

Hybrid X-ray Area Pixel Array Detectors for High-Flux Applications

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X-ray experiments are very frequently detector limited at today's storage ring synchrotron radiation (SR) sources, and will be even more so at future Energy Recovery Linac and X-ray Free Electron Laser sources. Commercial silicon foundries and design tools enabling the production of large, customized integrated circuits are beginning to have a profound impact on SR detectors and are ushering in the age of detectors tailored for specific groups of applications. Specifically, area Pixel Array Detectors (PADs) are starting to appear in which each pixel has dedicated, complex circuitry capable of high speed and capability and, in some cases, significant data processing power. PADs tend to be of two varieties: Photon counters and analog integrators. I will describe our recent work on the development and application of several analog integrating PADs. In many cases, such as at XFELs analog integrators are the only viable option. A properly designed analog PAD is easily capable of single photon detection while still maintaining an acceptably wide dynamic range.