Instruments That Advance The Art

Polaris

D G F P o l a r i s

Desktop Digital Spectrometer

GENERAL DESCRIPTION

The Polaris is a high-precision, ultra-fast all-digital spectrometer. It provides unparalleled spectral accuracy with up to 64K channels spectrum length, and can on the other hand sustain count rates of up to 750,000 counts per second into the spectrum. The Polaris can accept signals from virtually any radiation detector. Signals as fast as having a 230ns decay time (from NaI(Tl) for instance) can be processed without the need for external electronics. The Polaris has built-in support for HPGe detectors with a Compton shield: The photomultiplier signal from the shield can be fed directly into the Gate input of the Polaris. No external electronics is necessary. For specialty applications, the Polaris can perform pulse shape analysis, for instance for neutron/gamma discrimination, and can also report data as a list of entries containing energy, time of arrival and even waveforms.

FEATURES

- Designed for high precision γ-ray spectroscopy with HPGe detectors.
- Directly compatible with scintillator/PMT combinations: NaI, CsI, BGO, and many others.
- Input signal decay time: as fast as 150ns and up to 10ms, exponentially decaying.
- Wide range of filter rise times: from 50ns to 45µs, equivalent to 22 ns to 20µs shaping.
- Selectable spectrum length: from 1K to 64K channels, $4.3 \cdot 10^9$ counts per bin.
- Sustained count rate into spectrum: up to 750,000cps (with scintillator)
- Excellent pile up inspection: double pulse resolution of 100ns.
- Automatic optimization of instrument settings to match detector characteristics.
- Digital oscilloscope and FFT for health-of-system analysis.
- Digital gain stabilization.
- Triggered waveform acquisition for advanced R&D: 14-bit, 40MSPS, 100µs. (Contact XIA for 14-bit 65MSPS and even 80MSPS option.)
- Compton suppressor input accepts photo-multiplier input.
- Includes preamplifier power supply and high voltage.

SPECIFICATIONS

Inputs (Analog)

Signal Input: Selectable input impedance: 50Ω, 90Ω, 250Ω and 1kΩ, ±10V pulsed, ±3V DC. Selectable input attenuations: 1:21, 1:12, 1:5, and 1:1.

Gate Input: (Dual purpose, see below) Input for photo-multiplier signal from Compton shield. Impedance: 50Ω, ±10V pulsed, ±2V DC

Inputs (Digital)

Gate Input: (Dual purpose, see above) TTL logic input for specialty applications.

Sync Input: TTL logic input to control time resolved data collection, including scanning and "phase locked loop" applications.

HV Inhibit: TTL logic input. Selectable logic HI or LO for HV-shut down.

Interface

USB: Serial interface.

EPP: Enhanced Parallel Port, IEEE 1284.

OEM: Auxiliary 25 pin programmable bidirectional I/O connector for specialty applications.

Digital Controls

Gain: 80:1 gain range in fine steps.

Shaping: Digital trapezoidal filter. Rise time and flat top set independently : 0.050 - 45µs in small steps.

Data reported

Spectrum: 1024-65536 channels, 32-bit deep (4,294,967,295 counts/bin).

Other: Real time, live time, input and throughput count rates, and Compton shield statistics.

Control I/O (via OEM Port)

Control Signals: sends or receives TTL/CMOS control signals via optional OEM connector, to create flexible custom interfaces to external instruments or industrial equipment. Custom on-board software facilitates integration of the Polaris processor core into dedicated spectrometry applications.

Other Specifications

Detector Supply: High Voltage +/- 5000 V, SHV connector, push-button on/off, front panel adjust, 60 sec. on/off ramp.

Preamp Supply: +/- 24V and +/- 12V, each rated at 100 mA.

Power Requirements: 110 V at 0.2 A 50/60 Hz or 220 V at 0.1 A 50/60 Hz, specify at time of order.

Dimensions: 9.75" W x 7.0" D x 3.8" H.

Weight: net: 5.0 lbs., shipping: 8.0 lbs.

Manual: Hardware and software manuals provided with each instrument.

Software: All software necessary for operation of the Polaris is included. Operation requires external computer running Microsoft Windows.

Figure 1:

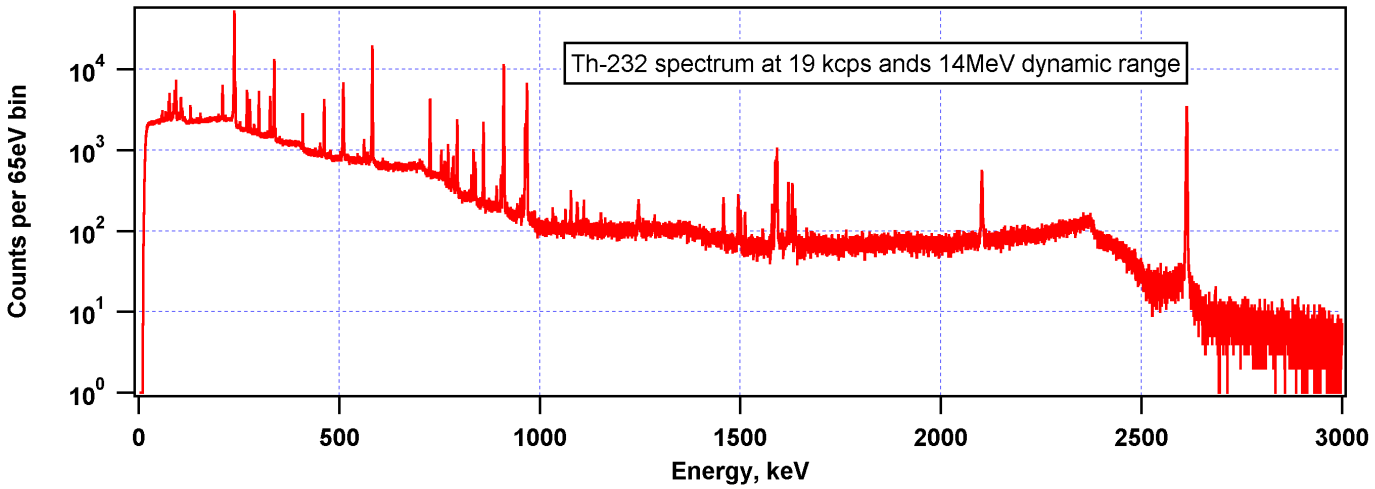
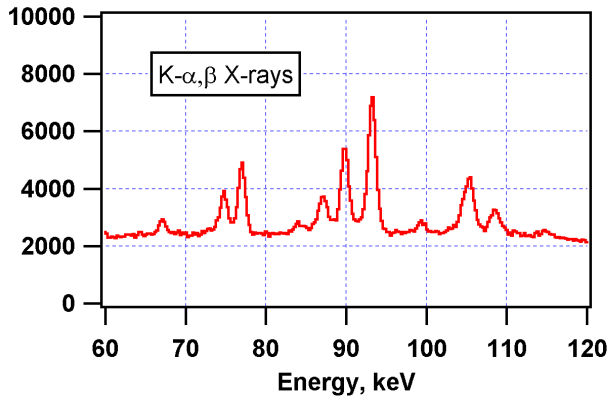
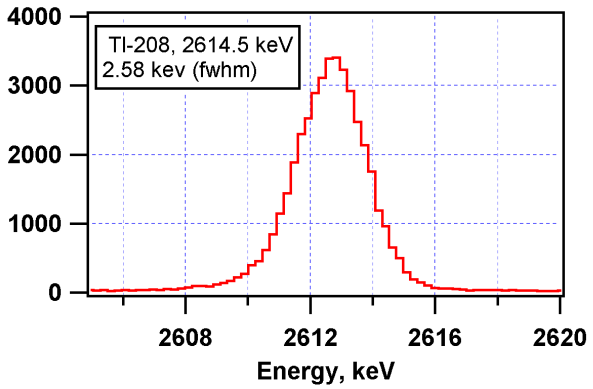


Figure 1: 64K channel spectrum of ^{232}Th and daughters at 19 kcps input count rate. The dynamic range was set to 14 MeV, adequate for prompt neutron-induced gamma-ray analysis. The detector was a 18-year-old coaxial Ge-detector from Aptec, with an estimated efficiency of about 15%. The top graph shows the revelant part of the entire spectrum. The two lower charts highlight the performance at the ends of the spectral range. At 14 MeV dynamic range a 64K spectrum has a bin width of 214 eV, and is thus capable of resolving the various K-line X-rays nicely. At the high end, the energy resolution at the 2614.5 keV ^{208}Tl line is 2.58 keV (fwhm).





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