



In this Issue:

- Six New Products for 2008 . p. 1*
- Low-Background Gamma Spectroscopy p. 2*
- Low-Background Gamma Spectroscopy – cont. p. 3*
- Global Value – The Optimum Solution for the Counting Lab p. 4*
- Global Value – The Optimum Solution for the Counting – cont. p. 5*
- Improved Gamma-Ray Measurements, Analysis and Reporting p. 6*
- Automated Gamma Spectroscopy System for Counting Labs . p. 7*
- High Sensitivity Neutron Counter for Security Applications . . . p. 8*
- The World’s Best Radiation Identifier Shrinks! p. 9*
- New Algorithms for Waste Characterization p.10*
- Positron Lifetime Spectroscopy for Materials Analysis. p. 11*
- Lowest Cost NIM MCA Available p. 11*
- Update Your Info to Win . . . p. 12*

Six New Products for 2008

In addition to the recently announced Micro-Detective, ORTEC will release six more new products before the end of 2008. The Micro-Detective is a smaller and lighter version of the Detective-EX hand held radioisotope identifier (HHRID) that is regarded as the “gold standard” for the interdiction of illicit nuclear trafficking.

Recently announced is the carbon fiber endcap for HPGe detectors. Carbon fiber is virtually background-free, making it an ideal material for use in detectors intended for low background counting. It has a very high transmission rate for low energy gamma-rays, comparable to that of Beryllium, and is considerably better than aluminum which is most commonly used for HPGe detector endcaps. In addition, carbon fiber offers the added advantage of being corrosion resistant, and it is just as strong and durable as metal endcaps.

ORTEC will soon announce a harsh environment (HE) option for GEM and GMX model HPGe Detectors. The HE detector was designed for use in taking in-situ measurements in extreme conditions that might otherwise corrode or damage the detector. Featuring the carbon fiber endcap, the HE detector is impervious to moisture, sand, and dust by virtue of sealed electronics. The HE detector is splash resistant and a field-replaceable desiccant pack ensures the electronics enclosure remains free of humidity.

The HE detector will expand the reliability and range of applicability of ORTEC detectors to damp, dusty, or dirty environments such as in shipboard, tropical, and dusty clean-up site measurements.

This summer, ORTEC will introduce a truly compact, economical MCA. The EASY-MCA available in 2k and 8k versions, interfaces to a PC via a USB 2 cable and is constructed in a small stackable form.

Expanding the DSPEC family of USB-connectable products for HPGe detector gamma spectrometry, ORTEC will introduce an economy model, the DSPEC LF. This economical, yet powerful, DSP based instrument provides the same rock solid stability of the more costly models. It offers the following great features: Automatic optimization of detector parameters, SMART-1™ intelligent HPGe support, ballistic deficit correcting digital filter, fast data transfer and live spectrum display, and full computer control of every function.

Alpha Spectroscopy has not been ignored! The OCTETE-Plus has now been redesigned to include a USB port for simple, fast connection to the PC. This gives the latest generation of the OCTETE-Plus three options for communication: USB, Ethernet (10Base2) through BNC connector, or RS-232.

Late summer, ORTEC will introduce ANGLE software which is offered as an add-on for ORTEC’s GammaVision-32 Gamma Spectroscopy Software. ANGLE utilizes the solid angle theory to generate multiple calibrations from a single point source.

For more information on these products, contact your local sales representative, contact us directly at ortec.info@ametek.com, or visit the ORTEC website at www.ortec-online.com.

Low Background Gamma Spectroscopy

HPGe gamma spectrometry is a powerful technique both for the measurement of low environmental levels of radioactivity and sample dating through the quantification of naturally occurring radionuclides. However, an important consideration in making such measurements is the level of background radiation and the steps which can be taken to reduce it to as low a level as possible; with background usually defined as the spectrum in the detector with no source or sample present. The radiation causing this background comes not only from the detector and shield materials, but also from cosmic ray interactions with them.

Why is background important? First of all, full energy peaks of nuclide specific gamma rays in the background spectrum can mask the presence of these peaks in the sample. The presence of non peak background increases Minimum Detectable Activity (MDA), a measure of the quality of spectra which can be obtained from any detector. The resolution (R), background (B) and efficiency of the detector (ϵ) are all related to MDA at any given energy (E) as follows:

$$MDA(E) \sim \sqrt{R(E)B(E)}/\epsilon(E)$$

It is important to note that the MDA is also proportional to the square root of the detector resolution and inversely proportional to efficiency, so it's worth choosing as large a detector as possible, with good resolution and efficiency specifications over the energy range of interest. Equally vital is choosing a detector with geometric efficiency to match the sample. For example a flat ORTEC GEM-FX detector for filter samples or a well detector to maximize efficiency on small sized samples.

Let's talk now about the background itself, starting with that emanating from the shield and cosmic rays. Contributions from these sources can be minimized by choosing a suitable lead shield with walls and lid made from 100 mm low background lead, 50 mm sliding lead undershield, and a graded z liner of tin and copper to reduce lead x rays.

What steps can be taken to reduce background in the detector? At the heart of the detector/cryostat assembly is an HPGe crystal, mounted inside a copper cup, and connected to a cooling rod. The rod protrudes down through a preamplifier assembly into the liquid nitrogen dewar. The crystal and cooling rod are maintained at cryogenic temperatures and insulated from the outside world by a vacuum containing sieve material.

There is also a detector endcap surrounding the crystal and maintaining the vacuum (Figure 1).

In an ORTEC low background (LB) detector, the detector cup, pedestal and cooling rod are all manufactured from low background Oxygen Free High Conductivity (OFHC) copper, the flange from low cobalt steel, and the sieve material is replaced by activated charcoal. In an important new development, low background detector

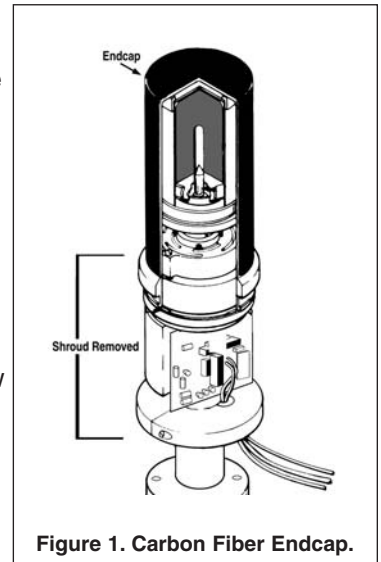


Figure 1. Carbon Fiber Endcap.

endcaps may now be manufactured from carbon fiber, having previously been made from either low background aluminum or magnesium. Carbon fiber is intrinsically very low background and since the endcap is a large body of material close to the crystal the use of carbon fiber has significantly improved the performance of ORTEC LB detectors. The improvement in performance is shown in figure 2, which compares carbon fiber and low background aluminum endcaps.

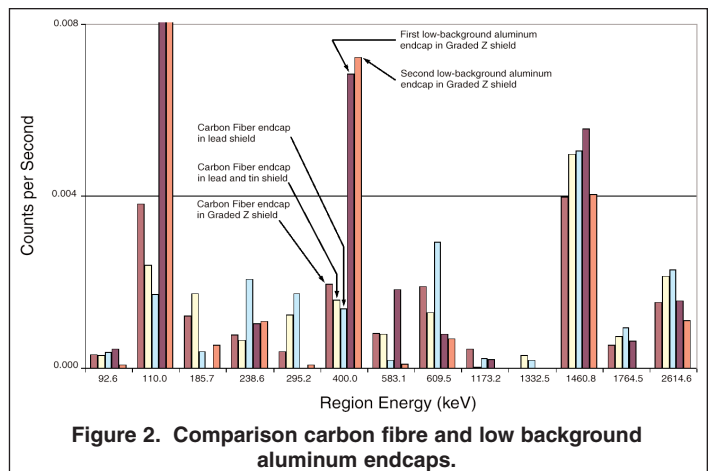


Figure 2. Comparison carbon fibre and low background aluminum endcaps.

ORTEC XLB (extra low background) detectors incorporate all these refinements, but also have a 2 cm thick aged lead shield behind the detector cup. This shields the crystal from any background originating from preamplifier components.

Continued on page 3

Low Background Gamma Spectroscopy

Continued from page 2

The ultimate in low background is called the 'Low low background' or LLB. In this design a different approach is used to eliminate any background from preamplifier components, with the preamplifier assembly positioned remotely away from the detector, and outside the lead shield altogether. The dewar and cooling rod are connected to the detector in a J shape arrangement as shown in figure 3.

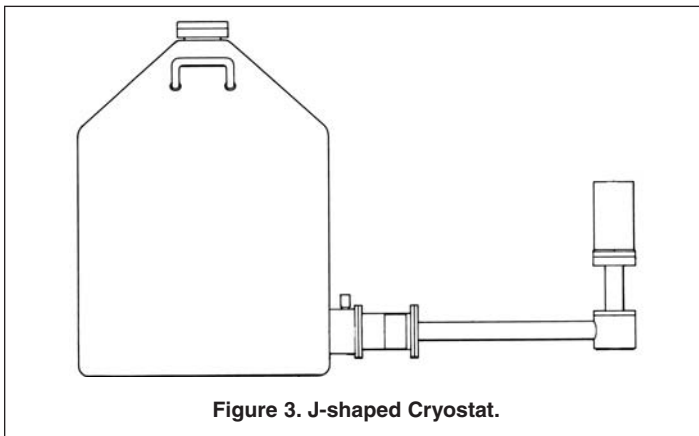


Figure 3. J-shaped Cryostat.

ORTEC can also manufacture custom designs to suit particular low background requirements, usually based around the standard options described above. An example is a variation of the LLB, in which the detector, cooling rod and dewar are in the more typical vertical arrangement. In this case the remote preamplifier is positioned outside the lead shield, directly below the sliding undershield of the lead shield, saving floor space in the lab.

In terms of cooling, liquid nitrogen and a traditional 'streamline' cryostat is usually the best way to achieve the lowest background possible, although, there is a compromise choice for users who want the convenience of electrical cooling, plus reduced background, but don't necessarily need the lowest background possible. They may find the reduced background PopTop capsule suitable, also known as 'RB'.

ORTEC RB detectors are constructed from the low background materials described above including the new carbon fibre endcap. Sieve material is used in the capsule to maintain adequate pumping of the vacuum, but the crystal is partially shielded from it by the OFHC copper cup.

Further information can be found in the following technical papers:

<http://www.ortec-online.com/papers/inmm2006-118.pdf>

<http://www.ortec-online.com/pdf/iec.pdf>

http://www.ortec-online.com/papers/char_and_app.pdf

Did You Know?

ORTEC maintains stock HPGe Detector items with specifications you can see before your buy? These items can be delivered in three weeks of the order date?

If you have not already, see what ORTEC has to offer at

www.ortec-online.com/detectors/stocklist.htm

Just when you thought you had seen it all in low-background counting. . . enter the Carbon Fiber Endcap from **ORTEC**.

A Carbon Fiber Endcap

- is virtually background free
- has excellent gamma-ray transmission below 10 keV
- has excellent sidewall transmission compared to Al – increasing low energy efficiency
- is stronger than Al, Mg, or Cu
- is resistant to corrosion and easier to clean

**Lower Your Background,
Increase Your Efficiency,
and Reduce Your MDA.**

ORTEC HPGe Detectors now available with Carbon Fiber Endcaps.



801 South Illinois Ave., Oak Ridge, TN 37831-0895 U.S.A. • (865) 482-4411 • Fax (865) 483-0396 • ortec.info@ametek.com
For International Office Locations, Visit Our Website

ORTEC

www.ortec-online.com

AMETEK

Tight Budget? Then you need this complete, economical, and easy to install Multichannel Analyzer System.

926-M32-USB

- 926 MCB in a one-wide NIM
- 8000-channel ADC (8 μ s)
- Two methods for Dead-Time correction
- 2 billion counts/channel
- Multiple presets
- Multiple computer interfaces
- GATE, BUSY, and PUR Inputs
- **USB connectivity**
 - Simple to install USB Interface
 - Direct connection to legacy ORTEC devices
 - Optional interface for PC parallel port connection
- **MAESTRO-32 MCA emulation software**
 - Advanced peak search algorithms
 - Windows graphical user interface

www.ortec-online.com/pdf/926-m32-usb.pdf



801 South Illinois Ave., Oak Ridge, TN 37831-0895 U.S.A. • (865) 482-4411 • Fax (865) 483-0396 • ortec.info@ametek.com
For International Office Locations, Visit Our Website

ORTEC

www.ortec-online.com

AMETEK

Global Value – The Optimum Solution for the Counting Lab

The ORTEC GammaVision gamma analysis software has been the backbone of ORTEC gamma spectroscopy systems for many years and is in widespread around the world. GammaVision software is used in many different applications from research to high productivity radiochemistry counting laboratories applications.

In order to minimize data entry errors and maximize productivity, many counting laboratories now see the need to automate as much of their counting procedure as possible as well as to establish a rigorous quality assurance and sample analysis review process. To meet these needs ORTEC has developed a suite of add-on programs for GammaVision called Global Value.

At the heart of the Global Value system is a high productivity user interface used for managing large numbers of gamma detector systems. Global Value incorporates comprehensive data management, electronic data review, custom reporting and QA tools and uses GammaVision to perform the basic functions such as data analysis, system calibration, nuclide library editing etc.

Key features of Global Value include:

- Completely automated analysis routines
- Analysis routines can be started from any PC on a network running Global Value
- Advanced data management with instant access to analysis data and reports.
- Analysis data and QA data stored in security protected Microsoft Access database
- Electronic analysis report editing, digital signatures and encrypted PDF reports.
- Custom reports can be produced with NO special expertise or software required
- Quality Assurance module with data review, evaluation and custom report features
- Analysis log for easy, filtered searching and recall of report data
- Seamless integration with Microsoft Excel for unlimited calculations, QA data evaluation, and post-analysis data processing

The Quick Start utility which is the launch pad for starting automated analysis procedures within Global Value allows the user to select the specific detector to be used. The software automatically checks to see if the selected detector is already being used by another system on the network. In addition, a QA status check is also automatically performed which prompts the user, indicating any QA failure for the specific detector selected during the sample analysis routine.

Continued on page 5

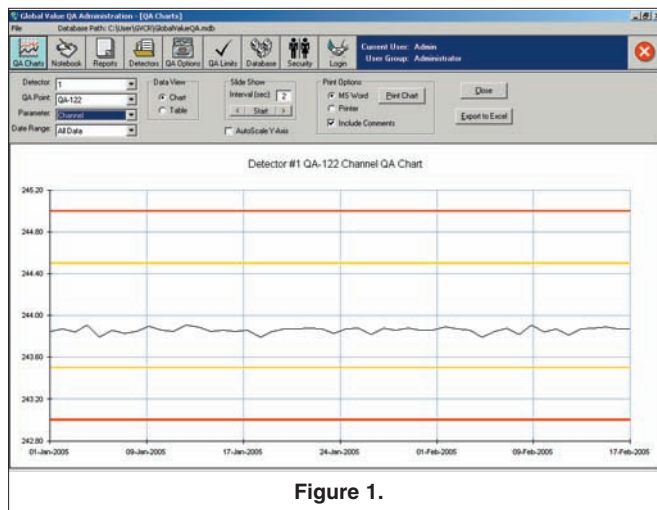


Figure 1.

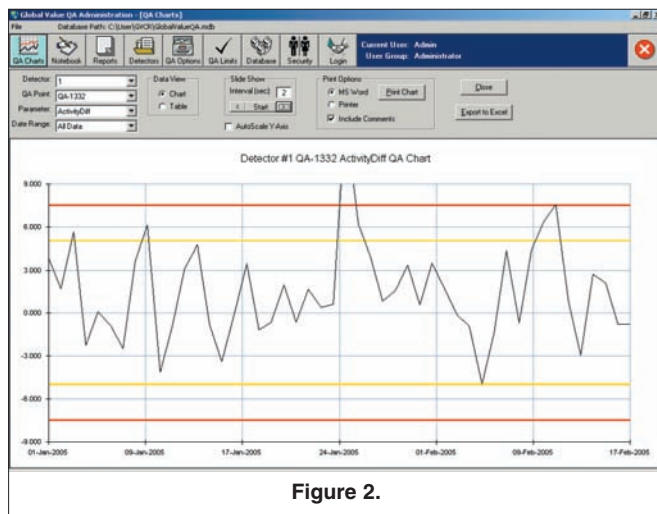


Figure 2.

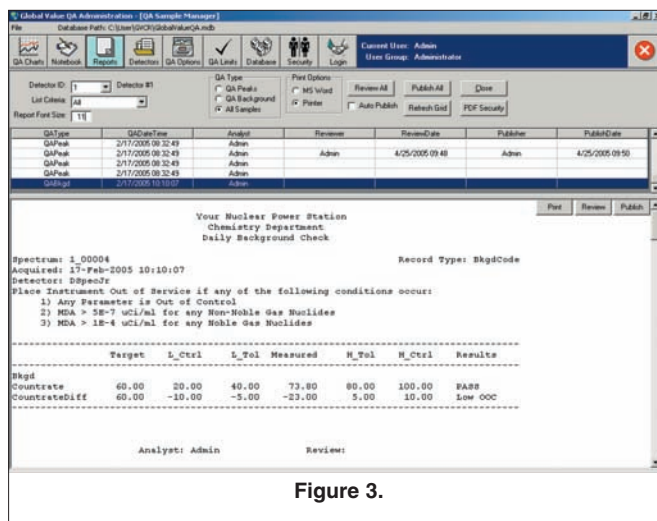


Figure 3.

Global Value – The Optimum Solution for the Counting Lab

Continued from page 4

Global Value includes a sophisticated sample administration program to allow electronic review, editing and publishing of analysis reports. Any changes made by the reviewer to the report data are automatically marked.

The QA program allows for complex statistical analysis of QA data via an Excel Add-In utility and export to Excel feature. It also includes historical data review, charting, an electronic notebook function and a QA log book for easy searching and recall of QA data.

Global Value also includes a range of additional tools including a utility for generation of Source Certificate Files used for detector efficiency calibration, a timer control feature for setting specific start times for analysis procedures and a database utility program.

Global Value is designed to be setup specifically to meet the requirements of individual laboratories. A key part of the Global Value service is that a member of our Technical Support Group will visit the laboratory to install the software and set up any specific analysis procedures, custom reports and other custom routines. At the end of the installation process the laboratory automation is complete with all procedures in place, staff fully trained and the system in full operation. Typically this process takes 2–3 weeks depending on the amount of site specific work required.

For more information on the Global Value software or to arrange a demonstration please contact your sales engineer.

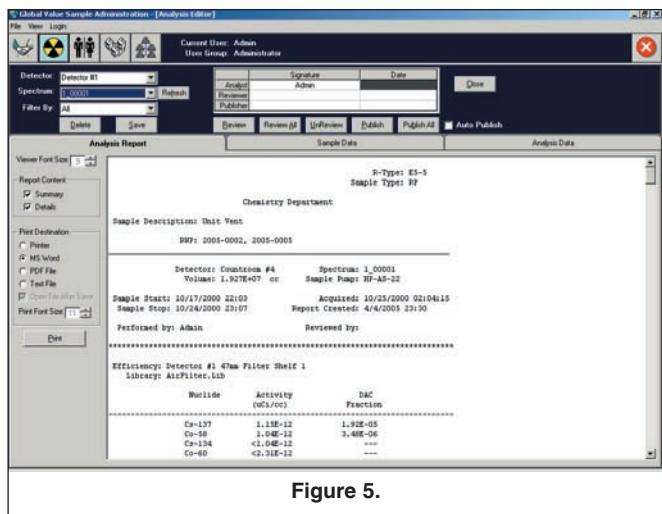


Figure 5.

Serious About Gamma Spectroscopy?
 $GV^2 = \text{GammaVision} \times \text{Global Value}$

Maximize Productivity in a Paperless Environment

- LIMS Integration
- Advanced QA
- Complete Automation
- Custom Reports
- Custom Calculations

801 South Illinois Ave., Oak Ridge, TN 37831-0895 U.S.A. • (865) 482-4411 • Fax (865) 483-0396 • ortec.info@ametek.com
 For International Office Locations, Visit Our Website
ORTEC www.ortec-online.com **AMETEK**

Alpha Spectroscopy Your Way!
 The world's first integrated alpha spectrometer system is STILL THE BEST, with MORE FEATURES and MORE UTILITY for the discriminating alpha spectroscopist.

Octète[®] PLUS

- Fully integrated control for eight internal alpha spectrometers PLUS an additional eight external spectrometers — including direct, transparent support for the TC-256, 7401, and 7404 Spectrometers!
- Simple, automatic networking with no user network knowledge required
- Full range vacuum control from 10 mTorr to 30 Torr with Bias Interlock
- Acquisition, analysis, and QA control from the world's most complete, Windows[®]-platform 32-bit software, AlphaVision[™]-32

AlphaVision 5

- Dynamic, intuitive user interface
- Over 25 new user defined features
- Full LIMS in-and-out data handling
- Advanced Peak Fit and ROI analysis techniques
- Windows 2000 and XP

ULTRA Charged-Particle Detectors

- Ultra-thin entrance contact for optimum energy resolution
- High geometric efficiency due to close detector-to-can spacing
- Rugged and reliable
- Gold-plated cans for contacts that last a lifetime
- Advanced surface passivation for total device stability
- Low-background ULTRA-AS version

Alpha Spectrometry Short Course in Practical Methods
 August 11-15, 2008 at the University of Nevada, Las Vegas

This 5-day course will begin with a review of the basics of alpha spectrometry and then present a detailed overview of some of the most useful innovations for the analyst. Real-world examples will be emphasized throughout and a "hands-on" approach will be emphasized with about 60-70% laboratory sessions.

For more information or to register, visit the ORTEC website at <http://www.ortec-online.com/training/training-courses.htm>.

801 South Illinois Ave., Oak Ridge, TN 37831-0895 U.S.A. • (865) 482-4411 • Fax (865) 483-0396 • ortec.info@ametek.com
 For International Office Locations, Visit Our Website
ORTEC www.ortec-online.com **AMETEK**

Improved Gamma-Ray Measurements, Analysis and Reporting

ORTEC GammaVision-32 is a comprehensive software package for the measurement, analysis and reporting of gamma spectroscopy spectra from HPGe detectors and is widely used in applications from ²¹⁰Pb dating to monitoring nuclear power stations. It offers the “look and feel” of ORTEC MAESTRO-32, the industry’s leading definitive MCA software, but with many more advanced analysis features.

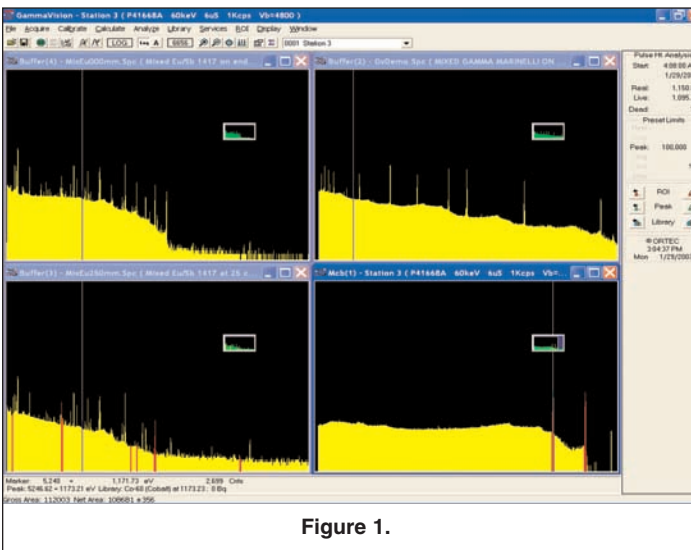


Figure 1.

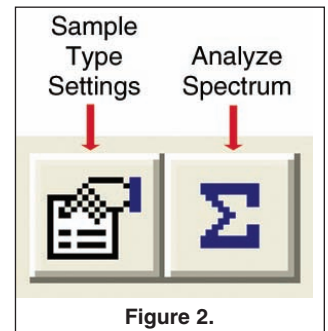
Version 6.07 was released earlier this year and incorporated some new functions which will hopefully help to enhance the software and make it more user-friendly. Some of these functions include:

- ROI Analysis Engine operates across the entire spectrum, performing an ROI analysis on user marked ROIs and a modified WAN32 analysis (no peak stripping or directed fit) on the unmarked regions. The engine will work for both live and archived spectra.
- Total Uncertainty Algorithm — previously limited to the type of distribution users could apply to specific uncertainty terms, with GammaVision V6.07, the user can now define their uncertainty terms and decide how to propagate them. Furthermore, there is the option of treating the additional uncertainty as a uniform or normal distribution and the software will apply the correct mathematical propagation of the Total Uncertainty.
- The Multiple Detector Interface allows for your entire gamma spectroscopy laboratory to be visible within the GammaVision-32 program interface, viewing up to

eight Detector and eight Buffer windows simultaneously for a total of 16 interactive windows. Controlling multiple detectors, visually comparing spectra, and viewing multiple MCB properties is now easier than ever, with up to 250 detectors being connected to GammaVision.

Further additions to the menu functions with new ‘Hot’ Buttons and a Create PBC function added to the menus all work together to enhance user-interaction. Significantly, this version of GammaVision has been through an exhaustive Validation and Verification process to ensure compliance with all necessary quality assurance standards. The new features are sure to improve the performance of your lab.

GammaVision is unique in the industry. It is the only program allowing the user to complete data acquisition, analysis, reporting, archive and quality assurance, all within a single package.



The Best Gamma Spectroscopy Software Just Got Better!

The Latest Version of GammaVision-32 has just been released.

Gamma-Ray Spectroscopy Software for High-Resolution Gamma-Ray Measurements, Analysis and Reporting

- New ROI-32 Analysis Engine allows the user to define specific Regions-of-Interest for spectral analysis.
- Added “Hot Buttons” for easy navigation to frequently used commands.
- User Manual Documentation to assist in making decisions on analysis engine and MDA calculations.
- Complete Verification and Validation – our software engineers, physicists, and quality control engineers have completed a thorough V&V. With GammaVision-32, you can be certain the answer will be right the first time, every time!

Maximize your Performance and Accuracy. Get your GammaVision-32 Upgrade today!

801 South Illinois Ave., Oak Ridge, TN 37831-0895 U.S.A. • (865) 482-4411 • Fax (865) 483-0396 • ortec.info@ametek.com

ORTEC www.ortec-online.com **AMETEK**

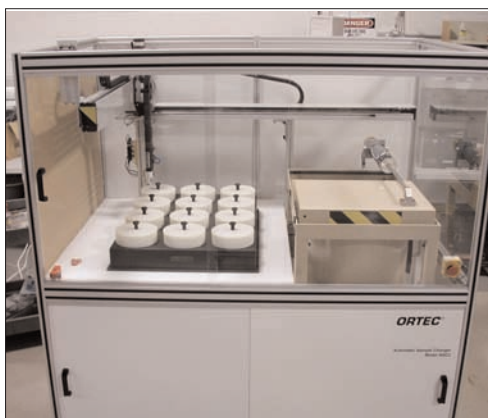
Automated Gamma Spectroscopy System for Counting Labs

Many counting laboratories operate below maximum sample throughput because of the lack of an available technician when a sample count is completed and the next sample needs to be placed in position. Those labs which have a large number of samples to count, or need to count sample for a long period of time (several hours) could be missing out on valuable counting time during hours when the laboratory is closed, due to this lack of manpower.

The ORTEC ASC2 Automatic Sample Changer can eliminate this “wasted” counting time as it allows users to take advantage of time available during the night, and can keep the laboratory productive during hours when nobody is working! It's no surprise that this system has become the top choice for those performing high-resolution gamma spectroscopy, and looking for an integrated, automotive system for unattended analysis of bulk samples. Benefits of the system include:

- Unattended acquisition and analysis of multiple high-resolution gamma-spectroscopy samples.
- Low background design: no moving parts inside lead shield.
- Completely safe – totally enclosed!
- Easy to use.
- Variety of sample geometries and number combinations available.
- In many cases, it is not necessary to replace the existing lead shield and HPGe detectors – the ASC2 can be easily added onto an existing system.

A complete ASC2 system, as pictured, comprises an ORTEC HPGe detector in a low-background shield; a safe ultra-reliable automatic sample changer; ORTEC spectroscopy electronics; ORTEC GammaVision analysis software and control via a unique GV Automation software package. No dedicated PC is required to be near the system since an Ethernet cable between the electronics and PC allows control of the sample changer to take place remotely via the network. Assuming the ASC2 is used in conjunction with a DSPEC, DSPEC-Plus, DSPEC-Jr-2.0, or DSPEC-Pro, these integrated electronics are all that is required at the system itself.



ASC2 Sample Changer System.

Safety was considered to be of paramount importance during the design of the ASC2. Interlocks are built in which prevent the motor arms from moving when the doors are opened meaning the shield can not accidentally cause injury if someone reaches into it while the system is in operation. An emergency stop button is also prominently mounted on the front of the system.

The ASC2 accommodates a wide variety of size/sample number combinations, including a variety of

Marinelli beakers. The twenty standard 1-litre containers are perfect for holding scintillation vials, small beakers, charcoal and paper filters, and various sample bottles. Optional sample carriers such as the Marinelli beakers can be used on the same system as the standard 1-litre carriers. There are no screws to remove, nor carriers to dismantle. Simply pull out one set of carriers and install the new set. A command to the X-Y-Z controller resets the positioning mechanism to pick up the new carriers. When the other set is needed, simply reverse the process. Total time to change out a carrier set is <5 minutes.

Samples to be counted are first registered into a loading jig, from which they are sequentially taken into the counting chamber by the pre-programmed action of X-Y-Z robotic arm. The sample count starts as soon as the data for the first sample has been entered, thus maximizing count time. The sliding top of the lead shield is rolled back smoothly under computer control to allow for sample changing. When the sample is in place, the robotic arm releases it, and returns to its rest position as the shield lid closes and the count starts.

Through the use of the automation software, different sample types can be completed in one batch. Simply choose the right template for each sample to be counted, and the automation software will handle the rest.

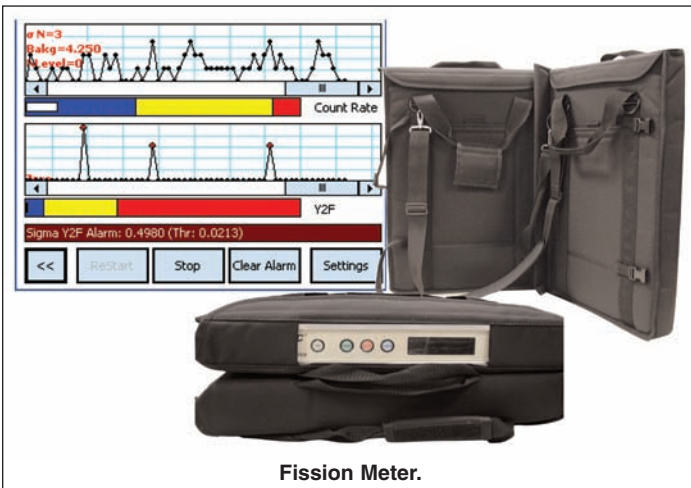
The ASC2 is designed to operate with a variety of spectroscopy electronics systems. It also brings the advantage that it can be fitted to an existing gamma-spectroscopy system helping to fully utilize all counting time available.

High Sensitivity Neutron Counter for Security Applications

The detection of illicit radioactive material is highly important in homeland security applications worldwide. There is great concern about Radioactive Dispersal Devices (RDDs), but the destructive power of these terrorist weapons is small compared to that of a nuclear explosion produced by an Improvised Nuclear Device (IND) or state-built nuclear weapon. Even a crude nuclear device could have an explosive power equivalent to 250 Kilotons of TNT.

A nuclear explosion requires the presence of so-called Special Nuclear Material (SNM), that is, Uranium or Plutonium. The major technical challenge is to detect and identify SNM rapidly and with certainty. The most common approach to the detection of RDD or IND devices is through their gamma-ray signatures. However, heavy metal shielding may ultimately defeat such methods.

The ORTEC Fission Meter aids the interdiction of illicit trafficking by augmentation of gamma-ray identification with a neutron detector of very high sensitivity which, in addition, can specifically identify fission neutron sources by the inherent characteristics of the decay process.



Gamma-rays are 100 times more abundant than neutrons so the gamma-ray nuclide identifier such as the ORTEC Detective will always be first choice, providing the easiest way of source location. However identification, not simply detection, of gamma-rays and neutrons is required; both exist in normal background and their signatures may be similar to those of illicit nuclear material. Circumstances arise where reliance on a gamma-ray detector alone comes into question; the package may be large enough to contain significant shielding, or the gamma-ray background may be seen to drop when measuring a particular package-indicating heavy shielding. The hand-

held identifier's neutron detector may show an elevated neutron count rate, or the gamma-ray spectrum may "see" evidence of gamma-rays from neutron reactions.

Many neutron detectors exist, but all other neutron detectors which might be used in the field are limited to basic counting. They can register the presence of neutrons, but nothing else. What is needed is a way to check a package or the environment for the existence of neutron sources beyond what would be expected from background.

The Fission Meter is a sophisticated portable neutron detector system. It can identify fissionable Uranium (U) and Plutonium (Pu), by evaluating the distribution in time of neutrons that are emitted spontaneously by these materials. The Fission Meter Technology is the most advanced technology available to segregate threat from non-threat neutron sources. The technology has been developed at Lawrence Livermore Laboratory* and is licensed to AMETEK's Advanced Measurement Technology ORTEC Division. The USA Federal Laboratory Consortium (FLC) recently selected Lawrence Livermore National Laboratory to receive an award for excellence in technology transfer for this development.

The Fission Meter has three operational modes: Mobile Search, Static Search (identification) and Characterization Data Collect. Mobile Search is the mode used to locate the neutron source. Static Search mode is next used for deciding if there are shielded "non-cosmic" real neutron sources present, that is neutrons due to a fissioning source, as opposed to a high neutron background due to cosmic ray interactions. Characterization Data Collect mode allows for the collection of much more data (~1 million counts) for expert analysis elsewhere.

To summarize, Fission Meter offers the following capabilities:

- "Proof Positive" identification of fission neutron sources through multiplicity analysis.
- Ultra-low level false positive and negative rates, even in the presence of high neutron background.
- Immune to cosmic background fluctuations.
- Highest sensitivity in a portable package.
- Easy to operate.

A technical paper on the Fission Meter can be found at <http://www.ortec-online.com/papers/inmm07-273.pdf>.

* LLNL License TL-01962

The World's Best Hand Held Radionuclide Identifier Shrinks !!!

In 2004 we released a unique product, the Detective High Resolution Radiation Identifier.

The Detective was like no other radiation identifier available because it incorporated a High Purity Germanium (HPGe) detector coupled to a miniature, high reliability battery powered cryogenic cooler. This combination provided a system with the performance of a laboratory grade HPGe detector system but in a portable, rugged package. In addition, the Detective incorporated all the signal processing electronics and an extremely powerful isotope identification software package originally developed by Lawrence Livermore National Laboratory (LLNL).

Even compared to the very latest scintillation detector technologies such as Lanthanum Bromide (LaBr³), HPGe offers far better energy resolution (selectivity) as illustrated in Figure 1, where the gamma spectrum from the same source has been collected using Sodium Iodide (NaI), LaBr³ and HPGe detector systems.

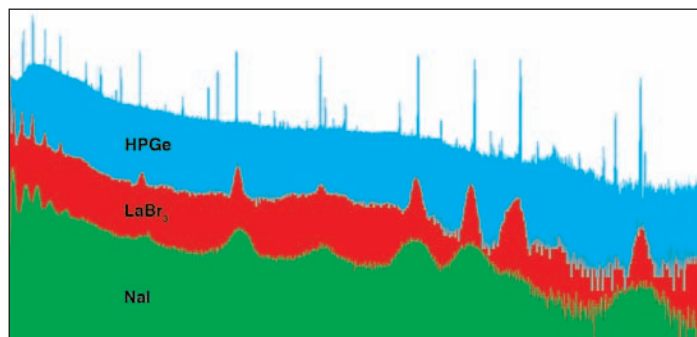


Figure 1. Comparison of LaBr³, NaI(Tl), and HPGe Spectra.

The following illustrations show an even more compelling example of why HPGe detector technology is currently the only solution when you need unequivocal identification of radioactive material. The illustrations show an expanded region of gamma energy spectra taken first of a ¹³³Ba source alone and then, in a representation of a potential “masking” scenario, with Pu added.

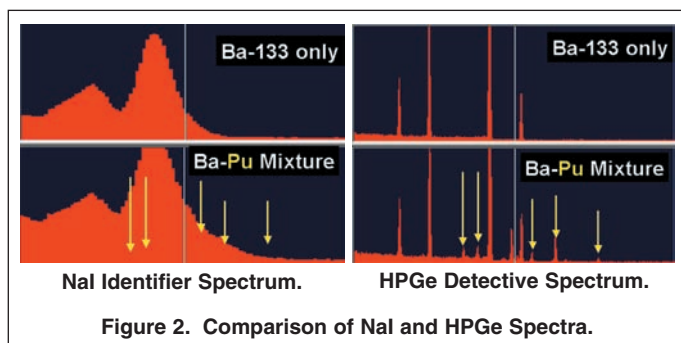


Figure 2. Comparison of NaI and HPGe Spectra.

The bottom left spectrum was taken using the NaI radiation identifier and the bottom right spectrum was taken from the same sources, but using the Detective. As you can see in the “masking” situation, the NaI system simply cannot separate the Ba from the Pu whereas with the Detective system we can clearly see five of the Pu peaks allowing for identification of the material.

The performance of the Detective system is now well proven with hundreds of units deployed worldwide. However, for certain applications the size and weight of the Detective can make it impractical to use. Now we have a solution to this problem, enter the Micro-Detective!

The Micro-Detective has all the performance of the Detective-EX using the same HPGe detector crystal and incorporating an internally mounted neutron detector but with a 50% reduction in size and 40% reduction in weight.



Micro-Detective

While the key objective with the Micro-Detective development was to reduce the size and weight of the system we have also added additional features. The Micro-Detective is even more rugged than the Detective-EX. It is water-spray resistant and has an improved sunlight readable TFT display. Also the Micro-detective now includes all the battery charging circuitry internally so all that is required to charge its internal Lithium Ion battery is a 12 volt DC supply. USB and Wi-Fi communication (Wi-Fi can be disabled) and GPS are included as standard plus the system includes both Secure Digital (SD) and Compact Flash (CF) slots for further expansion.

All the existing Detective and Detective-EX models will continue to be available but for those applications where minimum weight and size and maximum usability is essential the Micro-Detective is the solution.

Need to Upgrade Your Detective-EX?

Upgrades are now available.

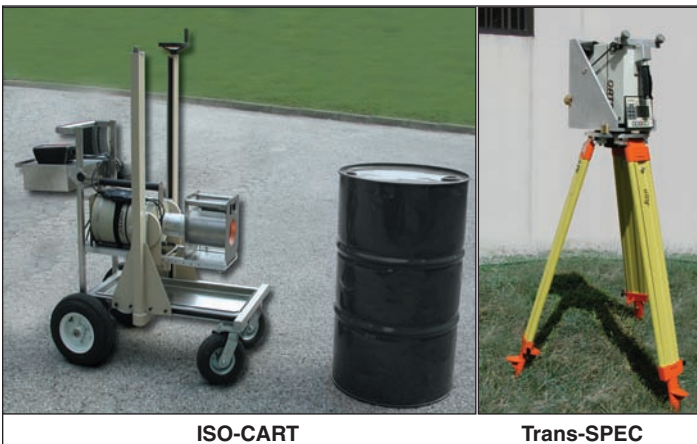
www.ortec-online.com/detectors/pdf/det_up_opts.pdf

ORTEC News

New Algorithms for Waste Characterization

With many nuclear facilities now moving into a decommissioning phase the need to characterize and assay possible waste materials is becoming an increased priority. One of the most useful and flexible techniques is the use of In situ High Resolution Gamma Spectrometry.

A typical system comprises a portable detector which may be electrically cooled, data acquisition electronics, and waste characterization software. Such specialist software allows the user to model a variety of sample types such as drums, pipes, walls, and even calibrating the system with a traceable point source, at his own facility. No special detector characterization is required.



ISO-CART

Trans-SPEC

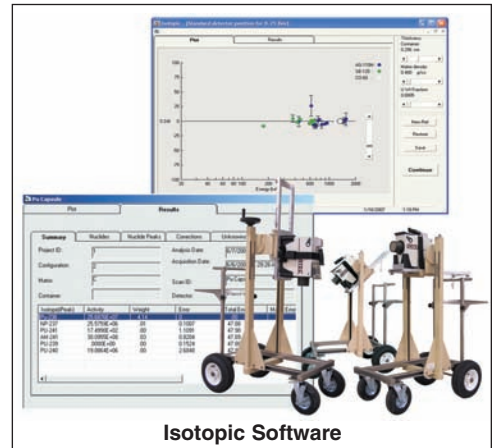
A key advantage of ISOTOPIC, ORTEC's waste characterization software, is on-site calibration, which allows the user to incorporate any detector into the system and then trace their measurements to national standards. However, until now, results were less accurate if the detector needed to be placed close to the object being measured, either because of physical constraints or due to the signal attenuation from the walls of the storage container. The software algorithms would assume a reasonable distance between object and detector, thus only counting gamma-rays entering through the front face of the crystal.

With the release of ISOTOPIC V4, these algorithms have been updated to allow for these 'close geometry' measurements to be made with confidence and accuracy. The algorithms break down the object being measured into voxels (three dimensional cells) and then calculate the interaction of gamma rays from each voxel onto both the front face and sides of the detector. With the newer algorithms, accuracy has been found to have improved in a variety of measurement situations and it is now possible for objects to be placed as close as 10 cm to the detector, with no loss of accuracy.

During initial setup, the user enters various detector parameters into the software, including crystal diameter and length, germanium dead layer thickness and can thickness.

Default information can be changed to allow detectors from other manufacturers to be used with the software.

A copy of a technical paper presented at INMM in July 2007 may be found at www.ortec-online.com/papers/inmm07-waste.pdf.



Isotopic Software

The ORTEC ISO-CART Waste Characterization System Just Got Even Better with ISOTOPIC V4!

ORTEC ISOTOPIC-32 Version 4

Waste assay software that works like you do, improved in Version 4:

- Powerful: analyze all types of gamma-emitting waste, fissile and non-fissile.
 - Capable: measure containers of commonly used shapes, sizes and matrices or contamination on surfaces and in soils, new methods for close geometry.
 - Traceable: simple calibration against point source means results pass traceability audit.
 - Flexible: choose from a variety of report options, or retrieve your results from an Access-format database, extended standard reports.
 - Credible: well described algorithms and individual report of all corrections and uncertainties; independently verified analysis methods.
 - Invaluable, and now easier to use!
- www.ortec-online.com/isotopic.pdf

ORTEC ISO-CART

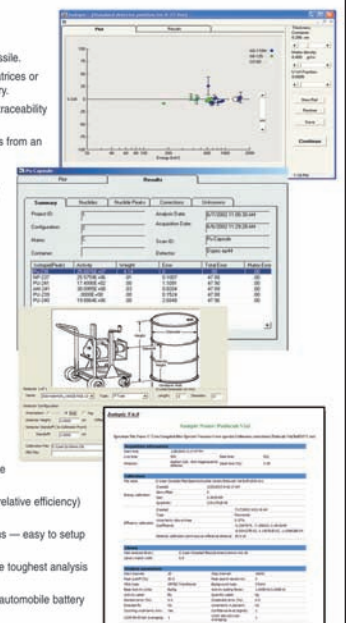
The experience-based hardware design:

- Easy for you to move on rough surfaces.
 - You can easily adjust the height and tilt of the detector.
 - Easy to transport in your SUV or truck.
 - The waste assay cart built for your application.
- www.ortec-online.com/isocart.pdf

ORTEC trans-SPEC-100

A really practical solution for a mobile germanium high-resolution HPGe Gamma Spectrometer for in-situ gamma spectroscopy:

- Miniature high-reliability, "run forever" Stirling-cycle cooler eliminates the need for LIQUID NITROGEN.
 - Meets your required MDA in lower counting times with the large (>40% relative efficiency) HPGe detector.
 - All-in-one rugged, compact integrated package, with no interconnections — easy to setup and go.
 - High quality and STABLE digital electronics give you the solution for the toughest analysis in the toughest conditions.
 - Use any power source: internal battery, supplemental external battery, automobile battery (any 12 V dc), line power; all with automatic switchover.
- www.ortec-online.com/transpec.pdf



For more details, visit the ORTEC website at www.ortec-online.com

801 South Illinois Ave., Oak Ridge, TN 37831-0695 U.S.A. • (865) 482-4411 • Fax (865) 483-0396 • info@ortec-online.com

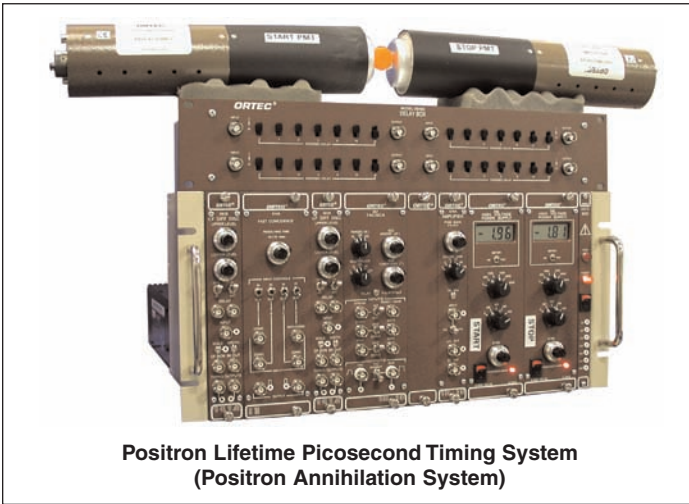


www.ortec-online.com



Positron Lifetime Spectroscopy for Materials Analysis

The existence of the positron, first predicted by Dirac, was experimentally identified in the 1930s. The positron is the antiparticle of the electron. A positron collision with an electron results in the annihilation of both particles and the emission of two characteristic 511-keV gamma rays.



**Positron Lifetime Picosecond Timing System
 (Positron Annihilation System)**

This phenomenon is useful to test predictions of quantum theory with regard to the differences between electron and positron interactions with matter. In addition, the positron has proven to be a useful tool in the study of various structures and processes. The lifetime of the positron is a measure of the local electron density at the point of annihilation. The annihilation can be easily detected by virtue of the gamma rays emitted.

Positron lifetime techniques are among the few methods sensitive to voids on the mono-atomic scale. Historically, defect studies in metals have been a major application area for positron lifetime techniques. In more recent years,

**From Components to Complete Systems. . .
 . . . It All Fits Together.**

HV Bias Supply
 Time-to-Amplitude Converter
 Constant Fraction Discriminator
 Fast Filter Amplifier

Contact ORTEC for your Solution to the Puzzle!

http://www.ortec-online.com/electronics/selection_guides.htm

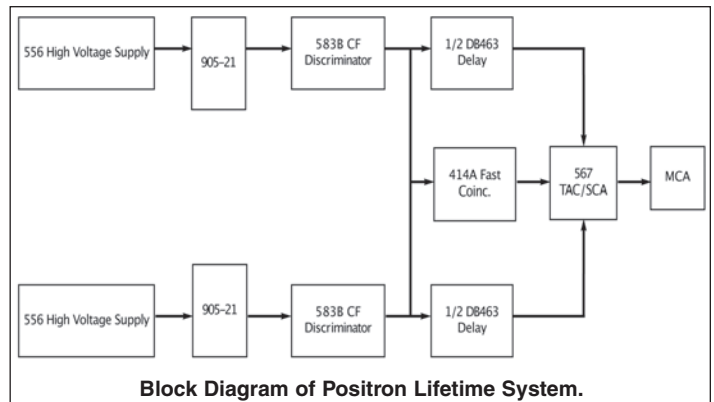
801 South Illinois Ave., Oak Ridge, TN 37831-0895 U.S.A. • (865) 482-4411 • Fax (865) 483-0396 • ortec.info@ametek.com
 For International Office Locations, Visit Our Website

ORTEC www.ortec-online.com **AMETEK**

this work has extended to defect studies in alloys and non-metals. In addition, some biological systems can now be studied with the aid of positrons.

Chemical properties of certain polymers and the specific surface areas of finely divided powders are being determined by the variation and range of positron lifetimes. An application note "characterization of Polymers: Free Volume Effects" is included on our website which discusses Free Volume measurements in polymers using Positron Annihilation Lifetime Spectroscopy, see <http://www.ortec-online.com/pdf/palsan70.pdf>

The illustration below shows the configuration of a complete Positron Annihilation Lifetime Spectroscopy (PALS) system using standard ORTEC Nuclear Instrumentation Modules (NIM) plus two ORTEC 905-21 Fast Plastic Scintillation Detectors.



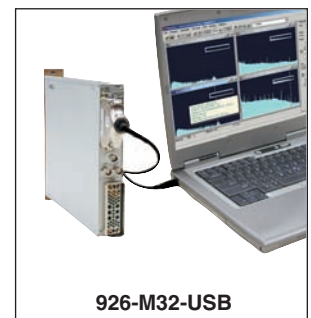
Block Diagram of Positron Lifetime System.

Lowest Cost NIM MCA Available

If you are looking to construct a Spectroscopy system and your budget is limited, we may have the answer – the 926-M32-USB – a compact MCA unit packaged in a single width NIM module with a USB interface to the host computer.

Suitable for use with all types of radiation detector systems, it offers excellent performance at an extremely attractive price.

- Single-input MCA with 8k Resolution ADC
- USB connection to PC
- MAESTRO-32 software



926-M32-USB

Update Your Info to Win!

Update your customer contact information online and enter our drawing to win a prepaid \$100 American Express Gift Card.



Go to www.ortec-online.com/update.htm and complete the form.

Are You Currently Using a TRUMP or TRUMP-pci Card?

Trade in your TRUMP or TRUMP-pci card for a discount on a new EASY-MCA.

Details are available on the ORTEC website at www.ortec-online.com/trump_trade.htm

What is an EASY-MCA?

See the data sheet at www.ortec-online.com/electronics/mca/easy_mca.htm

ORTEC®

www.ortec-online.com

Tel. (865) 482-4411 • Fax (865) 483-0396 • ortec.info@ametek.com
801 South Illinois Ave., Oak Ridge, TN 37831-0895 U.S.A.
For International Office Locations, Visit Our Website

AMETEK®
ADVANCED MEASUREMENT
TECHNOLOGY