

Condensed Catalog of Nuclear Products



- Nuclear Research Corporation
- Aptec Instruments Ltd
- EURISYS MESURES (a COGEMA Company)

INTRODUCTION

Nuclear Research Corporation (NRC), is a long established US manufacturer of health physics and radiation monitoring systems with a leading position in the supply of civil and military portable radiation protection instruments. NRC is also a recognized supplier of advanced radiation and area monitoring systems, for nuclear power plants and other nuclear facilities, both in the US and throughout the world. NRC has facilities in Warrington, Pennsylvania and in Dover, New Jersey.

Aptec Instruments Ltd. (Aptec), a Canadian company located in Concord (Toronto), Ontario, is a leading manufacturer of state of the art analytical spectroscopy and health physics related radiation safety monitoring equipment. Aptec manufactures a line of PC based multi-channel analyzers and analytical software and is a major supplier of advanced whole body and other surface contamination monitors for the detection and control of alpha, beta, and gamma radiation.

EURISYS MESURES (EM), a French company with a subsidiary in Germany and a world-wide network of representatives, is a leading manufacturer of nuclear electronics, high purity germanium and silicon detectors, alpha and gamma spectroscopy systems, He3 neutron counters, G-M detectors, alpha/beta counting systems, and electronic dosimeters. EM also services the nuclear industry with a complete range of nuclear systems for waste assay, decommissioning and dismantling, safeguard, and on-line process control for spent-fuel control and characterization.

EM, the nuclear measurement company of the French COGEMA Group, has entered into a definitive agreement to acquire a majority position of the combined operations of NRC and Aptec. It is anticipated that NRC and Aptec will be merged at the closing of the transaction in the summer of 1999 into one operating entity with facilities in Concord (Toronto), Ontario; Warrington, Pennsylvania; and Dover, New Jersey.

Earl Pollock, current President of NRC, will take the position of Advisor to the President and CEO of the new merged entity. He noted that "NRC has had a long history of providing outstanding instrumentation, systems and service to both the military and commercial fields. This new association is an exciting transition for NRC and will stage the company for increased expansion and capabilities in the future."

Christian Petit, Chairman and CEO of EM, will take the position of Chairman of the Board of the new merged entity along with his current duties with EM. He announced that "this acquisition and merger is a unique opportunity for the three companies to form together a strong nuclear instrumentation and systems group. We will be able to offer a wide range of products and services covering all possible nuclear measurement applications, including industrial safety, health physics, environmental measurements, and fundamental research. The newly established group has already increased market share, both in Europe and North America, and is earning a growing market position in the Far East."

Ed Zieba, current President of Aptec, will take the position of President and CEO of the new entity. He further noted that "the merging of Aptec and NRC, together with EM, forms a formidable entity that has all the resources to become a major player in its line of business going into the new millennium. We will be gearing ourselves to expand the business into new market areas so as to satisfy the future needs of the nuclear industry. This will include new levels of nuclear safety equipment and even more sophisticated tools for the coming tasks related to decommissioning and dismantling operations."

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ANALYTICAL INSTRUMENTATION

LOW BACKGROUND COUNTING SYSTEMS

Low background alpha and beta counting systems are mainly used for surveillance, environment and veterinary controls or in vitro counting. The measurement chamber, made of stainless steel, consists of a gas flow proportional counter (except for the IN20 alpha only unit which uses ZnS detectors) and two guard counters for each sample. These guard counters are located respectively over and under the gas flow detectors to efficiently reduce the background. The units are monitored by a PC computer using software for DOS or Windows ensuring setting acquisition and processing sequences, statistical processing, quality assurance and calibration by means of popup menus.

MINI20 Manual Alpha/Beta

The MINI20 is a manual low background α and β counting system. It offers a capacity of up to 8 samples simultaneously. There are one or two measurement chambers, the measurement chamber has a capacity of one 5" sample (130 mm) or one 8" sample (200 mm), one or two 3" samples (80 mm), or one, two, or four 2" sample (55 or 60 mm), or 1.25" (30 mm). Lead shielding of 4" (100 mm) thick is provided. Typical background is 0.04 cpm for α and 0.8 cpm for β in simultaneous α/β mode, efficiency in simultaneous α/β counting is 34% on ^{239}Pu and 42% on $^{90}\text{Sr}+^{90}\text{Y}$, detection limit is 10.5 mBq for alpha and 24 mBq for beta in 1 hour, all based on a 2" (55 mm) diameter sample.



IN20 Manual Alpha/Beta

Similar in performance to the MINI20, the IN20 offers 16 simultaneous counting channels.

ALPHA IN20 Manual Alpha

The ALPHA IN20 is an integrated low background α counting system using ZnS detectors. It offers a capacity from 1 to 8 samples simultaneously. There are one or two measurement chambers, each measurement chamber has a capacity of two 5" samples (130 mm) or four 2" (55 or 60 mm) samples. Typical background is 0.015 cpm, efficiency is 34%, and detection limit is 44 mBq for alpha and 75 mBq for beta in 1 hour, all based on a 2" (55 mm) diameter sample.

PEGASE Automatic Sample Changer

The PEGASE is the automatic sample changer version of the manual- β low background counting systems. It has a capacity of 50 up to 200 samples. The software is similar to the other software packages of the low background counting family and adds total control of the sample changer. The measurement chamber has a capacity of one 5" (130 mm) sample, or one 3" sample (80 mm), or four 2" (55 mm) samples or four 1.25" (30 mm) samples. Lead shielding of 4" (100 mm) thickness is provided, typical background is 0.04 cpm for α and 0.8 cpm for β in simultaneous α/β mode, efficiency in simultaneous α/β counting is 34% on ^{239}Pu and 42% on $^{90}\text{Sr}+^{90}\text{Y}$, detection limit is 44 mBq in 10 minutes, based on a 2" (55 mm) diameter detector.

SPECTROSCOPY

SILICON DETECTORS FOR ALPHA DETECTION

The DECADE ion implanted and passivated silicon detectors and the Si(Li) detectors for charged particles or X-ray are characterized by their rugged and reliable design.

IPA/IPC Series for Charged Particle Spectroscopy



The IPA allows up to 15 MeV α charged particles while the IPC allows up to 30 MeV, protons up to 8 MeV, and β up to 400 keV. Both versions are housed in a stainless steel or aluminum can with rear Microdot connector. The IPA has a thin entrance windows for short distance measurements, the IPC has a thicker and cleanable entrance window.

CAM IPN for HP Applications

The CAM series allows alpha air measurements, ideally suited for health physics applications. The CAM detector is available in 100 to 1700 mm² areas and has an entrance window ruggedized with an aluminum and plastic varnish coating. The front side is resistant to nitric or chlorhydric acids. The housing is stainless steel with rear

microdot or BNC connector (option).

EPK/EPN Series

The EPK and EPN series include a charge sensitive preamplifier. The housing is equipped with a male 9 pin Cannon connector. The EPN series is also provided with a front side resistant to nitric or chlorhydric acids.

NAI(TL) DETECTORS

Integral NaI(Tl) detector assemblies are provided for spectroscopy applications. The NaI(Tl) crystal is directly coupled to the PMT (photomultiplier tube) to give the best possible resolution and has an internal shield to reduce the effects of the earth's field. Standard detectors as well as end-well configurations are available in both 2 x 2 in. and 3 x 3 in. sizes, both PMTs use the industry standard 14 pin Phenolic base.

HPGE DETECTORS - COAXIAL OR PLANAR, N OR P-TYPE

Each detector system consists of a high-purity n or p type germanium detector in either a coaxial (EGC/EGNC, or EGPC) or semi-planar (EGMP/EGM) configuration. All feature an inline cryostat, charge-sensitive preamplifier, liquid nitrogen dewar, and 12 ft. (4m) cable set. The cryostat incorporates an electronics package that includes preamplifier, HV filter, and HV disable circuitry. All these elements are enclosed in a circular shroud that appears as an extension of the detector endcap. This design eliminates obstruction from preamplifier boxes and makes them ideal for applications with Compton suppression, lead, or steel shields.

EGPC - Coaxial P-type Detectors

The P type coaxial detector series include an aluminum end cap with relative efficiencies from 10 to 150% and FWHM ^{60}Co resolutions in the 1.75 to 2.15 keV range. The end cap varies from 2.75" (70 mm) to 4.5" (115 mm) diameter.

EGNC Coaxial N-type Detectors

With relative efficiencies ranging from 10 to 80% (or more) and FWHM resolution from 1.80 to 2.30 keV for ^{60}Co , the EGC and EGNC detectors offer a better resistance to irradiation by neutrons, the possible damages can be repaired a 100 °C annealing process. They present a lower energy detection threshold. The EGNC series has the same specifications as the EGCs but the end cap has a beryllium entrance window for enhanced low energy response.



EGMP/EGM - Semi-planar detectors

The EGMP semi-planar detectors have both high efficiency at medium energies and excellent energy resolution below 100 keV. Due to their relatively thin structure and large area, they offer backgrounds lower than equivalent coaxial detectors. The EGMP detectors are particularly well suited to routine measurements on large area samples such as waste barrel measurements, whole body monitoring, or lung monitoring applications. The EGM semi-planar detectors offer constant efficiency between 10 and 100 keV with a wide range of volumes and shapes. They are ideal for low to middle energy spectroscopy. Active areas range from 500 up to 3800 mm².

Ultra Low Background Detectors

Ultra low background detectors are used for very low activity measurements. The materials composing the cryostat are submitted to a severe selection with respect to the radioactive contamination and are certified in an underground laboratory. A wide choice of these detectors is available. We also offer a complete range of low background lead shields in various geometries, and adapted to the selected detector as well as to the geometry of the sample.

LOW BACKGROUND SHIELDS

Since the purpose of a shield is to minimize the presence of normal background radiation, the analysis of extremely low level radiation samples within the shield cavity can be achieved when paired with the correct detector, electronics, and software. All materials used to manufacture shields have been chosen and tested to minimize the possibility of contributing radioactivity which might affect the results of a sample being analyzed. Virgin lead, soft copper graded interior liner, and low carbon steel casings combine to ensure the utmost in performance. The lids and detector plug are stepped to minimize direct path radiation from external sources.

HPGe/Ge(Li) Shield - Model AG-1116



The AG-1116 4" (100 mm) thick Lead Shield is used with a HPGe or Ge(Li) detector in the detection and assessment of radioisotopes from a wide variety of samples. These may include environmental, radiopharmaceutical and calibration source samples in gaseous, liquid or solid states.

Nal(Tl) Shield - Model AG-410

The AG-410 2" (50 mm) thick Lead Shield is used with a Nal(Tl) detector in the detection and assessment of radioisotopes from a wide variety of samples. It is a superior quality product that is attractive, durable, and compact.

ALPHA SPECTROSCOPY

Alpha Spectroscopy - Module 7184



This alpha spectrometer is used for high resolution measurements and consists of an aluminum vacuum chamber and a complete α spectroscopy electronics package which can be used with a large variety of silicon detectors (DECADE series). Output is direct to a separate MCA. A 14 position sample holder is included, sample diameter can be up as large as 57 mm (2,550 mm²).

Frisch Grid Chamber - Model IN114/614

The Frisch grid chamber for low background measurements is the most sensitive of the alpha spectroscopy systems. It is a compact and robust unit consisting of a grid ionization chamber, a positioning and sample vacuum mechanism, plus built-in data acquisition electronics. The IN614 model has a 6 sample capacity. Both models are fully automated and can be remotely controlled and can be connected directly to a separate MCA. Typical background is < 1 cph, efficiency is 100%, and detection limit is 6.7 mBq in 1 hour.



Software For Alpha Spectroscopy - WinnerAlpha

WinnerAlpha is a comprehensive analysis software allowing the process of spectra obtained from silicon detectors or Frisch grid chambers. It performs tracer and tracerless analysis. The peaks are deconvoluted by modern sophisticated methods. The results of deconvolution can be displayed graphically and printed out.

NIM AND NUCLEONICS

Spectroscopy Amplifier - Model AMP-6300



A research grade #2 A.E.C. NIM shaping amplifier ideally suited to be used with almost any solid state or NaI(Tl) detectors to provide the utmost in flexibility, ease of use, and excellent performance in both low and high count rate applications. It includes many unique features such as "no scope" pole zero and pile up rejector adjustments, built-in NaI(Tl) preamp, a selection of sixty-three time constants with front panel LED display, and differential mode input for high noise environments.

HVPS/LN Monitor - Model AHV-1B

The AHV-1B is a universal dual-range high voltage #1 A.E.C. NIM module that provides high voltage, liquid nitrogen monitor, and preamplifier power connections for HPGe, Ge(Li), NaI(Tl), or Si(Li) detectors. High voltage is continuously adjustable from 0 to 5 kV (or 0 to 2 kV), using a front panel digital locking potentiometer, positive or negative output.

Gated Mixer-Router - Model MR-404

The MR-404 is a gated digital Mixer-Router #2 A.E.C NIM module designed to allow simultaneous acquisition of up to four(4) analog inputs into a SERIES 5000 PC-Based MCA card. As many as four (4) MR-404 modules can be connected in series (cascaded).

PC-Based HVPS - Model AHV-2PC

The AHV-2PC is a PC plug in card that is completely software controlled including high voltage and preamplifier power plus loss of LN protection, ideal for HPGe, Ge(Li), NaI(Tl), or Si(Li) detectors. High voltage is continuously adjustable from 0-5 kV, positive or negative output.

Flat Pack Integrated Spectroscopy Processor - Model FP-6300B

For users who want "NIM level" flexibility and hardwired controls, the FP-6300B Processor provides all necessary "front-end" electronics for a HPGe, IG, Ge(Li), Si(Li), or NaI(Tl) detector. It includes all the features of an AMP-6330 and AHV-1B NIM modules plus a low noise low voltage power supply, all contained in a low profile metal chassis.



NaI(Tl) tube base/HVPS - Model BB-200

The BB-200 Bias Base is a fully software programmable positive high voltage power supply (HVPS) and solid state high voltage divider network with an integrated high count-rate preamplifier that plugs directly onto the photo-multiplier tube (PMT) of a NaI(Tl) detector. The electronics are contained in a standard tubular PMT tube base format and are powered by any +12V DC power source.

LN Monitor with Continuous Reading Level Display - MODEL ALN-185/186

The ALN-185/186 are stand-alone liquid nitrogen monitors that provide not only HPGe detector loss of LN protection, but also an accurate continuous reading digital display showing the amount of LN left in the dewar. The 185 provides monitoring and display, the 186 adds fully automatic control of an LN cryogenic solenoid valve for filling from a storage dewar.

MULTI-CHANNEL ANALYZERS

MCARD for "No-NIM Needed" Spectroscopy - SERIES 5000



The SERIES 5000 family of totally software controlled PC-based plug-in MCA cards is clearly the most advanced ever designed. There are four (4) different models, from the 5002, specifically for NaI(Tl) detectors, up to the top of the line 5016, a true research grade MCA that can easily handle from environmental samples up to ultra-high count-rate n-type Germanium detectors. Simply add the appropriate detector and HVPS for a complete software controlled MCA, without the need for any external NIM units. Each model is optionally

available as ADC and memory only.

Advanced features available (model dependent) include a Gaussian uni-polar shaping spectroscopy amplifier, gated integrator amplifier, additional time constants, automatic BLR and PPR/LTC circuitry, up to 16k ADC gain and memory size, ultra high throughput 800 ns ADC, or full network operation. Intelligent menus allow you to optimize your system completely from software, no external NIM or speciality modules are needed.

Single Slot Scintillation Solution - Model BB-5002

A BB-5002 is a combination of a BB-200 HVPS/PMT base, 5002 MCARD, quick interconnect cable, and PCMCA/Super software. It is all that you need for basic teaching up to research level requirements using any standard 14 pin NaI(Tl) detector. Simply plug the card into your PC, connect one cable, load the software, and start acquiring high quality spectra.

DSP-Based MCA card - DIGIspec

The DIGIspec is a versatile PC plug-in card with high performance on-board DSP (digital signal processing) technology. The card has both ISA and PCI connectors and can be quickly changed to plug into either slot, as appropriate. There are several daughter boards that can be plugged onto the dMCArd to tailor it to your specific needs. Single or multiple input versions are available, up to 8 separate MCAs can be handled on one full length card. Inputs can be from a detector preamplifier, shaping amplifier, or direct to ADC. Amplifier gain, shaping parameters, pulse rejection levels, and ADC conversion gain are all controlled from software.

Field Portable MCA - SAFESpec



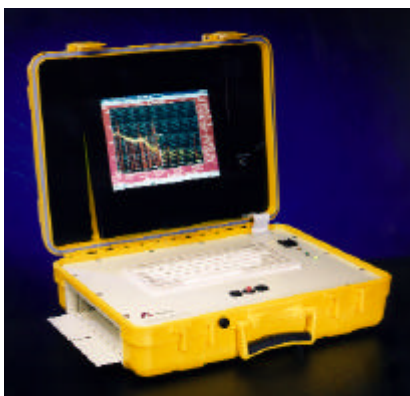
The SAFESpec is a complete gamma spectroscopy system including multichannel analyzer, amplifier, high voltage power supply, and memory with an integral 14 pin scintillation detector tube base. It is suited for remote applications, advanced warning systems, hazardous environments, and nuclear inventory monitoring. It can be provided with a 2" x 2" or 3" x 3" NaI (TI), or a BGO detector.

Portable Gamma MCA - VOIAGER

The VOIAGER is a portable MCA designed specifically for HPGe detectors. It includes a 0-4.5 kV HVPS, amplifier, 8k ADC, and spectral memory. A high speed serial interface can be interfaced directly to a notebook or desktop PC for control and remote readout and display. Electronics to add a wireless modem transfer and GPS based location data can be installed to enhance the in-field operation.



Integrated Portable MCA - ODYSSEY 2000



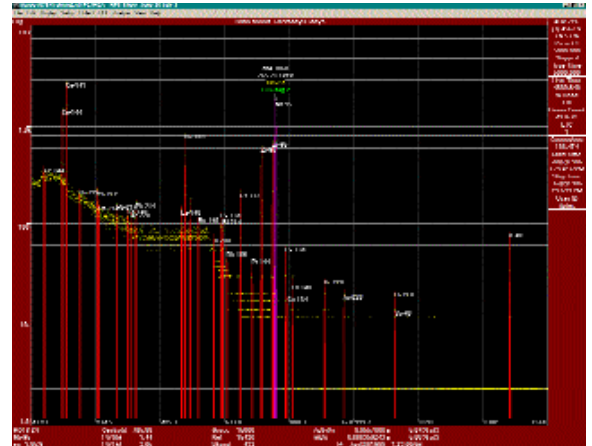
ODYSSEY 2000 is a modular, self-contained, PC-based MCA designed for simultaneous in-field acquisition, analysis, and spectral storage. All detector types from NaI(Tl) up to high resolution Ge or Si detectors are supported. The entire MCA, computer (TFT LCD display panel, P70 level 133 MHz CPU, keyboard, pointing device, floppy and hard disk drive), plus UPS, AC-DC converter, and battery is integrated into a ruggedized molded ABS plastic briefcase weighing in at less than 23 pounds, no external notebook PC is required. It is powered from +12 V DC, internal re-chargeable battery, or from external 115/230 Volt 50/60 Hz AC source. The ODYSSEY is the natural choice for applications that need full in-field laboratory grade acquisition and analysis. A "power user" upgrade to an Intel 233 MHz CPU, 64 Mbytes RAM, 6 Gbyte hard drive, and USB output is optionally available.

Desktop USB-based MCAs- EAGLE Series

The EAGLE is a powerful remote controlled MCA that provides an integrated “plug ‘n play” solution to your needs for high performance operation using the USB (universal serial bus) interface from a notebook or desktop PC as a controller and without the need for ISA or PCI slots. It includes high voltage and low voltage preamplifier power, “front end” nucleonics, pulse height analysis (PHA), high speed multi-channel scaling (MCS), and SURVEY (acquire - clear - restart) modes of acquisition. There are four different models: a basic 2k NaI(Tl), 8k NaI(Tl)/HPGe, 4k ultra-high throughput, or a 16k model for environmental up to ultra high count rate n-type HPGe applications. If you are an existing AHV and 5000 Series MCA user, the chassis only version will allow you to move up to USB operation at a reasonable cost.

Basic Software - PCMCA/Super

All MCA cards include setup, acquisition, stabilizer, display, analysis, and I/O software plus peak identification and semi-quantitative results. The software provided is clearly the most extensive available and the easiest to operate by even the most inexperienced user. All MCAs have a consistent user software interface so that users can easily mix any combination of MCAs and options in the same system without any changes to the software. The software is totally compatible with your existing MICROSOFT WINDOWS 95/98 or NT platform. Software is updated free for the first year from the factory or directly from our web site by means of no-charge “patch” files.



HEALTH PHYSICS

PORTABLES

RADIAGEM Personal Radiameter



This new generation portable unit measures the ambient β - γ equivalent dose rate $H^*(10)$ as well as the dose itself. Three models of different sensitivities are available: the RADIAGEM-1 unit (1 μ Sv/h to 3 Sv/h), RADIAGEM-2 unit (0.1 μ Sv/h to 100 mSv/h), and the RADIAGEM-3 unit (0.01 μ Sv/h to 999 mSv/h). It features an easy to read graphic and digital displays, plus audible and visual alarms. Ergonomically designed, it is robust, with a light-tight and easy to decontaminate case. External probes are available for remote measurements, dose rates up to 1000 Sv/h (with STHF probe) and beta surface contamination (with SB29 probe).

SYRENA Portable Detection Beacon for Gamma Sources

The portable and stand alone SYRENA is an extremely easy-to use device providing high sensitivity detection and localization of radioactive materials and gamma-ray sources in luggage, vehicles, on-board packages, or simply as a portable area monitor. It uses a large plastic scintillator yielding impressive sensitivity (5 kBq ^{60}Co at 50 cm in 10 s or 70 kBq ^{241}Am at 50 cm in 10 s) with built-in audible and visual alarms.



Advanced Automatic Ratemeter Monitor - omniTrak



The omniTrak is a reliable accurate survey instrument for sealed proportional, flow proportional, or Geiger-Mueller detectors. It uses a large easy-to-read LCD display providing simultaneous real time bargraph and digital readouts which enhances interpretation of both background and contamination levels. A WINDOWS application is provided to download or upload setup parameters making it easy to maintain several units in the same facility.

ADM-300 Series Portable

The ADM-300 series Portable Survey Instrument is a multifunctional, multi-probe, wide-range (10 μ R/h-10,000 R/h) survey instrument that operates using a patented detection technique called "Time-to-Count" that prevents saturation, fold-over, and dead time problems. The basic model uses two GM detectors with linear response across the entire range and can measure contamination levels up to 4 Bq/cm². The ADM-300 series has been "standardized" on by the U.S. D.O.E., the U.S. Air Force, the Royal Navy, and Canada's DND. Thoroughly tested and ruggedized, this unit also serves as the "engine" for the wireless and GPS-based instrumentation systems.

Emergency Response Kit - ERK-100

This radiac kit contains an ADM-300 and several probes that combine to cover gamma radiation and contamination levels up to 10,000 R/h with integrated levels to 1000 R and beta rates to 5 R/h. The U.S. Air Force and Air National Guard use this kit for emergency response and training purposes.



Portable Area Monitors - ADM-606M



With flexibility in mind, these nine-decade multi-purpose, portable area monitors are both a rate and dose meter in one. These units are capable of measuring wide ranges of intensity from background levels of 1 μ R/h-10,000 R/h and are both technically flexible and aesthetically appealing.

"Smart" Probes and Detectors for the ADM-300 or ADM-600 Series

There are currently over 23 different "smart" detectors available that work with Model ADM-300 and 600 Series Survey Meters and ratemeters. They include G-M, NaI Scintillation, CaF₂ Scintillation, Gas Proportional, Ion Chamber, Beta Scintillation, Gamma Scintillation, X-ray, Alpha, Alpha/Beta, Pancake, Micro R, Underwater, and Sealed Gas Proportional detectors.

Telescoping Survey Meter - ADM-300X

With infrared technology, the ADM-300X is a "wireless" telescoping radiation survey meter that is wide-ranging yet ruggedized for HP field use. It measures gamma radiation levels to 10,000 R/h and beta radiation levels up to 5 R/h. Both 10-ft. and 14-ft. lengths are available.

Portable Neutron Monitors

Several types of portable neutron monitors are available. The stand-alone neutron unit Model NP-2 "SNOOPY" is a BF₃ proportional counter that can have four linear ranges 0-2,000 mrem/h. Insensitive to up to a 500 R/h gamma field, it is tissue equivalent from thermal (0.025 eV) to fast (15 MeV) neutrons. Coupled with a digital interface is Model NG-2 auto-ranging neutron/gamma detector with a range of 10 µR/h-10,000 R/h gamma and 10 µRem to 10 Rem/h for neutrons. Both units have outputs for both a scaler and headphones. In addition, there is also a "smart" neutron detector (BF₃) which interfaces with portable survey instrument Model ADM-300. This unit covers a range of 0-20 rem/h with true rem/h measurement capability, independent of neutron energies, in the range of 0.025 eV to 15 MeV. Also available for greater sensitivity is a He-3 (Helium) based neutron detector.

SYREN Radiological Monitoring For Access Control

The SYREN monitors are equipped with large dimension plastic scintillators allowing a very sensitive detection of various radioactive materials and gamma ray sources, even when mixed within a vehicle. Sensitivities of 4 kBq ⁶⁰Co, 11 kBq ¹³⁷Cs, or 40 kBq ²⁴¹Am (all at 1 m of air in 1 s) are obtained.

Peripherals including proximity detectors, lights, barriers, alarms, printer, etc. allow for customized systems dedicated to vehicle and pedestrian access control such as boundaries, nuclear plant, exits, waste disposal entrances, etc.



Electronic Personal Dosimeter - DOSICARD

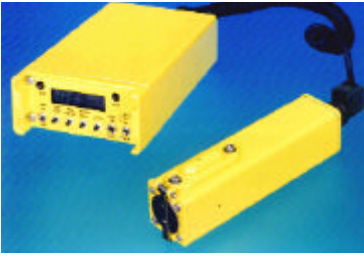


The DOSICARD badge dosimeter comes in a compact credit card format. Only three keys are needed to select its operating mode and to display the values of current dose and dose rate on a LCD screen as well as the integrated doses per day/month/quarter/year/5 years. The EEPROM non volatile memory of the dosimeter stores the detailed history of the daily doses, times when alarm levels have been exceeded as well as a complete identification of the badge wearer. A badge reader providing bidirectional infrared links allows, using the DOSEMANAGER software for Windows (via a PC), to transfer data into a local database.

DOSICARD Dose Manager System

The DOSICARD electronic personal dosimeter allows the setting up the high performance dosimetry systems. It offers computerized data collection, recording or real time management of the operational, individual and collective dosimetry data. It is particularly well adapted to facilities of (say) 10-20 people. All parameters and dosimetry data are stored into a database integrated in the software. The DoseNetwork system, more sophisticated, allows the management of the staff present in controlled areas. The entrance/exit badge readers are linked via Ethernet to a central computer managing the database and the history of events.

Survey Meter - Model CDV-718



The CDV-718 survey meter measures radiation/contamination levels (0.01 mR/h to 999 R/h gamma, and 0.01 mR/h to 5 R/h beta, and contamination levels to 999,000 cps, $\mu\text{Ci}/\text{m}^2$, dpm/100cm²) with alpha, beta-gamma, pancake, X-ray, and micro-R probes. Systems can be measured in Sv/h and cGy/h units and alarms can be set over the entire range of dose rates and contamination levels.

GPS-Based Radiation Training Systems

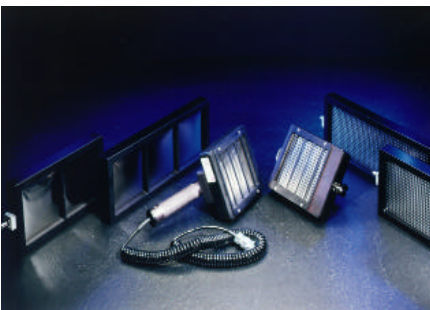
Radiation monitoring personnel can now be trained to measure radiation and contamination levels using the instruments that they use in their normal monitoring operations without receiving any radiation exposure. The user's organization decides on what the radiation pattern will be in the test area (based on the incident being simulated), programs the data onto a data input card based on the physical location of the desired levels, as determinable from GPS readings. The instrument used for the monitoring has its detector changed so that the pattern on the data card is put into the instrument's software. When the GPS detector (in the instrument pouch) receives location information it uses the radiation values from the data card to "drive" the instruments readings. It is therefore possible to have training with very high-simulated radiation levels and to make decisions based on these levels. While the system is initially engineered for radiation incidents, it can be used for training in other life threatening situations such as chemical and biological agents.

Geiger-Mueller (G-M) Detectors

G-M detectors currently offered include the most cost-effective pancake, Thin End Window, Thin Wall (Beta-Gamma), Gamma sensitive and Miniature Gamma sensitive available today. G-M detectors are sold with a two (2) year warranty and a 5% recycling credit for returned pancake and End Window detectors and offer the lowest prices and highest quality. Shipments are typically made within 24 hours.



Large Area Sealed or Flow Proportional detectors



The "heart" of many of the HP surface contamination products are the SP, PC, or FP Series proportional detectors. These detectors are sensitive beta and gamma detectors (plus alpha for the flow versions) and are ideally suited for area monitoring, low level counting, and survey applications. They exhibit excellent high count rate capability. They can be successfully used in hand and foot, laundry and floor monitors, and in "hot gamma particle" detection modules as they can operate in elevated background fields (up to 10 mR/h ⁶⁰Co gamma) without saturating or swamping. The SP and PC series flat large active area sealed proportional detectors have excellent beta detection efficiency because of their strong thin titanium windows and P-10 type proportional fill gas,

without the need for gas bottles and regulators. Sealed Xenon gas versions are also available yielding the best possible efficiency for medical isotopes such as ¹²⁵I.

CONTAMINATION MONITORS

Whole Body Surface Contamination

A complete line of sensitive PC-based whole body monitors to meet the complete needs of the nuclear industry are offered. They have been designed to provide fast sensitive release monitoring with minimum maintenance costs for the lifetime of the unit. Modern appearance and reliable operation guarantee employee acceptance and confidence. The results are improved health physics programs, better tracking of contamination and faster, more thorough, personnel throughput at boundary points. Models are available using sealed or flow proportional detectors with P-10 gas or Xenon (sealed only) to cover alpha, beta, or gamma contamination.



PC Based Hand, Cuff, and Foot Monitor



The C7/PC, C7/PCXe, or ALPHA-7 are unique and highly sensitive PC based Hand, Cuff and Foot Monitor with outstanding performance and extremely low maintenance costs. The C7/PC owes its excellent beta and gamma-ray sensitivity to ultra-thin titanium window large area sealed proportional detectors. These detectors exhibit long life, high beta efficiency, and do not require any external gas. The C7/PCXe uses similar detectors but with Xe gas for the ultimate low energy x-ray response, ideal for ^{125}I detection. The ALPHA-7 uses high efficiency flow proportional detectors with dual counting electronics for independent alpha plus beta response.

Portal Monitors - Models PME-600/PMF-600

Portable portal monitors (Model PME-600) and fixed portal monitoring systems (Model PMF-600) which meet FEMA requirements allow fast over-all monitoring in sturdy, stand-alone systems that have user-friendly setup and calibration. Using gain-stabilized scintillation detectors, the units produce reliable sensitivity with energy response from 60 keV to 3 MeV gamma. Background monitoring is continuous and all detectors are summed allowing an integral count to be obtained.



Floor Monitors - FM-300 Series



The FM Series of Floor Monitors are sensitive, yet rugged units designed to quickly and efficiently screen large areas such as floors, walkways, roof-tops, parking lots, or any large flat area for radioactive contamination. The rugged chassis design is suitable for both indoor and outdoor use. Complete with the most up-to-date omniTrak Advanced Alarming Ratemeter and the highly sensitive PC-252B sealed proportional detectors the unit has over 500 cm² of coverage. It is ready to use with the flick of a switch, there are no gas bottles to connect, no detectors to purge, and no setup time prior to use.

NUCLEAR PHYSICS

Special germanium detectors have been developed to meet an increasing demand for compact assemblies of various crystals. They cover a wide range of applications: large physics experiments, industrial systems and equipment for space science.

“Clover Detectors”

The famous "Clover" detectors have been initially developed by EURISYS MESURES for the EUROGAM collaboration program. It consists of N-type coaxial germanium detectors, compactly packaged in a single cryostat. In that way, an excellent global photoelectric efficiency is obtained in "add-back" mode. These detectors are also good polarimeters.

Encapsulated Detectors

Developed and patented within the EUROBALL collaboration program, EURISYS MESURES' unique encapsulation technique is designed for compact assemblies, arrays of detectors or flexible ruggedized systems. Each detector is sealed under high vacuum in a streamlined capsule. The distance and the quantity of material between crystals are minimized. Detectors can be exchanged or rearranged by the user without difficulty.



Segmented Coaxial Detectors

A germanium crystal segmentation either longitudinal or transversal, is the best compromise between efficiency, resolution and localization. Segmentation offers maximum efficiency (no dead zone between two consecutive segments and limited cross-talk). A wide range of applications are covered such as polarimetry, Doppler correction, localization of gamma sources, or gamma and X-ray tracking.

Helium 3 Detectors



The ^3He EURISYS MESURES DEXTRAY detectors are the most sensitive neutron detectors on the market. They are used for measurements in which neutron flux is relatively low:

- ° neutron scattering (material structure studies)
- ° fissile material control (non proliferation)
- ° alpha and beta emitters (nuclear waste measurements)
- ° moisture measurements (oil drilling)
- ° health physics measurements

There are three standard diameters, 1.0 - 2.5 and 5 cm. Active lengths are from 1 cm to 1 m, ^3He pressure up to 20 bars. Specific dimensions and filling on request. The DEXTRAY ^3He detectors with a rectangular section are patented and currently used for neutron scattering experiments (time-of-flight measurements).

RADIATION MONITORING SYSTEMS

A full line of RMS solutions including liquid, gaseous, area, criticality, tritium, and wireless monitoring technologies are available. Using modular, open-frame skid design and interchangeable PC boards between local and remote units, life cycle cost considerations are "built-in" providing cost-effectiveness not found elsewhere.

Area monitoring systems are available, from a basic single channel portable unit to a space-saving rack-mounted, 16 bit multiplex with 9 detector inputs and multiple outputs.

Liquid and gaseous monitoring systems are available in fixed skids with on-line, off-line, or In-line monitoring within process and effluent streams associated with light and heavy water nuclear reactors (PWR/BWR/CANDU).



Area Radiation Monitoring Systems (ARMS)



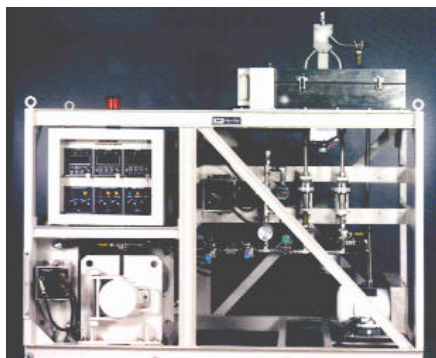
Wide-range (10 μ R/h-10,000 R/h) area monitors using patented "Time-To-Count" detection techniques provide reliable, cost-effective capability and are offered for both fixed or portable applications and can include up to three different detector inputs simultaneously. The remote digital ratemeter series communicates using a serial communication data highway providing highly reliable data transmission over a small, economical 2 twisted pair communications cable. For further cost-effectiveness, there are Control Room "rackmount" ratemeters and localized remote ratemeters that have the same internal PC boards. This makes it much more cost-effective in terms of maintenance, repair, and training.

Wireless Radiation Monitoring Systems (WRMS)

Using the latest in RF communications, our Wireless Radiation Monitoring System (WRMS) provide endless flexibility in fixed, mobile, outage support, and/or hot lab applications. Various configurations are available including battery backed detectors that transmit data back to the ratemeter or a stand-alone battery backed system that sends data to a centralized computer system. Either way, various detector combinations are possible and afford wide-range monitoring capability for changing environments.



Continuous Airborne Monitoring Systems (CAMS)

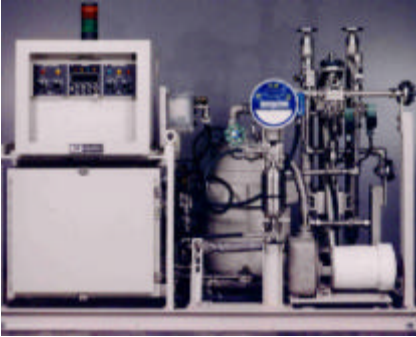


More than 50 models of continuous air monitoring systems to collect, detect, and measure the radioactivity of isotopes that are suspended in closed air streams or open work areas are available. They range from simple in-line stack single channel particulate monitors up to three channels of safety-related particulate, iodine, and noble gas and/or tritium detection. Also available are main steam line monitors (^{16}N), post-accident systems, and configurations such as specially designed shrouded probes or isokinetic nozzles. Modular components combine with unique detector configurations (such as gain-stabilization for scintillation detectors that allow long life and extended calibration cycles).

Hydrogen & Oxygen Analyzer - Model MHO-200

The MHO-200 is an accurate, reliable analysis of oxygen and hydrogen in off gas streams using state-of-the-art, skid-mounted sensors. Within a self-contained module, the system is fully tested for static and functional parameters and is seismically qualified per Reg. Guide 1.97. Providing easy calibration and verification, the monitoring system uses moisture-tolerant sensors for long-term reliability and to minimize downtime and exposure.

Liquid Effluent Monitoring Systems (LEMS)



On-line, Off-line, or In-line liquid monitoring systems are available to monitor liquids within process pipe lines or effluent releases associated with all types of nuclear reactors. The designs utilize various detectors and are comprised of samplers, preamps, ratemeters, check source assemblies, and multichannel analyzers, having either normal or accident range monitoring capability. Applications include such areas as component cooling water, liquid radwaste stream, steam generator blowdown, etc.

Criticality Alarm Systems (CAS)

Both gamma and neutron-based integrated criticality monitoring systems use gain stabilized scintillation detectors in rack-mountable NIM bin or field-mountable NEMA enclosures with redundant two out of three (2/3) logic providing audible and visual alarms.

Tritium Alarm Monitors (TAM)

The tritium alarm monitors offer wide range (up to eight decades) gamma compensated flow through ion chambers using high sensitivity vibrating reed or solid state electrometers that provide state-of-the-art digital control and display.



Portable Air Monitors (PAM)



Airborne radioactive particles are measured using scintillation detectors in a fixed geometry for repeatable measurements. Having a Remote Sensing Unit (RSU), and a Display and Control Unit (DCU), it can have various detectors as part of its sensing system. A vacuum pumping system is used for air transport and output pulses from the detector are amplified and analyzed by a spectrometer.

Boundary Monitoring Systems (BMS)

Site-specific perimeter/boundary monitoring systems consist of fixed and mobile high sensitivity area detectors, various air monitoring systems, and weather detection instruments. Radiation levels and/or other detectable data can be sent over hardwired or wireless methods using RF radio modem, telephone modem and/or GPS-based systems.

ENVIRONMENTAL MONITORING SYSTEMS

A full line of systems for "special" environmental monitoring needs such as emergency response, medical use, waste facilities, and general perimeter monitoring applications is available.

Global Area Radiation Dispersion System (GARDS) - GPS Emergency Response

"GARDS" provides a wide-range detection and real-time radiological mapping of surveyed data using the latest techniques in RMS and GPS technology in a portable, light-weight unit. By scanning in geographical maps of the area(s) being monitored and using Global Positioning System (GPS), the GARDS software allows you to visually see - in real-time - the radiation levels, the longitude and latitude of the monitor, and the speed of the detectors movement, updated every 2 seconds.



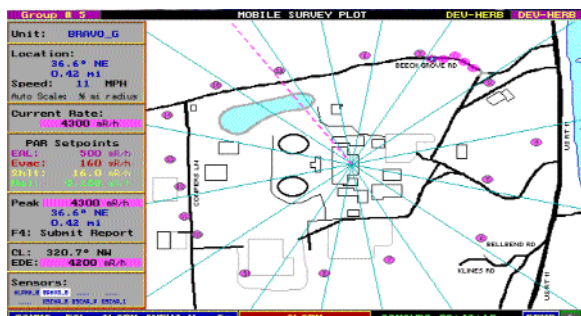
Mobile Vehicle-based Emergency Radiation monitoring System (MOVERS)



The mobile Vehicle-based Emergency Radiation monitoring System (MOVERS) provides global positioning and real-time radiation maps of area and airborne activity, using wireless transmission of monitored data to a centralized data acquisition base station. With ALARA and high performance-to-cost ratio in mind, it offers state-of-the-art technology in both radiological detection and communications.

Radiological Assessment, Display, and Control Software System (RADACS)

Real-time data acquisition and control is a necessity in dealing with radiological data and is provided by Radiological Assessment Display And Control System (RADACS). This interactive multichannel software is



designed to provide real-time data reporting control through a flexible display and graphical user interface. Data is collected, analyzed, displayed and recorded in real time while posting alarms for the operator. RADACS allows various functions to be performed such as: diagnostics, alarm settings, historical trending, and control of pumps and remote samples.



MILITARY DEVICES

Dosimeter/Doserate Meter - Model AN/UDR-13

This unit provides data on gamma and neutron radiation exposure and radiation levels received by personnel. Alarms can be set across the entire dose and dose rate range (i.e., 10 μ Gy/h - 999 cGy/h and 10 μ Gy to 999 cGy). A pin diode is used to detect neutrons and a PMOS-FET is used for prompt gammas with a G-M detector for residual gammas. A built-in test program assures that the data is always of the highest quality and an optical communication port adds computer-controlled calibration and networking. Very portable, yet rugged, it is also available with mR/h or Sv/h readouts.



Low Range Radiac - Model IN/PDR-27

This is a low range beta gamma analog radiac with dual G-M detectors that have a gamma range of 0.5 mR/h to 500 mR/h and a beta range up to 5 mR/h.

Multi-function Radiac Set - Model AN/PDR-77

This radiac set measures radiation levels using alpha, beta-gamma, pancake, X-ray, and/or micro R probes. It measures gamma radiation levels from 0.01 mR/h to 999 R/h and beta levels from 0.01 mR/h to 5 R/h. It also measures contamination levels to 999,000 cps, $\mu\text{Ci}/\text{m}^3$, dpm/100 cm^2 are measured. Systems are available in cGy/h and mR/h and alarms can be set over the entire range of dose rates and contamination levels.

Tritium Monitoring Unit - Model AN/PDR-73

The tritium monitoring system is used for measuring airborne tritium levels as low as $1 \mu\text{Ci}/\text{m}^3$ to 10,000 μm^3 (gaseous) and $1 \mu\text{Ci}/\text{L}$ to 1000 $\mu\text{Ci}/\text{L}$ (liquid). The system uses a vibrating reed electrometer with solid state circuitry for reliable measurements. It has a dual ion chamber for high sensitivity and gamma compensation. An audible alarm with user-adjustable set points and a recorder/external alarm output is available.

Radiac Set Model AN/VDR-2

This radiac set measures radiation rates and integrated radiation levels with its beta-gamma probe. Gamma levels from 0.01 $\mu\text{Gy}/\text{h}$ to 100 Gy/h and beta levels from 0.01 $\mu\text{Gy}/\text{h}$ to 5 cGy/h are measurable. Accumulated gamma dose levels from 0.01 μGy to 9.99 Gy are measurable. Alarms are settable for dose, dose rate, and contamination levels. Instruments are also available with readouts in mSv/h or mR/h.



Ion Chamber Survey Meter - Model IM-231/PD

This wide-range analog ion chamber survey meter provides detection over four linear ranges of 0-5, 50, 500, and 5,000 mR/h and detects alpha (above 4 MeV), beta (above 100 keV), and gamma/X-rays (6 keV to 3 MeV). The energy response for gamma is $\pm 20\%$ from 40 keV to 1.5 MeV and the linearity is $\pm 5\%$.

Dosimetry System - Model AN/PDR-75

The dosimetry system includes the DT-236 Personnel Dosimeter (wristwatch style) and the CP-696 dosimeter reader. It can measure neutron and gamma absorbed doses over the dynamic range of 1 to 1000 cGy. The dosimeter contains a pin diode for detecting/measuring neutron exposures and a phosphate glass for gamma detection/measurement.

Survey Meter - Model IM-249/PD

This analog radiation monitor detects X-Ray, gamma, beta, and alpha radiation and contamination levels. It has external G-M and Scintillation probes available, recorder output and a speaker allow continuous dose rate indication.

"SNOOPY" Neutron survey meter - Model AN/PDR-70

This neutron radiac is based on the well-known "SNOOPY" neutron survey meter and follows the ICRP response curve much better than other neutron monitors. It covers four linear ranges from 0 to 2,000 mrem/h, is gamma insensitive to 500 R/h, and is tissue equivalent from thermal (0.025 eV) to fast (15 MeV) neutrons. There are outputs for both a scaler and headphones.

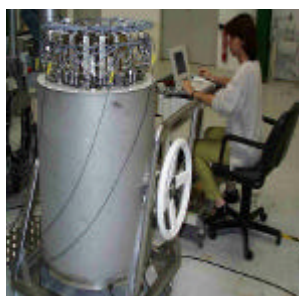
DECONTAMINATION AND DECOMMISSIONING

Cartogram Portable Real Time Gamma-Ray Imaging

Cartogram is an industrial gamma camera of very original design. It is used for a reliable and easy localization of radioactive sources. It allows superimposition of the gamma digital image on the digital video image of the observed site in real time. The gamma image is represented in false color and the video image in grey levels. Both images follow identical optic paths, thus avoiding any parallax error. The companion computer controls data acquisition, analysis and cartography which can be used directly on-site.



COMPASS Passive Neutron Safeguard System



Medium and high masses of Plutonium are measured for inspection by the COMPASS neutron safeguard system. The high efficiency cell (28%) enables coincidence and multiplicities analysis for accurate mass determination.

Acquisition of the ^3He counter signals is performed by ACH NP97 fast preamplifiers while analysis is processed by Winner Neutron software. Predeclared mass, isotopic composition and measurement results can be compared by Winner Neutron processing with delivery of a complete report file.

COMPAC Active Neutron Safeguard System

The COMPAC system is dedicated to the inspection of sample canisters or fuel rods. It uses the interrogation of fissile material by 2 Americium Lithium α, n sources, and performs its analysis by separation of the α, n neutrons from the "reals" neutrons emitted by ^{235}U interrogated in an high efficiency cell. Three sizes modular measuring room allows thermal Fast 1 and Fast 2 interrogation mode combined with neutron coincidence analysis.

SYMEG Gamma Drum Scanner

Designed to measure and sort out nuclear waste conditioned in standard 118 or 220 litre drums, the SYMEG family is equipped with one, two, or three HPGe detectors. Fast scanning is performed with three detectors, while drum lift is required with one detector unit. Using a large variety of basic and dedicated software, beta or gamma emitters as ^{137}Cs or ^{60}Co and alpha emitters as U and Pu can be assessed for final declaration.

SYMEN Passive Neutron Drum Assay System

This system enables the determination of fissile material which is contained in standard 30 or 55 gallon waste drums. Using large efficiency cell using ^3He counters, the SYMENE family combines low detection limits and wide measurement range of Pu mass. Coupled to the AMN10 neutron coincidence histogram card and with Winner Neutron software, the SYMENE system adds the capability to store raw data, coincidence and multiplicities processing, Pu-Cm ratio test and spatial distribution of the fissile material. With the addition of integrated interrogation ^{252}Cf source, SYMENE is able to determine the neutron matrix signature and performs matrix effect correction, improving the final accuracy.



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