Introducing project AVaQus: Annealing-based Variational Quantum processors

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The field of experimental quantum computing is advancing at a rapid pace. Despite the recent successes in building functional prototypes with a significant number of qubits, outperforming conventional computers for real-world, practical applications is likely at least a decade away due to the uncorrected noise present in quantum systems.

However, there exist alternative quantum computing schemes with an intrinsic robustness against environmental noise, such as quantum annealers. Here enters project AVaQus: Annealing-based Variational Quantum processors. In this project, we aim at building a superconducting quantum annealer prototype with the following characteristics: i) qubit coherence longer than annealing times; ii) non-Ising qubit-qubit interactions; iii) a complex qubit connectivity map; and iv) versatility to program the annealer as a quantum simulator. This is what we define as a coherent quantum annealer.

In designing this new type of annealers, we take advantage of the decades of development in superconducting quantum circuit technology, of which the majority of partners are renowned world experts. This project represents a ramp-up phase to kick-start a European coherent quantum annealing technology that will be consolidated through the connections with industry provided by the industrial consortium partners.

In this talk, I will introduce project AVaQus and its goals, which include those of the IFAE group and the Néel Institute group in Grenoble, among those of the rest of partners. I will give an overview of the current project status, its developments, and its future directions.