

## The New Dual Mode Pixel Array Detector

Pixel Array Detectors have wide application for 2-D X-ray diffraction applications at synchrotron sources.

There are three basic types of Pixel Array Detectors: Charge Integrating (XFEL-Cornell/LCLS), Charge Ramp Counting (the HighFlux detectors from Area Detector Systems Corp.), and Photon Counting (Dectris Pilatus).

Photon Counting Pixel Array Detectors have been in use for several years but incorrect counting of photons at high count rates ( called co-incidence loss ) is their most serious limitation. There is a need for a detector that can overcome this limitation at high counting rates but still offer the statistical accuracy of photon counting at the lower counting rates encountered in the rest of the diffraction pattern.

To this end ADSC is introducing a new type of pixel array detector called the Dual Mode Pixel Array Detector (DMPAD) that has pixels which are individually programmable through the software interface. Each pixel in a DMPAD detector can be set to operate in either the high-flux charge ramp counting mode or in the simple X-ray pulse counting mode used in the Dectris Pilatus.

For X-ray crystallography the pixels in the center part of the diffraction pattern could be set in the high flux charge ramp counting mode to accurately measure the bright low-order reflections (up to  $10^7$  X-rays / pixel / second !) without any dead time loss or saturation effects and the pixels in the remainder of the diffraction pattern could be set in the X-ray pulse counting mode.

An additional feature of our Dual Mode pixel design is the new “capture” feature which enables the capture of the pixel intensity information in 1 microsecond and allows nearly immediate restarting of the next X-ray exposure with virtually no readout dead time, providing nearly ideal support for “shutterless data collection”.