Open postdoc position

Quantum error correction with superconducting circuits at ENS Paris

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Summary :

In order to perform useful tasks, quantum computers will need to implement quantum error correction (QEC) routines to suppress noise-induced decoherence. Bosonic codes, which encode a limited number of quantum bits in the infinite-dimension Hilbert space of a harmonic oscillator, represent a promising, hardware-efficient, route towards QEC.

Building up on the first successful implementations of such QEC protocols in superconducting microwave cavities (ENS Paris [1] and Yale University [2]), we propose a novel scheme to implement a fully protected quantum bit dynamically stabilized in a high-impedance superconducting circuit. Exciting the circuit with a microwave frequency comb induces dynamics whose stable states are GKP “grid states” [3], fully protected against both bit-flips and phase-flips.

The recruited postdoc will be associated to all aspects of the project, from quantum feedback protocol design and simulation to circuit nanofabrication, cryogenic measurements and circuit characterization.

[1] Lescanne *et al.* “Exponential suppression of bit-flips in a qubit encoded in an oscillator”. arXiv:1907.11729(2019)

[2] Campagne-Ibarcq *et al.* “A stabilized logical quantum bit encoded in grid states of a superconducting cavity” arXiv:1907.12487(2019)

[3] Gottesman, Kitaev, and Preskill. “Encoding a qubit in an oscillator” PRA 64.1 (2001)