Reducing the cosmic muon flux in experiments with superconducting qubits

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Ionizing radiation poses near-future threats to quantum computation with superconducting qubits. Viable solutions involve both on-chip mitigation strategies and approaches to reduce the ionizing radiation flux in experimental setups. While on-chip solutions were already discussed in the literature, strategies to reduce the amount of ionizing radiation impacting the chip have received less attention. In this work, we propose and demonstrate two mitigation methods to attenuate the cosmic muon flux compatible with experiments involving superconducting qubits. Using a specifically-built cosmic muon detector, we find that chips oriented towards the horizon compared to chips looking at the sky overhead experience a decrease of a factor 1.6 of muon counts at the surface. Then, we identify shielded shallow underground sites, ubiquitous in urban environments, where significant additional attenuation, up to a factor 35 for 100-meter depths, can be attained.