Strategies to push the time resolution of X-ray Photon Correlation Spectroscopy Experiments with Pixel-Array Detectors beyond one microsecond.

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We have recently reduced the minimum time scale accessible via area detector X-ray Photon Correlation Spectroscopy (XPCS) from 1 ms to a few microseconds using a variety of increasingly more advanced area detectors and novel area detector techniques. One of these techniques exploited a Pixel-Array Detector (PAD) designed for timing experiments and capable of acquiring two gated-frames separated by a variable time delay to measure correlation functions much faster than the overall frame rate of the area detector [1]. Using another PAD, we demonstrated dead-time free continuous frame rate XPCS at 12 kHz [2] and more recently with upgraded electronics up to 52 kHz [3]. Through the flexibility of this PAD architecture, we've also demonstrated the use of a burst mode detection that achieved a peak frame rate of nearly 400 kHz [4]. When coupled with a continuous-mode data set, the detector enables XPCS measurements from a few microseconds to ten seconds. This presentation will review past milestones and current developments with this detector.

References

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