

QUANTEK - Towards consolidated Quantum Technologies in Basque Country

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Abstract

Quantum computing is a new computing paradigm, different from classical computing. It is based on the use of qubits, a special combination of ones and zeros. Classic computing bits can be either 1 or 0, but only one state at a time; while the qubits can be in *superposition*, that is, they can have the two simultaneous states. There are two main types of Quantum architectures which supports this concept: the gate-model quantum computer and the annealingbased quantum computer.

Quantum computing is not applicable for the resolution or optimization of any problem. There are real problems that require a high computational requirement, either due to the volume of information, the high number of variables to optimize or non-functional requirements (e.g. response times).

Some current application areas: logistics, simulation in chemical processes, design of new materials, communications, advanced services, etc.

QUANTEK is a project funded by the Basque Government which aims to position the Basque Country among the benchmarks in quantum computing and align with the advances of European countries. It plans to favour the generation of a Basque ecosystem in quantum technologies and their applications. The idea is to integrate and unify multidisciplinary capacities and lines of research related to quantum technologies.

Project Main Objectives are:

- Analyze the limits or restrictions that classical technology approaches imply for the great problems of Basque industry and analyze the viability and impact of quantum technologies in their resolution
- Develop technologies for the adoption of quantum approaches that allow Basque industry to facilitate its transition
- Improve the competitiveness and excellence of the agents of the Basque science and technology network around quantum technologies and adapt the needs of the industrial fabric

Project working areas are:

- Problems, challenges and limitations of quantum technologies study, and analysis of possible applications in Basque industry
- Research and Technological Development:
- Quantum Software Engineering
 - Quantum Optimization and Simulation
 - Quantum Security and Communications
 - Quantum Software Engineering
 - Quantum Computing Ecosystem
- Application of quantum technology to the problems or challenges identified
- Dissemination of applications and capacities of the Basque ecosystem around quantum technologies

Behind this project we have Tecnalia (coordinator), Ibermática, Deusto University and UPV (with two research groups, QUTIS group and IC group) participating in the project.