

Alpha Spectra, Inc. Data Sheet

Ultra Low Noise X-Ray Detector Offered by Alpha Spectra, Inc. Grand Junction, Colorado

Alpha Spectra, Inc. has introduced a new ultra low noise x-ray detector capable of discriminating very low energy photons. The new device utilizes a NaI(Tl) scintillator, low background construction techniques and low noise components.

The ultra low noise (ULN) detector has been successfully used by the University of Washington and Argonne National Laboratory Collaboration in their lower energy resolution inelastic x-ray scattering (LERIX) spectrometer. The ASI ULN detectors used in the LERIX experiments are shown here in Figure 1. The detectors as installed in the LERIX experimental apparatus are shown in Figure 3.



Figure 1. ASI's ULN detectors. (ASI photo)

The ULN detector is configured to reduce noise and improve the signal to noise ratio required at very low photon energies. A thin section of selected NaI(Tl) crystal is mounted to a quartz light pipe. The light pipe is optically coupled to a selected low noise photomultiplier tube (PMT) and a thin beryllium energy entrance window minimizes loss of low energy signals. A

voltage divider and low noise charge sensitive preamplifier is mounted to the PMT. The preamp output is a positive going signal with amplitude of 0-2 volts. This signal is suitable for input into any standard spectroscopy grade linear amplifier.

The ULN detector has a noise threshold of less than 1.0 KeV. Figure 2 shows the 5.9 KeV photon spectrum for Fe-55.

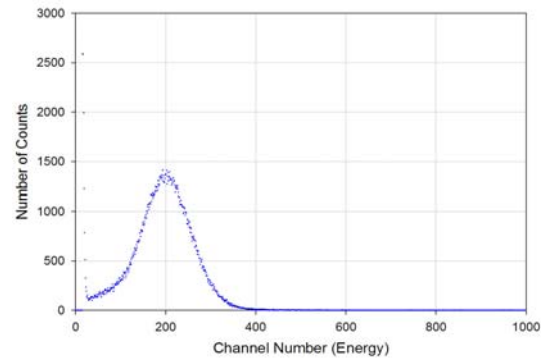


Figure 2. Typical Fe-55 spectrum showing 5.9 KeV photopeak. (ASI data)

Since many experimental applications require multiple detectors, ASI's ULN detectors can be gain matched so signals are easily processed.

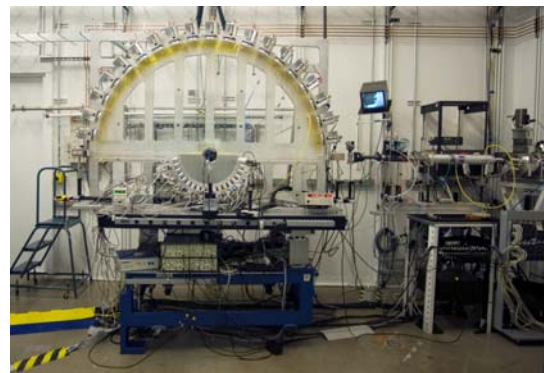


Figure 3. ULN detectors shown mounted in the new LERIX Spectrometer. (Courtesy U. of WA)

Alpha Spectra, Inc. Ultra Low Noise Detector Specifications

Detector Style:	Ultra low noise thin integral
Crystal Material, and Dimensions:	Selected Thin NaI(Tl), Typical thickness 0.020" thick
Crystal Housing:	Aluminum crystal body; aluminum light shield
Photomultiplier:	Selected for low noise wrapped with mu metal foil
Electronics:	Voltage divider and Preamp
Preamp Specifications:	
Noise	Equivalent noise charge RMS of 1.25×10^3 electrons at the input (typical)
Input:	Negative charge from the detector
Charge Sensitivity:	500 mV/picocoulomb (typical)
Output/Polarity:	Positive 2 Volts (saturation)
Rise Time:	40 nanoseconds
Decay Time:	60 microseconds
Impedance:	50 ohms
Gain Stability:	0.25% from 0°C to 50°C
Power Requirements, PMT:	PMT, High Voltage: 700 to 1000V at 150 microamps
Power Requirements, Preamp:	-24 VDC at 12 milliamps
Gain Potentiometer:	Provided
Connectors:	Signal (BNC), High Voltage (SHV), 9 pin D-style (Preamp power)
Detector Noise Threshold:	0.75 KeV (typical)
Detector Pulse Height Resolution:	63% at 5 KeV (Fe-55) (typical) 28% at 22 KeV (Cd-109) (typical)

Please contact Alpha Spectra, Inc. so that our design team may help you design a custom detector configuration for your experimental application.

