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ECLAIRs on-board trigger performance impacted by efficiency inhomogeneity and heat-pipes noise in 4-8 keV

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The Space-based multi-band astronomical Variable Objects Monitor (SVOM) is a Chinese-French mission dedicated to the study of the transient sky, scheduled for launch in 2024. Its core program focuses on the gamma-ray bursts (GRB) detection thanks to the ECLAIRs telescope and its onboard trigger system. This instrument under French responsibility is a large field-of-view coded mask telescope. ECLAIRs is designed to record photons from 4 keV up to 150 keV. It is the first time the detection energy band is extended down to 4 keV for a coded mask telescope on a space mission. In 2021 the ECLAIRs telescope underwent various calibration campaigns in vacuum chambers to evaluate the performance of its camera. At low energies, the response of the detection plane appears to be non-uniform, and shows the heat-pipes noise in two sides of the detector. In order to optimize the detection of soft X-ray rich sources, this non-uniformity and heat-pipes noise must be corrected prior to sky image reconstruction. We focus on the analysis of the data collected between 4 and 8 keV and identify distinct families of pixels that compose the detection plane. We study different strategies in order to correct the non-uniformity and the heat-pipe noise at low energies in terms of the quality of the produced sky images and the detection sensitivity. We highlight the corresponding operations performed by the onboard trigger software and discuss the impact on the detection of soft X-ray rich sources.

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