MS38-03 | PHOTON COUNTING WITH MIXED MODE DETECTION

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Modern single-crystal X-ray diffraction relies entirely on two dimensional pixel array detectors (PADs). Their underlying CMOS technology allows shutterless data collection which has widely eliminated experimental overhead time. Today, two different techniques are competing in the home laboratory market. HPADs, now available for a number of years, count individual X-ray events, based on electron-electron hole pairs and apply an internal threshold to suppress the background noise including the noise originating from the sensor. These detectors produce clear images, which at a first glance are perfectly noise free. However, the need for a threshold introduces a new source of noise for HPADs: charge sharing between pixels resulting in signal loss. The limited count-rate capability, parallax and bind areas of HPADs are other sources of errors.

Mixed-mode detectors offer the advanced technical alterative to HPADs. This rather new technology is now implemented at large research facilities, such as free electron laser sites. For the home market Bruker has developed the PHOTON III series of detectors. Large monolithic sensors without gaps are standard in these detectors. Mixed-mode detectors do not suffer from charge sharing and can cope with higher count rates. X-ray photons are efficiently absorbed within thin high-Z absorber layers minimizing parallax and leading to a smaller signal point spread.

Technical details and users benefits of the large area mixed-mode detectors will be presented.