation, the Commission concluded that the transaction would raise no competition concerns in any of the affected markets and cleared the case unconditionally.

Companies and products

EMI Music Publishing, based in the UK, is a music publishing business currently jointly controlled by Sony and Mubadala.

Sony Corporation of America, the US subsidiary of Sony Corporation, headquartered in Japan, is a leading player in the music recording and publishing business. Sony/ATV is not a party to the transaction, but has administered EMI MP's catalogue since 2012. Sony/ATV is the wholly-owned music publishing subsidiary of Sony Corporation of America.

MubadalaInvestment Company PJSC, based in Abu Dhabi, is a public joint stock company focused on investment and development that is wholly owned by the Government of the Emirate of Abu Dhabi in the United Arab Emirates. Mubadala is active in investing in a wide range of strategic sectors, including energy, utilities, real estate, basic industries, and services.

Merger control rules and procedures

The transaction was notified to the Commission on 21 September 2018.

The Commission has the duty to assess mergers and acquisitions involving companies with a turnover above certain thresholds (see Article 1 of the Merger Regulation) and to prevent concentrations that would significantly impede effective competition in the EEA or any substantial part of it.

The vast majority of mergers do not pose competition problems and are cleared after a routine review. From the moment a transaction is notified, the Commission generally has a total of 25 working days to decide whether to grant approval (Phase I) or to start an in-depth investigation (Phase II).

More information will be available on the competition website, in the Commission's public case register under the case number M.8989.

Main topics and media events 29 October – 11 November 2018

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ESAs propose new amendments to technical standards on the mapping of ECAIs

The Joint Committee of the three European Supervisory Authorities (EBA, EIOPA and ESMA – ESAs) launched today a public consultation to amend the Implementing Regulations on the mapping of credit assessments of External Credit Assessment Institutions (ECAIs) for credit risk to reflect the outcomes of a monitoring exercise on the adequacy of existing mappings, namely changes to the Credit Quality Steps (CQS) allocation for two ECAIs and the introduction of new credit rating scales for ten ECAIs. The Implementing Regulations are part of the EU Single Rulebook for banking and insurance aimed at creating a safe and sound regulatory framework consistently applicable across the European Union (EU). The consultation runs until 31 December 2018.

In the Implementing Regulations on the mapping of ECAIs, adopted by the European Commission on 11 October 2016, the three ESAs specified an approach that establishes the correspondence between credit ratings and the credit quality steps defined in the Capital Requirements Regulation (CRR) and in the Solvency II Directive.

The ESAs are now consulting on an amendment to the Implementing Regulation to reflect the outcome of a monitoring exercise on the adequacy of the mappings, based on a quantitative and qualitative assessment. In particular, the ESAs

are proposing to change the CQS allocation for two ECAIs, together with the introduction of new credit rating scales for ten ECAIs.

The ESAs also published individual draft mapping reports illustrating how the methodology was applied to produce the amended mappings in line with the CRR mandate.

Consultation process

Comments to the Consultation Paper on the mapping under Article 136 of the CRR can be sent by clicking on the "send your comments" button on the EBA's consultation page. Comments to the Consultation Paper on the mapping under Article 109 (a) of the Solvency II Directive can be provided using the template for comments downloadable from EIOPA's website. Please note that the deadline for the submission of comments is 31 December 2018.

All contributions received will be published following the close of the consultation, unless requested otherwise.

Legal basis

The proposed revised draft ITSs have been developed according to Article 136 (1) and (3) of Regulation 575/2013 (Capital Requirements Regulation) and of Article 109 (a) of Directive 2009/138/EC (Solvency II Directive), which state that revised draft ITS shall be submitted by the ESAs, where necessary.

Note to editors

This change follows a first amendment to the Implementing Regulations, which was proposed by the ESAs in 2017 and adopted by the European Commission on 24 April 2018. The first change reflected the withdrawal of the registration of one CRA and the recognistion of five additional CRAs since the adoption of the Implementing Regulations in October 2016.

Two ECAIs, Creditreform and Spread Research, have not consented to the publication of their mapping reports. In the absence of a consent, the ESAs published only the outcome of the revision, i.e. the relevant mappings in Annex III of the draft amended ITS ("Mapping tables") together with two documents listing the applicable credit rating scales and credit rating types for each of the concerned ECAI.