



Instruments That Advance The Art

DXP Mercury

One and Four-channel standalone Digital X-ray Processors

FEATURES

- One or four channel 14-bit 50 MSPS pulse processor.
- Peaking time range: 0.1 to 160 μ s.
- Low noise front-end for high resolution with soft X-rays.
- Output count rate up to 1 Mcps.
- Sophisticated pile-up inspection.
- MCA, fast scanning, or list mode readouts.
- 4 MB dual buffer memory for continuous fast scanning.
- Auxiliary digital lines available to support special applications.
- Instrument control via XIA's ProSpect software and Handel drivers.

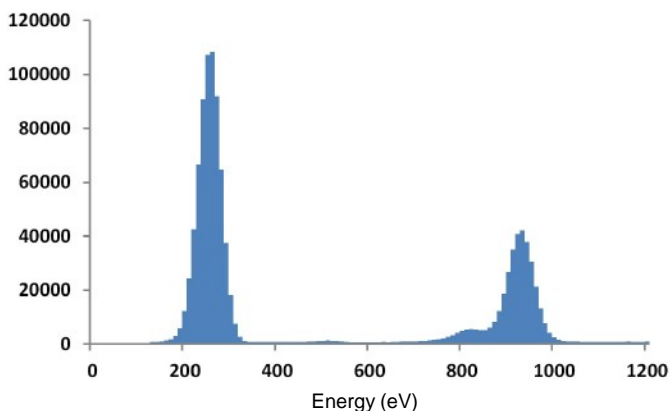


OVERVIEW

The DXP Mercury-1 and Mercury-4 package either one or four-channel high speed digital pulse processors into a compact desktop box with built-in power supply. Peaking times range from 0.1 to 160 μ s with a maximum output (at the shortest peaking time) of up to 1 Mcps into the spectrum. The DXP Mercury has excellent noise performance suitable for high resolution spectroscopy over an extended energy range 0.1-100 keV and beyond, using either a single detector or multi-element detector arrays. The Mercury processors offer computer control over all amplifier and spectrometer settings including gains, peaking times, and pileup inspection criteria.

The trapezoidal digital filters achieve significantly enhanced throughputs at comparable energy resolutions when compared to analog systems, but at a lower cost per detector. Energy resolution is nearly independent of count rate up to maximum throughput (63% dead-time). The full computer interface allows all data taking and calibration operations to be automated. Data can be collected either into a full spectrum of up to 16K channels or into up to 32 regions of interest (ROIs) and passed to the host computer without stopping data collection.

The DXP Mercury operates with a wide range of Reset type preamplifiers of either polarity. Several timing modes are offered, including fast scanning with full MCA readout or multiple ROIs, as well as list mode readout, where time and energy are stored for each event. The onboard memory manager gives full access to the data even during data collection. For deadtimeless operation with fast scanning, the memory can be organized into two independent blocks, allowing readout of one block while the other is being filled. Peak readout speeds across the USB2 interface exceed 16 MB/sec.



Low energy C-K and Cu-L lines collected with a Mercury and SDD.
Contact XIA for more low energy performance data.

APPLICATIONS

- **X-ray Spectroscopy:**
High resolution spectroscopy with single or quad SDDs.
- **X-ray Microanalysis:**
Fast mapping and list mode operation for SEM and other scanning applications.
- **Synchrotron beamline research:**
High rate continuous data collection for XAFS.
- **Imbedded OEM Applications:**
Available as a stand-alone box or OEM card.

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SPECIFICATIONS

Analog Inputs

- BNC connector.
- One or four preamplifier inputs with jumper-selectable gain: 0db (x1) with 10k Ω impedance, \pm 4V range. 6dB atten. (1/2 gain) with 600 Ω impedance, \pm 8V range.
- Works with reset type preamplifiers of either polarity.

Digital Inputs (TTL)

- Each module has a pair of BNC connectors programmed for one of the following functions:
 - Gate:* Suppresses data collection when asserted. Allows synchronized multi-channel data acquisition.
 - Sync:* Logic input to control time resolved data collection, such as scanning.

Hard-wired Data Outputs

- Front panel 25-way connector(s) with ROI, ICR and Live-Time TTL outputs.
- M1: Up to 14 ROIs plus trigger and live time outputs.
- M4: Each channel, up to 6 ROIs plus trigger and live time outputs.
- Auxillary digital lines can be configured for special applications.

Digital Controls

- **Gain:** 100x range, controlled by 16-bit DAC. Preamplifier gain range from 0.1 to 10 mV/keV at standard settings. Automated multi-channel gain setting and calibration.
- **Filtering:** Peaking times from 0.1 to 160 μ s. Adjustable flat top to eliminate ballistic deficit effects.
- **Pileup:** Fast channel filter time, pulse detection threshold, and fast channel pile up may be set independently to optimize performance. (Pulse-pair resolution typ.<100 ns).
- **Data collection:** MCA limits, bin widths, ROIs.

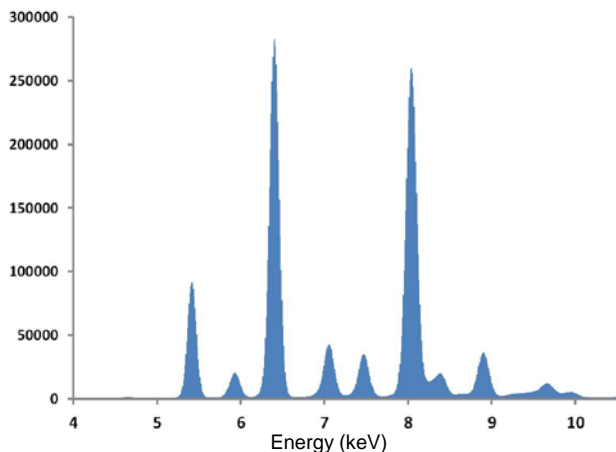
Software Data Outputs

- **Spectrum:** Up to 16384 (16K) channels (32 bits deep).
- **ROIs:** Up to 32 ROI regions can be defined per channel.
- **Timing:** Multiple spectra or sets of ROIs can be stored; continuous operation using dual-bank memory.
- **Statistics:** All values required for pileup correction are available; livetime, realtime, input events, output events.
- **Diagnostics:** ADC trace, baseline distribution and history.

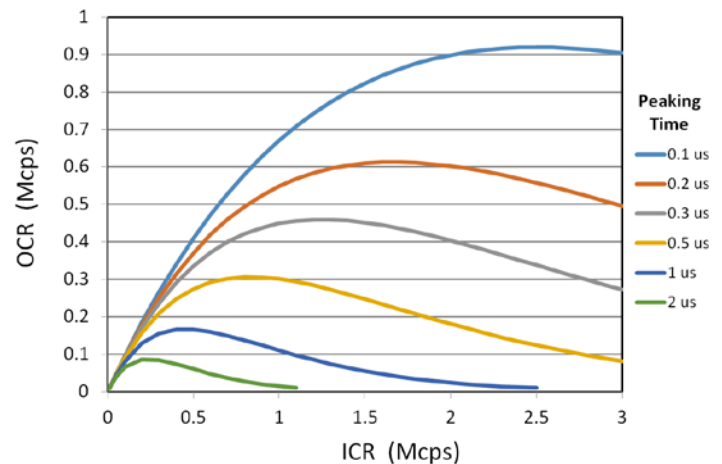
Interface

- High-Speed USB2.
- Peak USB2 transfer rate exceeds 16 MB/sec.

SAMPLE PERFORMANCE



XRF spectrum from a complex metallic sample collected with a Mercury and 30-sqmm SDD.



Filter throughput rate at various peaking times for a 0.1 μ s gap time.

SOFTWARE

XIA provides ProSpect, a software package primarily intended for setting up and optimizing the Mercury processor, for performing basic data acquisition and storage functions, and for generating configuration files for use by other control packages. Handel, a comprehensive set of C libraries, simplifies integration of DXP Mercury control into existing data collection software. Several alternative control packages are available, either commercially or as open-source from National Laboratory groups.