

# Superconducting Qubits as sensors of High Energy Physics

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## Abstract

Superconducting qubits are a leading technology to build quantum computers. The state of maturity of this technology, with qubit lifetimes in the 100s of microseconds and an exquisite level of qubit state control and readout with fidelities exceeding 99%, brings forward the possibility to use qubits as detectors of fundamental physics events, particularly using qubits as photon counters. In this talk, I will present the developments of the QCT group at IFAE towards observing the interaction of qubits with ionizing radiation, including methods to mitigate the impact of this kind of radiation [1]. I will also introduce the research conducted in the area of detection of dark matter axions using superconducting qubits located in cavities, involving the development of novel superinductance materials [2] to create qubits resilient to strong magnetic fields.

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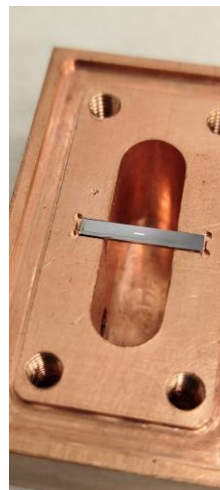
## References

- [1] Elia Bertoldo *et al.* *New J. Phys.* **27** 023014 (2025).  
[2] Alba Torras-Coloma *et al.* *Supercond. Sci. Technol.* **37** 035017 (2024).

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## Figures

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**Figure 1:** Superconducting transmon qubit located inside a copper cavity used to sense environmental radioactivity and cosmic rays.

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