

Superconducting circuits in axion dark matter search: microwave photon counting with transmon qubits

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Devices and methods of quantum information science can bring significant upgrades to current and future particle physics detectors. In particular, I will discuss experiments testing the hypothesis that dark matter is composed of very light particles, detectable as an effective field with a specific frequency set by their mass. As the signal to noise ratio is very poor in these experiments, new technologies need to be developed and tested, including superconducting circuits like Josephson parametric amplifiers and microwave single photon detectors (SMPD). With SMPDs, the speed at which most detectors probe the open parameter space at relevant sensitivity can largely be enhanced, and I will report about recent results obtained by applying a transmon-based microwave photon counter to the readout of a cavity haloscope.

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Primary author: BRAGGIO, Caterina

Presenter: BRAGGIO, Caterina

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