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Data analysis and results for multi-absorbers TES

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We have been developing position-sensitive detectors, most recently for the proposed Lynx X-ray observatory currently under study for the next 2020 decadal survey. These detectors, referred to as hydras, are composed of multiple absorbers connected to a single transition-edge sensor (TES), each with a different thermal conductance. Using this technique as a form of thermal multiplexing allows the design of arrays at the scale of a hundred kilo-pixels, while keeping fairly good performance with reasonable read-out electronics. For these detectors a different pulse shape is measured by each of the pixels of the hydra when X-rays are absorbed. It is hence crucial to optimize the process of analyzing the data, to optimally discriminate the events from different pixels, and to provide the best possible energy resolution.

In this work we describe our studies of the characterization of our latest hydra designs. Two different designs are studied, one with 50 μm and one with 25 μm absorbers, but in both cases there are 25 pixels per hydra. These have demonstrated a combined (rms) energy resolution ΔE of ~2.5 eV for the small pixels and ~3.4 eV for the large ones at 1.25 keV, which is roughly in agreement with our expectations. We review the different measurements performed in order to characterize the pixels and discuss how the processing had to be adapted in order to properly handle this kind of data, in particular to discriminate between X-ray events in the different pixels.

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

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