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Measuring the temperature of X-rays with superconducting detectors

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Low Temperature Detectors (LTDs) are thermal detectors that are operated at cryogenic temperatures and measure the energy deposition via conversion to heat. Unlike HPGe, their spectral resolution is not limited by the statistics of charge creation and collection, and they can thus achieve exceptional energy resolutions.
This performance comes at a price. The cryogenic environment (the working temperature of LTDs can be as low as few tens of mK) alongside their small collection area dictate a tradeoff between dead-time and the complexity of readout.
Among all the types of LTDs, superconducting Transition Edge Sensors (TES) combine the superior resolving power of wavelength dispersive techniques (the energy of single photons can be measured with resolving powers E/ΔE > 10^3 in the case of x-rays) with a large collection capability, a relatively high speed and established multiplexing schemes.
In this contribution I will introduce the working principles of a TES and their applications in the field of X-rays spectroscopy. In particular, I will present the design and performance of fast TESs, designed for neutrino mass measurement, but fully characterized by an external soft X-rays source.

Summary

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