VERIFICATION OF HIGH RESOLUTION TIMING SYSTEM WITH SPACEWIRE NETWORK ONBOARD ASTRO-H

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Short Paper

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ABSTRACT

ASTRO-H is an X-ray satellite to explore the extreme universe to be launched in 2014. The data acquisition system will be fully constructed with SpaceWire links. One of the most important improvements is to evaluate a timing design via SpaceWire networks; the requirements from the science goal are timing stability of 10^{-9} s/s and accuracy of a few micro-second at user nodes, to assign times arrived in random timing from fast variable objects. The master clock for the timing system is synchronized to the GPS onboard, and described as a 38-bit time-information (TI) with 15.6 msec resolution at the master node. The TIs in over second are distributed from the master node to users via RMAP every second on a defined time-slot, and time-ticks (= TIs in under second) are distributed via time-code. Since the time resolution of TI is not sufficient for the scientific use, user nodes have local counters with finer resolution as a sub counter. In this method, total timing performance is

affected by 1) jitters of arrival of time-codes to user nodes, 2) stability of a local counter and TI itself, and 3) the sampling rate of them. In addition to detail descriptions, verification experiments performed by SpaceWire instruments are also presented. As a result, timing accuracy in this system at 100 MHz link is only affected by (1) jitters of time-codes, which is measured as ~70 or ~140 ns with no or one hop, respectively, as expected, when we assume (2) the stability of local counter is in 10^{-8} s/s in 1 day, and (3) the sampling rate in 1 Hz.