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Impact of environmental and materials radioactive contamination in superconducting quantum bits

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Radioactivity was recently discovered as one of the main concerns for quantum processors based on superconducting circuits. Cosmic rays and radioactive isotopes naturally present in the environment can affect the coherence time of single qubits and induce correlated errors in qubit arrays, seriously affecting quantum error correction. We developed a GEANT-4 based simulation to study the effect of "external"sources of radioactivity (gammas, neutrons and cosmic muons), and close materials contamination (chip holder, magnetic shield, ⋯) on a typical qubit developed within the SQMS center. We finally propose mitigation strategies.

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