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Real-time autocorrelator for fluorescence correlation spectroscopy based on graphical-processor-unit architecture: method, implementation, and comparative studies[1] NICHOLAS LARACUENTE, CARL GROSSMAN, Swarthmore College — We developed an algorithm and software to calculate autocorrelation functions from real-time photon-counting data using the fast, parallel capabilities of graphical processor units (GPUs). Recent developments in hardware and software have allowed for general purpose computing with inexpensive GPU hardware. These devices are more suited for emulating hardware autocorrelators than traditional CPU-based software applications by emphasizing parallel throughput over sequential speed. Incoming data are binned in a standard multi-tau scheme with configurable points-per-bin size and are mapped into a GPU memory pattern to reduce time-expensive memory access. Applications include dynamic light scattering (DLS) and fluorescence correlation spectroscopy (FCS) experiments. We ran the software on a 64-core graphics pci card in a 3.2 GHz Intel i5 CPU based computer running Linux. FCS measurements were made on Alexa-546 and Texas Red dyes in a standard buffer (PBS). Software correlations were compared to hardware correlator measurements on the same signals.

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