

# ORTEC® News

## Welcome to the ORTEC Newsletter

This is the second edition of our newsletter in which we update you with recent developments and events at ORTEC.

In this issue you will find articles on a number of new and existing products used in a diverse range of applications including Environmental Research, Health Physics & Internal Dosimetry, Radiochemistry, Waste Assay and Homeland Security. We hope they are of interest.

Customer Service is very important to us and we aim to provide the best support and service we can to our customers. Included in this issue is a focus on our Service Department with information on the services offered and key contact personnel within the organisation.

As usual we've included information on events we are attending and training courses we are providing over the next 6 months, we would also welcome hearing of any specific training courses that you, our customers, would be interested in attending.

We hope you find this newsletter useful and of course we appreciate any feedback on how we could make improvements or if you have any specific topics that you would like us to cover in subsequent issues.



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## New Model added to DETECTIVE family of Hand-Held Radiation Identifiers

In 2004 ORTEC released the first model of this unique range of Hand Portable Radiation Identifiers called the **DETECTIVE** - unique in that it incorporates a battery powered High Purity Germanium (HPGe) detector system with miniature cryogenic cooler and the most advanced identification software, originally developed at Lawrence Livermore National Laboratory in the United States.

For the first time it was possible using a hand portable system, to quickly, accurately and reliably identify Gamma emitting radioactive material in complex mixtures, including Special Nuclear Material (SNM),

even when an attempt had been made to shield or "mask" the material.

Subsequently the **DETECTIVE-EX** derivative was released which added a Neutron detection capability in order to confirm the presence of SNM. The **-EX** derivative also added an integrated PDA computer in place of the dedicated keypad and display used on the standard **DETECTIVE**. The PDA brought with it additional benefits in terms of an improved user interface, wireless communications options and additional data storage capacity.

Many users have expressed interest in having the benefits of the PDA computer and software as used on the **-EX** but do not require the Neutron detection capability. Therefore to meet these requests we have now released a version of the system which adds the PDA but does not include the Neutron detection capability - the **DETECTIVE-DX**.



The Detective



DETECTIVE-EX Startup Screen

## New Low Background Carbon Fibre Endcap

The measurement of low activity radionuclides in various applications (such as Soil and Sediment dating) has historically provided manufacturers the challenge of ensuring the end-cap and other materials used in low background detector construction are of the lowest possible activity.

Traditionally, specially selected aluminium, magnesium and beryllium have been used but each contains small, measurable amounts of naturally occurring isotopes; Beryllium also has an associated health hazard if the window is broken.

Leading directly from ORTEC's experience in the development of Carbon Fibre windows over the past 10 years, an endcap has been designed which is constructed **entirely** from carbon fibre materials. They are inherently free of radionuclides and will provide lower detection limits than metallic endcaps. Overall transmission and thus efficiency is also higher with a carbon fibre endcap because of the lower density of the material. In addition, metallic endcaps can corrode and cause detector failure over time; again this is bypassed with an all Carbon Fibre Endcap.

In summary, the carbon fibre endcap shows real promise as a superior replacement for existing low-background endcaps, and it is expected these endcaps may well start to dominate in the near future for Low Background applications.



## Rugged and Portable NaI Gamma Spectrometer

Low-resolution gamma spectrometry is used in many different measurement situations from bore-hole monitoring to clinical measurements in hospitals. The detector type of choice for these measurements is typically the Sodium Iodide (NaI) detector because it has good efficiency, does not require cryogenic cooling, and offers a low cost solution.

ORTEC has for many years offered NaI based Gamma Spectrometry systems that can be used both in the lab or in-situ. Most popular of these systems is a product called the digiBASE - a complete Digital Spectrometer with high voltage supply that plugs directly onto the NaI detector Photo Multiplier Tube (PMT).

The DigiBASE is an ideal solution for many applications as its all-in-one design and USB Plug'n'Play connectivity mean that it is simple to set-up and use, plus its Digital Signal Processing electronics offer benefits in terms of counting stability, resolution and throughput. However, NaI detectors are not necessarily the most robust of detector types and in certain situations this can be a disadvantage.

To address these situations we have introduced the DigiBASE-R-X range of ruggedised NaI Spectrometers which package the DigiBASE electronics with an NaI detector and PMT into a purpose-built splash-proof aluminium detector housing for field-based applications or anywhere the detector and PMT Base needs some additional protection.

A single USB cable connects from the DigiBASE-R-X to the host notebook or tablet computer operating either the industry standard ORTEC Maestro-32 (included) or ScintiVision-32 software (additional cost).

The rugged housing also includes a removable carry handle and a heavy duty, screw in "eye" to allow attachment of a cable to lower the complete assembly when used in bore-hole type applications. Three models of the DigiBASE-R-X are offered in order to accommodate standard ORTEC NaI detector crystal sizes (diameter/length) as follows –

- DigiBASE-R-1 - 25mm x 25mm
- DigiBASE-R-2 - 50mm x 50mm
- DigiBASE-R-3 - 75mm x 75mm

In addition to the DigiBASE-R-X range is the ScintiPack -R-X range also offered in three versions to accommodate the same standard NaI detector sizes as the DigiBASE-R-X.

ScintiPack is a combined PMT voltage divider/preamplifier and high voltage supply for use with NaI detectors and typically used in conjunction with the ORTEC MicroNOMAD spectrometer.

The MicroNOMAD spectrometer has long- been the system of choice for many research customers and those performing in-situ measurements. Its success is primarily because it is a small battery operated device which can operate over 8hours continuously on standard AA type batteries and does not require to be connected to a PC. Spectra can be recorded directly onto the system's built-in data memory by a single click of a button and downloaded later for detailed analysis.

The combination of the MicroNOMAD plus the ScintiPack -R-X provides an excellent solution for many in-situ applications where the use of a PC is not possible or desirable.



NaI Spectrometer in Rugged Housing

## The World's most advanced Radiation Identifier - Now with SNM Search Mode

In parallel with the release of the new DETECTIVE-DX detailed on page 1, we have also taken the opportunity to upgrade the software on the PDA computer used in both the DETECTIVE-EX and -DX systems. This new software adds a number of key features including –

- SNM Search Mode
- Calibration of the system with ANY suitable radioactive source
- Gamma and Neutron alarms levels now user adjustable
- GPS co-ordinates of measurement location stored with identification results (if GPS option purchased)

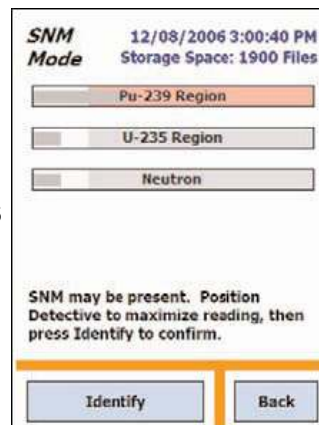
Most significant of all these improvements is the addition of the SNM Search Mode. This is a unique mode whereby the **DETECTIVE-EX** or **-DX** operates in a “tuned” search mode in order to locate SNM.

In SNM Search Mode the system essentially ignores all other counts detected outside the Pu-239 and U-235 regions of the energy spectrum allowing for fast detection of material that may be SNM, even in the presence of high levels of interfering background radiation or other radioactive material. Once the suspect material or object has been located the operator can simply press the “Identify” button on the PDA for the system to perform a definitive identification.

In addition to the new features of the PDA software, all DETECTIVE-EX and -DX models now also ship with Remote Control software for remotely operating the instrument via a Personal Computer.

Also, as alluded to above a new option now available with both systems is the addition of a GPS receiver integrated into the PDA computer.

If you would like a more detailed description of the SNM Search Mode, information on the **DETECTIVE** family of products or if you are an existing **DETECTIVE-EX** user and are interested in purchasing an upgrade to the latest PDA software please contact our Sales Office.



DETECTIVE-EX SNM Search Mode Screen

## Detective Case Study

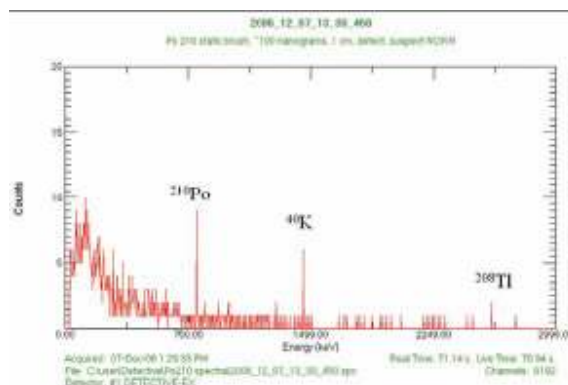
Established as a special health authority (SpHA) in 2003, the Health Protection Agency (HPA) aims to provide an integrated approach to protecting UK public health through the availability of support and advice to the NHS, local authorities, emergency services, other Arms Length Bodies, the Department of Health and the Devolved Administrations.

The HPA have been using a mobile whole body monitoring system for a number of years and in order to supplement this system and to help them respond more promptly to potential radiation exposure, they purchased a Detective system in October 2006.

Mike Youngman of their Radiation Protection Division says that the Detective's “intended principal use is as a portable high-resolution whole body monitor (and radioiodine in thyroid monitor) following an incident where members of the public may have been exposed to radioactive material. The Detective will complement our existing transportable whole body monitor, which already uses two ORTEC germanium detectors. Although the existing transportable system is more sensitive, the Detective based system will be much quicker to deploy. It also has the advantage of being simpler to transport as liquid nitrogen is not required.”

Mike continued, “The HPA response to the recent polonium-210 incident has been well documented ([www.hpa.org](http://www.hpa.org)), but we need to be prepared for any incidents which could involve a gamma-emitting radionuclide.”

*Editor's note: tests have shown that the ORTEC Detective can detect ~100 nanograms of Polonium-210 (around 1/10 of a lethal quantity) in about one minute, with no possibility of mistake.*



Spectra from DETECTIVE-EX model showing Polonium-210

## In-Vivo Measurements and Medical Applications

The use of Gamma Spectrometry as a technique for In-Vivo and medical applications is well established and covers a variety of applications including -

- Whole Body Counting (WBC)
- Actinide-in-Lung measurements
- Wound Monitoring
- Thyroid Uptake monitoring
- PET product studies and QA on radiopharmaceuticals
- Post-treatment monitoring of patient urine

However, the choice of Gamma-Ray detector system used for the specific application can vary significantly. Applications like thyroid monitoring or PET studies typically use Sodium Iodide (NaI) based systems whereas Actinide-in-Lung measurements are performed using High-Purity Germanium (HPGe) detectors.

HPGe detector systems offer many advantages over their NaI counterparts including a more robust analysis algorithms; greater stability over long periods of use; superior identification capabilities for individual nuclide peaks; advanced peak de-convolution, peak background subtraction and peak interference corrections. However, for thyroid monitoring and other medical applications where the nuclide to be measured is well known, the benefits of the HPGe detector system offer little advantage.

ORTEC can supply a range of systems for use in all the above applications from the simpler NaI detector through to complete, turnkey Whole Body and Lung Burden Counting systems.

### Want to upgrade or replace the electronics on your existing Thyroid Counter or WBC?

Upgrading an existing NaI detector based counting system used for these types of application is simple using the ORTEC digiBASE Gamma Spectrometer (mentioned previously on page 2) - a complete, self-contained Digital Spectrometer with USB single-cable connection to a host computer.

The system plugs directly into the NaI detector and incorporates the high voltage supply as well as a pre-amplifier and Digital MCA. This means there are no health and safety issues which can be a problem when using instruments that supply the voltage via separate high voltage cables.

Multi-detector arrays, usually required in Whole Body Counting applications, can also easily be set-up as multiple digiBASE units can simply be connected directly to a host PC or via standard USB hubs.

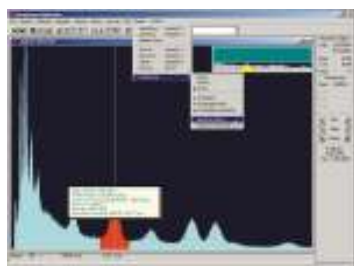


digiBASE with NaI detector

### Using out-of-date data acquisition software on your existing WBC system?

Then our Renaissance-32 WBC and Lung Burden Analysis Software could be of interest. When it comes to Whole Body Counting, Renaissance software is key to the whole system, whether it is a completely new installation or upgrade of an existing system. With the purchase of new software and PC, and as far as possible, minimal replacement of electronics/detectors, the system can be totally rejuvenated.

Renaissance supports either NaI or HPGe type detector systems or a combination of both and will support arrays of up to 64 detectors for complex applications. Acquisitions and analysis of data using both NaI and HPGe detector types can be performed simultaneously and individual detector data can be analysed separately or "summed" together as required. When used with our latest Digital Spectrometers such as the digiBASE or DSPEC-jr-2.0, the Renaissance software also offers an automated gain synchronisation feature to ensure the quality of summed spectra analysis.



Renaissance-32 screenshot

Renaissance-32 supports both scanning and fixed geometry type Whole Body Counting systems, for example chair or bed facilities. It also incorporates a Supervisor Mode for system set-up, calibration and diagnostic work and an Operator Mode for performing routine scans and tasks such as background measurements and QA.

The software is a PC based application supported under Windows 2000/XP with easy archive of Subject History in LIMS compatible Microsoft Access™ and custom reporting options. There is also an option for seamless transfer of results to the latest version of IMBA Professional Plus Dose Assessment Software developed by the Health Protection Agency.

### Looking for an Integrated Walk-Through WBC system?

The ORTEC StandFast II (shown on facing page) is a stand-up whole-body counter system for rapid screening of workers in order to identify and quantify fission and activation product radionuclides within the body. The system offers industry leading detection capability and has a remarkably large interior dimension compared to other Walk-Through counter systems.

The large 4" x 4" x 16" NaI detectors in the centre column of the StandFAST II give an ideal geometry and high efficiency for a walk-through counter. The combination of large detectors with superior shield design ensures very low detection capability. The StandFAST II system includes detectors, electronics, and a computer with Renaissance-32 analysis software described earlier. The single cable connection from the detectors to the electronics provides ease of installation, service, and maintenance.

### Interested in HPGe-Based WBC and Lung-Burden Systems?



StandFAST II walk-through WBC

As described earlier HPGe detector systems offer many advantages over their NaI counter parts. HPGe based WBC using bed scanners and fixed position installations are quite common in many facilities. ORTEC detector systems, scanning mechanisms, and bed arrangements are designed for such installations. These types of systems often incorporate a number of HPGe detectors positioned above or below the subject.

The ORTEC Actinide-85 is an HPGe detector designed specifically for lung burden and whole body counting applications. The unique detector design combines large sensitive area and excellent energy resolution across a wide range, with excellent peak shape. The result is excellent sensitivity for the detection of small amounts of actinides such as uranium, plutonium, and americium as well as higher energy fission products and naturally occurring radioisotopes, in a distributed source such as the human lung. It is therefore ideal for monitoring radiation workers - for lung burden, body burden and wounds.

Typically Actinide-85 detectors are fitted with the latest SMART detector technology whereby the detector includes an integrated module that provides the detector high voltage in addition to monitoring key detector parameters. A single cable connects the SMART equipped detector to one of our latest Digital Spectrometers such as the DSPEC-JR-2.

Combining the Actinide-85 detector with SMART technology and the X-Cooler-II Electromechanical Cooling system, the HPGe WBC becomes a very powerful option, enabling positioning of several detectors in a confined space and without the hassle of having to fill liquid nitrogen dewars in those tight spaces.

## Versatile solution to Waste Characterisation

As more and more nuclear facilities and establishments move into decommissioning programmes the requirements for accurate characterisation of possible waste material increases significantly. A number of measurement solutions exist that meet these requirements but one of the most useful and flexible techniques is the use of High Resolution Gamma Spectrometry (HRGS) and in particular In-Situ HRGS.

In-Situ HRGS allows for the radioactive characterisation and assay of material stored in a wide variety of containers, buildings, floors, walls and pipes and even large areas of contaminated land, without the need for sampling or moving the material. Typically In-Situ HRGS systems utilise portable High Purity Germanium (HPGe) detectors and sophisticated data acquisition electronics but possibly the most important part of the system is the Waste Characterisation software.

Waste Characterisation software takes the pulse height spectrum information from the HRGS and calculates peak area information for each individual photo-peak in the energy spectrum then applies modelling techniques to correct this peak area for the measurement conditions to give a final report of activity or activity concentration by nuclide.

Typically Waste Characterisation software corrects for things such as: sample geometry; sample matrix; sample container attenuation; sample self-attenuation; detector shielding/collimator as well as the efficiency of the detector system itself. This is obviously a very complex process but to be useful and to allow maximum flexibility, software that performs these functions must be easy to set-up and to use. The ORTEC ISOTOPIC-32 software is an answer to this conflicting demand of sophisticated analysis capability and ease of use.

Look out for the new version of ISOTOPIC software, due any day now. Version 4 is even easier to use and offers several new features. ISOTOPIC is a valuable tool in situations where large quantities of radioactive waste need to be assessed before treatment or disposal.

The software allows the user to model a point source and traceable on site calibration to a variety of sample types such as drums, pipes, walls and even soil. Several measurements can be combined to increase accuracy with larger objects and results can be checked and optimised by comparing the measured and calculated reference peaks for each nuclide. Use in the field is simplified through the use of operator and supervisor modes of operation.

A key feature of the ISOTOPIC software is that it can be used with virtually any HPGe detector as the system is calibrated using a mixed nuclide point source. This is a major advantage over other types of system that require an expensive "characterisation" of the HPGe detector by the manufacturer before they can be used, if the detector subsequently fails a replacement detector must also be "characterised".

ISOTOPIC is not limited in this way, all that is needed to get a detector operating is a simple calibration using the software's built-in calibration "Wizard". In addition by using a source to calibrate the system, the calibration is traceable directly to National Standards and can be easily verified and updated at any time.

Combine the new version of Isotopic software either with your existing hardware, or with the trans-SPEC 100 and ISO-CART to make a big impact on your waste characterisation problems.



trans-SPEC and ISO-CART Waste Assay System

## Fast Screening of Samples for Alpha-Beta

Screening of samples for gross Alpha-Beta activity is a standard requirement in many radiochemistry laboratories and nuclear facilities. Traditionally instruments used for performing these measurements have been manual "drawer" type instruments with simple scaler/timer counting electronics. These instruments are simple to operate and reliable but can be labour intensive and tie up too much of the analyst's time in the busy laboratory.

Protean Instruments, who specialise in the design and manufacture of Alpha-Beta counting systems, have introduced a low cost system that is one answer to this problem, the Automatic Swipe Counter or ASC.

Instead of using a manual single drawer arrangement for locating the sample to be counted in position the ASC system uses a high-speed automatic sample changer with a capacity of up to 100 samples. With a sample change time of less than three seconds this means large numbers of samples can be counted quickly and efficiently with minimal operator intervention.

Take a look at the sample throughput that can be achieved –

LLD (Bq)	Count Time: 1 Sample	Count Time: 50 samples
0.01 Alpha	~ 17 minutes	~ 14.3 hours
0.04 Alpha	~ 70 seconds	~ 1 hour
0.4 Beta	~ 11 minutes	~ 9.5 hours
1.0 Beta	~ 100 seconds	~ 90 minutes



The ASC is designed to count a range of typical sample types including filter papers, swipes, PAS cards and planchets and includes an integrated bar-code reader to automatically record sample identification information. The system is also offered with a choice of either a Gas Flow Proportional Counter detector using P-10 counting gas or alternatively if supplying gas to the system is undesirable a Plastic Scintillator (Dual Phosphor) detector can be selected.

Control of the ASC is performed using the integrated keypad and LCD display or alternatively via a Personal Computer using the Protean VISTA-FC software.



VISTA-FC is a Windows 2000/XP application designed for Health Physics applications allowing full control of the instrument with a minimal amount of operator input and which also allows for the counting data produced to be stored directly into a Microsoft Access format database.

Modular electronics are used in the system for ease of maintenance and the Gas Flow Proportional detectors also feature user replaceable detector windows. Installation is simple and the system has been designed to be compact and the weight minimised which enables installation on a standard laboratory bench.

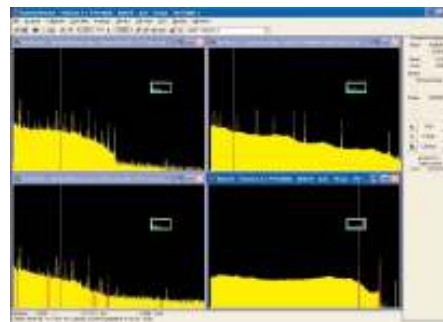
## Speed up your Gamma-Ray Measurements, Analysis & Reporting

Life in the counting laboratory just got slightly easier with the release of the latest version of Gammavision, version 6.06. Gammavision is a fully featured software package for the measurement, analysis and reporting of gamma spectroscopy samples and is used in applications from lead 210 dating to monitoring nuclear power stations.

The new version includes a new analysis engine, more hot buttons to reduce key presses and operates more efficiently, increasing speed. It has been through an exhaustive validation and verification process to ensure compliance with all the necessary quality assurance standards.

The new version continues to build upon the many improvements seen in version 6. These include a multiple detector interface, which allows the user to display up to 8 buffer and 8 detector windows at the same time and control multiple detectors simultaneously.

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.



## UK Global Service Centre, Wokingham



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The UK Global Service Centre (UKGSC) located in Wokingham, Berkshire is one of two Global Service Centres operated by ORTEC, the other being the US Global Service Centre located in Oak Ridge, Tennessee.

The UKGSC has facilities and engineers for the testing and repair of both electronics and HPGe detectors and is primarily responsible for the support of the ORTEC range of instruments for the European territories. 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 instruments that need to be sent to the UKGSC for repair, we offer a 'flat rate' 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.

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. 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 be upgraded to an on-site warranty at any time in the first year of ownership and we offer return to factory contracts that cover all parts and labour for in-house repairs for almost any ORTEC instrument, regardless of age. All of our contracts are individually tailored to meet your budget and requirements.



If you would like more information on any of our service solutions, or would like to talk about arranging a service contract, repair or field service visit, please contact Mandy Primmer, our Service Co-ordinator at [mandy.primmer@ametek.co.uk](mailto:mandy.primmer@ametek.co.uk)



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## **US Department of Homeland Security selects ORTEC to supply Portable Radiation Detection System**

The U.S. Department of Homeland Security (DHS) has awarded a contract to AMETEK for the design, development and production of a high-resolution portable radiation detection system. The system will be used by U.S. Customs and Border Protection, public safety officials and other first responders to screen vehicles and search public facilities for potentially harmful nuclear materials.

The contract calls for a base year award of \$2.4 million for research and development, as well as option years for both research and development and production. If all option years are exercised by the government, the total value of the contract will range from approximately \$5 million to \$50 million over a five year period.

"AMETEK is pleased to be selected as the only high-resolution germanium supplier for this important program. We believe our system represents the best technology for quickly, accurately and reliably identifying nuclear material and determining whether or not it poses a threat," noted AMETEK Chairman and Chief Executive Officer Frank S. Hermance.

"Our Detective® family of high-resolution radiation detection systems represents a substantial advance in system performance and significantly improves the ability to detect potentially harmful radioactive material without interfering with the normal flow of commerce.

"These systems employ a unique class of high-purity germanium-based gamma ray detectors that offer the best available combination of resolution and sensitivity for the rapid, positive identification of nuclear materials. These detectors can identify nuclear material which can be used in a nuclear weapon, an improvised nuclear device or a dirty bomb," added Mr. Hermance.

This award from DHS follows a number of recent wins for AMETEK's radiation detection systems. In recent months, AMETEK has been awarded contracts totaling more than \$12 million by the US Departments of Defense and Energy and the UK Ministry of Defence. These include standard handheld Detective radiation identifiers, a backpack version of the Detective, and a transportable portal system.

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## **Forthcoming Exhibitions & Training Courses**

We will have a stand at the following exhibitions and will be happy to discuss any product requirements you may have:

- Technology Show at CCLRC Rutherford, 3rd May
- Technology Show at UKAEA Dounraey, 17th May
- Nuclear Spectrometry Users Forum, National Physical Laboratory (NPL), 22nd May
- Technology Show at AWE, 24th May
- Technology Show at Sellafield, 9th October

### Training Courses

- GammaVision Software — 23rd-27th April 2007, Wokingham. 4 day course covering operational aspects of the software, along with associated hardware, with optional extra day for new users covering foundation Gamma technology.
- Alpha Spectrometry — 4th-8th June 2007, NPL, London, covering techniques and methods used in Alpha Spectrometry
- AlphaVision Software — 11th-15th June 2007, Wokingham. One 3-day basic course, followed by a 2-day advanced course. Enrol on either, or a discounted rate is available for enrollment on both courses.

Please contact Clare Payne if you would like to attend or find out more about any of these events.