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Quantum annealing with superconducting qubits

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Analog quantum processors hold a high potential to show quantum advantage in the near future. These systems may be programmed to operate as quantum annealers to address optimisation problems, as well as variational quantum algorithms and quantum simulations. The technology to build coherent analog quantum processors is still in a premature stage and requires dedicated efforts to be able to scale up into large-scale processors to address real-world problems.

The AVaQus (Annealing-Based Variational Quantum Processors) program coordinated by IFAE is the largest-scale European effort to develop the technology and functionality to operate analog quantum processors as coherent quantum annealers and variational processors. The focus of the project is on both the hardware as well as the theoretical sides, to yield a small-scale prototype representing the unit cell of a larger-scale processor that will succeed project AVaQus in the future.

In this talk, I will report on the current state of project AVaQus, focusing on the most recent developments particularly at IFAE on fabricating and characterizing superconducting flux qubits for coherent quantum annealing applications.

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