

Application of MTCA in the Hybrid Pixel Detector for the High Energy Photon Source

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HEPS-BPIX40 is an new hybrid pixel detector developed for the High Energy Photon Source in China. This detector represents a significant advancement from its predecessor, BPIX20, boasting a larger 128 x 96 pixel matrix and smaller 140 μm x 140 μm pixel size. The circuitry of HEPS-BPIX40 operates in single photon counting mode, incorporating dual thresholds and programmable gains for enhanced performance.

In terms of frame rate, the detector module has been tested to achieve up to 2 kHz in continuous readout mode. Each detector module covers an area of 3.7 cm x 8.1 cm and comprises 2 x 6 chips. To accommodate the full system, which will consist of approximately six million pixels distributed across 40 modules, four MicroTCA crates are employed for continuous data readout. The estimated maximum data rate will reach 165 Gbps at 1 kHz frame rate, which poses a significant challenge for both the backend electronics and the data acquisition system. In addition, the White Rabbit (WR) is adopted for system-level clock synchronization.

Currently, preliminary tests have verified the module and chip design. X-ray imaging results have been obtained by a module (uncalibrated). More detailed results for the full system design will be presented in this talk.

Primary author: ZHANG, Jie (Institute of High Energy Physics, Chinese Academy of Sciences)

Co-authors: WEI, Wei (IHEP); LI, Zhenjie (IHEP); JI, Xiaolu (IHEP); DONG, Mingyi (IHEP); LI, Hangxu (IHEP); MA, Si (IHEP); ZHANG, Yan (IHEP); LI, Zhe (IHEP); LIU, Peng (IHEP); CHEN, Yuanbai (IHEP)

Presenter: ZHANG, Jie (Institute of High Energy Physics, Chinese Academy of Sciences)

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