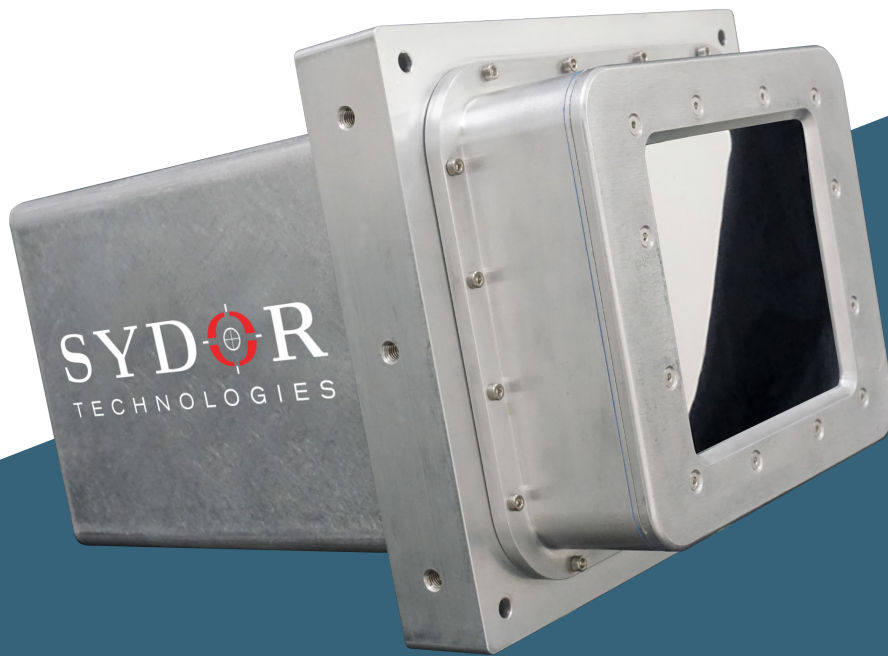


Keck-PAD

Direct Detection of Hard X-Rays at MHz Rates



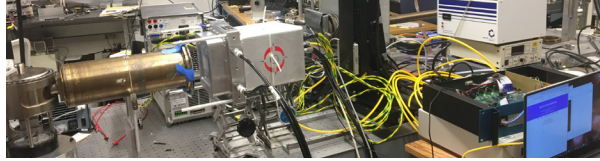
Applications

- Materials in Extreme Conditions with x-ray and/or laser probes
- Shock Physics
- Time-resolved experiments
- Destructive experiments

Features

- Frame rates up to 10 MHz
- Maximum QE with silicon (Si) or cadmium telluride (CdTe) sensor
- Configurable frame length and inter-frame spacing for up to 8 frames in a burst
- Full well exceeds 10^3 photons/pixel/frame
- Tiled design enables potential for custom configuration

With sensitivity to a single x-ray photon, the Sydor Keck-PAD is a direct x-ray detector with ultra-wide dynamic range and low noise, enabling the study of the temporal evolution of complex materials under dynamic loading.



The Sydor Keck-PAD is a burst rate, direct x-ray imager capable of acquiring up to 8 successive images at frame rates of up to 10 MHz with single x-ray sensitivity, making it ideal for irreversible or single-shot experiments. More importantly, each of the eight frames can be individually configured and triggered. Image data is stored on-chip until readout which takes 1 ms per image. Exposures can be triggered by an external sync to coordinate with time-resolved events.

The Sydor Keck-PAD has a full well capacity of greater than 10^3 8 keV x-rays/pixel/frame. The current Sydor Keck-PAD capabilities have been extended to x-ray energies from 20 keV to 150 keV by replacing its silicon sensors with cadmium telluride sensors.

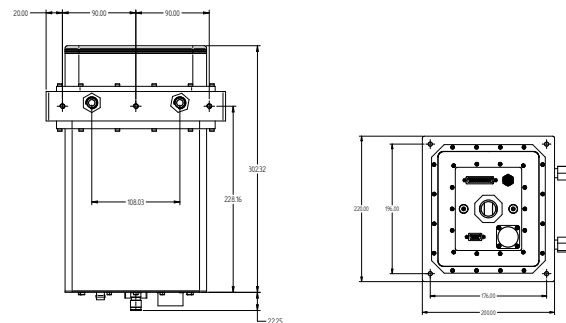
The Sydor Keck-PAD is comprised of 8 sub-modules of 256 x 128 pixels having a pixel pitch of 150 microns and resulting in an overall format of 512 x 512 pixels. Custom array sizes may be available upon request. Each sub-module can also be triggered individually for up to a 10 MHz frame rate with the 8 frames. For more details on the timing configurations, see our Keck-PAD Application note available from SydorTechnologies.com.

At 8 keV, read noise is ~ 0.5 photons/pixel and dark currents are 2 photons/pixel/s. A thermoelectric cooling system is integrated with the Keck-PAD to maintain the least possible dark current. Cooling and general detector functions are controlled via ethernet connection to the user's PC and support the EPICS control interface or a proprietary Sydor control interface.

Product Specifications

- **Sensor Material:** 500 μm thick Si or 750 μm CdTe
- **Sensor Format:** Eight submodules of 256 x 128 pixels; Standard detector array is a 512 x 512 pixel format
- **Pixel Pitch:** 150 μm
- **Full Well Capacity:** $\sim 10^4$ photons
- **Read Noise:** ~ 0.5 photons/pixel @ 8 keV
- **Dark Current:** 2 photons/pixel/s @ 8 keV
- **Frame Rate:** up to 10 MHz (for 8 frames)
- **Minimum Integration Time:** 50 ns
- **Maximum Continuous Frame Rate:** up to 1 kHz
- **Spectral Range:** up to 20 keV with Si sensor or greater than 20 keV with CdTe sensor
- **Cooling Method:** Thermoelectric Cooler (TEC) with water waste heat removal
- **Physical Dimensions:** 220 x 220 x 300 mm, 10 kg
- **User Interface:** EPICS and/or proprietary Sydor Control Interface

512 x 512 Detector Head



QE Curve for Si and CdTe Options

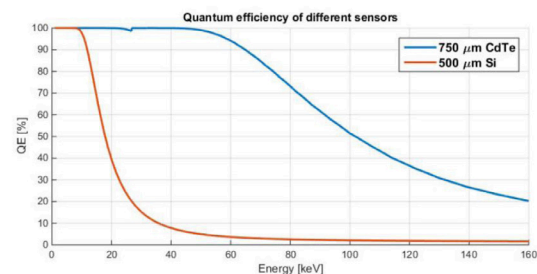


Figure 1. Quantum efficiency of 750 μm CdTe and 500 μm silicon sensors.