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Università di Pisa

Seminar Series on Quantum Computing

The effect of phase noise in superconducting qubit control

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Abstract:
In the control of superconducting qubits the generation of properly shaped RF (radio-frequency) pulses is necessary to manipulate the state of the qubits. Over the years, several solutions have been proposed to implement the control hardware, such as arbitrary waveform generators with or without upconversion, and, more recently, Direct Digital Synthesis and RFSoC-based systems.
Phase noise represents a limitation for all of these systems, degrading the performance of the quantum system in terms of coherence time and fidelity.
We have measured the phase noise in the pulses produced by an RFSoc 4x2 board by Xilinx and of a frequency synthesizer that we have designed and tested for the up- and down-conversion chains. We have focused on the optimization, from the point of view of phase noise, of this latter component.
Finally, we have performed numerical simulations based on the open-source Qiskit Dynamics platform, aimed at evaluating the effect of phase noise in control pulses on the operation of a superconducting qubit, in terms of fidelity. Phase noise for the simulations has been generated in such a way as to reproduce the measured spectra.

Venue: **Stanza 250, Ed. C, Polo Fibonacci**
Time: **Monday, 06/05/2024, 17:00**

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MISSIONE 4 COMPONENTE 2, INVESTIMENTO N. 1.4
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