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Dynamic characterization of cryogenic optical photon detectors with Ir/Pt bilayer transition edge sensors

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Low-temperature calorimeters (or phonon detectors) have proven to be great detectors to search for rare processes like neutrinoless double beta decay and dark matter interactions. While the massive calorimeters used in the aforementioned searches can achieve excellent energy resolution, their sensitivity is limited by the background radioactivity. One technique to enable event-by-event background rejection by reading out the phonon and photon signals simultaneously from a scintillating crystal or a Cherenkov light-emitting crystal. We have an ongoing R&D effort towards developing sensitive optical-photon detectors that can measure tiny amounts of scintillation/Cherenkov light from low-temperature calorimeters. The detectors use a novel Iridium/Platinum bilayer superconducting transition-edge-sensor (TES) that can be operated at temperatures ~ 30 mK. In this work we will show the characterization of optical photon detectors in terms of energy and timing resolution, together with a thermal model describing the steady state current-voltage characteristics and the dynamic response of the detector.

Less than 5 years of experience since completion of Ph.D

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