ATELIER « INFORMATION QUANTIQUE : CODES, GÉOMETRIE ET STRUCTURES ALÉATOIRES »
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WORKSHOP ON QUANTUM INFORMATION: CODES, GEOMETRY AND RANDOM STRUCTURES
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Protected gates for superconducting qubits

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I explain how continuous-variable quantum error-correcting codes can be invoked to protect quantum gates in superconducting circuits against thermal and Hamiltonian noise. The gates are executed by turning on and off a tunable Josephson coupling between an LC oscillator and a qubit or pair of quits ; assuming perfect qubits, we show that the gate errors are exponentially small when the oscillator's impedance is large in natural units. The protected gates are not computationally universal by themselves, but a scheme for universal fault-tolerant quantum computation can be constructed by combining them with unprotected noisy operations.

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