

Compact readout electronics for a hard X-ray polarimeter(POLAR)

A new readout electronics system has been developed for a hard X-ray polarimeter named POLAR, which is dedicated to measure the polarization of gamma ray bursts (GRBs) between 50-350 KeV. POLAR utilizes low Z, fast plastic scintillator bars readout by multi-anode photomultiplier tubes (MAPMTs). The output electric signals of MAPMTs are amplified and digitized by readout electronics. As a space-based instrument, the size of POLAR is restricted to a volume of 400mm $\times$ 400mm $\times$ 400mm. This requires compact readout electronics to co-operate with the detector. The readout electronics takes advantage of a front-end ASIC chipset named VA32/TA32 for charge-sensitive amplification and self-trigger. Every 64 channels of preamplifier are digitized one by one in a 12-bit ADC. SRAM FPGAs are used to configure and control the readout flow. The test results prove that the performance of readout electronics well satisfies the requirements of detector.

Summary (Additional text describing your work. Can be pasted here or give an URL to a PDF document):

POLAR will be an important payload for the Chinese Space Laboratory, which is scheduled to launch in 2012. The POLAR demonstration models have been implemented and full test is on-going. This paper presents the design of readout electronics and corresponding test results. The limited installation space imposes difficulties to implementation of readout electronics. The scheme of readout electronics based on VA32/TA32 ASIC makes all the circuits accommodated in the specified dimensions.

Test results show that the linear range of charge measurement reaches to -25pC, with the rms noise around 10 fC. This will be sufficient to measure the deposition energy from 5 KeV to 350 KeV.

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