MIRION TECHNOLOGIES

DETECTORS

Multi-Element SDD Arrays

Custom Configurations

X-PIPS SXD X

The design of the multi-element Silicon Drift Detector Arrays can be configured to meet the specific needs of your application while maintaining excellent energy resolution at high count rates.

FEATURES

- Cryogenic (pulse-tube) cooled
- Up to 13 elements
- Planar or focused configurations
- CMOS-based preamplifiers
- Integrated HV bias supply
- 1 mil (25 µm) Be window
- No active pumping required (no ion pump)
- Thermal cycle free

PERFORMANCE

- Collimated Active Area: 30, 50 or 80 mm^2 per element
- Thickness: 0.5 mm
- Guaranteed resolution: 135 eV FWHM (typ. <125 eV)
- Maximum throughput per element: >3 Mcps
- Energy range: 1 to 30 keV
- P/B ratio: >10 000:1

DESCRIPTION

The X-PIPS multi-element detector or SXD arrays are extremely sensitive to X-rays and low-energy gamma rays (up to 30 keV). The SXD can consist of up to 13 Silicon Drift Detectors (SDD) elements. Each element has a low noise CMOS reset type preamplifier, and the complete system contains a HV bias supply and is electrically cooled with a cryogenic pulse-tube cooler. A thin Beryllium entrance window (1 mil (25 µm)) allows for measurement of X-rays as low as 1 keV (see Figure 1). Examples of different designs are shown below.

The detector elements and CMOS preamplifiers are cooled and temperature regulated, ensuring stable operation in changing environmental conditions. The energy resolution is guaranteed within an ambient temperature range of +10 °C to + 30 °C with the default factory settings.

APPLICATIONS

- X-ray Absorption Spectroscopy (EXAFS, XANES)
- X-ray Fluorescence
- X-ray Diffraction
- Mössbauer Spectroscopy
- Densitometry

The CMOS preamplifiers have a fast reset mechanism which reduces dead time and allows the detector to perform well at very high count rate performance. The combination of this CMOS preamplifier with the high performance SDD provides a very fast, low noise response, resulting in superior energy resolution with fast peaking times (see Figure 2). The signal rise time is well below 50 ns which makes for excellent energy resolution at high count rates (see Table 1 and Figure 3).

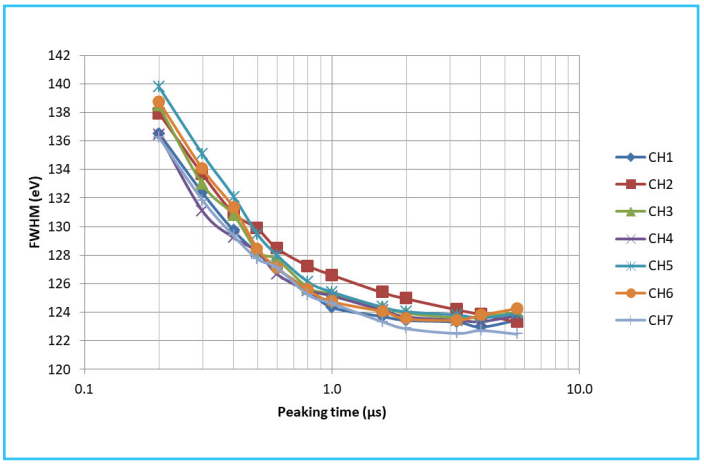


Figure 2. Typical energy resolution (FWHM 5.9 keV Mn-Ka) as a function of peaking time for a 7-element SDD array. Incoming count rate was 10-15 kCPS.

Table 1. Guaranteed energy resolution at higher count rates. Energy resolution is given at 5.9 keV (Mn-Ka).

Input count rate (Mcps)	Output count rate (Mcps)	Energy resolution FWHM (eV)	
		Typical	Max
1	>0.9	150	165
2	>1.5	160	175

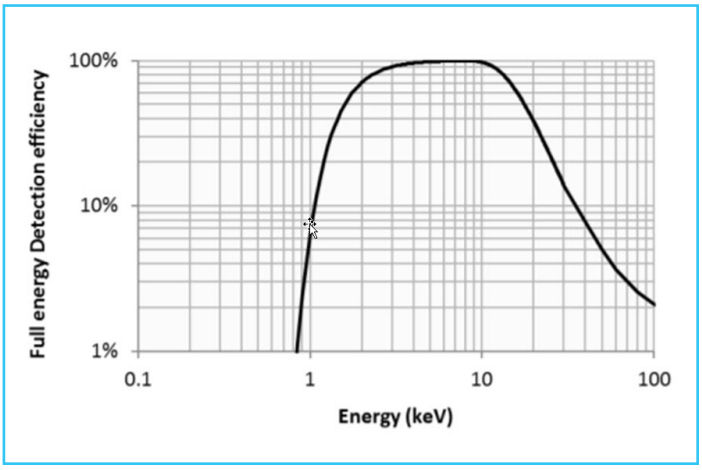


Figure 1. Calculated efficiency curve for the X-PIPS™ detector with 1 mil Be window and 500 µm Silicon.

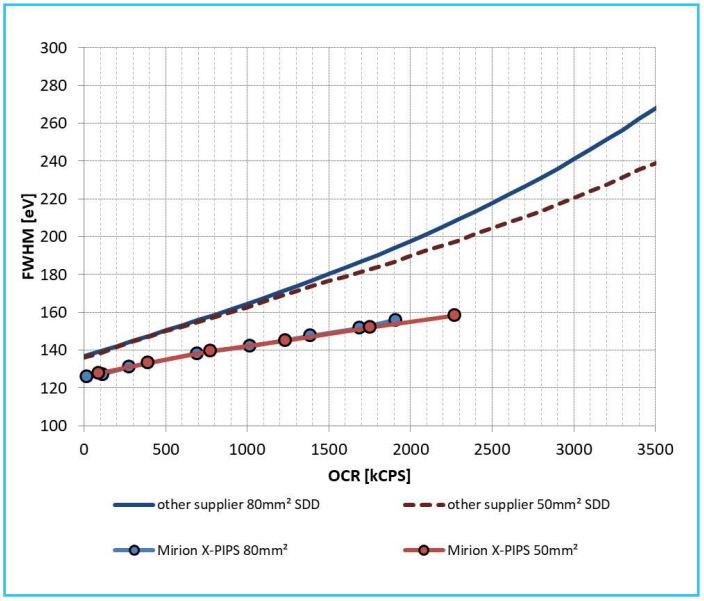
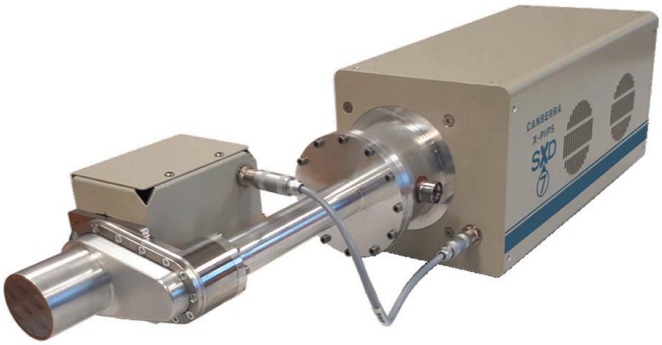


Figure 3. Typical high count rate measurements on one channel of a 7-element system for an active area of 50 or 80 mm² per element. Comparison to another SDD supplier is also shown.

EXAMPLES

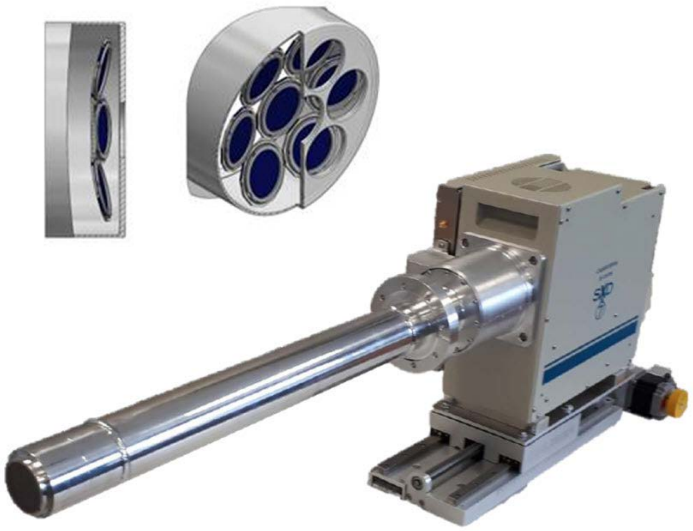
Example 1

- 7x50 mm^2 collimated elements
- 1.5 W Pulse-Tube cooler
  - High reliability and long life (>10 years)
  - Low power consumption (<50 W)
- Air or water cooled heat sink



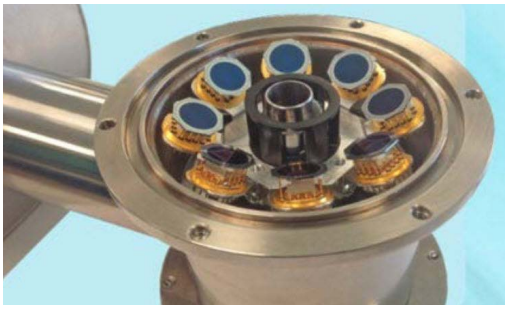
Example 2

- 7x80 mm^2 collimated elements
- 5 W Pulse-Tube cooler
  - High reliability and long life (>10 years)
- Focused arrangement
- Air or water cooled heat sink



Example 3

- 8x80 mm^2 collimated elements
- Focused arrangement



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