

## Transparent X-Ray Camera (TXC) for Beam Profile Imaging



### Applications

- Profilometry of x-ray beams at synchrotron light sources
- For continuous collection of beam position, size, shape, and flux
- Instantaneous correlation of beam profile and flux with imaging or diffraction experiments

### Features

- In-situ data collection
- >90% transmission above 5 keV, >95% transmission above 8 keV
- PID feedback to control peripheral optics

The Sydor Transparent X-ray Camera (TXC) is a precise imaging tool, designed to give users real-time information about their beam position, size, shape, and flux. Unlike other monitors, the TXC can be left in the beam and is linear from  $10^7$  –  $10^{16}$  photons per second.

Similar to Sydor's Diamond-based Beam Position Monitors (DBPMs), the TXC is manufactured with electronic-grade single-crystal CVD diamonds. Given the mechanical properties of diamonds, the TXC is an extremely robust tool. Unlike other in-line monitoring modalities, users can leave the TXC in their beam's path as a permanent fixture. With >90% transmission above 5 keV and >95% above 8 keV, the camera is essentially transparent.

The standard design features 60  $\mu\text{m}$  pixels in a 32x32 array. The active area is approximately 2x2 mm. As with all Sydor products, modifications can be made to satisfy any unique requirements.

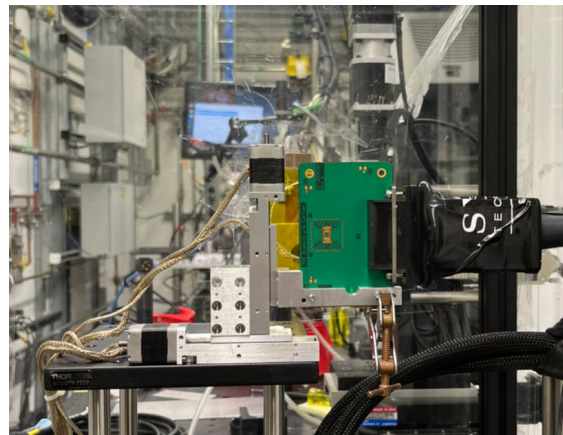
The TXC has three different gain settings and three operation modes:

- Continuous Imaging- full 32x32 array at up to 30 fps
- Fixed Quadrant: readout is divided into event quadrants and software outputs the total current in each quadrant
- Dynamic Quadrant: user-defined center point of the diamond at any x,y location. Software outputs the total current in each quadrant

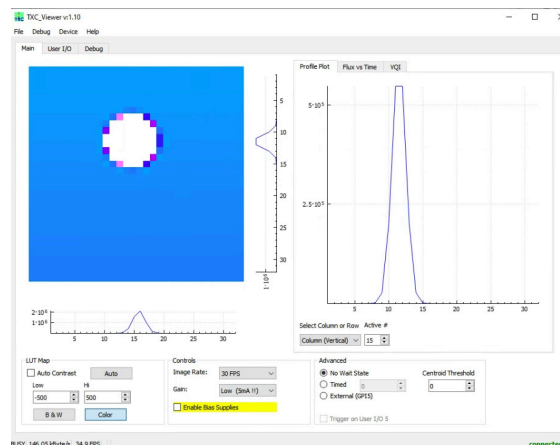
Each mode provides instant total flux measurements. As data is collected, the PID control can be set up for beam adjustment using calculated x, y position or quadrant output currents. This feedback is particularly useful for applications that utilize toroidal mirrors or require precise focusing. Sydor's TXC Viewer is provided with the system. This software enables users to view the beam profile, store data, and perform analysis. Users can control the basic setting of the system through the interface including gain selection, mode selection, selection of frame rate, and definition of the PID output.

## Product Specifications

- **Sensor Material:** 40-50  $\mu\text{m}$  electronics-grade single-crystal diamond
- **Sensor Format:** 60  $\mu\text{m}$  pixels in a 32x32 array
- **Aperture:** 1.92 mm diameter
- **Transmission:** >90% above 5 keV, >95% above 8 keV
- **Frame Rate:** <30 fps
- **Dynamic Range:** 50 pA - 5 mA per pixel, across all three gain settings
- **Cables:** ~1 meter cables standard between monitor and electronics
- **Electronics Enclosure:** 2U rack mount, 19(w) x 3.467 (h) x 10.492 (d) inches
- **Software:** Sydor TXC Viewer



TXC sensor and diamond carrier board in the inert gas testing chamber located on XFP 17-BM at Brookhaven National Laboratory's NSLS-II.



Screenshot of TXC Viewer-software is Windows or Linux compilable, provides x and y line profiles, and allows selection of imaging modes.