ORTEC® News

Autumn 2010

Welcome to the *ORTEC* Newsletter

As ORTEC celebrates it's 50th anniversary this year we continue our drive to develop more new products for our customers. Five new products are highlighted in this issue with the most significant being our new Alpha Suite of Alpha Spectroscopy systems. This edition also includes articles on the Gamma-Screen-8 an instrument for rapid screening for individuals exposed to radioactive materials, and an update on our HPGe Portal Monitor installation in New Mexico. Our ever popular Micro-Detective has also gone to Hollywood again, this time appearing in an episode of CSI Las Vegas. Look for more ORTEC products to appear next summer in a Marvel Studios release of the movie Thor. With additional articles ranging from the use of HPGe detectors for the chronological dating of sediment samples to the reduction of ion-recoil contamination in solid-state Alpha particle detectors hopefully there is something of interest to all readers.

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All requests will be completed within five working days of receipt.

New Range of Alpha Spectroscopy systems

Over the past few years, there has been an increased emphasis on Alpha Spectrometry as focus for the nuclear industry changes from the issues of nuclear proliferation, to waste characterisation, site decommissioning and decontamination.

Alpha Aria

As an application, Alpha Spectrometry is full of potential issues which can affect the gathering of data and thus results. Once the complicated sample preparation processes have been completed, spectroscopists need technologically advanced equipment in order to analyse and present results. With this in mind, ORTEC have recently released a complete range of Alpha products targeted at all users, whether they are extensive users of Alpha Spectrometry, or deal with a relatively small number of samples.

The 'Alpha Suite' includes the Alpha Aria, a 2-wide NIM module, the Alpha Duo, a bench top 2-channel instrument and the Alpha Ensemble, either a 2, 4, 6, or 8 channel instrument in a bench top/rack mountable enclosure. Each product is 'fully integrated', in that they include both the spectrometer and an advanced digital MCA, requiring only USB, power and vacuum inputs. All the products feature the latest digital signal processing technology and also include a digital spectrum stabiliser as standard. For the first time the benefits of digital quality stability are brought to alpha spectroscopy where it is of high importance because of the typically long acquisition times.

Alpha Duo

Alpha Ensemble

With the introduction of the Alpha Suite range of integrated Alpha Spectrometers, ORTEC is able to address the needs of any counting laboratory, large or small, upgrading or just starting out. The latest advanced digital design, together with a modular mechanical approach, aligns value and performance with unparalleled configuration flexibility. Any of these spectrometers may be added to existing ORTEC systems simply by installing the latest drivers included with the instrument.

…../Continued on page 2

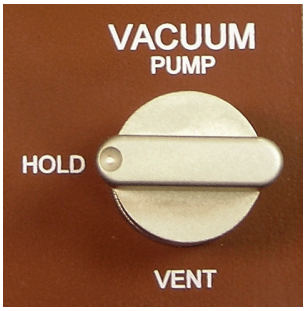
New range of Alpha Spectroscopy systems

All Alpha Suite models are compatible with previous ORTEC Alpha Spectrometer Systems and provide simple and fast USB 2.0 connection to a computer. Each model also offers the following features:

- A complete instrument requiring only vacuum, power and connection to a PC
- Internal advanced digital MCA
- Individual MCA for each detector/vacuum chamber
- Digital Spectrum Stabiliser
- Computer controlled calibration pulser
- Computer controlled HV supply
- High quality nickel-plated brass vacuum chamber, easily decontaminated
- Alpha recoil protection system (optional)

Alpha Aria

For those Counting Laboratories which still use NIM instrumentation, the Alpha Aria just requires an available dual NIM slot in order to add it to an existing system. There is a simple to operate PUMP/HOLD/VENT control mounted on the front panel which makes it easy to insert, count, and remove samples without disturbing the vacuum on any other Alpha chambers attached to the same vacuum pump.



Vacuum control on Alpha

The Alpha Aria has a variable detector bias supply (positive or negative), pre-amplifier; test pulse generator with variable amplitude; and leakage current monitor. Its detector operates with a completely adjustable energy range from 0 to 10 MeV. The pulse generator is adjustable over a range representing 0 to 10 MeV and the detector bias supply is also fully adjustable over the range from 0 V to ±100 V.

All hardware controls, data acquisition settings, and detector bias voltage and leakage current are controlled and monitored by either the ORTEC MAESTRO-32 MCA Emulator Software supplied as standard or the optional AlphaVision-32 software. A significant new development on the Alpha Aria is the inclusion of a digital MCA meaning it is now possible to purchase a complete integrated high performance Alpha Spectroscopy system at a competitive price. An optional ion-recoil contamination protection system is also available for the Aria which includes a biased sample holder and a Granville-Philips gauge with a solenoid actuated vacuum controller. Please refer to the article on page 4 which discusses the issue of ion-recoil contamination in more detail.

Alpha Duo

The Alpha Duo is conveniently packaged in a compact bench top enclosure, requiring only a vacuum connection, power, and a USB connection to the PC. It is a dual channel system, with each unit offering a vacuum gauge; variable detector bias supply (positive or negative); preamplifier; test pulse generator with variable amplitude; and leakage current monitor.

Each of the two spectrometers has its own digital MCA with digital offset and conversion gain settings for maximum flexibility. Hardware controls, data acquisition settings, detector bias, and leakage current are displayed and controlled with either the standard MAESTRO-32 supplied with the system or the optional AlphaVision-32 software.

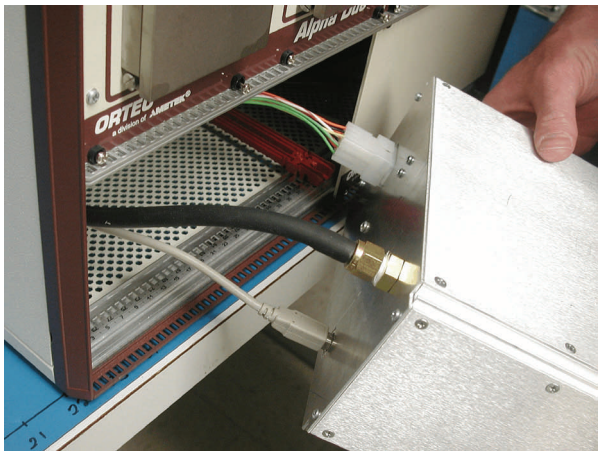
The Alpha Duo's twin chambers share a vacuum connection, so both chambers operate at the same pressure; which of course means that any pumping, holding, and venting operation affects both chambers. A single pressure-gauge head per Duo monitors the chamber pressures whilst the vent/hold/pump functions for the two chambers of the Alpha Duo are software controlled.

Rear of the Alpha Duo unit - requires just 3 inputs

The unit can easily be upgraded into an Alpha Ensemble unit should the need for more spectrometers arise.

Alpha Ensemble

The Alpha Ensemble is available in 2-, 4-, 6-, or 8-input models with any empty slots in the chassis covered by easily removed blank panels. Expanding the number of channels is simple - the ALPHA-DUO-M1 (Alpha Duo without the bench top enclosure) slides into any available space in the chassis, and after making a few simple connections, is ready for use.



Fitting the Alpha Duo into the Ensemble

This modular formation means that in the event of a contamination problem, a complete Alpha Duo unit is simply removed from an Ensemble, and the vacuum line easily isolated with supplied hardware.

The chamber pressure is monitored, vented and controlled via a computer. Each chassis has an integral vacuum manifold with a single external connector for attachment to a vacuum pump, and four internal connectors for attachment to four Alpha Duos. This simplifies the installation of the vacuum system, and reduces the possibility of vacuum leaks. The pressure in each Duo in the Ensemble is controlled and monitored independently. As with all the Alpha Suite products an inexpensive option for ion-recoil contamination protection is available.

Vacuum Chambers

Each Alpha Suite member incorporates one or more high-quality modular vacuum chambers. These individually cast brass chambers are nickel plated for corrosion protection and ease of decontamination, and can be isolated and removed if necessary without affecting the operation of other chambers. The chambers are sealed with a high-performance O-ring secured in a cleanly machined groove in the face of each chamber. Samples sizes from 13 mm to 51 mm in diameter, with 4 mm to 44 mm detector spacing are accommodated. ORTEC ULTRA-AS silicon ion implanted and R Series ruggedised surface barrier detectors with surface areas from 300 mm^2 to 1200 mm^2 can be used with the system.

Electronics

As stated previously, each sample chamber on every Alpha Suite product is served by its own computer controlled bias supply, preamplifier, pulser and ultra stable digital MCA. Each detector operates independently with completely adjustable energy ranges from 0 to 10 MeV.

Alpha Duo/Ensemble Vacuum Chamber

In addition to this each MCA has a maximum of 4096 channel resolution available for each detector with individual control of digital offset and conversion gain settings offering huge flexibility when selecting the required energy range. Each MCA also incorporates a digital spectrum stabiliser, this is a major advantage particularly when performing sample analysis using a radioactive tracer. In this instance the tracer peak in the spectrum can be used as the reference peak for the digital spectrum stabiliser, this ensures that the energy calibration of the system remains rock solid at all times.

Unlike our previous Octete-Plus system and other systems available on the market which use a single MCA with multiplexer, as mentioned previously the entire Alpha Suite range includes an individual, dedicated digital MCA for each detector. With a Alpha Spectroscopy system that utilises a multi-plexer in order to use a single MCA/ADC with multiple detectors, if one sample in one chamber is ‘hot’ and causes a signification amount of system dead time, this dead time impacts on all the other chambers connected to the same MCA. Even low activity samples in the adjacent chambers will be subject to the same percent dead time as the “hot” sample, potentially leading to an increase in already long count times for low activity samples. With each chamber having its own dedicated digital MCA “cross-talk” of this kind is eliminated.

Alpha Recoil Avoidance

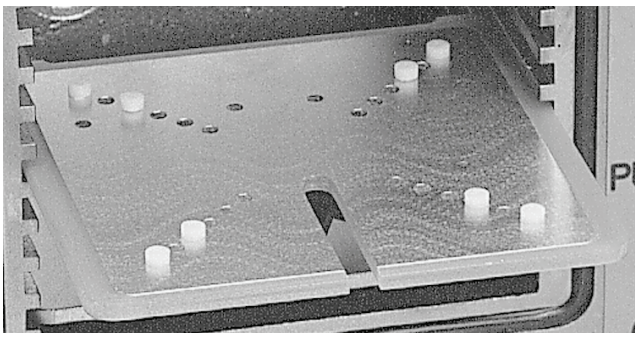
Alpha recoil avoidance often arises as an issue in alpha spectrometry. What is it exactly and why is it important?

Alpha spectrometry is a valuable technique for determining the quantity of alpha emitting nuclides, especially those which are difficult to measure with gamma spectrometry, either because their gamma emissions are very weak or entirely absent in the decay chain. Examples are the various isotopes of uranium, plutonium, thorium and polonium.

The extraction, chemical treatment, and electro deposition process necessary in alpha spectrometry results in a small sample with relatively few counts. An accurate measurement with low MDA (minimum detectable activity) requires a long count time with as low a background as possible.

Background can be minimised by selecting a low background variant of the various ion implanted silicon detectors available on the market. An example of this is the ULTRA-AS detector from ORTEC, which is made with special low background materials and an optimised depletion thickness to minimise background counts from cosmic rays.

Background can be reduced further by maintaining the cleanliness of the detector and measurement chamber. ULTRA-AS detectors can be cleaned with a cotton swab moistened with acetone; methanol and water are recommended for the measurement chamber.



Sample tray with eight holding pegs and sample placement/removal slot. The tray is shown partially inserted into a measurement chamber.

A further source of potential contamination, polonium volatisation, can be reduced by heating samples containing polonium uncovered on a on a hot plate for five minutes prior to measurement. This will oxidise the polonium to a non-volatile state.

Once these steps have been taken, it is time to start looking at alpha recoil avoidance.

After the emission of an alpha particle, kinetic energy is imparted to the resulting daughter, often enough to allow it to escape from the sample plate. These daughter atoms are positively charged and so are attracted to the small negative charge present on the detector during measurement. They often embed themselves into the detector material, making removal difficult.

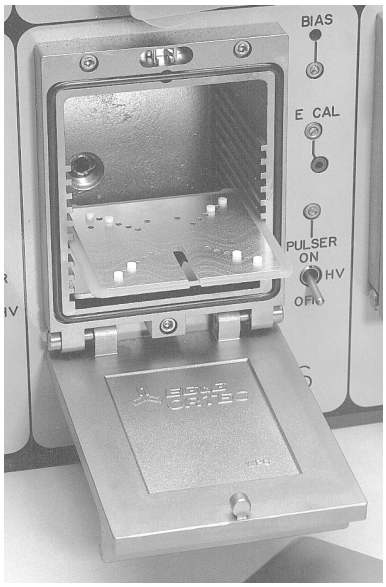
If the daughter atom is itself an alpha emitter, then the detector will be contaminated, increasing background. In the case of short lived daughters, the contamination can be allowed to decay away naturally. Daughters with very long half lives will produce few alphas and can be ignored, more serious are alpha emitting daughters with half lives measured in days or weeks.

Examples of decay-chains producing recoil contamination include ^{228}Th (produces alpha emitting daughters ^{224}Ra-^{220}Rn-^{216}Po-^{212}Po-^{212}Bi), ^{229}Th (^{225}Ac-^{221}Fr-^{217}At-^{213}Po), and ^{226}Ra (^{222}Rn-^{218}Po-^{214}Po).

How can such contamination be avoided?

Fortunately, a small increase of measurement chamber pressure above vacuum and a negative voltage applied to the sample tray is enough to prevent recoiling atoms from reaching the detector and return them to the sample plate. The method is explained in detail in a paper entitled Sources and Prevention of Recoil Contamination of Solid State Alpha Detectors by Sill & Olsen [1)]. The results of their work showed that recoil contamination can be reduced by a factor of 100 using this technique. They believed that it was possible to reduce contamination by a factor of 1000 by fine tuning of the method.

Reference
1) CLAUDE W. SILL, DALE G. OLSON. Analytical Chemistry, Vol.42, No.13, Page 1596 November 1970.

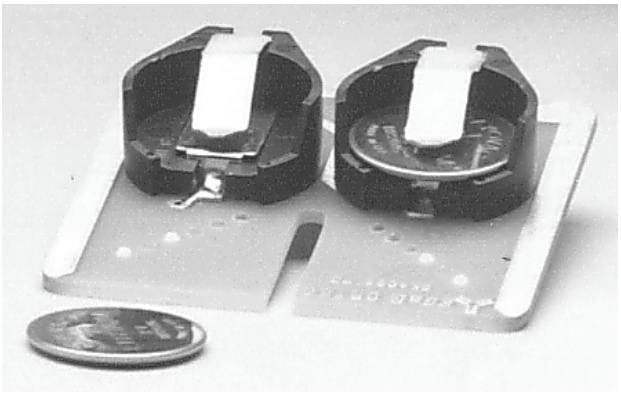


Loading a sample tray into a measurement chamber

Sill & Olsen recommend a 'thickness' of air of between 12 to 16 µg/cm^2. This translates to an air pressure of between 2 and 16 mm Hg according to the distance between detector and sample, with 1mm Hg approximately equal to 1 Torr (a typical detector to source distance of 44mm would need a pressure of 2 to 3 Torr). Also the sample tray should be biased at more than 2 volts compared to the detector. They found virtually no loss of counting efficiency and little significant effect on resolution at these levels.

The practical application of alpha recoil avoidance has been made much easier with the launch of the new Alpha Suite range of alpha spectrometers from ORTEC. Alpha Duo and Alpha Ensemble spectrometers have pressure gauges and controllers built in as standard. These allow vacuum pressure to be read by computer and then controlled by accompanying software over the 10mTorr to 20 Torr range to within +/- 10% of the target pressure.

Biased sample trays are available to provide negative sample bias at a modest cost. The trays are based upon a well proven design used for many years in the ORTEC Octete-Plus spectrometer, each one comprising a printed circuit board applying 12 volts DC from four hermetically sealed lithium batteries, located on the underside of the tray.



Battery holders on the underside of a sample tray

The tray is drilled to accommodate small plastic pegs which can be adjusted to accommodate a variety of sample sizes from 19mm to 50.8mm. The sample tray also has a slot, extending to within 12mm of the centre of the tray, for placing and removing samples with forceps.

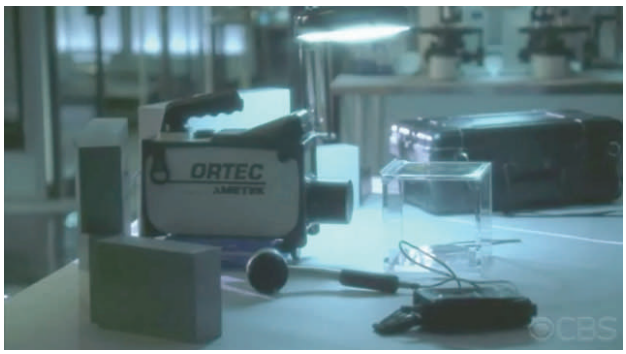
The accompanying photos show the ORTEC biased sample trays (product code is RCAP-ST).

Where can you find a HPGe Gamma-ray detector in Vegas?

This was a problem faced by the team of CSI Vegas in a recent episode of the hit drama, entitled 'Irradiator'. Fans of the programme may have noticed the use of a ORTEC Micro-Detective during the course of their investigation into the murder of a husband and wife, and their incessantly barking dog!

When a suspect dies suddenly, a small radioactive pellet is discovered inside his brain. The Micro-Detective is used to identify the pellet as containing Irridium-192, used in the treatment of cancer patients. This discovery leads the CSI team to a case-solving realisation...

The ORTEC Detective family of products are already widely deployed in the battle against illicit nuclear trafficking by companies such as Nuclear Safeguard Organisations, National Security Organisations, and Emergency Response Teams. As illustrated by one of today's most popular television shows, they can also be used in the laboratory helping to identify suspect materials. Further analysis can then be completed using our GammaVision software.



Micro-Detective as seen on CSI Vegas

Further information about the Detective range of products can be found on the ORTEC website or alternatively you can call our sales department on 0118 936 1210.

HPGe Spectroscopy of Pb-210

Gamma spectroscopy is an important tool for use in geochronology work. Within the diverse range of radioactive tracing methods in use, the use of Pb-210 as a tracer is of particular interest here due to the demands it places on the HPGe spectroscopy performance required to produce the best possible results. So this short overview of the specific topic might be of some interest to the wider gamma spectroscopy user community.

The dating of soil and sediment cores from water systems is commonly needed geographers and others. It is used for many reasons but typical applications would be based on sediment accumulation and erosion studies. Pb-210, Cs-137 and Be-7 fallout have been used as gamma emitting tracers. Above ground nuclear testing exercises from the mid 1950's to the mid 1960's and also the Chernobyl incident in the '80s have left identifiable global Cs-137 fallout peaks. This provides useful marker positions for dating core samples back as far as the first test. Cs-137 continues to be a very important tracer isotope although at some future point the measurements are likely to suffer from the diminishing activity of the original fallout. Unlike Cs-137, Be-7 and Pb-210 fallout originates from natural processes and is constantly supplied to soil and sediment surfaces. Be-7 is generated by cosmic interactions with air and the supply is therefore continuous. However the short half life of Be-7 means that it is only used for dating over relatively recent histories. Pb-210 is also deposited continuously by natural uranium series decay but finds more widespread applications.

To varying degrees natural uranium is present in almost all soils. The half life of U-238 is extremely long so the activity is effectively present continuously at a constant rate. This U-238 in the soil, decays indirectly via Radium-226 to Radon-222 gas. The radon gas is released into the atmosphere resulting in a relatively constant low concentration of radioactivity in the air. The Rn-222 gas decays within in a few days to Polonium-218 and then Pb-210 which either falls or is carried to earth via precipitation. The traceable history of the Pb-210 then begins.

The Pb-210 either reaches the top layer of sediment directly by falling on water surfaces or indirectly via attachment to soil particles that are subsequently transported to the sediment by some other physical means. This Pb-210 is often referred to as 'unsupported' to distinguish it from the Pb-210 produced in-situ by decay of Rd-226.

A significantly simplified measurement and analysis application might be as follows: The sediment core sample would be segmented into slices, to allow measurement of Pb-210 activity by depth. Note: The supported Pb210 activity (usually in secular equilibrium with Ra-226 activity) would also need to be determined by some means. Assuming each sample activity measurement could be corrected for the supported Pb-210 activity, then a plot of depth vs. unsupported Pb-210 activity will follow an exponential curve with the highest activity near the surface falling off with depth. A straight line fit to the log of the activity would be used to produce and appropriate sediment accumulation rate. This could then be used to characterise the core depth by date.

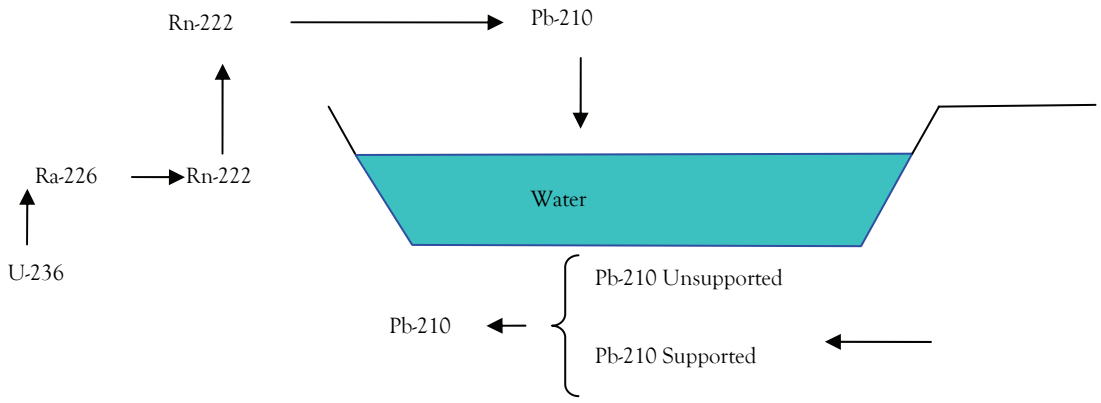


Fig1: Pb-210 sources in the environment. Modified from 3)

Note: There are other methods to determine the Pb-210 activities. For example alpha spectroscopy of the Po-210 daughter or beta counting of Pb-210 by liquid scintillation.

The activity of Pb-210 in sediments will be very low. This presents measurement challenges in common with the measurement of other tracer isotopes and their gamma peaks. Furthermore, the most useful Pb-210 gamma peak is at 46.52keV. At this energy, standard P-type HPGe detector efficiency is poor. Very often such analysis also combines measurement of other nuclides in the sample so the detector needs to be sensitive to the higher energy peaks also.

The low energy requirement coupled with the sample form and container determines the basic detector type that is used. For example an ORTEC model GEM-FX extended range HPGe detector might typically be selected where samples are in beakers. If samples are to be contained in marinelli beakers then an ORTEC model GMX N-Type HPGe detector with suitable dimensions might be preferred. For small sample quantities (– often the case in this work) "Well" type HPGe detectors combine the benefits of excellent low energy response with almost 4π absolute efficiency.

The minimisation of background counts requires consideration of the origin and effects of the interfering gamma rays. For example a sharp interfering peak with few counts can be more disruptive to peak analysis than a low broad background peak with more counts.

There are a number of options to consider in the specification of the shield and cryostat configuration. There is no single best solution as detector type, cost, space, and overall application often demand different emphasis. The following could be considered although good results can be obtained without adhering to every point.

- Select a detector with appropriate detector materials to minimise background gamma activity in the detector itself.
- Lead shield design optimised for the detector and cryostat to be used.
- Appropriate shield liners to remove Pb-210 gammas emanating from the shield itself and also to stop low energy X-rays generated from sample gammas interacting with the lead shield
- Shielding between the detector preamplifier and the crystal. This is most commonly achieved by remotely mounting the detector preamplifier outside the lead shield.

Very occasionally lab managers choose to displace the air within the shield space to eliminate Pb210 and other background emission from the air. Caution: If LN2 boil off is to be used, care must be taken to avoid condensation or temperature fluctuation of the detector.

Until recently the typical low background material specifications for the detector construction would be oxygen-free high conductivity copper (OFHC), low cobalt steel, high purity aluminium, carbon fibre (for detector entrance windows). For end cap and end window materials, background activities ordered from lowest to highest would be: carbon fibre, OFHC copper, high purity aluminium.

For flat bottom samples ORTEC would traditionally recommend a copper end cap with carbon fibre window. However due to the low transmission of copper at low energy we would specify an aluminium end cap for Marinelli samples. Well detectors would have copper end caps with aluminium well tubes.

More recently ORTEC has introduced carbon fibre as the preferred low background material for end cap construction. We now have the option to offer full carbon fibre end caps for standard detectors where aluminium or copper would previously have been specified. Furthermore we have recently shipped a number of Well type detectors which incorporate carbon fibre well tubes and copper end caps.

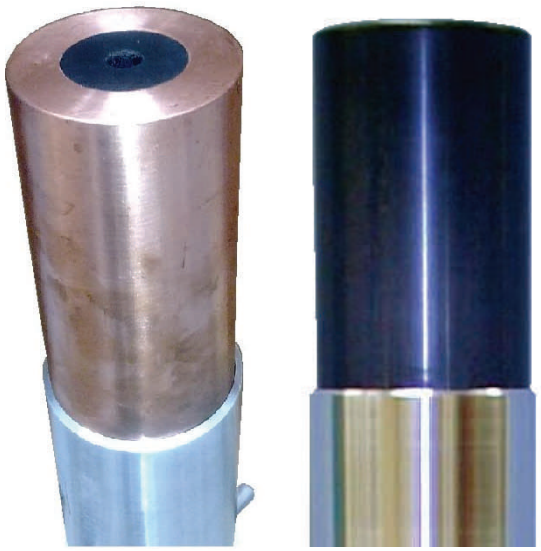


Figure 2: ORTEC carbon fibre well tube and carbon fibre end caps

References
1) APPLEBY, P.G. AND F. OLDFIELD (1979). Nature. 280:53-55
2) WALLING, HE, QUINE, IAHS Pbl. NO229, (1995) p163
3) CHEEVAPORN, PHAITHOON. J.Sci. Soc. Thailand, 22 (1996) 313-324

UK Service Department

The UK Global Service Centre located in Wokingham, Berkshire is one of two Global Service Centres operated by Advanced Measurement Technology, the other being the US Global Service Centre located in Oak Ridge, Tennessee.

UK Service Centre, Wokingham

The UKGSC is primarily responsible for the support of the ORTEC range of instruments for the European territories and has facilities and engineers for the testing and repair of all ORTEC products as well as products from Berthold and Protean. Our flexible approach to serving our customers means that we can call on the vast experience of our technical staff throughout the world to give you the best possible support, regardless of territory.

For most instruments that need to be sent to the UKGSC for repair, we offer a fixed price repair programme. This means that we will quote you for the repair of your instrument before it is returned to us so you know exactly how much your instrument will cost to repair, regardless of how complex the fault may be. For obsolete products we can evaluate the fault and quote for the repair providing that the required parts are still available.

We also offer a full range of Field Service solutions including on-site repairs, installation, training, and laboratory relocations.

Our Service Contracts are designed to offer you peace of mind so you can fix your maintenance costs and minimise down times and are individually tailored to meet your budget and requirements. Our top level contract covers all parts and labour for any repairs performed on-site or in-house. The return to factory warranty supplied with new instruments can also be upgraded to an on-site warranty at any time in the first year of ownership.

Extended Warranties that cover all parts, labour and return carriage for in-house repairs can be purchased for almost any ORTEC product, regardless of their age and can last for 1, 2 or 3 years.

Ken Masters

Introducing Ken Masters.

Ken Masters joined us in April this year as a Field Service Engineer with his primary responsibility being the technical support of ORTEC and Protean products at customer sites throughout the UK and Ireland.

When not visiting customers, Ken is part of the team at the UK Global Service Centre offering technical support and performing in-house repairs in support of our customers, regional offices and distributors throughout Europe.

UK Service Team

Martin Trew, Service Manager

Tel: 0118 936 1227

Email: martin.trew@ametek.co.uk

Sharon Miller, Detector Repair Engineer

Tel: 0118 936 1226

Email: sharon.miller@ametek.co.uk

Ken Masters, Field Service Engineer

Tel: 0118 936 1214

Email: ken.masters@ametek.co.uk

Will Ticehurst, Electronics Repair & Field Service Engineer

Tel: 0118 936 1229

Email: will.ticehurst@ametek.co.uk

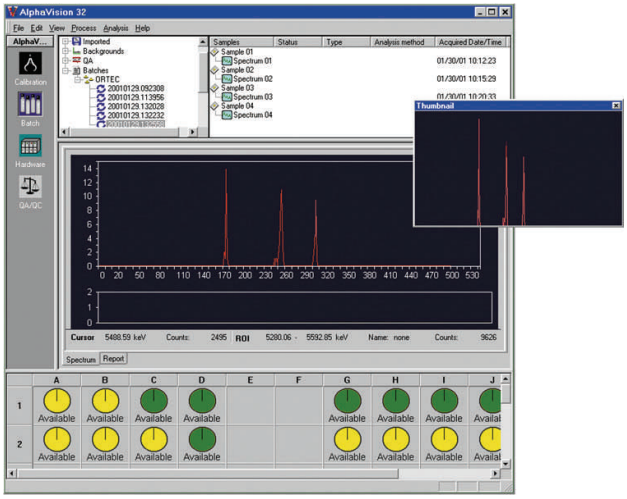
New version of AlphaVision-32 released!

To coincide with the release of our new Alpha Suite product range we are pleased to announce that version 5.5 of our AlphaVision-32 Alpha Spectroscopy Data Management and Analysis software has also been released.

AlphaVision-32 is designed to provide a comprehensive data management and analysis solution for laboratories and includes the capability for control, status monitoring and sample analysis of up to 256 alpha detectors from a single computer. Its graphical user interface (GUI) is designed to simplify management of the batch processing of samples with the emphasis on multiple samples, flexibility of sample preparation methods, and analysis types and reporting, all within a "set and forget" philosophy.

In addition to integrating the hardware support for the range of Alpha Suite products the new version also benefits from –

- Improved sample batch setup
- Additional new peak search based analysis mode for low count, asymmetric peaks
- Activity values in any input field can now be input either as DPM, Bq or Ci
- Manual entry of chemical recovery factor now included
- Improvements to the QA facility
- New database search tool
- Improved database security
- Improved custom reporting capability with compatibility with SAP Business Objects Crystal Reports version 11



For detailed information on the new version please visit the Nuclear Applications Software section of our website or

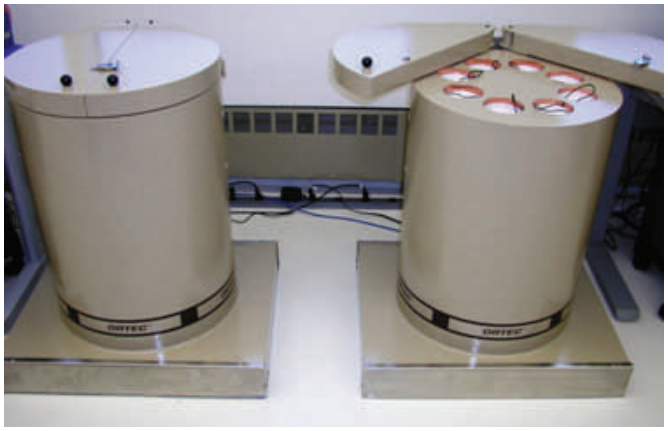
Rapid Gamma Screening now available

The possibility of accidental or intentional releases of radioactive material means that public health laboratories need a rapid and robust method to screen large numbers of people who may require or demand internal monitoring. Failure to respond quickly can increase the level of public anxiety and even when the risk is slight, large numbers of subjects may need to be screened to reduce this anxiety.

To address this need, ORTEC has released a new system - the GammaScreen-8. Originally developed for the Center for Disease Control (CDC) in Atlanta, Georgia, it consists of 8 sodium iodide well detectors and signal processing electronics, all enclosed in a compact floor mounted lead shield, together with a supervisory computer and associated software.

GammaScreen-8 has been developed to measure urine samples (10 ml or 50 ml) over the 0 to 2 MeV range and reaches an MDA of 52 Bq/L with a 300 second count. The software quickly determines a pass/fail decision for each sample whilst an optional bar code scanner can be used to simplify sample ID data entry. It is possible to process up to 700 samples over a 20 hour period with full spectral data retained for detailed analysis if required.

The modular design of the system means that it can be easily adapted for other applications, for example the screening of food or water samples for radioactive contamination. Full details are available on the ORTEC website or contact us to request a copy of the GammaScreen-8 brochure.



GammaScreen-8

LVis Lives!

In many Gamma Spectrometry laboratories it is quite typical to have two or more HPGe detector systems operating at any one time. In addition to this each detector system may be calibrated and setup to count samples in a range of different counting geometries and matrices. To complicate matters further it is often a requirement for technicians or analyst's with relatively little experience or training on the Gamma Spectrometry system to be able to operate the system in order to maximise efficiency and minimise cost.

The ORTEC GammaVision-32 software, which is widely used in Gamma Spectrometry laboratories around the world, is designed to carry out all the routine requirements of the laboratory and offers a huge range of features and flexibility. However, in order to simplify the routine operation of the Gamma Spectrometry system for the situations as described above we have developed a new Counting Laboratory Application Manager software package called LVis as a supplement to the GammaVision software,

LVis uses the underlying software components of GammaVision to control acquisition hardware, construct analysis libraries, calibrate the system and perform the analysis of the spectral data. However, LVis manages the complete acquisition and analysis process for multiple detectors using its own unique Graphical User Interface (GUI), as illustrated in Figure 1 below.

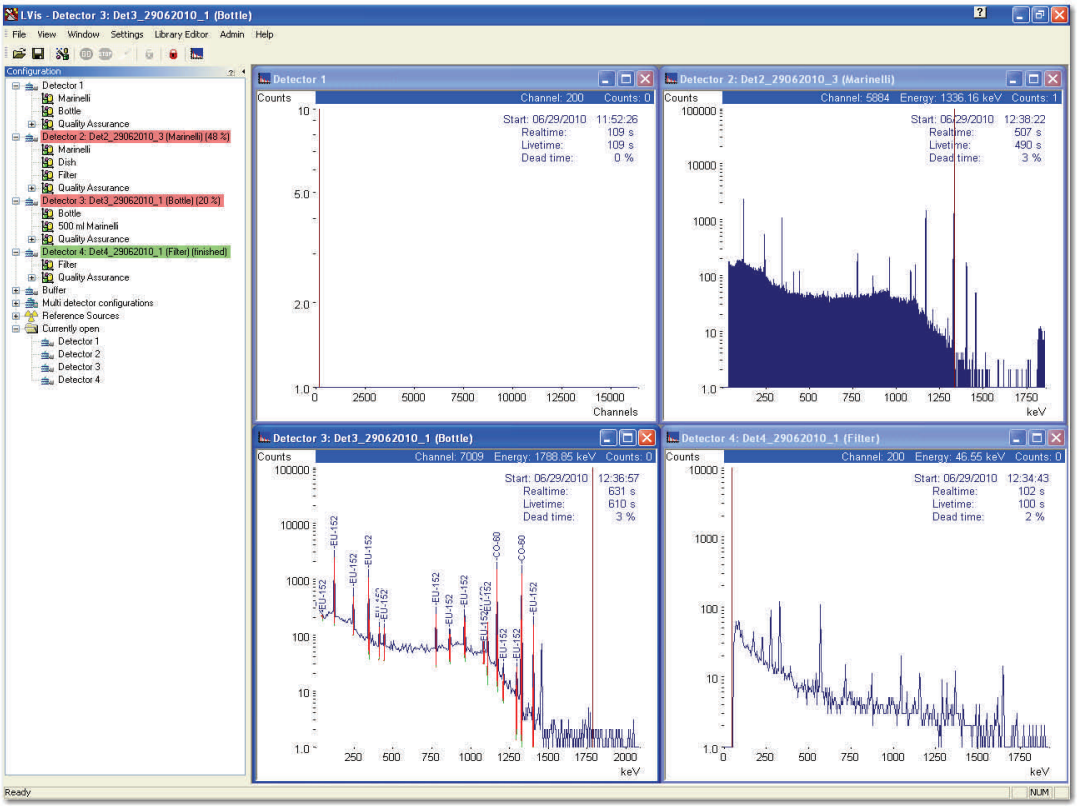


Figure 1. Graphical User Interface (GUI)

In LVis a complete acquisition – analysis – report process is defined for each detector and sample type and saved as a parameter set. Once the parameter sets are defined the operator simply selects the Detector and then the Sample Type they wish to count and the process commences and prompts for the input of any sample specific information required. In the example in Figure 2 **Detector 1** has been selected followed by the **Soil** sample type.

As well as automating the acquisition, analysis and reporting sequence, LVis provides standard report templates for reporting of results, library, calibration and quality assurance data. LVis utilises Crystal Reports templates to provide these reports and the user also has the capability to construct their own custom analysis reports using Crystal Reports 11 software (not included). Additional features are also included with LVis including expanded QA functionality which records and tracks peak specific data plus an interactive peak editor.

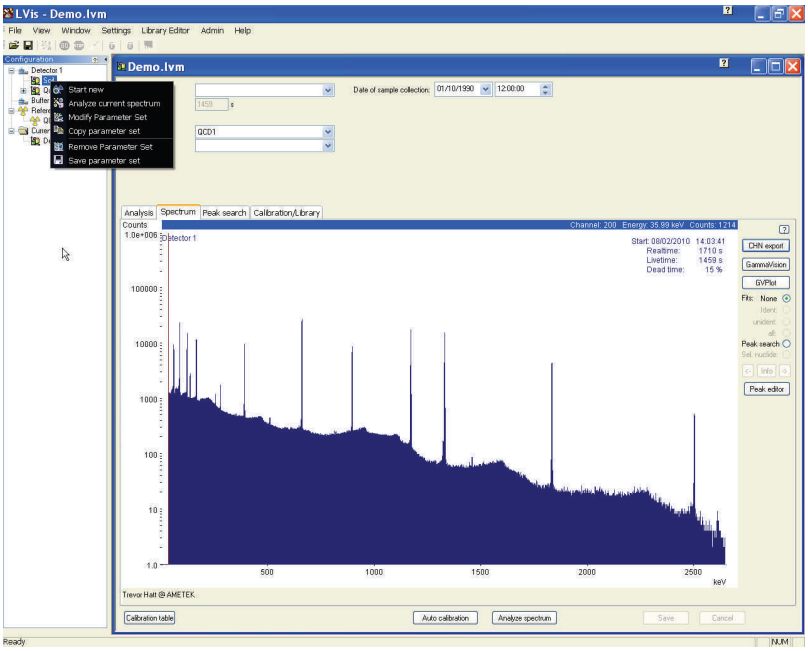


Figure 2 - Selected Detector

LVis also records all measurement data in LVis Measurement (LVM) files and has a facility to transfer this information into a Microsoft Access format database which in-turn allows for simpler integration into a Laboratory Information Management Systems (LIMS).

For existing users of the ORTEC Multi-Takser-32 software which is no longer available or supported, LVIs is a direct replacement offering a much improved user interface plus a range of additional features. For further in-formation please visit the Nuclear Applications Software section of the ORTEC website.

ORTEC Portal Monitor detects Uranium!

In our last newsletter we reported that we had recently installed a Detective ASP High Purity Germanium Portal Monitor at one of New Mexico's busiest ports of entry. Since installation it has been fully operational, 24 hours a day, and during New Year's Eve 2009, it resolved a gamma radiation alarm generated by one of the plastic scintillator based primary portal monitors.

Detective ASP Portal Monitor—New Mexico

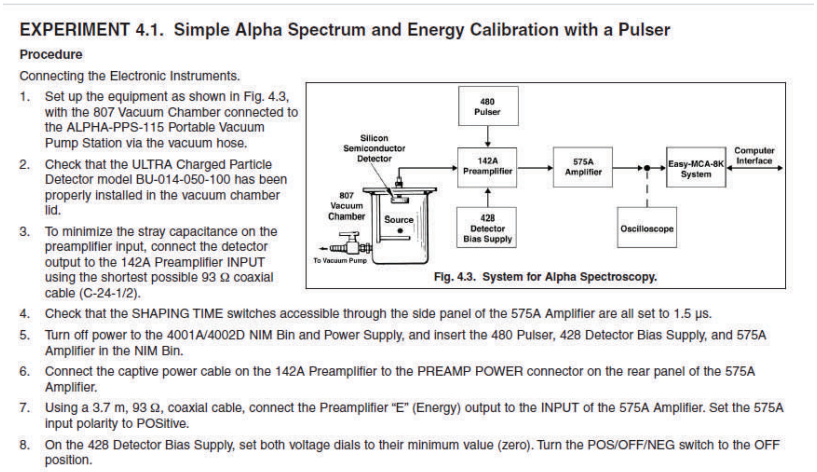
After a high gamma ray count from a passenger bus caused the primary monitor to alarm, the bus was directed by an inspector to the Detective ASP. After a 300 second stand-in count uranium, radium and thorium were detected and identified at high confidence levels. The inspector already had an idea where the radiological source was located due to the counting profile provided by the monitor, so on entering the bus, she was quickly able to find a backpack which caused her personal radiation detector (PRD) to alarm.

The passenger who owned the backpack said that he had found it in a trash dumpster in Arizona and that it contained rocks along with some vials containing either powder or some type of liquid metal. After determining the gamma ray activity from the backpack was safe, the passenger voluntarily exited the bus and the backpack was removed for further evaluation. After the bus exited the Detective ASP, the backpack was measured alone, using the Detective ASP and data was collected for another 300 seconds. Background and source spectra were transmitted to the US federal Joint Analysis Center (JAC) for analysis where it was discovered the glass vials were not holding liquid metal but appeared to contain some type of mineral, possibly gold ore. The back-pack also contained two rocks that gave off high gamma count-rates, later determined to be high-activity, naturally-occurring uranium ore.

Educational Experiments - AN34 Manual

Many of our Research and Educational customers may have noticed a number of experiments sent to them as part of our phased 're-launch' of the AN34 - a manual consisting of 26 Experiments in Nuclear Physics, published in the 1970s. Used by many Teaching Laboratory Supervisors in Universities around the world it describes numerous laboratory experiments with recommended equipment and a written experimental procedure.

The experiments outlined are the result of many years of developing and refining experiments in nuclear science for the undergraduate laboratory. It is recommended that each course manager select appropriate experiments and modify them to suit the specific needs and equipment in the intended programme.



EXPERIMENT 4.1. Simple Alpha Spectrum and Energy Calibration with a Pulser

Procedure

Connecting the Electronic Instruments.

1. Set up the equipment as shown in Fig. 4.3, with the 807 Vacuum Chamber connected to the ALPHA-PPS-115 Portable Vacuum Pump Station via the vacuum hose.
2. Check that the ULTRA Charged Particle Detector model BU-014-050-100 has been properly installed in the vacuum chamber lid.
3. To minimize the stray capacitance on the preamplifier input, connect the detector output to the 142A Preamplifier INPUT using the shortest possible 93 Ω coaxial cable (C-24-1/2).

Fig. 4.3. System for Alpha Spectroscopy.

4. Check that the SHAPING TIME switches accessible through the side panel of the 575A Amplifier are all set to 1.5 µs.
5. Turn off power to the 4001A/4002D NIM Bin and Power Supply, and insert the 480 Pulser, 428 Detector Bias Supply, and 575A Amplifier in the NIM Bin.
6. Connect the captive power cable on the 142A Preamplifier to the PREAMP POWER connector on the rear panel of the 575A Amplifier.
7. Using a 3.7 m, 93 Ω, coaxial cable, connect the Preamplifier "E" (Energy) output to the INPUT of the 575A Amplifier. Set the 575A input polarity to POSitive.
8. On the 428 Detector Bias Supply, set both voltage dials to their minimum value (zero). Turn the POS/OFF/NEG switch to the OFF position.

Excerpt from Experiment 4 - Alpha Spectroscopy

For each experiment, a list of recommended equipment has been provided. Equivalent equipment can be substituted to utilise existing inventory, or to update to newer models. Several experiments call for special apparatus to hold the samples, detectors and/or filters, and to control the geometry of the experiment; sufficient information is provided to guide the laboratory manager in sourcing or developing those items.

The manual provides an introduction to the various techniques currently used to study nuclear science and a framework to help the student learn. The methodology, list of equipment, and step-by-step instructions are included, together with sufficient reference material and theoretical information, to help with the analysis and interpretation of results. Many of the experiments are applicable to the major disciplines involved in nuclear science, including physics, chemistry, biology, nuclear engineering and other specialised nuclear technologies.

Experiments which are appropriate to nuclear technology are also appropriate for nuclear technician training. Other combinations of experiments can be derived for use in other fields of interest such as environmental studies, medical research, quality control and many more in the growing list of nuclear applications. Most of the experiments are divided into parts that can be completed in an average time of 30-45 minutes and can be performed independently, although should be done in sequence.

ORTEC's objective is to partner with teaching facilities in universities and research institutions to add to and further develop these pre-scripted experiments. If you have developed teaching experiments employing ORTEC products, we would welcome the opportunity to include them for others to use. We are happy to acknowledge your institution for the contribution of the experiment.

UK Sales Team

Trevor Hatt
Sales Manager UK & Ireland
Tel: 0118 936 1224
Mobile: 0781 809 7234
E-mail: trevor.hatt@ametek.co.uk

Nigel Rimmer
Sales Engineer, North
Tel: 01244 677 746
Mobile: 07971 063 709
E-mail: nigel.rimmer@ametek.co.uk

Shane Toal
Sales Engineer, South & Ireland
Tel: 0118 936 1239
Mobile: 0781 809 7235
E-mail: shane.toal@ametek.co.uk

AMETEK
Advanced Measurement Technology
Spectrum House
1 Millars Business Centre
Fishponds Close
Wokingham
RG41 2TZ
Tel: 0118 936 1210
Fax: 0118 936 1211
E-mail: ortec.uksales@ametek.co.uk