
QuantumCAT:

Accelerating the application of quantum technologies

A consortium of research institutes, led by ICFO, and industry partners in Catalonia join forces to develop the Quantum Technologies Hub

About one hundred years ago, scientists of the time tried to explore and understand the nature and behavior of the elements that make up the world that is governed by the laws of quantum physics. Nowadays and with a robust and solid understanding of how that world works, current generations of scientists and engineers are searching for new methods to control and manipulate these elements in order to create a new range of applications for digital technologies. Quantum technologies based on unique properties of quantum physics offer unprecedented capabilities for modern applications of the information society.

Continuously adapting and changing to new situations, societies are preparing for the emergence of novel disruptive technologies that will soon signify a paradigm shift, specifically in the fields of security and privacy of communications via the Internet. Governments and industries around the world are putting their efforts and beliefs in this scientific-technological trend, and are therefore allocating considerable resources to make it a reality.

Comprised by internationally renowned scientists with extensive experience in quantum technologies, as well as a growing network of companies interested in this field, Catalonia has joined this new wave, establishing a Quantum Technologies Hub in the region called **QuantumCAT**.

The aim of QuantumCAT is to promote technology transfer and innovation projects with an industrial and social impact in the short and medium term. To achieve this, it aims to focus on transferring discoveries made in research laboratories to the market, by means of industrially viable implementations and applications, addressing three main problems. Firstly, to promote specific and high-potential laboratory technologies and to encourage their industrial deployment and implementation through collaborative and cooperative research efforts. Secondly, to facilitate the dissemination of successful development and innovation strategies at the community level. And thirdly, to conduct outreach actions, such as networking events and workshops, aimed at academic and industry audiences, to discuss experiences and collaborations, as well as share knowledge among the community regarding success stories and use-case studies.

Coordinated by ICFO, QuantumCAT includes leading research institutions in Catalonia, such as ICFO itself, the Autonomous University of Barcelona (UAB), the Polytechnic University of Catalonia · BarcelonaTech (UPC), the University of Barcelona (UB), the Fundació i2CAT, the Barcelona Supercomputing Center (BSC), the Catalan Institute of Nanoscience and Nanotechnology (ICN2), and together with the Institute of High Energy Physics (IFAE) and the National Center of Microelectronics (CNM) as collaborators. It also includes different industrial players, such as Metempsy, Volkswagen Group, MemComputing, VetGENOMICS, BcnInnova, Cellnex, Keysight Technologies, Quside, AIA Group, Everis, and Telefónica I + D, among others.

As Dr. Morgan Mitchell, scientific coordinator of the initiative, comments, "[This is a very exciting time for quantum technologies. In particular, the support that QuantumCAT is receiving from the](#)

community in Catalonia proves it. Those who have been working in this field for many years are delighted to see that policy makers are supporting the acceleration of these technologies towards the development of innovative and relevant applications for industry and society”.

The Hub will coordinate activities in various technological areas, mainly in: quantum communication and cybersecurity, quantum computing and simulation, quantum artificial intelligence, and quantum metrology. Developments in these fields will seek to facilitate the transformation of scientific concepts into tangible implementations for industry and citizenship in general, through applications ranging from secure Internet communications to ultra-high precision images for the management of natural resources as well as medicine.

Dr. Lluís Torner, Director of ICFO, emphasizes the strategic importance of the field by mentioning that *“it was already known that the potential of quantum technologies in the medium term is enormous; what the COVID episode has shown is that, with the exponential growth of security needs and the preservation of privacy in communications that will remain with us forever in the context of the digitalization of industry, society and economy in general, it is urgent to implement it for companies, entities, and citizens who manage sensitive data, such as medical, economic or simply private information”.*

On behalf of the Government of Catalonia, **the Hble. Mr. Ramon Tremosa, Minister of Business and Knowledge of the Government of Catalonia**, has stated that *“quantum technologies have long been among us to make our day-to-day life easier, overcoming illnesses or managing complex problems that were previously beyond our reach. We carry them in our pockets in the form of smartphones and use them every time we calculate a route with GPS or an MRI is performed at the hospital.”* In addition, he has highlighted that *“the commitment to a quantum technologies hub is strategic if we really want to make Catalonia a leading country, generating the necessary knowledge to bring competitiveness to companies and, ultimately, quality employment and well-being to society as a whole. It also represents a project fully aligned with the country strategy proposed by the National Agreement for a Society of Knowledge that will establish the roadmap for the future of our country”.*

Finally, **the Hble. Mr. Jordi Puigneró, Minister of Digital Policies of the Government of Catalonia**, concludes that *“Catalonia has the technological capabilities to become a leading region in the development of quantum technologies and, in turn, profit from the opportunities for economic development that derive from these. An area of special interest for the Government lies in the field of quantum cryptography for critical communications, which will allow us to improve the security and privacy of communications networks, one of the challenges identified within the research and innovation program for advanced digital technologies, included in the digital strategy of the Government of Catalonia”.*

QuantumCAT receives the support of the Secretaria d'Universitats i Recerca del Departament d'Empresa i Coneixement of the Government of Catalonia and of FEDER (001-P-001644). It is part of RIS3CAT, an initiative of the Government of Catalonia. RIS3CAT aims to develop and promote the industrial vision of Catalonia, with an open, competitive and sustainable economy, combining talent, creativity, and a diversified business ecosystem in addition to its own system of research of excellence, in the framework of a dynamic, enterprising and inclusive society. Within the region, there are multinational and local companies, which are considered international leaders and experts in emerging technology sectors.

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Link to the website**Link to the [vídeo of QuantumCAT](#)****ABOUT ICFO**

[ICFO](#) was founded by the Government of Catalonia and the Universitat Politècnica de Catalunya (UPC), both of which are members of its board of trustees along with the Cellex and Mir-Puig Foundations, philanthropic entities that have played a critical role in the advancement of the institute. Located in the Mediterranean Technology Park in the metropolitan area of Barcelona, the institute currently hosts 400 people, organized in 25 research groups in 60 state-of-the-art research laboratories. Research lines encompass diverse areas in which photonics plays a decisive role, with an emphasis on basic and applied themes relevant to medicine and biology, advanced imaging techniques, information technologies, a range of environmental sensors, tunable and ultra-fast lasers, quantum science, photovoltaics and the properties and applications of nano-materials such as graphene, among others. In addition to three state awarded Severo Ochoa accreditations of excellence, ICFOians have secured 15 ICREA Professorships and 37 European Research Council grants. ICFO is proactive in fostering entrepreneurial activities, spin-off creation, and creating collaborations and links between industry and ICFO researchers. To date, ICFO has helped create 8 start-up companies.

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