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Towards a realistic resistive transition model for AC-biased TESs

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Proximity effects in Transition Edge Sensors (TESs) do shape the superconducting transition and are potentially responsible for non-ideal behavior and undesired non-uniformity in multiplexed large arrays of X-ray microcalorimeters for the XIFU instrument on board of the future ESA space mission Athena.
In particular, nonlinear effects in the resistance and the reactance are observed
when the TES detector are ac biased at MHz frequency, like it is the case for the Frequency Division Multiplexing read-out under development for XIFU.
The TES physics can be fairly well described by the Josephson effect using the Resistively Shunted Junction (RSJ) model.
Previous experiments on TES based micro-calorimeters and bolometers, and the related theoretical work, suggested that the resistive transition could be calculated from the analytical solution of the Langevin equation for the Brownian motion of a particle in a tilted potential, as described in Coffey et al. [1], once the TES fundamental parameters like the TES normal resistance R_n and the TES critical current $I_c(T)$ as a function of temperature have been experimentally measured
In this paper, we use the above mentioned theoretical framework to simulate the $R(T,I,f\_bias)$ transition surface for the latest generation of devices currently under developed for XIFU.

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

N

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N

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