

V322b Ground performance test of the pulse shape processor in the XRISM/Resolve microcalorimeter under a high-count-rate situation

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In the *Resolve* x-ray microcalorimeter onboard the XRISM satellite, x-ray events are triggered and reconstructed in the orbit and only the characteristic values of events are downlinked. The Pulse Shape Processor (PSP) is the onboard digital electronics responsible for this processing, such as event triggering and reconstruction. With this modest resources, the onboard process becomes CPU-bound at count rates higher than about 200 s^{-1} , which is equivalent to about 100 mCrab. Beyond this rate, the instrument suffers significant loss of events, but the data are still useful for spectroscopy if the behavior is understood in advance of observations. We report the result of the ground testing in the high count rate case. We tested that the original x-ray signals can be correctly reproduced from the processed events even when the event losses occur, except for the energy resolution. The energy resolution becomes worse as the count rate increases due to the cross talk effect; if the event losses occur, some of the cross talk cannot be identified. We modelled the degradation of the energy resolution. We also developed a method to calculate the CPU usage and estimate the energy resolution when the x-ray model spectrum and flux are given as inputs. This method is essential when planning observations of bright objects in XRISM.