UHSS - A Hybrid Photon Counting Detector with a 50 Kfps Sustained Data Rate

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For time-resolved X-ray measurements, the ability to acquire many images quickly is perhaps the most important requirement of the experiment. We have developed a photon counting hybrid pixel array detector based on the UFXC 32k chip [Kmon, *et l.* 2016], the Ultra-High-Speed System, UHSS. The first UHSS detector is a 1024 x 512 (500k) pixel array of 76 μm pixels. The design of the UFXC chip provides for no inter-chip pixels enhancing image quality. With the UHSS 500k, zero-deadtime continuous measurement at more than 50 Kfps is possible. A burst-mode of operation is available allowing the UHSS to acquire data at over 1 Mfps with 8% duty cycle. The combination of high count rate, small pixel size and fast frame rate makes this an excellent detector for time-resolved X-ray measurements including but not limited to diffraction, scattering and absorption experiments down to sub-micro-second time scales.

In this paper we will review the properties of the detector in detail and describe some preliminary time-resolved experimental results.

[1] Kmon, P., Maj, P., Grybos, P. & Szczygiel, R. (2016). *IEEE Trans. Nucl. Sci.* **63**, 1194–1201.

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