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A High Frame Rate Test System for The HEPS-BPIX based on NI-sbRIO Board

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HEPS-BPIX is a pixel detector designed for the High Energy Photon Source (HEPS) in China. As a hybrid pixel detector, it consists of a silicon sensor and a readout chip which is bump-bonded to the sensor with Indium. The detector contains an array of 104×72 pixels while each pixel measures $150 \mu\text{m} \times 150 \mu\text{m}$. Each pixel of the readout chip comprises a preamplifier, a discriminator and a counter. Aiming at X-ray imaging, HEPS-BPIX works in the single photon counting mode, the counting depth of every pixel is 20 bits. The test system of the detector which implements all the control, calibration, readout and real-time imaging has been developed based on the NI-sbRIO board (sbRIO-9626). The field programmable gate array (FPGA) of the NI-sbRIO board deserializes the data from the pixel array and translates the clock as well as the serial configuration data to the detector. The FPGA firmware and the simple data acquisition (DAQ) system have been designed with LabVIEW environment in order to decrease the time of the development. Through the use of the LabVIEW programmed DAQ software, the test system can control the signal generator by Ethernet to calibrate the detector automatically. Meanwhile, it can monitor the real-time image and change the configuration data to make the debugging much easier. The test system has been utilized for the X-ray test and the beam line test of the detector. A series of X-ray images have been taken and a high frame rate of 1.2kHz has been realized. This paper will give the details of the test system and present results of the performance of the HEPS-BPIX.

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