Contribution ID: **9** Type: **not specified**

Superconducting Qubits as Quantum Sensors for the Detection of Ionizing Radiation

We present measurements directed toward utilizing a superconducting qubit, not for quantum information processing, but as a quantum sensor for the detection of ionizing radiation. Whereas ionizing radiation presents a potentially serious problem for quantum error correction due to spatially and temporally correlated errors, it represents an opportunity for quantum sensing. A parameter characterizing superconducting qubits is the ratio (EJ/EC) where EJ is the Josephson energy and EC is the charging energy. We report on measurements of transmon qubits with 20 ⊠ (EJ/EC) ⊠ 60 directed toward quantum sensing for the detection of ionizing radiation. Our experiments are designed to measure multiple values for (EJ/EC) on a single die and therefore within a single cooldown. Our experimental design enables an ionizing radiation source at room temperature to be detected by our quantum sensor at low temperature.

This work was performed in part at the Center for Integrated Nanotechnologies, a U.S. DOE Office of Basic Energy Sciences user facility. This work was supported by the Laboratory Directed Research and Development program at Sandia National Laboratories, a multimission laboratory managed and operated by NTESS under DOE NNSA contract DE-NA0003525.

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Session Classification: Poster Session