DISCONTINUED: SEE GAMMA-RAD

Gamma Ray & X-Ray Spectroscopy System
Hand-Held, High Efficiency NaI(Tl) Detector

The GAMMA-8000 is a powerful, portable instrument combining a scintillation probe and MCA that provides the same high quality spectroscopic information both inside the laboratory and in the field.

Features

- The Pocket MCA provides power to the Probe from two AA batteries
- Scintillator Probe includes
  - PM Tube
  - Ultra stable High Voltage Supply
  - Preamplifier and Amplifier
- Crystal Sizes from 30 x 30 mm up to 152 x 76 mm (76 x 76 mm standard)
- Choice of crystals: NaI(Tl) (standard), CsI(Tl), BGO, etc.
- Rugged design, water and gas tight
- Low power consumption (200 mW)

Applications

- High resolution X-ray and Gamma ray spectroscopy
- Homeland security
- Nuclear safeguards verification
- Cargo container inspection
- Toxic dump site monitor
- In situ processing
- Environmental monitoring
- Teaching and Research

Homeland Security Applications

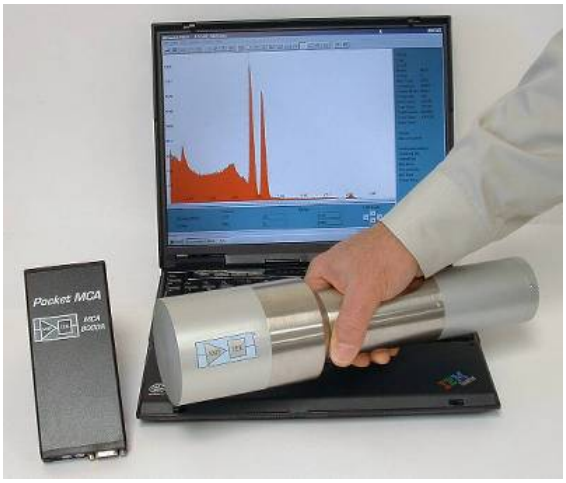


Figure 1. Gamma-8000 (MCA8000A and 76 x 76 mm NaI).

The GAMMA-8000 is a unique combination of a low power Scintillation Probe and the world's smallest MCA, the MCA8000A. The scintillation probe features a complete, ruggedized design of Scintillator, PM Tube, High Voltage Supply, Preamplifier and Amplifier.

The standard scintillation crystal is NaI(Tl). The internal High Voltage supply ensures stable gain at high count rates and low power consumption. The housing is made of anodized aluminum with a thickness of 0.5 mm around the scintillation crystal.

A low power preamplifier and spectroscopic amplifier process signals from the photomultiplier tube. The output pulses from the shaping amplifier are directly connected to the MCA8000A via a 4-wire cable. The cable also provides power to the probe from the two AA batteries located inside the MCA8000A. A high voltage monitor and control is provided at the back of the probe via a twenty-turn potentiometer. For laboratory use, the AC adaptor included with the MCA8000A can provide continuous power to the system.

Energy resolution for the standard 76 x 76 mm NaI(Tl) crystal is typically 6.9% at 662 keV and 4.7% at 1.33 MeV.

Control and display of the MCA8000A can be provided by a laptop or desktop computer. The MCA8000A

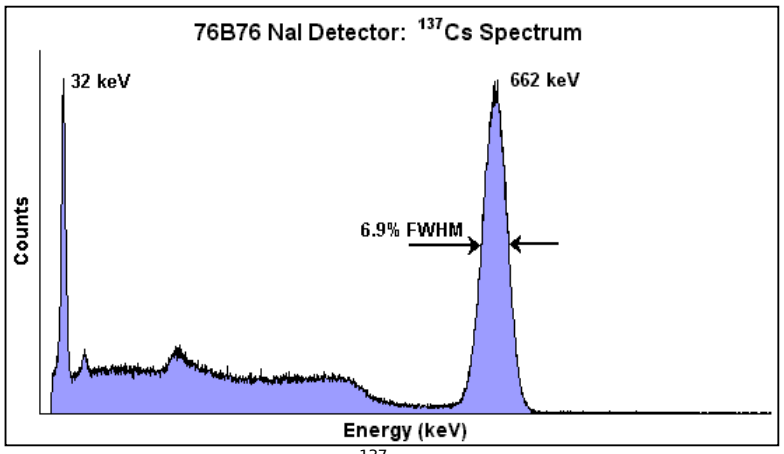


Figure 2. ^{137}Cs Spectrum.

features up to 16k channels successive approximation ADC with less than 5 µs conversion time and sliding scale linearization. Windows software is included (see MCA8000A specifications).

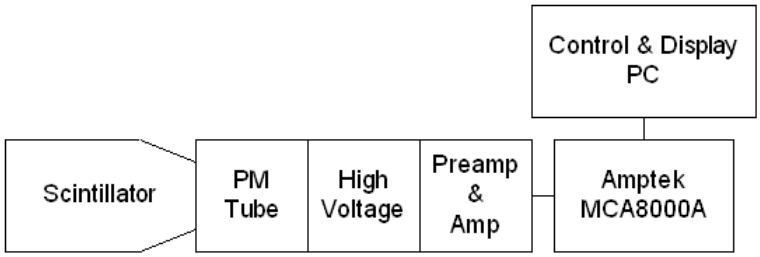
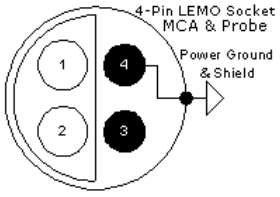


Figure 3. GAMMA-8000 Block Diagram

Specifications

Scintillation Crystal	Standard: 76 x 76 mm NaI(Tl)
Photomultiplier Tube	Standard: 78 mm diameter, fast liner focussed
Housing around Scintillation Crystal	Anodized aluminum 1 mm thick front surface 1.5 mm thick side surface
Energy Resolution (Typical)	76 x 76 mm NaI(Tl): 6.9% at 662 keV; 4.7% at 1.33 MeV
High Voltage Generator	Cockroft Walton type
High Voltage Regulation	0-1500 V (20 turn screw potentiometer at back of assembly)
Power Supply	+5 V to +6 V provided by the MCA
High Voltage Monitor	1 V = 1 kV (back of assembly)
Power Requirements	200 mW
Spectroscopy Amplifier	Output Impedance: 50 Ohm Pulse Shape: Bipolar, 3 µs rise time, 3 µs fall time Maximum Output: + 4.0 V
Cable Type	Shielded cable for power supply and signal (2 m)
Connectors on probe and MCA8000A	LEMO, ERA 0 S 304 CLL
Connectors on cable	LEMO, FRA 0 s 304 CLAC42
Pin Out	Pin 1: Signal Pin 2: Signal Ground Pin 3: +5 V to +6 V Pin 4: Power Ground 
Operating Temperature Range	-25°C to +55°C
Weight	MCA8000A: 300 g 76B76 NaI(Tl): 2kg

Click here for full MCA8000A specifications

Output Pulse of the Gamma-8000 NaI(Tl) Probe

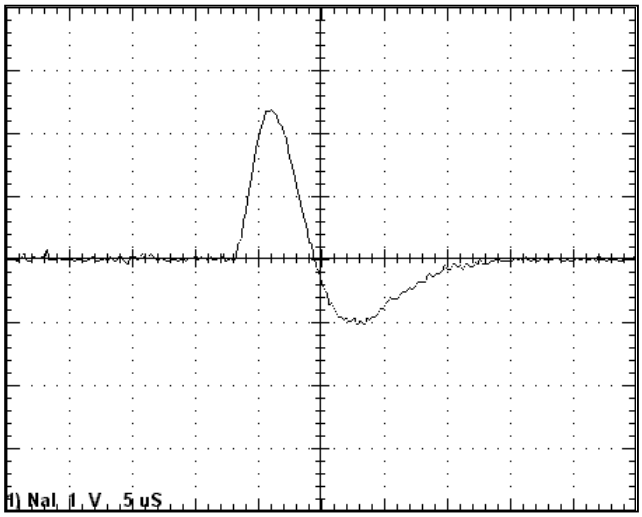


Figure 4. Output Pulse from the Amptek GAMMA-8000 NaI probe. Bipolar, 3 µs rise time, 3 µs fall time.


Figure 5. Gamma-8000 shown with a special order 30 x 30 mm NaI(Tl) probe.

Use of the MCA8000A With Other Detectors

In applications other than the Amptek GAMMA-8000, the signal from the PM tube or other detector must be first connected to a preamplifier and shaping amplifier and then to the MCA8000A. The input to the MCA8000A from other detectors must be a positive going unipolar or bipolar pulse from the output of a shaping amplifier with peaking time greater than 250 ns. The MCA8000A will not accept pulses directly from the PM tube.

NaI(Tl) Efficiency

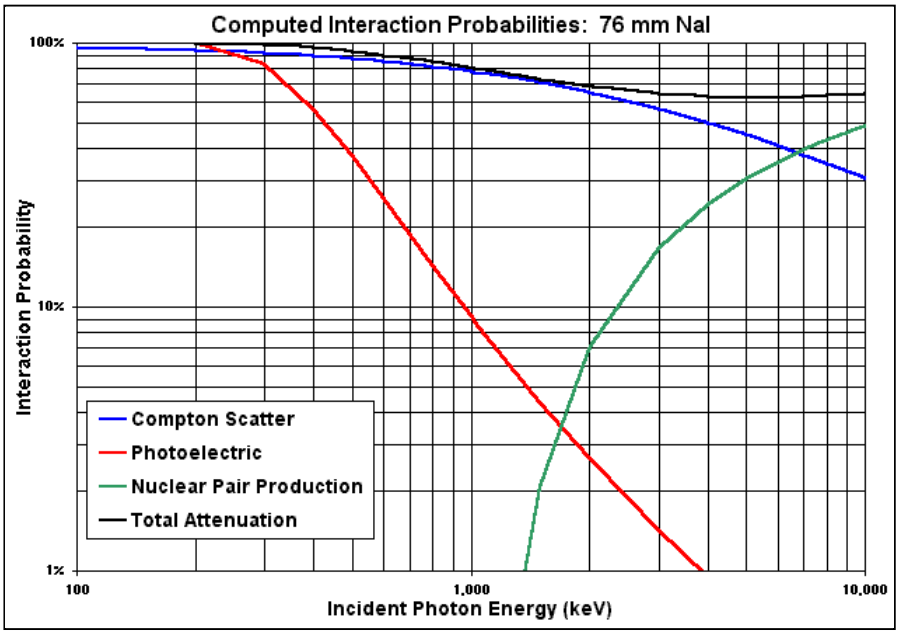


Figure 6.

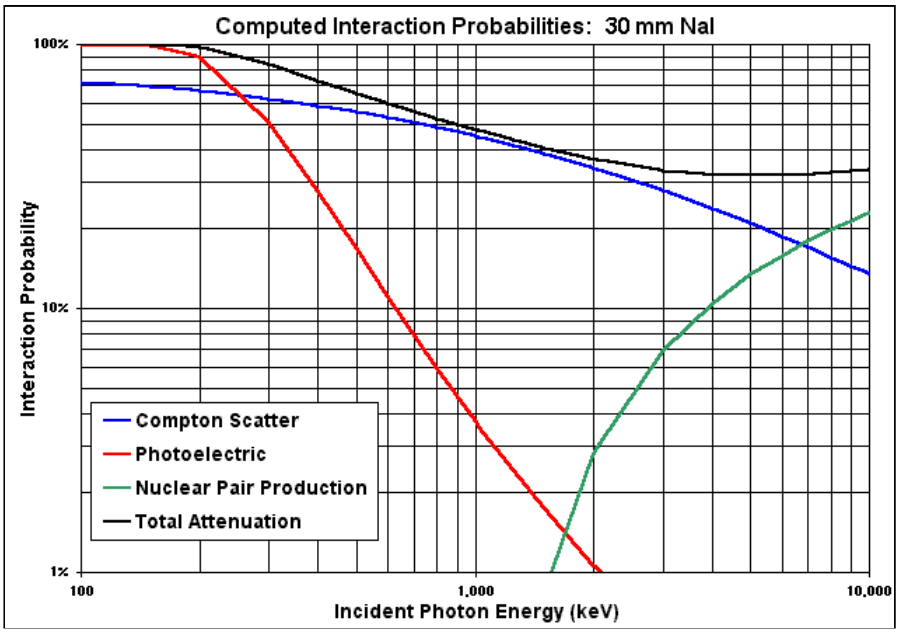


Figure 7.

Application Notes

Long Term Radiation Monitoring of the Environment

An example program written in Visual Basic and using the MCA8000A communication libraries has been provided to aid in the long term radiation monitoring of the environment. This routine automatically saves a complete spectrum at user defined intervals. In addition, it produces an ASCII file consisting of the Total Counts in each spectrum. This Total Counts file can then be plotted to show the variation in counts over time. An example is given below.

Click here to dowload the package

Pedestrian Monitoring System for Radioactive Materials (GAMMA-8000 76 x 76 mm NaI)
Homeland Security Application

Example of a pedestrian walking 10 ft away from a monitoring station and carrying a 100 µC ^{137}Cs radioactive source. This type of event could not have been detected with a standard Geiger counter since it registered a natural background of 0.02 mR/hr before and during the pedestrian incident. However, as shown in the figure below, the GAMMA-8000 quickly detected a rise in the Total Counts in order to sound the alarm, and unlike the Geiger counter, recorded the spectral information separately for every second. Hence, positive identification of the ^{137}Cs isotope was made by identifying the 662 keV peak.

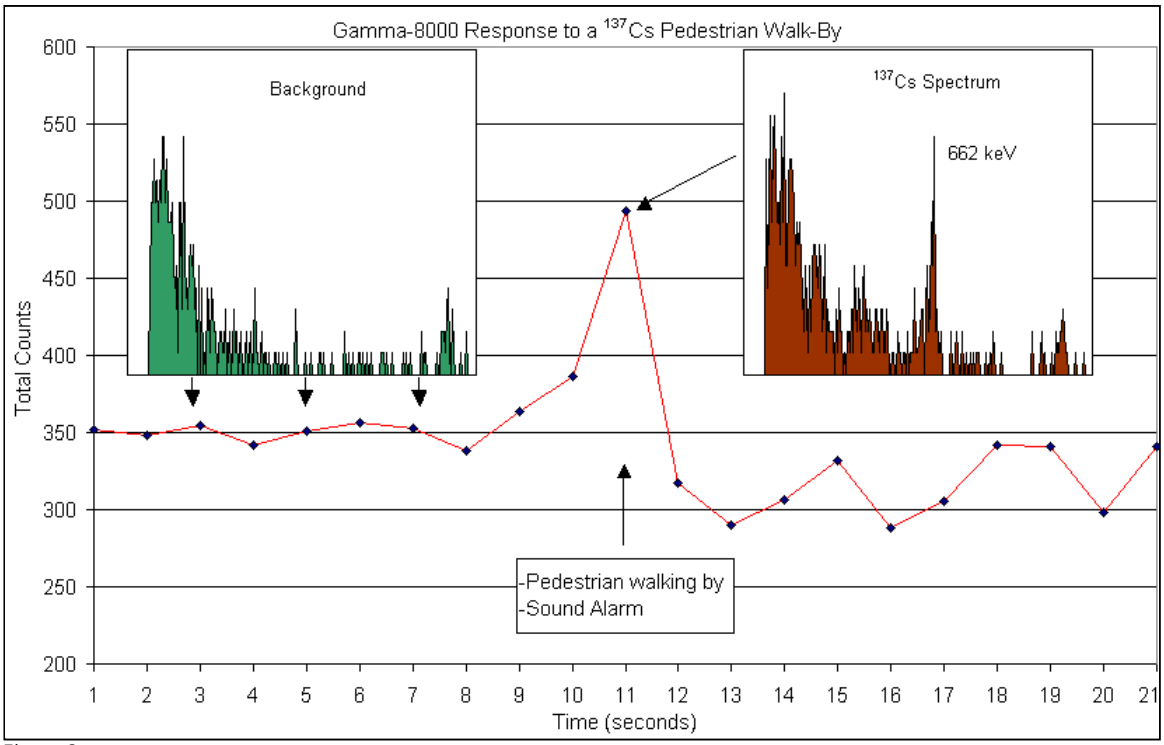


Figure 8.

Typical GAMMA-8000 Spectra with 76 x 76 mm NaI(Tl) Detector

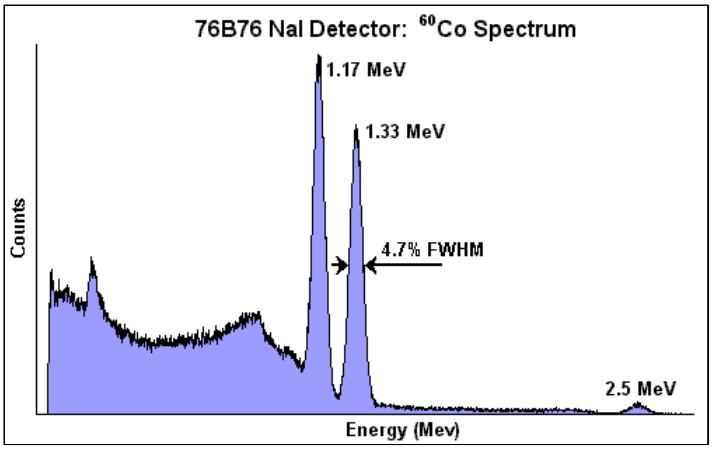


Figure 9.

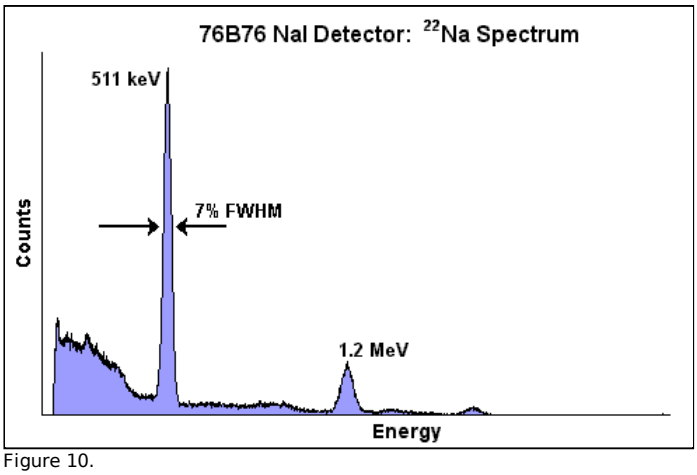


Figure 10.

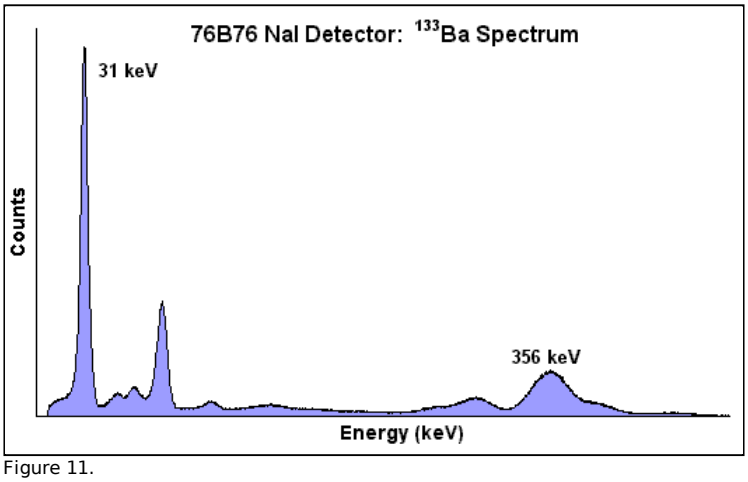


Figure 11.

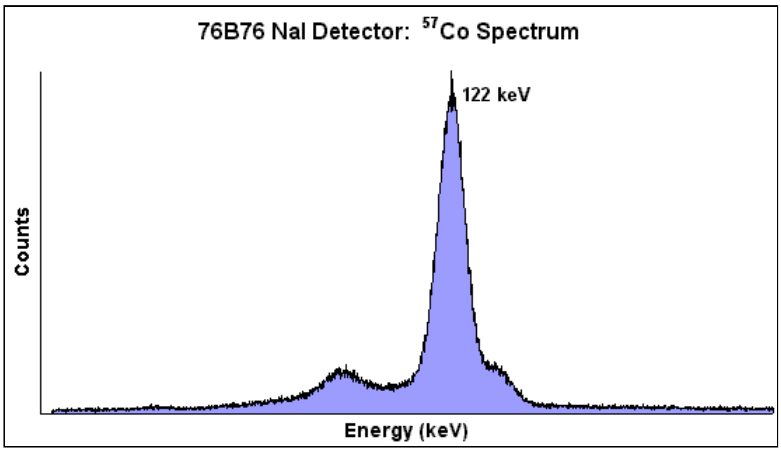


Figure 12.

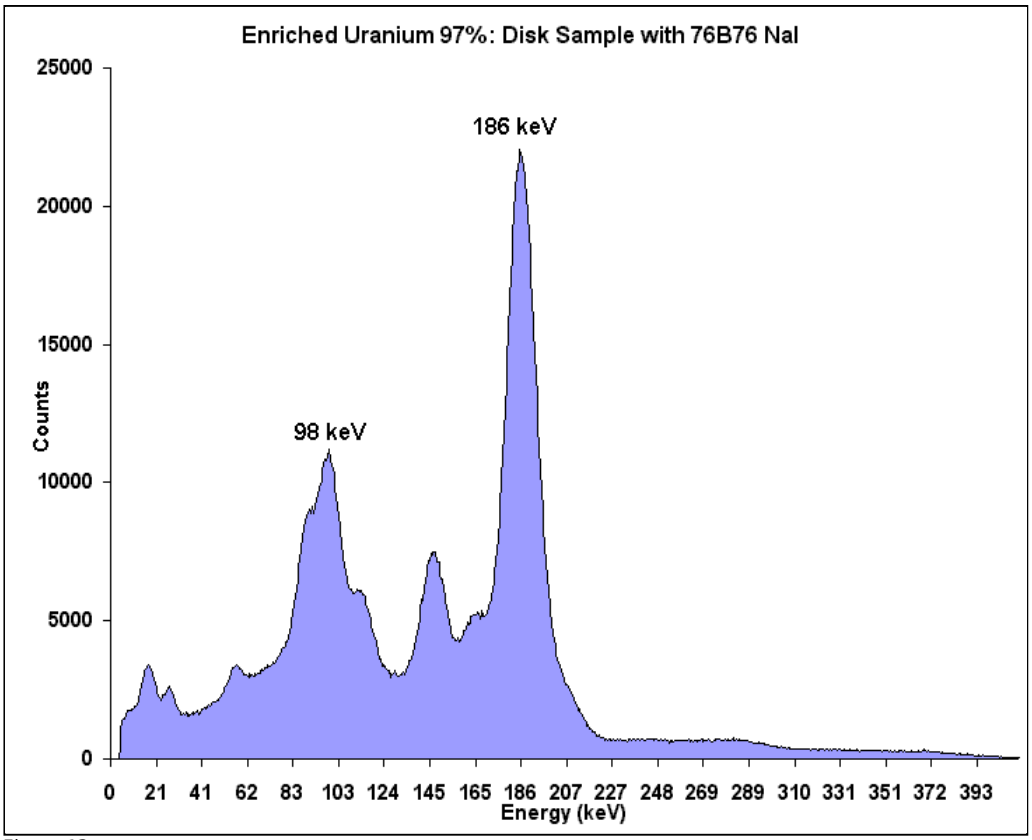


Figure 13.

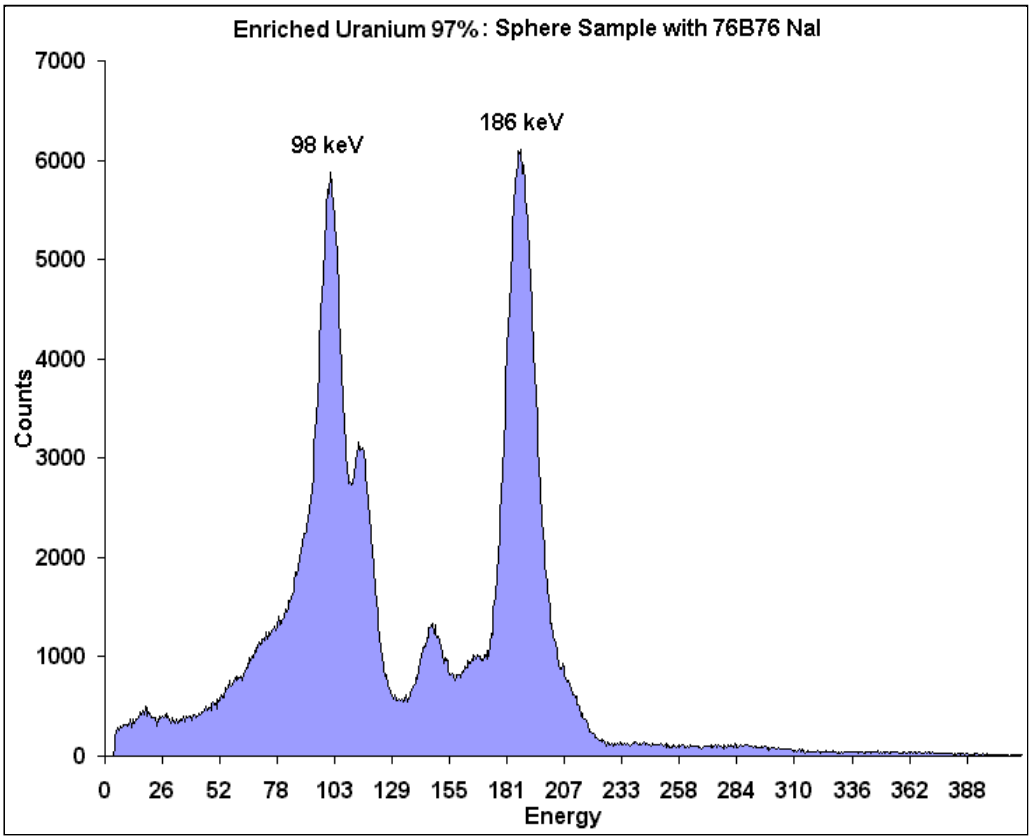


Figure 14.

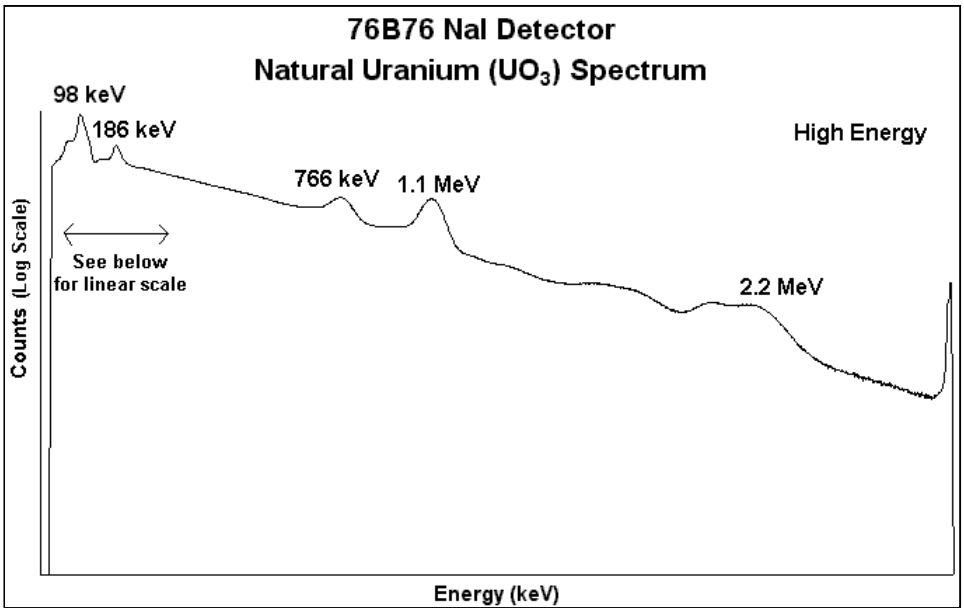


Figure 15.

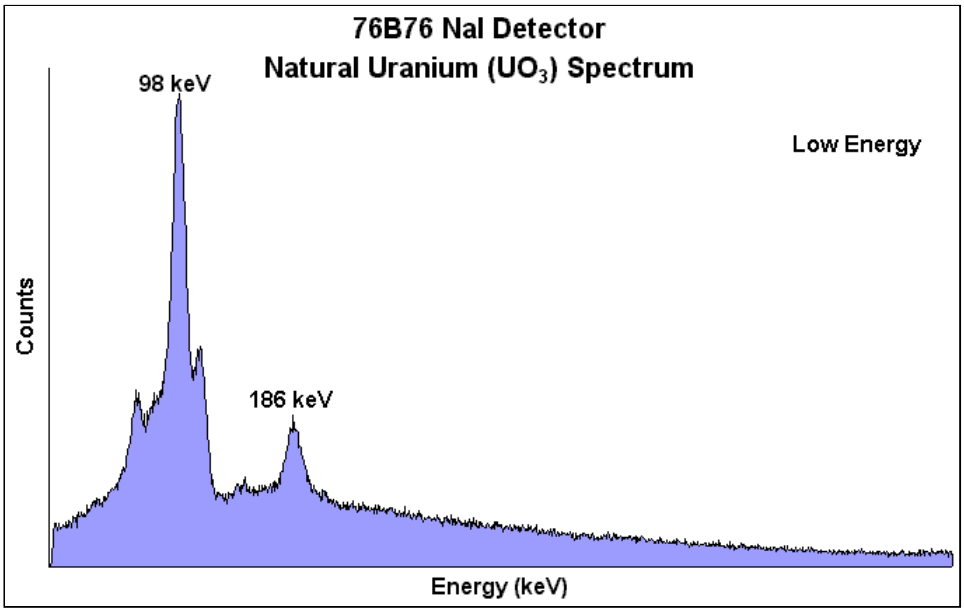


Figure 16.

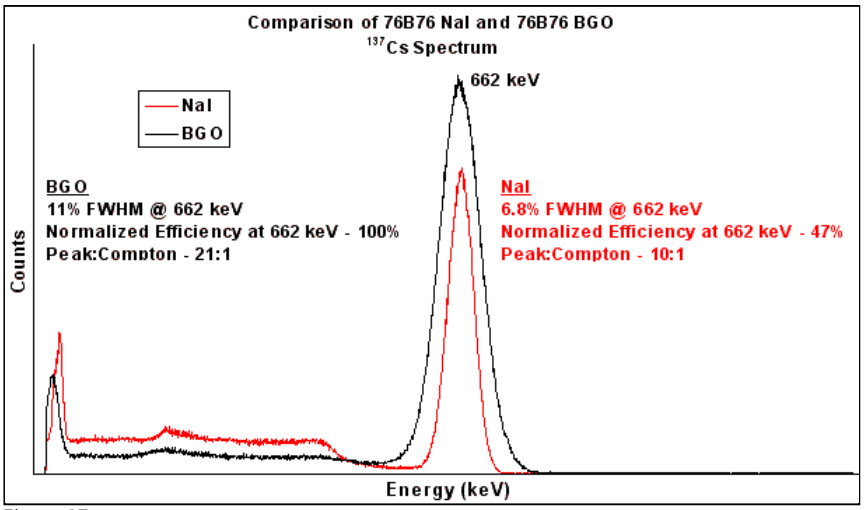


Figure 17.

Mechanical Dimensions

30 x 30 mm NaI Probe

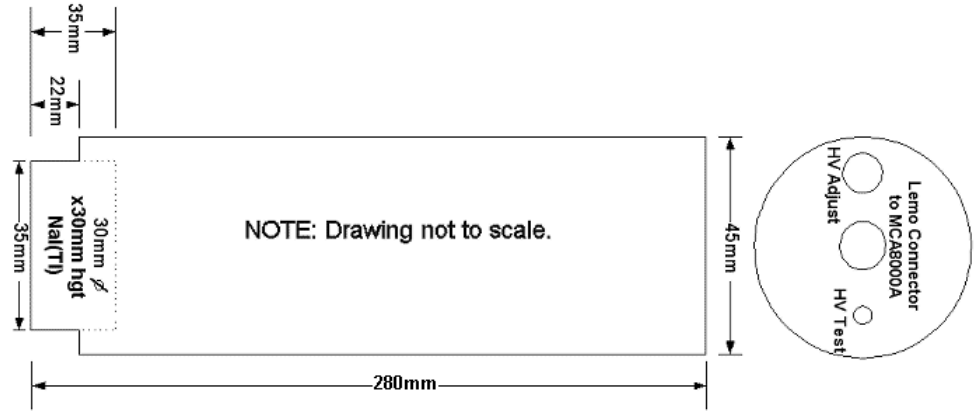


Figure 18.

76 x 76 mm NaI Probe

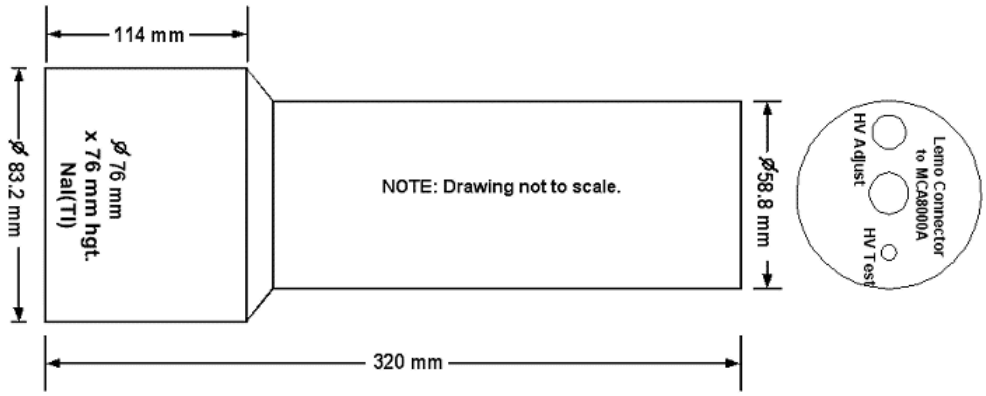


Figure 19.

Click here for MCA8000A mechanical dimensions

Click here for the GAMMA-RAD Scintillation Detector and Digital Pulse Processor

GAMMA-8000 Specs in PDF format (578k)

The Gamma-8000 is being replaced by the Gamma-Rad. Amptek strongly suggest chosing the Gamma-Rad over the Gamma-8000. It is a more powerful system and less cost. Please click here for more information.

Home page | MCA8000A | Products | Price List | Company Profile | Press Release

Revised December 7, 2006