

First Results from VIPIC, a Custom Detector Made for X-ray Speckle Measurements

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The Vertically Integrated Photon Imaging Chip (VIPIC) explores the possibilities of three-dimensional integration for x-ray imaging applications. VIPIC operates without any readout dead-time. Each detected photon is immediately read out as a time- and position-stamped event. This event stream can be fed directly to an autocorrelation engine or accumulated to form a conventional image. The detector only delivers non-zero data (sparsified readout), greatly reducing the communications overhead typical of conventional frame-oriented detectors such as charge coupled devices (CCDs), and allowing continuous acquisition of data with timescales from microseconds to hours. This detector was custom-designed for x-ray photon correlation spectroscopy (XPCS), an application in which occupancy per pixel is low but high time resolution is needed. In this work we have used VIPIC to measure XPCS data on polystyrene latex nanocolloidal suspensions. Our results demonstrate that VIPIC can operate in the microsecond time frame, which is otherwise inaccessible by current imaging detectors.