



Instruments That Advance The Art

Pixie-32

32-Channel Low Cost PXI Express Digital Processor

FEATURES

- 32 channel 12 bit 65 MSPS pulse processor.
- Synchronous multi-channel waveforms acquisition.
- Processor peaking times adjustable from 0.08 - 162 μ s.
- Pile-up inspector and run statistics counters.
- Sub-nanosecond timing resolution.
- PXI Express platform: x4 link.
- Front and back panel digital I/O signals.
- Coming soon: on-board energy histogramming and pulse shape analysis parameters

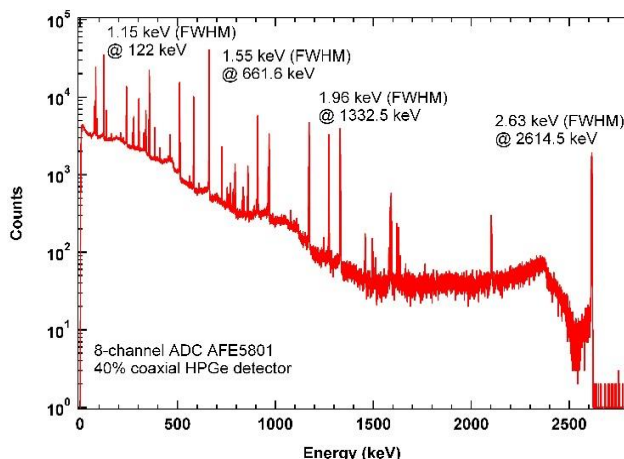


OVERVIEW

Taking advantage of new low cost, high density ADC components, this new member of XIA's Pixie spectrometer family is designed to address needs in the nuclear physics community for instrumenting large scale radiation detectors at relatively low cost. The Pixie-32 is a true multi-channel spectrometer that not only digitally captures incoming waveforms but also provides good time and energy resolution at a per channel cost up to 10 times lower than other digital readout modules of similar capability.

The Pixie-32 is the first member of a family of digital spectrometers modules that will all share the same communication back-end while their front-ends have a variety of digitization and signal processing options to meet the community's broad spectrum of readout electronics needs. This approach enhances the instrument's flexibility because the front-end is easily adaptable to different experiments or applications.

The Pixie-32 is a 3U PXI Express (PXIe) card housed in a PXIe chassis. Its front panel high density connector can accept up to 32 single-ended analog signals. An optional 32 channel mezzanine board is under development that will expand the Pixie-32's capacity to 64-channels. Output data transfer is via PCI express which, with suitable PC configuration, supports reading out multiple modules in parallel. Integration into larger systems is facilitated by front and back panel digital I/O that allow the Pixie-32 to generate and respond to various clock, trigger and veto signals.



APPLICATIONS

- HPGe detector arrays.
- Scintillator detector arrays.
- Silicon detector arrays.
- Gas counters.
- Real-time pulse-shape discrimination.
- Waveform analysis.
- Time dependent spectroscopy.

XIA LLC
www.xia.com

sales@xia.com Tel: +1-510-401-5760
 31057 Genstar Road, Hayward, CA 94544 USA

SPECIFICATIONS

Front Panel I/O

- 32 or 64 analog signal inputs. Input impedance 50 Ω or 1 k Ω .
- 10 digital inputs / outputs for triggers or veto signals. (Also configurable as 5 high speed differential signals.)

Backplane I/O

- Low skew system clock distributed to all modules.
- Configurable LVTTTL and LVDS lines for veto, run synchronization, multiplicity, and trigger distribution.

PXI Express Platform

- 3U CompactPCI form factor with x4 PCI Express interface.
- Measured sustained data rate over 400 MBytes/s from module to host PC.
- Parallel readout of modules with suitable chassis and PC. (E.g., a x16 host PC can read 4 modules in parallel.)

Digital Controls

- On-board variable gain amplifier for flexible gain selection, $\pm 10\%$ digital adjustment.
- Offset: -1.25 V to 1.25 V in 16384 steps by channel
- Energy filter: Rise time and flat top: 0.08 - 162 μ s.
- Acquisition: Local and shared trigger, hit pattern, coincidence window.
- Real time pulse shape analysis (charge integration) (coming soon).

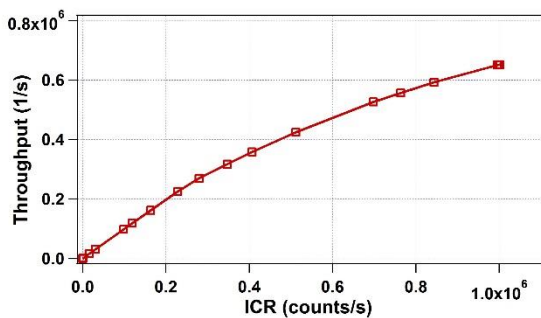
Pulse Processing

- Signal digitized at 50 MSPS, 12 bit standard, 65 MSPS Max.
- Waveform capture at full ADC rate.
- Pile-up inspection, out-of-range detection.
- 16 bit fixed point DSP suitable for user DSP code.

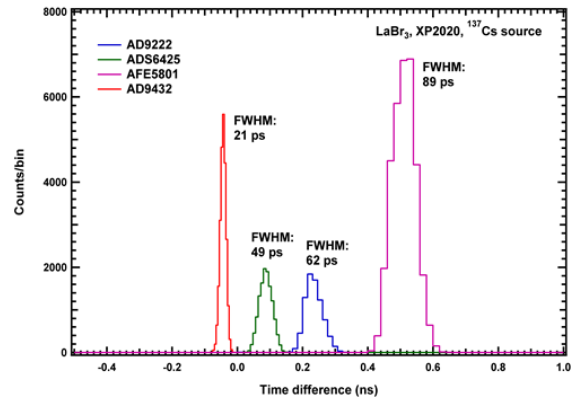
Data Reported

- List mode data, (energies, timestamps, and waveforms).
- Run statistics.
- Online energy spectra (coming soon)

SAMPLE PERFORMANCE



OCR vs. ICR for the Pixie-32 using a very short energy filter time



Intrinsic timing resolution of the AFE5801 compared to other common ADCs. The signal from an LaBr_3 crystal coupled to an XP2020 PMT was split between two ADC channels and Δt measured

SOFTWARE

The Pixie-32 is operated through XIA's graphical user interface OmmniVore. All interfaces call functions from the same C driver library, which handles conversion of physical parameters (e.g. filter times) into numbers used by the firmware. All parameters can be saved to disk for easy reloading at boot time.

The C library is largely compatible with Linux and code is available to users who plan to integrate Pixie-32 modules into a custom data acquisition system. All host software is provided as open source. Users can also add their own functions to the DSP events processing code.

