

Welcome to the ORTEC Newsletter

This edition concentrates on a number of our recent new product launches starting with the introduction of the new MÖBIUS™ liquid nitrogen recycler. Other new products covered include the LDM-1 laboratory detector system, Alpha-Mega alpha spectrometer, IDM-200 detector modules and the PINS-3F neutron spectroscopy system. We are also pleased to announce the release of the latest version of our AlphaVision alpha spectrometry software.

In addition to this we also discuss the recent acquisition by AMETEK of Sunpower Inc. a world leader in the design and manufacture of Free-Piston Stirling Engines and Cryocoolers. All this just illustrates that it has been another extremely busy period for everyone at ORTEC.



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If you would like your details removed from our database, please send an email to: ortec.uksales@ametek.co.uk.

All requests will be completed within 5 working days of receipt.

NEW COOLING OPTION FOR DETECTORS

The superior resolution offered by high purity germanium detectors makes them the first choice for laboratories using gamma spectroscopy to analyse samples for radionuclides, especially if a high degree of precision is needed. However one of the main challenges is cooling the detector to the optimum operating temperature of less than 120 degrees Kelvin (-153C).

A liquid nitrogen dewar is the most established method of cooling a germanium detector. The detector is physically connected to a cryostat inserted in the liquid, and the system relies on liquid nitrogen boiling off at 77 degrees Kelvin. The advantage of this approach is that cooling continues until all the liquid nitrogen is exhausted, even if the lab experiences a lengthy power cut. The user does not have to worry about thermally cycling the detector and possibly degrading the vacuum inside it. However, the dewar has to be refilled at least every two weeks and there are safety concerns around handling such a cold material, as well as the possibility of asphyxiation. These drawbacks, the improved temperature and calibration stability offered, plus the sheer convenience of electrical cooling have led to its increased popularity in recent years.

ORTEC has now released a new cooling option which recycles liquid nitrogen named 'MÖBIUS', combining the advantages of both liquid nitrogen and electrical cooling and so providing an excellent choice for laboratories who experience regular power cuts. The development of the new system was made possible by the recent acquisition of Sunpower Inc. and the integration of that company into the AMETEK corporation, see the article on page 3.



MÖBIUS Liquid Nitrogen Recycler

NEW COOLING OPTION FOR DETECTORS

The new system comprises a 28 litre dewar with a Stirling cycle cooler developed by Sunpower. As the liquid nitrogen evaporates and rises, it condenses onto a cold plate inside the top of the dewar and drops back into the reservoir. As a result the dewar does not need frequent refilling; under normal continuous operating conditions it will only require topping up every two years. A predictive 'time to empty' level monitor provides the user with information about the liquid nitrogen level regardless of mains power loss. A smart cooler controller also senses when MÖBIUS is operating from UPS power, switching off the cooler to direct remaining power to the rest of the system. MÖBIUS comes into its own in the event of a power cut. If the dewar is full, the liquid nitrogen inside it will keep the detector cold for two weeks. Power can be re-applied at any time during this period, without the need for thermal cycling, improving long term detector performance and reliability.

A further advantage of the MÖBIUS system is the extremely low level of micro phonic noise produced by the Sunpower Stirling cycle cooler during operation. As a result users should expect similar spectroscopic performance from detectors they move from standard liquid nitrogen dewar to MÖBIUS. New detectors are warranted to normal performance standards above 15 keV and less than 10% degradation of performance below 15 keV.

MÖBIUS is an excellent choice for both new and existing detectors from ORTEC but is also compatible with detectors from other manufacturers. It is easy to upgrade your current laboratory detectors in either streamline or ORTEC Pop-Top configuration cryostats, cooled by liquid nitrogen dewar's or the ORTEC X-COOLER system. It has the same footprint as a standard dewar and so will just slot into most lead shields.

MÖBIUS is supplied as standard with a 2-year warranty with options for further extended warranties available. To aid servicing and minimise downtime in the event of a fault the system has been designed such that all major components of the electrical cooling system can be replaced in-situ. Also if there is a failure of the electrical cooling system the MÖBIUS can continue to cool the detector using liquid nitrogen only until the required servicing can be completed.

The price for the MÖBIUS varies depending on whether the system is purchased with or without a detector. Also for customers with X-COOLER systems who wish to upgrade to the MÖBIUS we offer a special trade-in allowance for the X-COOLER. We are also currently offering an additional 10% discount on all MÖBIUS prices for orders received by December 30th 2013 so now really is the time to upgrade !

The MÖBIUS is only one of a range of HPGe detector cooling options we can offer and the most appropriate solution will depend on the application, available budget and other laboratory or site requirements.

For brand new detector or system purchases, it's also worth considering the Laboratory Detector Module (LDM-1). The LDM-1 integrates a 40% efficiency germanium detector, MCA, Stirling cycle cooler and 4 hour battery into a single compact device, small enough to fit most laboratory lead shields. A more detailed description of the LDM-1 system is included on page 4 of the newsletter.

Last but not least of the cooling options is the X-COOL-III, the third generation of the popular X-COOLER product line and incorporating many improvements developed over a period of several years. The X-COOL-III is compatible with ORTEC Pop-Top detectors and offers an economical electrical cooling option for new or existing detectors.

Please use the following links to download data sheets for the Mobius, LDM-1 and X-COOL-III:

<http://www.ortec-online.com/download/mobius.pdf>
<http://www.ortec-online.com/download/LDM-1.pdf>
<http://www.ortec-online.com/download/XC3.pdf>



LDM-1



Detector with X-COOL-III

SUNPOWER ACQUIRED BY AMETEK

Sunpower Inc., a leading manufacturer of Stirling cycle engines & cryocoolers has been acquired by the AMETEK corporation. It has been placed within AMT (Advanced Measurement Technology), which also includes ORTEC, to enable close co-operation between the two business groups. Sunpower was incorporated in 1974 to commercialise the Free-Piston Stirling Engine, invented 10 years previously by the company's founder William Beale, a professor of mechanical engineering at Ohio University in Athens, Ohio, USA. A Stirling engine can be used to produce power from any heat source or alternatively be configured to run in reverse, using power to move heat away from any heat source to act as a cooler.

The free-piston design, developed by Sunpower, uses gas bearings and compact linear alternators. It is mechanically simpler than a traditional Stirling engine and does not require lubrication, seals or mechanical bearings. As a result it needs less maintenance and has greater longevity, with a tested lifetime of over 10 years.

This longevity has been demonstrated by NASA in the RHESSI program, which is using high purity germanium detectors cooled by Sunpower cryocoolers, to measure gamma rays produced by the sun during solar flares. The RHESSI satellite was launched in February 2002 with a planned mission length of 2 years. It is still operational, testament to the technology used on board, including the Sunpower cryocoolers.

Sunpower is also working with the NASA Glenn Research Centre to develop an Advanced Stirling Converter. The device will be integrated into a Lockheed Martin Advanced Stirling Radioisotope Generator that may be selected for future NASA missions.

So, what does this mean for you as an ORTEC customer? If you are a user of high purity germanium detectors you will be aware of the need to reliably cool the detector to its preferred operating temperature of less than 120 Kelvin or -153C. Established methods are based around liquid nitrogen and electro mechanical coolers, mainly Kleemenko cycle type devices using technology similar to a domestic fridge.



**Sunpower
CryoTel Cooler**



RHESSI Satellite

Stirling cycle cooled detectors have started to appear in the last few years, notably on the ORTEC Detective product range and also recently on the ORTEC LDM-1 Laboratory Detector Module. The new technology is highly efficient, reducing size, weight and power consumption plus increasing reliability. The brand new MOBIUS system, described on page 1 of this newsletter is the first ORTEC product to include a Sunpower cryocooler. As the company is integrated into AMT, it is highly likely that this advanced cryocooler technology will appear in more exciting new ORTEC products and product improvements.

The Sunpower range of CryoTel cooler can also be purchased separately for a wide variety of uses, where their small size, high heat lift, flexible orientation and form factor offer many advantages. Please contact ORTEC to discuss your application and see this link for further details:

<http://www.sunpowerinc.com/>

FULLY INTEGRATED LABORATORY HPGe SYSTEM

It is well understood that High Purity Germanium (HPGe) detectors are the “Gold” standard when it comes to performing High Resolution Gamma Spectroscopy. However, one of the challenges of operating HPGe detectors is the need to cool them down to liquid nitrogen temperatures in order for them to perform correctly.

For certain applications the use of liquid nitrogen is not practical or even possible for health and safety reasons. In order to solve this problem liquid nitrogen free electro-mechanical cooling systems such as the ORTEC X-COOLER system have been in widespread use for many years.

However the typical liquid nitrogen free electrically cooled system designed for laboratory use still has some limitations. For example if the electrical power is lost and the HPGe detector starts to “warm up” typically the complete system needs to be taken through a full thermal cycle. This can mean a significant amount of time before the system is ready for use again. This risk of having to take a system through a full thermal cycle can be mitigated to a degree by using an uninterruptible power supply (UPS) to maintain power to the cooling system compressor during the power outage.

However ORTEC has addressed these issues and many others in the development of the DETECTIVE range of Hand Portable HPGe systems which have been hugely successful. This technology has been developed, improved and migrated to a range of other products over the last few years including the Trans-Spec range of portable instruments and the Interchangeable Detector Module (IDM) systems described elsewhere in this newsletter.

Primarily the products developed so far have been targeted at applications where the system needs to be either hand portable (DETECTIVE and Trans-Spec) or optimised for efficiency and robustness (DETECTIVE-200 and IDM-200).

However we have now migrated this technology to the laboratory system - enter the LDM-1 Laboratory Detector Module.

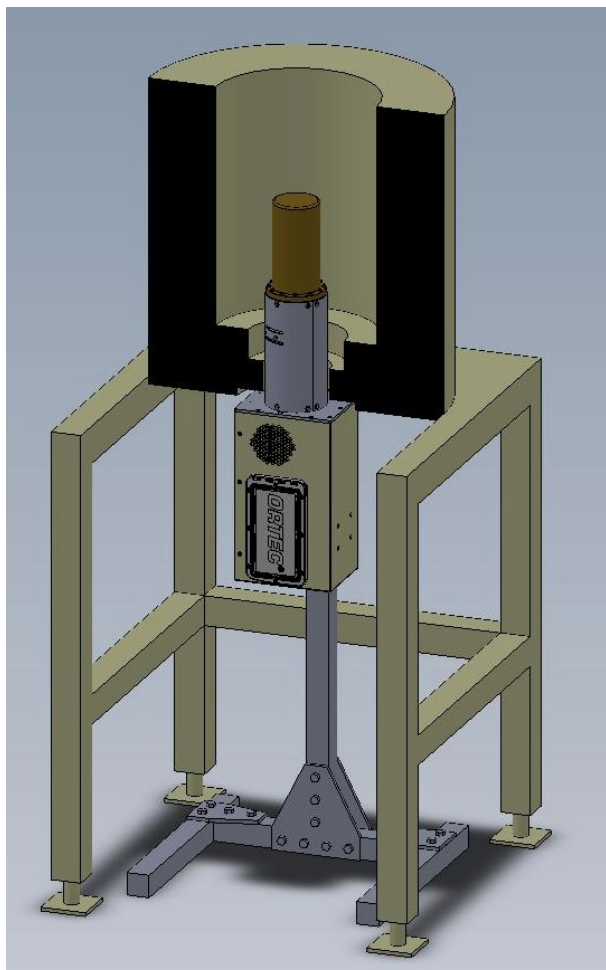
The LDM-1 is another unique product from ORTEC in that it integrates a complete high resolution gamma spectroscopy system into a single unit designed primarily for laboratory applications. In the LDM-1 a P-type HPGe detector of nominally 40% relative efficiency (crystal dimensions are 65mm diameter x 50mm length) is combined with a “run-forever” Stirling cycle cryogenic cooling system. Importantly the detector is also mounted in our “hardened cryostat” design developed from the DETECTIVE product range. In the hardened cryostat the HPGe detector can be partially thermally cycled at any time without affecting the system performance. Standardisation of the size of HPGe crystal means that LDM-1 units can be interchanged with minimal effect on the system performance.

As well as the HPGe detector, cryostat and cooling system the LDM-1 also integrates a high performance 16,382 channel resolution Digital Signal Processor (DSP). The DSP interfaces to the host computer via an integral USB-2 interface, in fact in the LDM-1 there are only two external electrical cable connections to make when the system is installed, 12-17 V DC input power connection from the AC/DC power adaptor supplied plus the USB-2 connection.



LDM-1 Laboratory Detector Module

FULLY INTEGRATED LABORATORY HPG_e SYSTEM



Cutaway illustration of LDM-1 installed in Low Background Lead Shield

The LDM-1 has also been designed so it can be integrated into the typical laboratory setup with the minimal of effort. To this end the system is supplied with a removable stand which can be used for mounting the unit in a typical low background lead shield found in most laboratories as you can see illustrated in the picture opposite. However, the LDM-1 is designed such that it can be installed and used in any orientation if required. This feature allows the system to be used in a wide range of applications in radiochemistry and counting laboratories and makes it an ideal choice for use in a mobile or portable laboratory.

The high voltage required by the detector is also factory set and high voltage is automatically applied as soon as the detector reaches the correct operating temperature. With Plug-n-Play connectivity to the computer via all the standard ORTEC software packages system setup is simple. The digital filter parameters for the detector are factory optimised so the only setup required by the operator when installing the system is adjustment of the channel resolution and then the system gain to define the energy range required.

Another key benefit of the LDM-1 is the integrated "State-of-Health" technology. Key detector parameters are monitored continuously and if they fall outside limits, automatic warnings are displayed to warn the operator via the standard ORTEC Connections software such as Maestro, GammaVision and Isotopic.

So the LDM-1 integrates all this technology into a single instrument but what happens in the event of a power failure, surely the HPG_e detector will start to warm up and data acquisition has to stop? No, the LDM-1 also incorporates an internal battery backup which maintains the complete system operation for up to 4 hours. This means that data on the LDM-1 can still be acquired even if the power is interrupted.

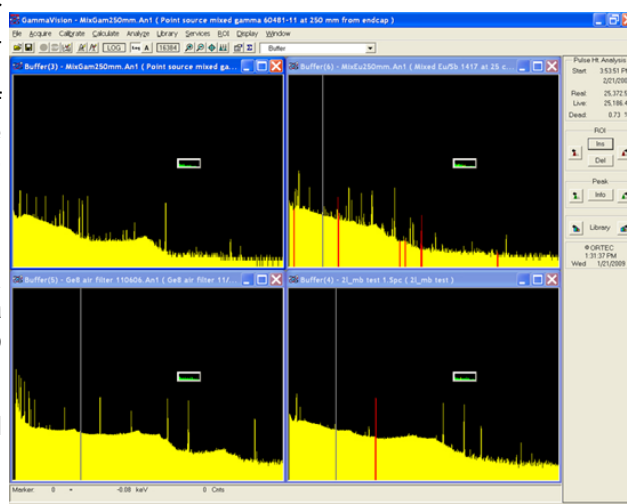
Even after the 4 hours has expired and the detector eventually starts to warm up, as soon as power is re-applied the system will automatically start to cool down again. Also, as the LDM-1 only requires a small amount of power, <30W, it is easy to extend the battery backup time simply by adding additional batteries or an uninterruptible power supply (UPS).

As an introductory offer for any order placed for an LDM-1 system by the 30th September 2013 we are including a free-of-charge copy of our GammaVision Gamma Spectrometry and Analysis Software, the perfect partner to the LDM-1 system.

For more information on the LDM-1 system and GammaVision software please select the following links

<http://www.ortec-online.com/download/LDM-1.pdf>

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



GammaVision Software

NEW ADDITION TO THE ALPHA-SUITE RANGE

We are pleased to announce the release of another new model to our Alpha Suite range of integrated Alpha Spectrometers, the Alpha-Mega. As a reminder the existing Alpha-Suite range comprises of the following products all designed to utilise either Silicon Surface Barrier Charged Particle detectors or more typically Ion Implanted Silicon Charged Particle detectors:

- Alpha Aria - Single channel instrument in a double width NIM unit.
- Alpha Duo - 2 channel instrument in a compact bench top enclosure or expansion chassis.
- Alpha Ensemble - 2, 4, 6, or 8 channel instrument in a bench top/rack mountable enclosure.



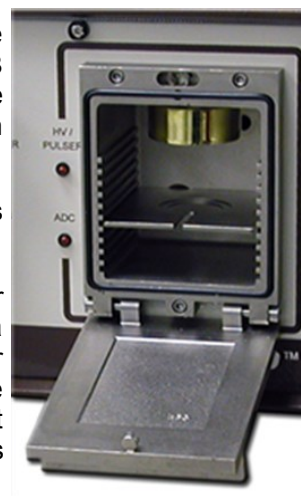
ALPHA-ARIA, ALPHA-DUO and ALPHA-ENSEMBLE-8

Each product is a 'fully integrated' Alpha Spectrometer in that they include all the electronics plus vacuum chamber and associated hardware requiring only a USB connection to a PC, input mains power and vacuum connection. All the products feature the latest digital signal processing technology and also include a digital spectrum stabiliser as standard.

A key feature of all the Alpha-Suite products is that each vacuum chamber/detector has its own dedicated completely independent Digital MCA.

Other Alpha-Spectrometers available typically use a single MCA with multiplexer for multi-channel systems, in this case if one sample in one chamber is 'hot' and causes a significant amount of system dead time, this dead time impacts on all the other chambers. Even low activity samples in the adjacent chambers will be subject to the same percentage dead time, potentially leading to an increase in already long count times for low activity samples. With each channel having its own MCA "cross-talk" of this kind is eliminated.

Each detector "channel" also has a variable detector bias supply, pre-amplifier, variable amplitude test pulser and a completely adjustable energy range from 0 to 10 MeV.



Vacuum chamber on
ALPHA-DUO

NEW ADDITION TO THE ALPHA-SUITE RANGE

All hardware controls and data acquisition settings are controlled and monitored with ORTEC Maestro MCA Emulator Software or our AlphaVision Alpha Spectroscopy Management software. The only exception to this is the vacuum control on the Alpha-Aria which uses a simple to operate manual PUMP/HOLD/VENT control mounted on the front panel.

The Alpha-Aria is an excellent solution if only a single detector/chamber is required for the application and a NIM bin and power supply is already available, in this situation the Aria is the most cost effective solution.

The Alpha-Duo system can be purchased either in the standard compact bench top unit, as an expansion unit for installation in an existing Alpha-Ensemble chassis or preinstalled in a new Alpha-Ensemble chassis. Up to four Alpha-Duo units can be installed in one Alpha-Ensemble chassis. In addition Alpha-Duo units purchased in the bench top chassis can later be transferred to an Ensemble chassis if capacity needs to be expanded.

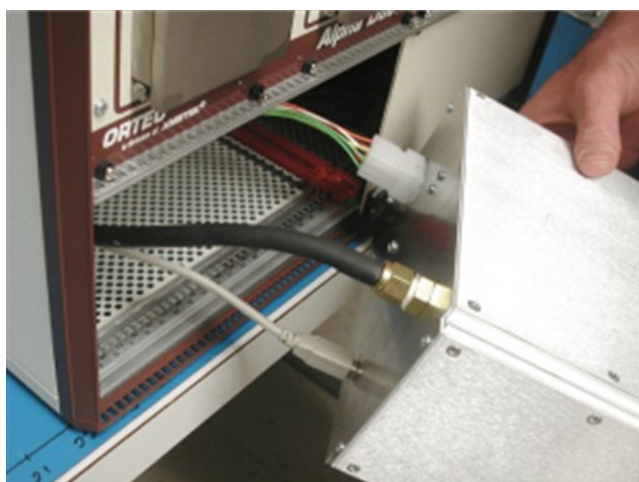
In total up to 256 detectors of any combination of Alpha-Aria, Alpha-Duo or Alpha-Ensemble can be controlled using either the standard Maestro software supplied with the instrument or alternatively using the ORTEC AlphaVision 6 Alpha Spectrometry Management software. More information on the AlphaVision 6 software is included in a separate article in this newsletter.

As the name suggests size is a key feature of the new Alpha-Mega or rather the vacuum chamber size. The new instrument is based around the same compact bench top chassis as the Alpha-Duo but incorporates a single large vacuum chamber and associated hardware. This new larger chamber can accommodate samples up to 106mm in diameter.

The new instrument has all the standard features of the Alpha-Suite range of products including Digital MCA and full computer control of all functions including vacuum control.



ALPHA-MEGA



ALPHA-DUO / ALPHA-MEGA expansion unit being installed in an ALPHA-ENSEMBLE chassis

As per the Alpha-Duo the Alpha-Mega can be purchased either in the standard compact bench top unit, in an expansion unit for installation into an existing Alpha-Ensemble chassis or preinstalled in a new Alpha-Ensemble chassis. Up to four Alpha-Mega units can be installed in one Alpha-Ensemble chassis. An Alpha-Ensemble can also accommodate combinations of Alpha-Duo and Alpha-Mega units giving maximum flexibility.

A typical application for the Alpha-Mega is likely to be counting air filters from high volume or personal air samplers where its large volume chamber allows the user to insert the complete filter or filter card assembly without having to fold or cut the filter.

Further information on the Alpha-Mega and the complete Alpha-Suite range can be downloaded using the following link

<http://www.ortec-online.com/download/Alpha-Suite.pdf>

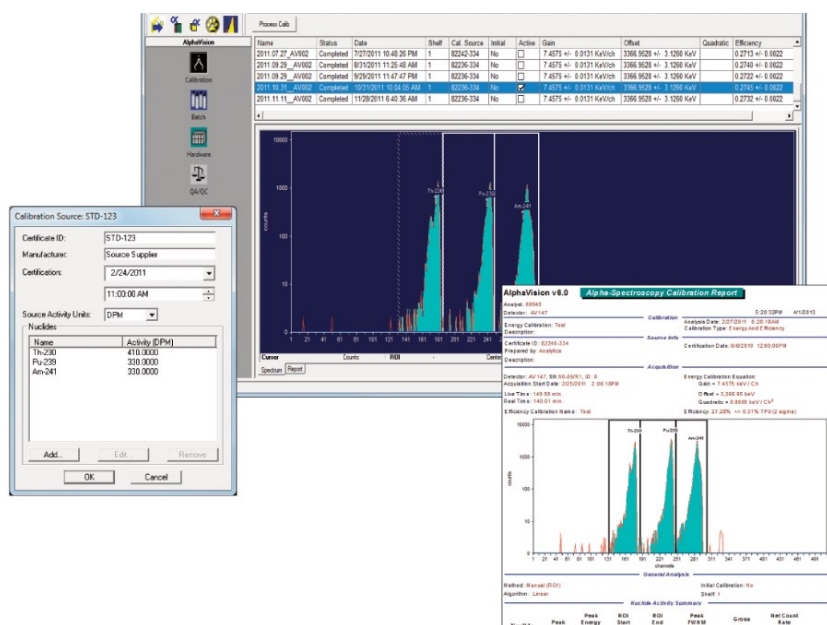
NEW ALPHA SPECTROMETRY MANAGEMENT SOFTWARE

The introduction of AlphaVision Version 6 follows the launch of the Alpha Ensemble range of Alpha Spectrometers. In addition to fully supporting the added features of the Ensemble range this new version of AlphaVision offers much more. AlphaVision is a comprehensive PC-based alpha spectrometry application that combines rich features and intuitive processes to meet the demands of modern radiochemistry laboratories. In large-scale commercial laboratories with hundreds of alpha detectors or small labs with only a few detectors, AlphaVision optimizes routine measurement processes and monitors system performance.



Full utilisation of AlphaVision's capabilities will ensure you gain the maximum value from the investments in instrumentation and the supporting radiochemistry. Also, if you are already fully utilising the benefits of earlier versions of AlphaVision, then it is likely you will wish to update to AlphaVision version 6. So whether you have yet to introduce the software in you lab or are already using it fully, then you can do so at significantly reduced cost until the end of September... (see details at end of article).

The functions of the software can broadly be broken into four categories – hardware control, calibration, batch automation and quality assurance. These are easily accessible via the toolbar shown in these screen captures. The software is compatible with many different instrument types and depending on the instrument in question, different levels of control will be available. At the higher end are the newest Ensemble family of instruments (HV, vacuum valves, pressure, pulser etc.) but the software will comfortably configure instruments alongside with more basic levels of control (i.e. some older instruments only allow access to the MCA).



The interface provides simple visibility of the detector status 'at a glance'. A detector grid provides a graphical representation of the detectors which can be laid out to visually represent the physical groupings and positions in your lab. Each of the detectors on the grid then provides instant visual information and ready access to more detailed information and control. Operations on groups of detectors can be easily and rapidly carried out.

An easy to use calibration wizard makes the set up and control of calibration simple and intuitive. Both energy and efficiency calibrations are available. Automated and interactive peak fit options can be used and the calibration report can be customised to your own requirements.

NEW ALPHA SPECTROMETRY MANAGEMENT SOFTWARE

A batch wizard provides templates easing process operation and ensuring consistent measurement processes are maintained. Extensive analysis options cover the peak fitting, activity analysis, corrections, MDA, true count to MDA presents.

Data management is based on an Microsoft Access database. This is key to maintaining a comprehensive chain of custody over your clients' samples and keeping control of hundreds of data records. The batch explorer panel, is the main gateway to all records in the database including features such as: switching databases and creating new databases, database management and archival tools, importing data from previous versions of AlphaVision, exporting analysis results from the report window and exporting spectra as .SPC spectrum files. The software is also designed to provide the ability to integrate with LIMS. Reports are generated using Crystal Reports templates and can be customised using Crystal Reports. Historical Analysis retention is provided when re-analysing samples. Also a record is kept of detailed event logging for routine operations, warnings, and errors.

A comprehensive coverage of quality assurance and quality control are a key part of the software. It is ANSI N42.23 and ANSI N13.30 compliant. Automated control charts and reports result from the analysis of numerous sets of data – detector background (total and isotopic), calibration energy and efficiency, pulser centroid and width, detector bias and chamber pressure, reagent blank and control sample nuclide activity, tracer peak width and chemical recovery. Warning and alarm limit calculation are of course part of this.

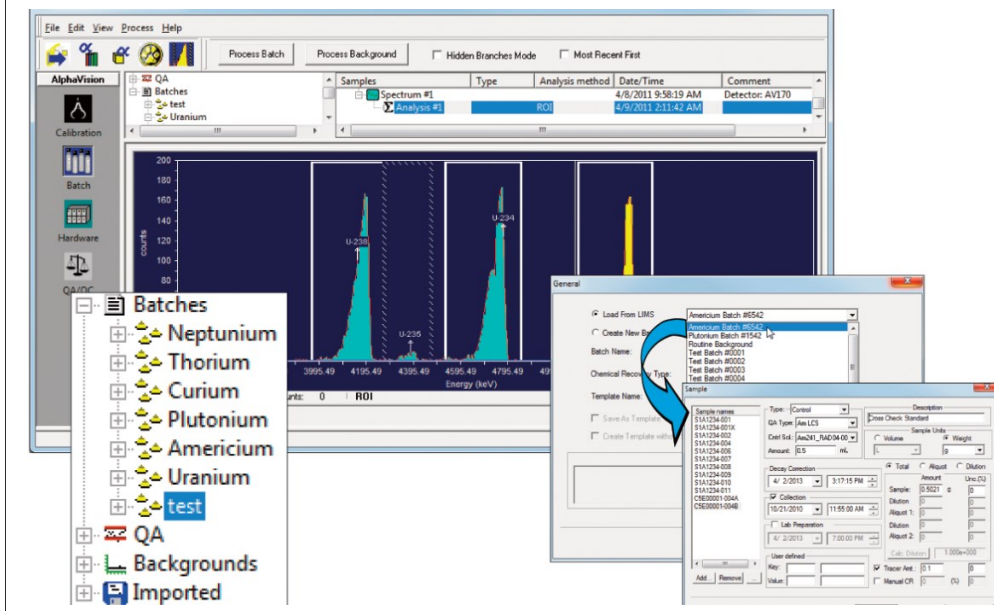
There are some important improvements that have been introduced with version 6. The software is now compatible with 64-Bit Windows 7 and earlier versions of Windows. Crystal Reports Version 11.5 templates are included providing reliable custom reports compatible with common file formats. As explained earlier, integrated hardware control allows instant adjustment or feedback on vacuum, pulser, or high voltage status on large detector groups. Automated region of interest adjustment can correct gain shift during analysis. Automated spectrum and report export during batch counting processes for use with external applications. Formal verification and validation test results are now available as an option. Toolbar controls now provide rapid access to the most common menu functions.

Three excellent offers are currently running until September 30th 2013.

- AV50 - Purchase either an AlphaVision full license or upgrade copy or AlphaVision with the Verification & Validation documentation at 50% discount.
- AE35 - With the purchase of a new Alpha-Ensemble-8 system you can purchase an upgrade license copy of the combined AlphaVision with V&V documentation package at 35% discount
- AE75 - With the purchase of a new Alpha Ensemble 8 system you can purchase a full licence copy of the combined AlphaVision with V&V documentation package at 75% discount.

Please refer to the following link below for further information on the AlphaVision software:

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



THE INTERCHANGEABLE DETECTOR MODULE

ORTEC has recently launched two new instruments in our range of all-in-one HPGe spectrometer systems, the IDM-200-P and the IDM-200-V. IDM stands for Interchangeable Detector Module and the IDM can essentially be thought of as a Gamma Spectroscopy “building block” that can be used for a wide range of applications.

The new instruments are both fully integrated Gamma Spectroscopy systems comprising of a large area HPGe detector, Stirling cycle electrical cooler and Digital Spectrometer all in a compact package. There are only two electrical connections required, input power and USB communications. Both systems incorporate the same large area 85 mm diameter by 30 mm thick HPGe crystal as used in our Detective-200 Radiation Identification System (see ORTEC News Edition 10).

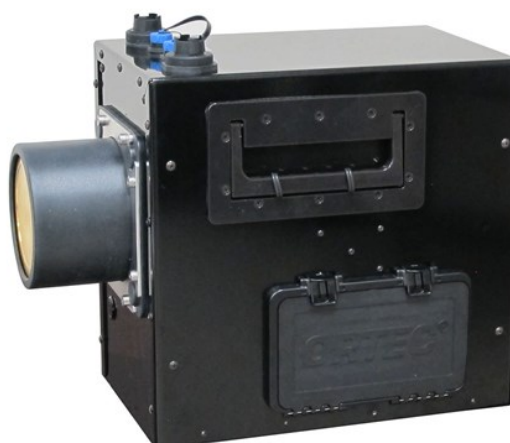
The high efficiency of the Stirling cooler and low power design of the electronics results in a low power consumption of 30W during normal operation. In fact power consumption is so low that we have incorporated a battery into the design of both units which will power the complete systems for up to 2.5 hours in the event of an external power failure. So not only will the Stirling cooler remain operational during a power outage, the complete system will be operational and can continue accumulating data. The instrument switches automatically to internal battery power as soon as external power is lost and by adding the optional external battery pack you can increase the operational time on battery backup to 12 hours or more depending on the size of battery.

As well as their superb thermal efficiency, low power requirements and compact size the Stirling Cycle coolers used in the IDM-200 require absolutely no maintenance whatsoever. The systems do not require forced air ventilation in fact there are no apertures, ventilation grilles or cooling fans thus avoiding the potential for internal contamination of the instrument.

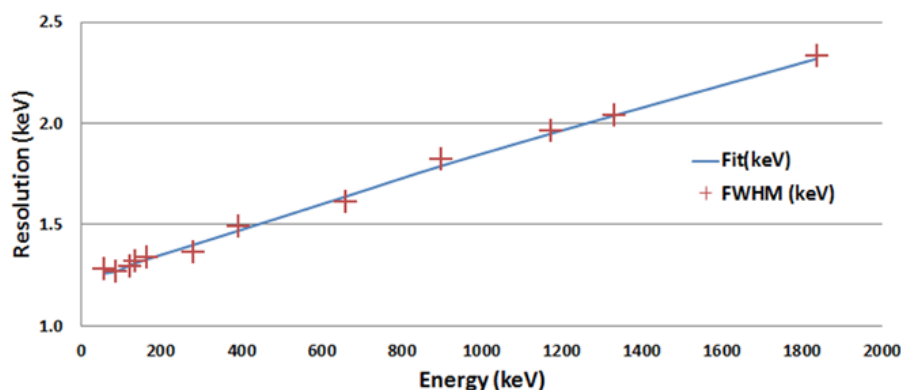
In keeping with our Detective-200 system both IDM-200 models operate over an extremely wide temperature range from -10°C to $+50^{\circ}\text{C}$ which means they can be installed and operated in industrial locations where there is limited or no temperature control of the environment.



IDM-200-P



IDM-200-V



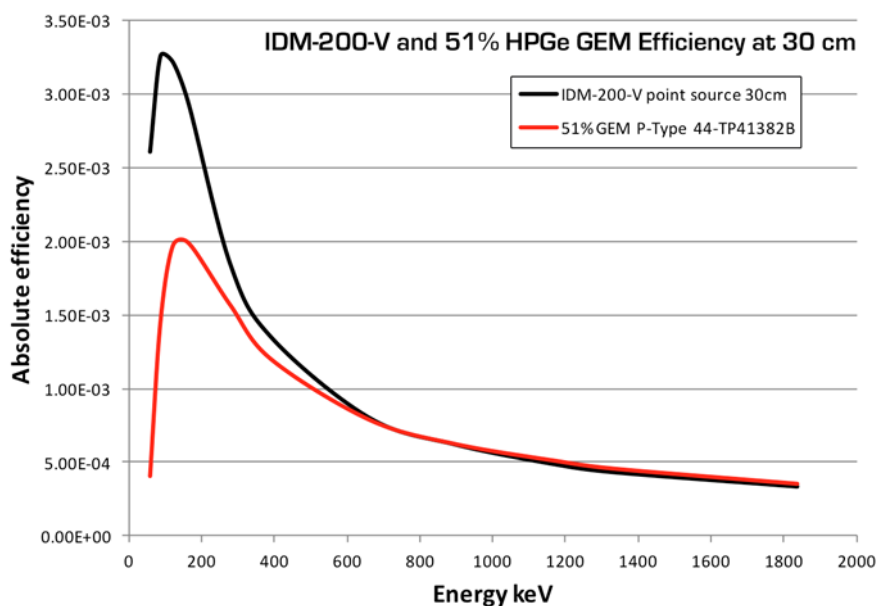
As mentioned earlier, one of the key features of the IDM-200 systems is the large diameter “over-square” geometry HPGe detector incorporated into the design.

This detector offers the excellent selectivity (energy resolution) only achievable with HPGe detectors, see plot of detector energy resolution vs. energy opposite.

THE INTERCHANGEABLE DETECTOR MODULE

With the “over-square” crystal geometry the detector also offers exceptional sensitivity (efficiency) for extended sources due to the large active surface area of the detector.

The plot opposite shows a comparison of the absolute efficiency of the IDM-200-V detector vs. a conventional P-type HPGe detector with a measured relative efficiency of 51%. This comparison uses a point source measured at a distance of 30cm on axis from the front face of the crystal. As you can see between 700keV and 1.9MeV the efficiencies of the two detectors are virtually identical. However as the energy drops below 600keV the IDM-200-V efficiency starts to improve in comparison and at approximately 100keV the efficiency is around 60% higher. The IDM-200 systems also have a reduced thickness



dead-layer on the front face of the HPGe crystal in comparison to the conventional P-type detector. At 60keV this reduced dead-layer in conjunction with the large active area yields an even more significant improvement compared to the conventional P-type detector with IDM's efficiency at around 650% higher.

Both versions of the IDM-200 include a high performance Digital Signal Processor (DSP) or Digital Spectrometer. This DSP can process the detector signals in the traditional Pulse Height Analysis (PHA) method generating a histogram of the energy spectrum or alternatively output a List Mode data stream of time stamped events to an attached computer. Connection to a PC is via a standard USB-2 interface and both systems are supported by all the standard ORTEC Gamma Spectrometry software products such as Maestro, GammaVision, Isotopic etc. In addition we also offer a software toolkit to enable integration of the systems by system integrators and developers.



DETECTIVE-SPM Spectroscopic Portal

So what is the difference between the two systems? Well the IDM-200-P version has been primarily designed as the “building-block” for Radiation Identification Systems used in security related applications such as Spectroscopic Portal Monitors or Search Systems. In fact the IDM-200-P units are the key component of the ORTEC DETECTIVE-SPM Spectroscopic Portal Monitor shown opposite. The IDM-200-P version incorporates some mechanical features designed to make installation in a Portal system straightforward including “front” mounted carry handles to aid in installation and “hot-swapping” of units in the Portal. This version is also normally supplied with a fixed energy range optimised for use with the Identification Software algorithms developed for the ORTEC DETECTIVE family product range. The IDM-200-V version is a more general purpose instrument and has some mechanical features designed to make it more suited for use as a stand-alone instrument as part of a Waste Assay system such as the ORTEC ISO-CART system. Alternatively it can also be used for a wide range of other applications such as Mobile Laboratories, Whole Body Counting Systems or On-Line monitoring applications such as stack or effluent monitoring.

Further information on both IDM-200 systems can be downloaded from the following links –

<http://www.ortec-online.com/download/IDM-200-V.pdf>

<http://www.ortec-online.com/download/IDM-200-P.pdf>

PORTABLE ISOTOPIC NEUTRON SPECTROSCOPY

Portable Isotopic Neutron Spectroscopy (PINS) is a non-destructive assessment system that analyses and provides on-site identification information about the contents of unidentified or suspect chemicals inside completely sealed containers. The system is designed to identify chemicals inside a container without the need for disassembly, contact, physical sampling or breach of the container. Items typically of interest would be.. Artillery, Mortar, Rockets, Bombs, Land mines, Gas cylinders, Storage tanks, Bags, Brief cases, Parcels, Chemical war heads, Explosives, Gases and Smoke.

With the introduction of the trans-SPEC-P the new PINS3-CF brings significant benefits compared with the standard ORTEC PINS product. The trans-SPEC-P has been specifically designed and tested to replace existing liquid nitrogen cooled detectors currently used for neutron chemical assay systems and provides the necessary field spectroscopy readings for non-intrusive chemical identification. PINS3-CF provides significant advantages over previous liquid nitrogen designed systems by eliminating the logistical and safety problems associated with the storage and transport of liquid nitrogen, equipment handling, maintenance, and training.

The Portable Isotopic Nuclear Spectroscopy (PINS) Chemical Identification System identifies dangerous compounds and mixtures non-destructively. The test object need not be opened or touched, providing significant safety benefits. As shown, PINS probes a test object with neutrons that excite the atomic nuclei within, causing the excited nuclei to produce gamma rays. The energy intensity pattern or spectrum of these gamma rays is unique for each chemical element, and by analysing the gamma-ray spectrum, the PINS software identifies the chemical elements inside the test object and determines if the object contains a chemical warfare agent, a military explosive, a fill (such as sand), or a smoke generating chemical.



PINS3-CF System

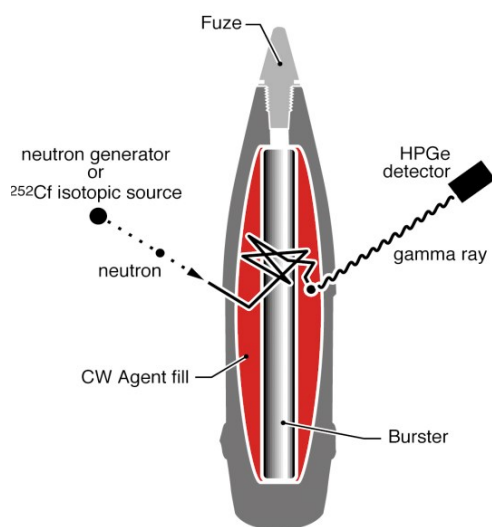


Illustration of PINS methodology

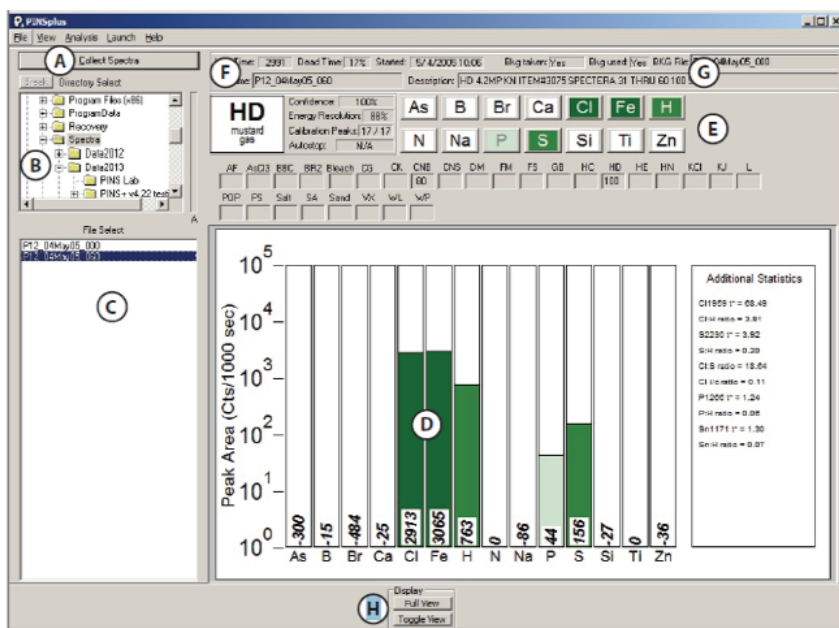
PINS3-CF uses neutrons produced by fission of the radioisotope Californium-252 (Cf-252). The standard PINS3-CF 5-microgram Cf-252 source produces ten million neutrons per second. The source emits neutrons Omni-directionally, and approximately 1,000 neutrons per second strike each square centimetre of the test object surface. Since neutrons are a very penetrating form of radiation, most pass through the test object casing and interact with the chemicals inside .

Neutrons from the source excite the nuclei they encounter by inelastic scattering or by neutron capture. In either case, the excited nuclei decay to their ground states by gamma-ray emission, and the gamma rays are characteristic of the emitting nucleus. That is, the gamma-ray energies and intensities vary, often strongly, from one nucleus to another. For example, the hydrogen nucleus emits a 2.2-MeV gamma ray under neutron bombardment, while a phosphorus nucleus emits a 1.3-MeV gamma ray. The neutron-induced gamma rays are measured by a high-purity germanium (HPGe) spectrometer and sorted into a spectrum by the spectrometer electronics. By analysis of the spectrum, the chemical elements excited by the neutrons are determined, and the chemical substance inside the test object can be identified.

PORTABLE ISOTOPIC NEUTRON SPECTROSCOPY

Unlike the liquid-nitrogen-cooled HPGe spectrometers used in previous PINS systems, PINS3-CF uses the trans-SPEC-P mechanically-cooled HPGe spectrometer, requiring no liquid nitrogen. The electrical power required to cool the spectrometer detector is approximately 30 watts. The trans-SPEC-P lithium ion battery can keep the detector cold for 10 to 12 hours and the external battery can be "hot-swapped" for extended field use of the instrument. The trans-SPEC-P provides a flexible and modular solution to support field inspections of chemical and explosive threats.

The PINS data acquisition program records and displays the incoming spectral data from the Trans-SPEC-P. It also analyses the spectrum being recorded every 10 seconds, fitting the peaks of interest, re-calibrating the energy scale, and performing a chemical analysis.



PNS-3 Software User Interface

The new chemical analysis method, based on the decision tree logic shown below attempts to identify the chemical inside the object under test. The new probabilistic method traces through every path in the decision tree, and computes a score for each possible content chemical. The chemical with the highest score is chosen as the content chemical. The new chemical analysis method is faster and more accurate, plus it is easier to expand

the list of chemicals that PINS can identify automatically.

Chemicals and agents automatically Identified by PINS3 include:

Chemical Warfare Agents: Blister agents, choking agents, nerve gases and others

Explosives

Training munitions: Bleach, Plaster of Paris, sand, water-antifreeze, concrete

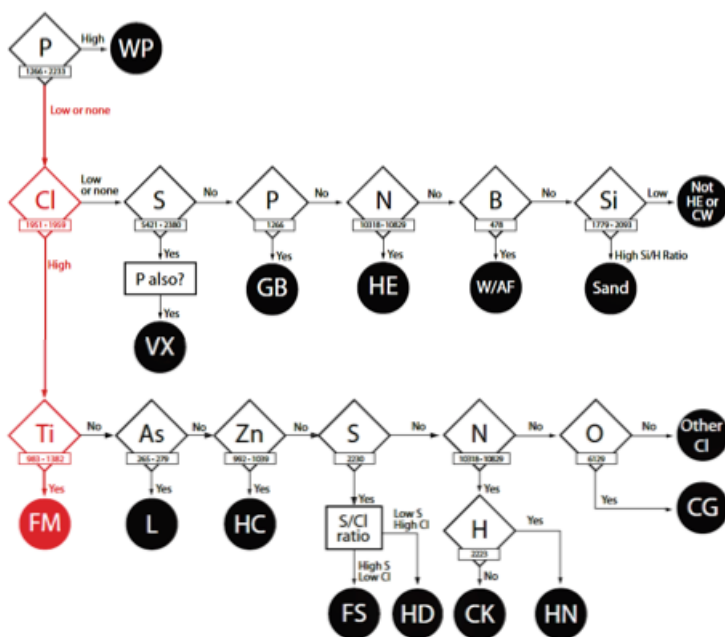
Riot Agents: CA, CNB, CNS

Smoke Chemicals: FM, FS, HC, WP

Further information on the PINS3-CF can be downloaded from the following links –

<http://www.ortec-online.com/download/PINS3-CF.pdf>

<http://www.ortec-online.com/download/PINS-Presentation.pdf>



PINS-3 Software Decision Tree for Identification of material

BATTERY AND DOOR UPGRADE FOR THE MICRO

As part of the continual development process that we carry out on our products we have now released a new upgrade kit for our Micro-Detective and Micro-Trans-SPEC Instruments. The new model MICRO-DET-ACC-BAT-UPG kit comprises of a new design "snap-open" battery door assembly plus a new longer life Lithium-Ion SMART internal battery. The new kit contains everything you need to upgrade an existing Micro-Detective or Micro-Trans-SPEC instrument including the necessary tools plus easy to follow instructions.

The snap-open door assembly now means that the instrument internal battery can be replaced in a matter of seconds effectively giving a "hot-swap" capability. This new door assembly is now fitted as standard to all new Micro-Detective, and Micro-Trans-SPEC units as well as the LDM-1, Detective-200, IDM-200-P and IDM-200-V instruments.



New snap-open battery compartment



Desktop battery charger

The new generation battery, which has about 30% more capacity, represents a substantial increase in operating time. Up to 5 hours of operation has been achieved in tests of the new battery.

Exhausted internal batteries can be swapped out and are easily recharged via the optional new desktop battery charger. The recharge time for an exhausted battery using the desktop battery charger is approximately 5 hours.

It is also possible to increase the operating time of the instruments further by use of the optional Ultra Battery Life Extender battery pack. This light weight battery pack typically adds a further 8-hours operation time to the instrument on-top of the operation time provided by the internal battery. Further information on the new kit can be downloaded using the following link

<http://www.ortec-online.com/download/Micro-Battery.pdf>

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