

Sydor Diamond Beam Position Monitors Overview

Sydor's Diamond Beam Position Monitors (DBPMs) offer one of the world's most precise position monitoring solution, with resolutions down to 0.1% of the beam diameter. Sydor DBPM's are available in a variety of configurations to meet beamline requirements and optimize its performance. Each DBPM is built to each beamline's parameters including the beam energy range, environmental conditions, and mounting requirements. Sydor's engineers then customize device parameters including diamond thickness, contact metallization, inter-contact gaps (street size), and can build to include any required cooling capabilities.

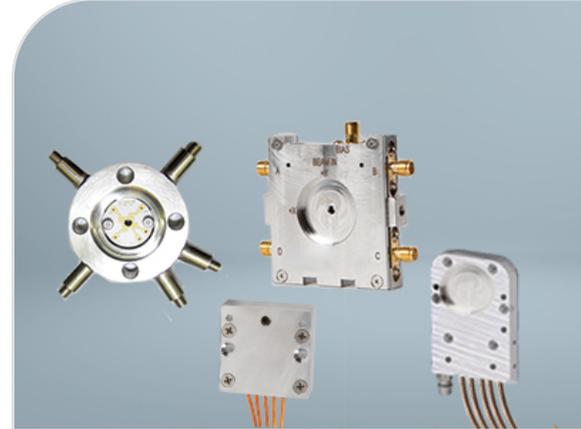
DBPM's are typically supplied with 4 channel outputs to measure position, flux, and timing information. However, for applications where only flux and/or timing information is required, a single channel configuration may be provided.

Sydor's DBPM's include designs for ambient to ultra-high-vacuum environments. Each design has a small form factor for space limited installations. Very thin, low-absorption DBPM's are designed to stay inline at all times. When this is not practical, Sydor offers packages designed with an offset beam aperture. The device can be offset with a 7 mm translation stage to remove the device from the beam. This solution is ideal for extremely coherent or soft/tender x-ray beamlines.

Each DBPM is manufactured using electronic-grade single-crystal CVD diamond which is required to avoid non-linearities that any diamond imperfections will create. The properties of these high-quality diamonds enable quick charge collection of single incidence x-ray bunches with resolution that allows individual bunches to be resolved.

DBPM's offer a quick return on investment, reducing set-up time resulting in labor savings. DBPM's are useful upstream or downstream with designs available for white, pink, or monochromatic x-rays. Data can be used for beam steering or to adjust other peripheral equipment such as mirrors or the sample. Ultimately, this information can correct for drift, temperature changes, or other factors impacting beamline stability.

Sydor's readout electronics provide bias, 4-channel readout, and the Sydor Advanced Electrometer adds intelligent closed loop control capabilities. Software providing Fast Fourier Transforms of the data can be utilized to pinpoint vibrations issues, improve beamline control loop tuning, and can correct other frustrating, but inevitable instabilities.



Features:

- ⊕ Designed for continuous beam monitoring with a linear response across specified x-ray energies with nanometer precision
- ⊕ Manufactured to be compact down to 25 mm x 25 mm with options for ambient (purged) to UHV environments
- ⊕ Optimized for each user's requirements and built-to-order
- ⊕ Designed to accommodate demands of next generation light sources due to high power density options

Applications:

- ⊕ Continuous collection of beam stability, flux, angle, and/or position data
- ⊕ Identification and fast analysis of alignment, vibration, or malfunctioning peripheral equipment
- ⊕ Automated feedback control with Sydor's Advanced Electrometer
- ⊕ Detection and prevention of drift that can result in positional/flux errors



Product Specifications

Beam Characteristics

- ⊕ **Beam Diameters:** Nanometers up to 2.75 mm
- ⊕ **Maximum Absorbed Power:** ~200 mW. Options: passive cooled to < 5 W, active cooling for white/high power density applications
- ⊕ **In-Situ Operation X-Ray Energies (>70% transmission):** > 5 keV (see transmission curves). Stage-mounted versions have short stage stroke for full beam clearance.
- ⊕ **Detectable Beams:** Photons, electrons, and protons
- ⊕ **Beam Types:** From low flux bench top sources to Synchrotrons and X-FELs

Sensor

- ⊕ **Material:** Electronic-grade single crystal CVD diamond
- ⊕ **Thickness:** Standard nominal: 50 μm (others available on request)
- ⊕ **Active Area:** 3 mm
- ⊕ **Contact Thickness:** Metallization dependent, ~30 nm typical
- ⊕ **Contact Material:** Pt, Rh, Al, and Ti available
- ⊕ **Available Formats:** Intensity monitors have a single metalized contact on each side. Position monitors have a single metalized contact on the one side (Bias) and four metalized contacts on the opposite side. Each quadrant is separated by a 20 μm gap (other gap sizes available upon request).
- ⊕ **Contamination protection:** Protective sensor overcoating improves ability to clean surfaces
- ⊕ **Inert environment options (non-vacuum):** Self-contained inert gas chamber with slow bleed Kapton windows

Monitor Specifications

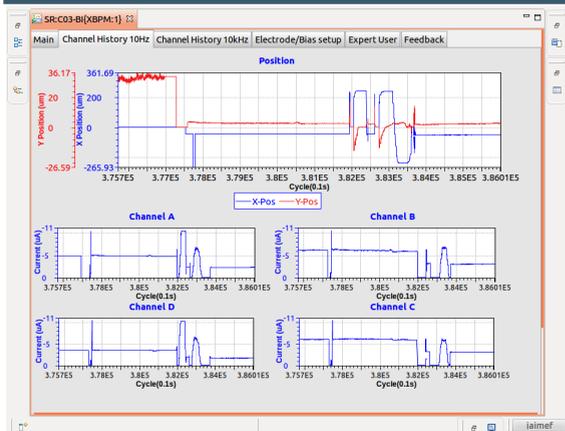
- ⊕ **Position Resolution:** 0.1% of beam diameter (down to 25 nm)
- ⊕ **Frame Rate:** DC to frequencies compatible with modern synchrotron rates (< 500 MHz)
- ⊕ **Bias Voltage Range:** +10 or -10 VDC
- ⊕ **Operating Environment:** Inert at 1 bar down to UHV
- ⊕ **Operating Temperature:** 10°C to 60°C
- ⊕ **Bake Out Temperatures:** Up to 120°C

Available Models



Standard DBPM packages are available and can be paired with Sydor's readout electrometers

Readout Software



Sydor's DBPM and electrometer systems provide users with a simple-to-read interface

