The Quantum Technologies Roadmap

The European quantum community establishes a QT Roadmap for the future of quantum technologies development.

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Countries around the world are vying for leadership in the revolution that many believe quantum technologies will present. Within the last two decades, these technologies have made remarkable progress, advancing beyond Nobel Prize winning discoveries into a more cross-disciplinary field of applied research and even a few commercial applications.

Aside from existing and new large-scale government backed research programs, large multinational companies, including Google, IBM, Intel, Microsoft and Toshiba, are making ambitious investments in the development of quantum technologies, in particular in areas related to quantum computing and quantum communication. In addition, start-up companies have emerged this past decade creating state-of-the-art technology that is bringing

successful solutions to specialized markets.

Such rapid growth has been possible thanks to a well-aligned global research community that holds a common understanding of the challenges and opportunities that quantum technologies present. The European quantum physics community has come together to elaborate a Quantum Technologies Roadmap aimed to put into perspective the status, the needs and possible future solutions.
This Roadmap (a summarized version), recently published in the New Journal of Physics, is a document that was compiled by experts in quantum physics including ICREA Professors at ICFO Antonio Acin and Maciej Lewenstein. The content has been divided into four main domains: quantum communication, quantum computing, quantum simulation and quantum sensing and metrology, plus two sections on quantum theory and software and quantum control, which are transversal to the four domains previously mentioned. For all these sections, the authors provide an overview of the status of QT today, its main challenges and how science and technology, expected to emerge in the coming decade and beyond, will provide solutions.

Although this roadmap is based on European coordination efforts and all authors are Europeans, the scientific and technological status as well as the challenges and required advancement described in this roadmap are not perceived by the authors as specific to Europe, but global to the field of QT.