Experimental setup to measure superconducting flux qubits in the underground laboratory of Canfranc

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Abstract

The interactions of ionizing radiation with superconducting qubits is a fundamental limitation to the coherence of these devices [1]. Moreover, high energy radiation can cause chip-wide correlated errors of multiple qubits, limiting the efficacy of error correction techniques [2]. The primary source of radiation in common laboratories is constituted by cosmic rays. The cosmic ray flux can be reduced by several orders of magnitude by moving the experiment inside a deep-underground lab [3]. Enhanced performances of superconducting quantum devices have been already demonstrated in deep-underground facilities due to the suppression of ionizing radiation levels [4].
One of the suitable underground laboratories is the Laboratorio Subterráneo de Canfranc (LSC) located in the Spanish side of the Pyrenees, which ensures a strong cosmic ray suppression [5].
This work shows the preparation of an experimental setup dedicated to the measurement of superconducting flux qubits at LSC. The setup is meant to run experiments designed to understand the impact of different fluxes, energies, and types of ionizing radiation on the performance of flux qubits.

References

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Figures

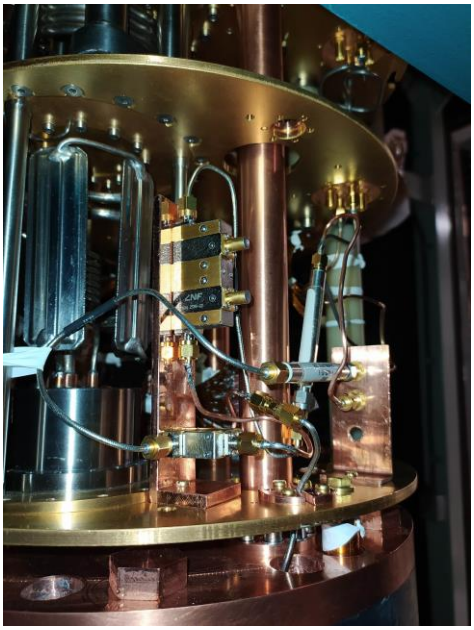

Figure 1: The mixing chamber plate of a dilution refrigerator installed in the underground laboratory of Canfranc after the preparation for the flux qubit measurement.