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Quantum Technologies will shape the landscape of the next future



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Quantum Technologies, or technologies based on the second quantum revolution, represent a completely new way to transform and transmit information, which leads directly to the technology of tomorrow, where quantum limits will define the performance of industrial applications. It is expected that this will lead to an exponential growth in computing power, allow information to be communicated in an absolutely secure way and, again, allow measurements to be made with extreme precision.

Italy has one of the largest scientific communities in this sector: more than 60 working groups with some of the most authoritative researchers and scientists, many of them winners of projects within the ten-year European Flagship on Quantum Technologies.

Italy was also among the first countries in the world to implement a fiber optic network for the distribution of the time / frequency standard and for quantum communications, managed by the Italian Institute of Metrology (INRIM) called "Quantum Backbone".

The Italian Ministry of University and Research (MUR) has been able to grasp, in the new edition of the National Research Plan *promoted by the Minister Gaetano Manfredi*, the importance of Quantum Technologies by including them among the key sectors of the great "Information Technology, Industry, Aerospace" area.

The **CNR**, appointed by the MUR to coordinate the Italian efforts within the European Flagship, was immediately at the forefront in the development of the quantum program, co-financing the Flagship anticipation program, QuantERA, leading to the success of 23 projects with Italian participants out of 38 overall. After the award of one of the two major Flagship Simulation projects, coordinated by Italy, by the **CNR-INO** directed by Paolo De Natale, and, within the framework of the MUR Infrastructure Strengthening Program, the **CNR** approved the construction of an Infrastructure for Simulation and Quantum Computing (called with the acronym PASQUA) which will operate in Pisa and Florence.

Among Quantum Technologies, Quantum Communication, which includes methods of "teleportation" of the single quantum state, is able not only to connect the quantum computers of the future, but also to make communication systems intrinsically unassailable. In particular, quantum cryptography provides a secure method for distributing authentication keys, such as pins and passwords, allowing any intrusion attempts to be detected.

The hope is that, as happened with the first Italian electronic computer, a great alliance between public and private, among Universities, Research Bodies and Companies, Italy will once again be able to seize the great opportunity represented by Quantum Technologies, that are expected to redesign the industrial and socio-economic landscape of the next future.

*President of the Italian Research Council (**CNR**)

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At ESOF meetings leading scientists, researchers, young researchers, business people, entrepreneurs and innovators, policy makers, science and technology communicators and the general public from all over Europe discuss new discoveries and debate the direction that research is taking in the sciences, humanities and social sciences.



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