

ORTEC[®]

AMETEK



DAVIDE SACCHI

ORTEC Overview

ORTEC®

ORTEC was founded in 1960 by researchers from Oak Ridge National Labs to commercialize charged particle detectors

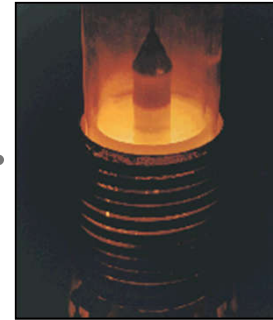
- **Headquarters:** Oak Ridge, TN with global sales and service offices
- **Employees:** 300+ worldwide
- **Core focus:** Ionizing radiation detection, identification and analysis instruments and systems
- **Ownership:** AMETEK, Inc., a leading global manufacturer of electronic instruments and electromechanical devices with 2015 sales of \$4.0 billion



ORTEC Core Competencies



- **High Purity Germanium Crystal Mfg.**
 - Purest industrial substance in the world
 - $\sim 1 \times 10^{10}$ atoms/cc of impurity or better (out of about 1.2×10^{23} atoms/cc total)
- **Cryocooling Technologies**
 - Vertically intergraded design and manufacturing of Stirling coolers
- **Specialized Electronics**
 - Highly specialized for nuclear, corrosion and materials analysis
- **Analysis Software**
 - Comprehensive offerings for integrated hardware control, data analysis and visual display
- **Integrated System Applications**
 - Focused expertise to assess and configure or customize targeted solutions to meet your needs

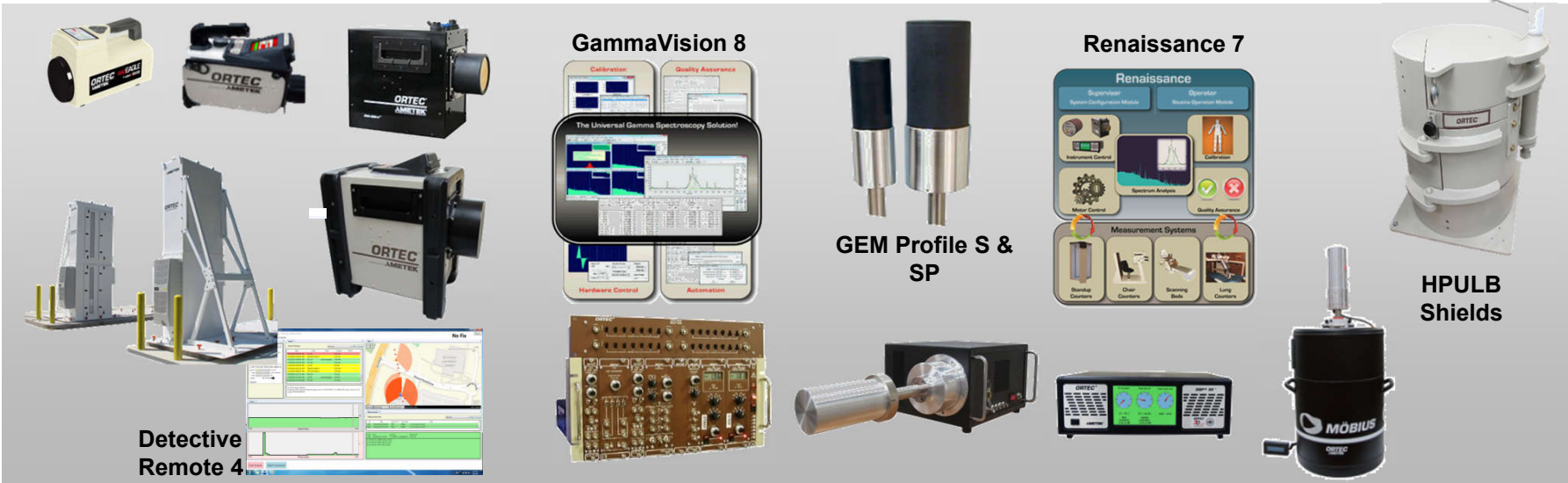


ORTEC Served Markets



Nuclear Security & Safeguards

Radiochemistry, Health Physics, Nuclear Power, Research and Education



- Scintillation based detection and ID
- Enhanced mobile search software

- Integrated gamma spec. software
- High resolution, wide energy HPGe

- Advanced whole body cntg. software
- Ultra-low background lead shielding

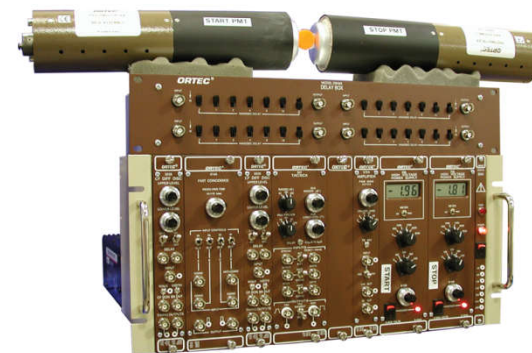


Key Technology: HPGe Detector LN2 and Electromechanical Cooling Systems



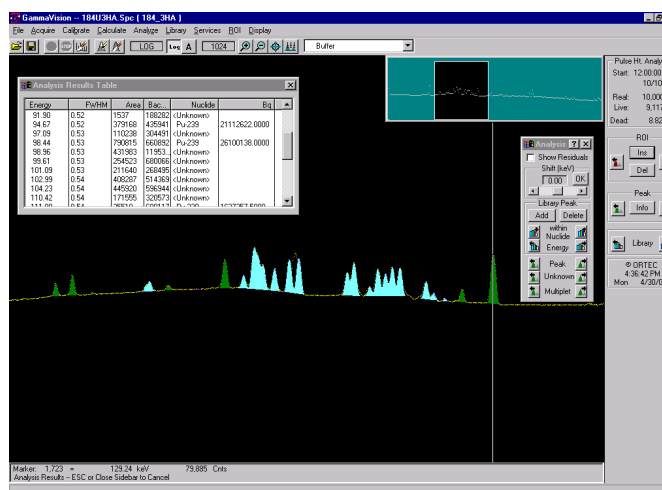
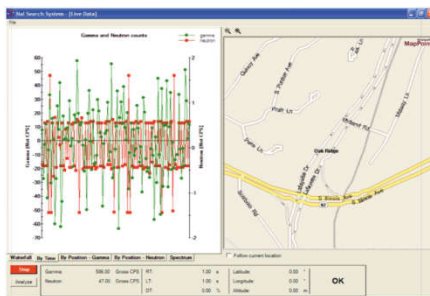
Key Technology: Electronic Products

Signal processing electronics
for radiation detector
systems and fast timing
systems



Key Technology: Software

High degree of collaboration with national laboratories for state of the art analysis methods.



ID Mode

Elapsed Time: 24 sec
Battery Avail: 113 min

Neutron Count Rate = 0 cps

Dose Rate = 0.67 uSv/h

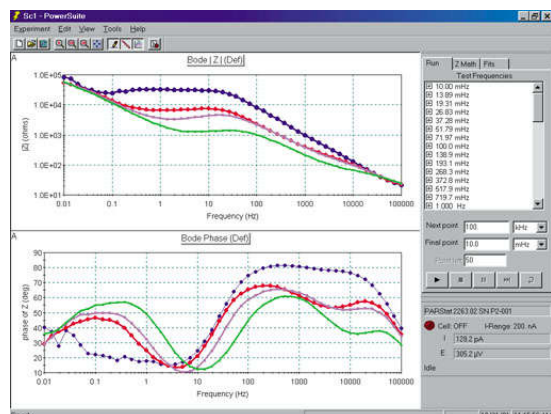
Found Industrial(1)
Suspect NORM(1)
Found Nuclear Uranium

Intense Restart Search

Save Pause Back

ORTEC Analysis Software for :

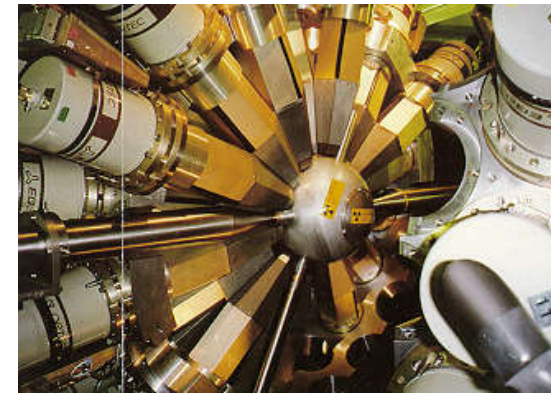
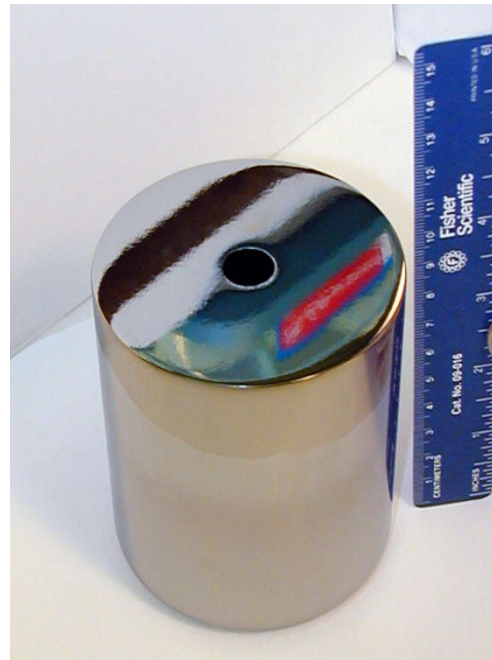
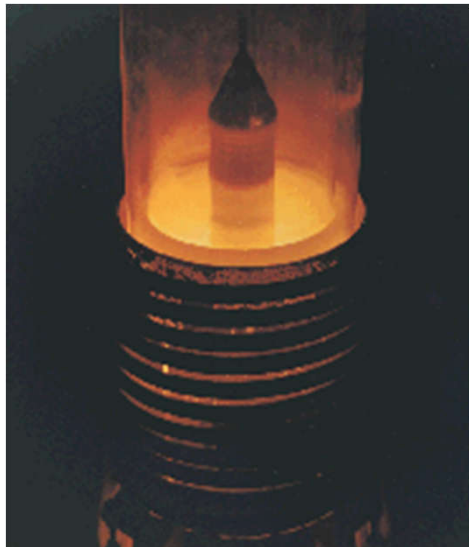
- Gamma Spectroscopy
- Alpha Spectroscopy
- Waste Assay
- Safeguards
- Whole Body Counting
- Homeland Security



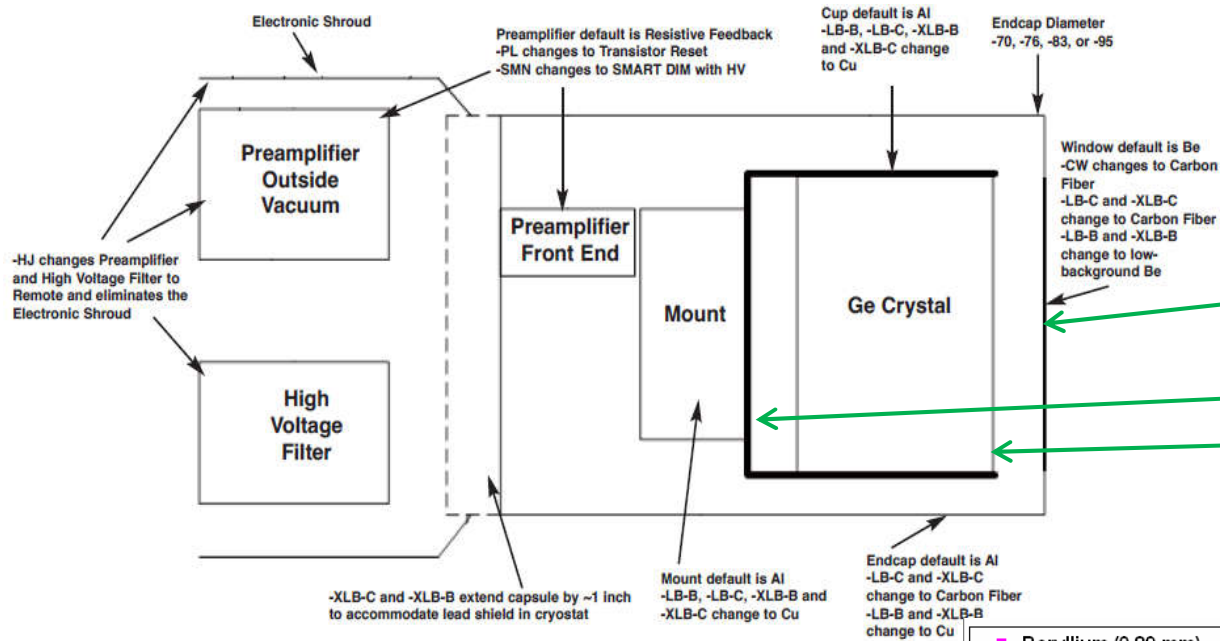
Key Technology: HPGe Crystals for Detectors

ORTEC is a world leader in nuclear instrumentation, including both growing HPGe crystals and fabricating detectors.

ORTEC has significant experience in large scale production of HPGe detectors for a variety of projects.

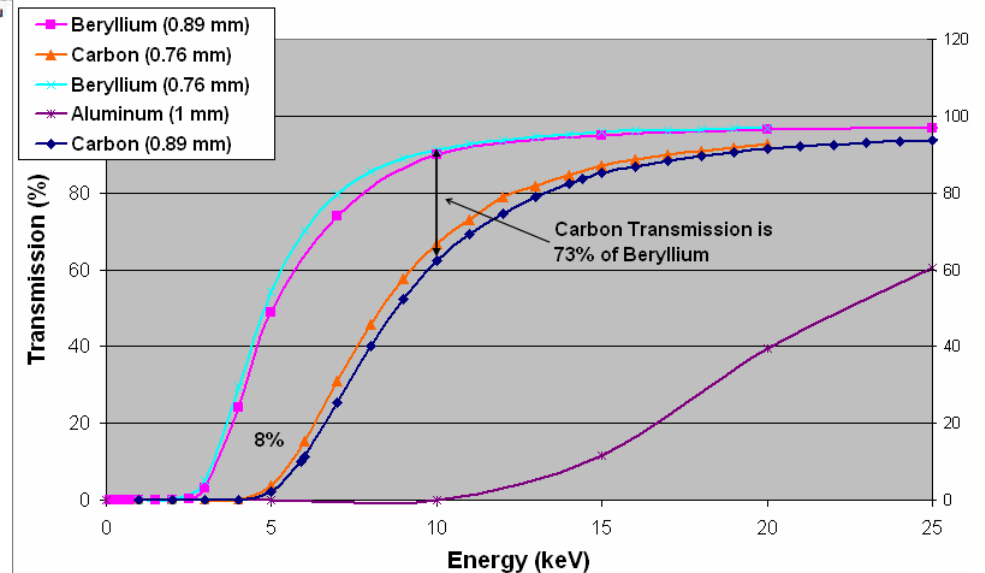


Detector Efficiency



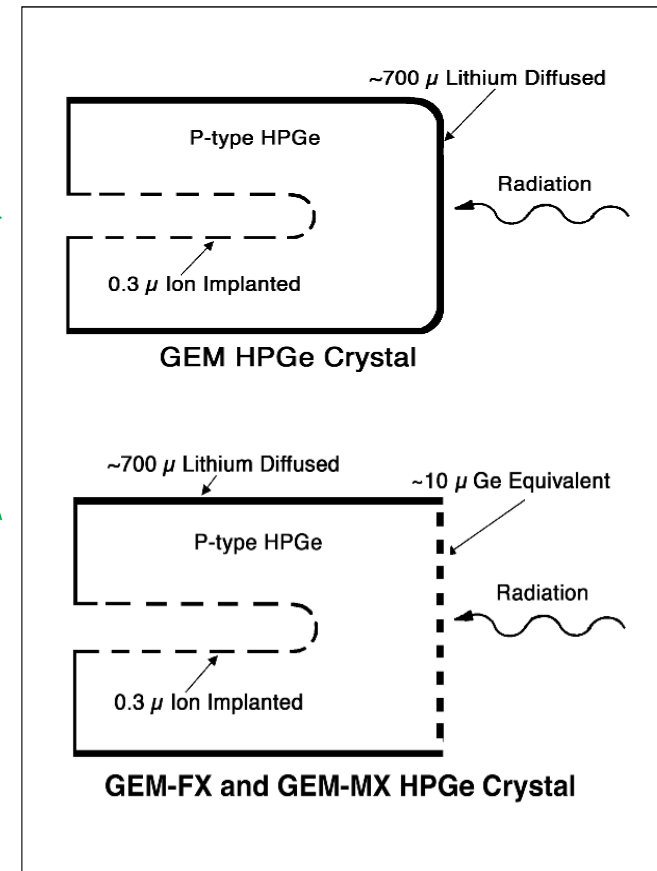
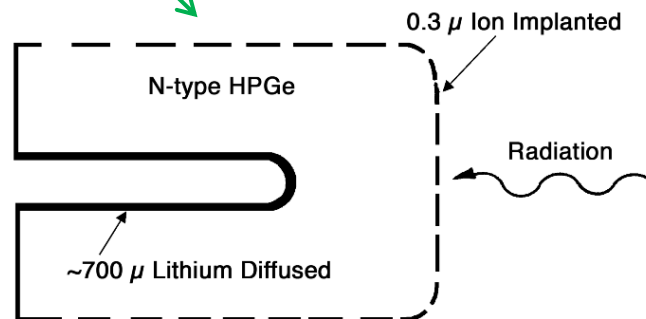
Components affecting efficiency:

- Front and sides of the endcap
- Crystal holder
- Crystal contact



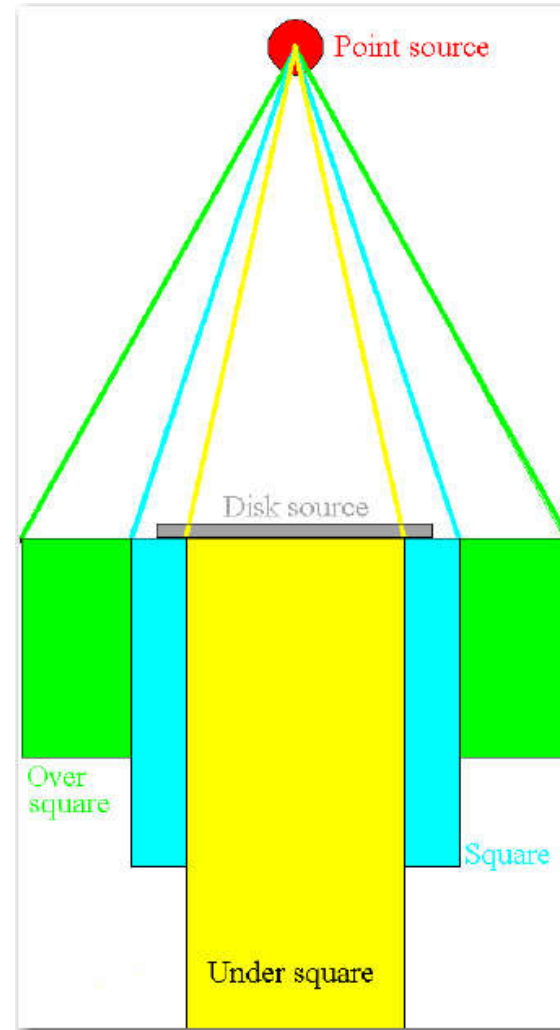
P-type vs N-type HPGe detectors

- P-type (GEM, Profile):
 - Better resolution
 - Ruggedness
 - Lower price
- N-type (GMX):
 - Better lower energy efficiency from sides
 - Neutron/proton damage resistivity



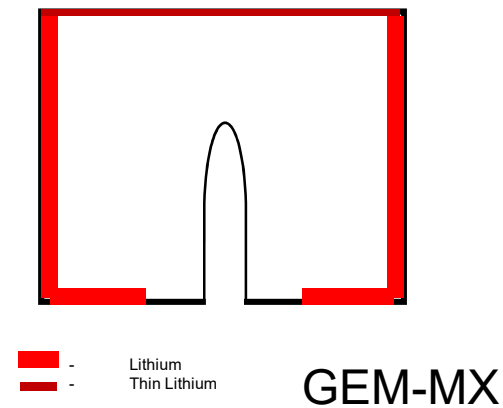
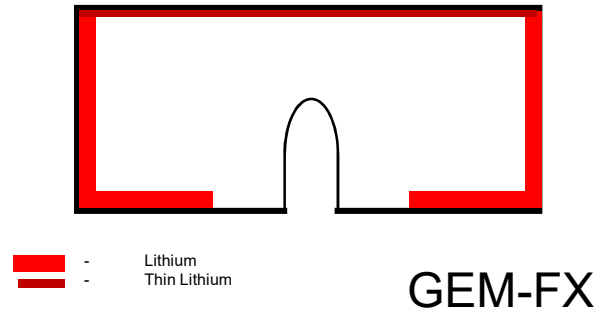
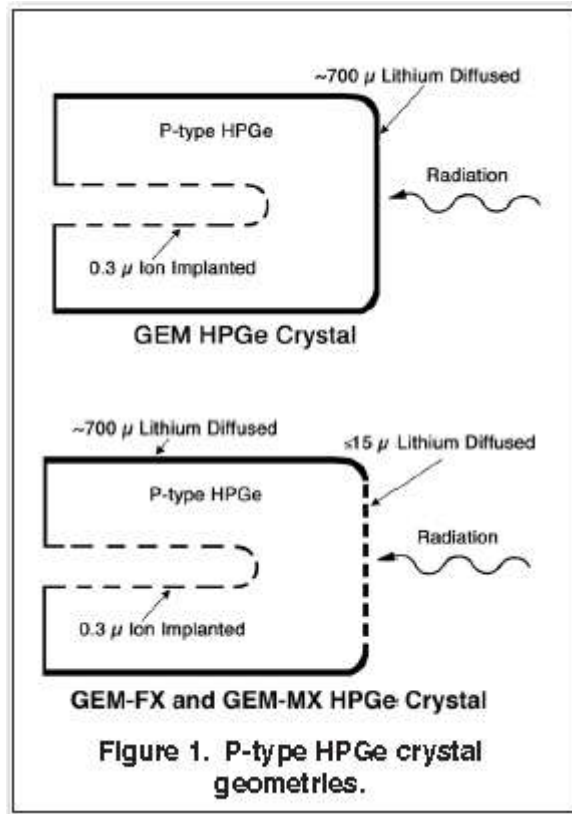
HpGe serie GEM Profile

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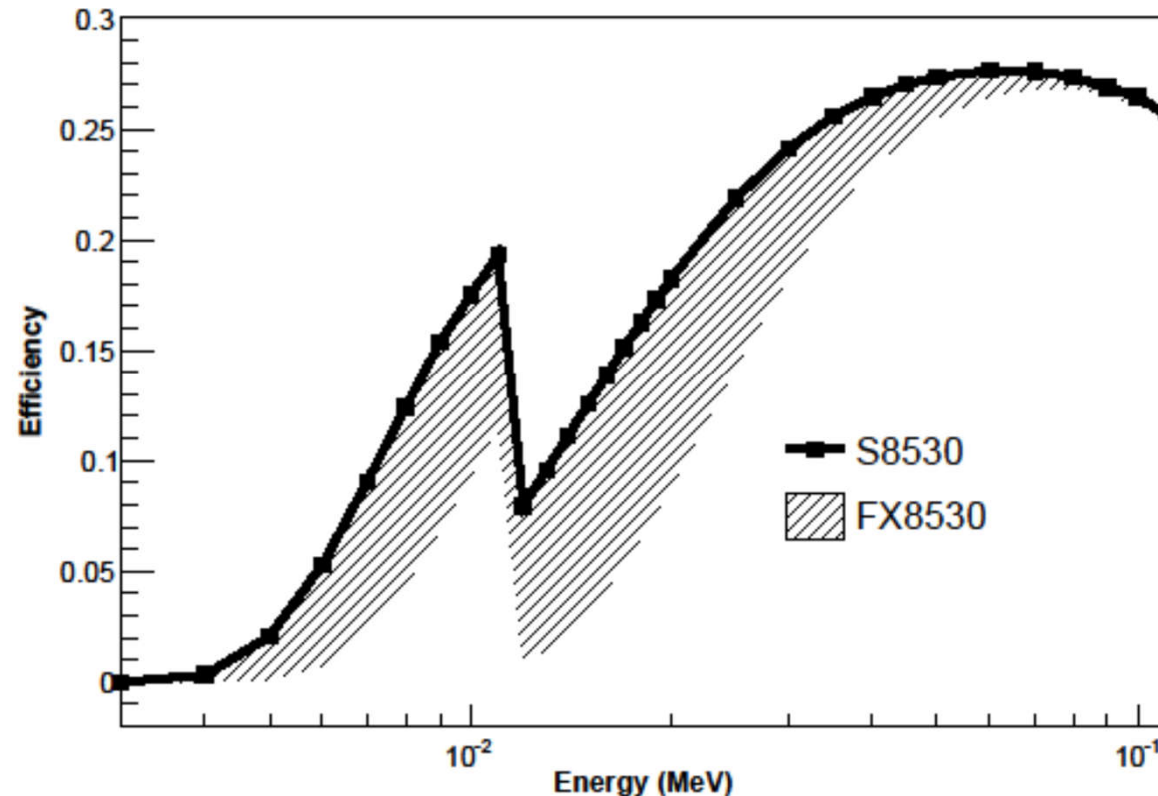


2011... GEM Profile MX & FX

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Dead Layer Comparison

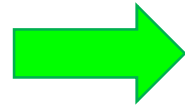


Improvements:

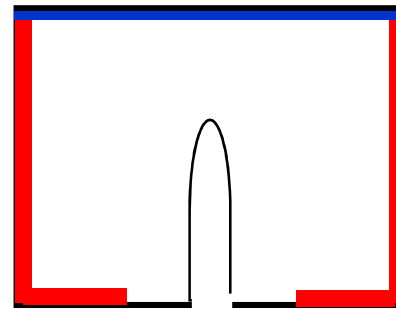
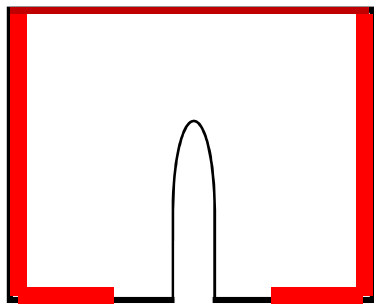
Profile S with STFC shows improvement in efficiencies over former Profile FX detector for energies below 100 keV.

- *Stable Thin Front Contact (STFC) presented at the IEEE NSS/MIC, November 2014 in Seattle, Washington – Kyle T. Schmitt, Gregor G. Geurkov, Elaine. G. Roth, Timothy R. Twomey, and Teresa Underwood “Improved Efficiency at Low Energies with P-Type High Purity Germanium Detectors”.*

Profile MX



Profile C (Coaxial)



 - Lithium
 - Thin Lithium

GEM-MX

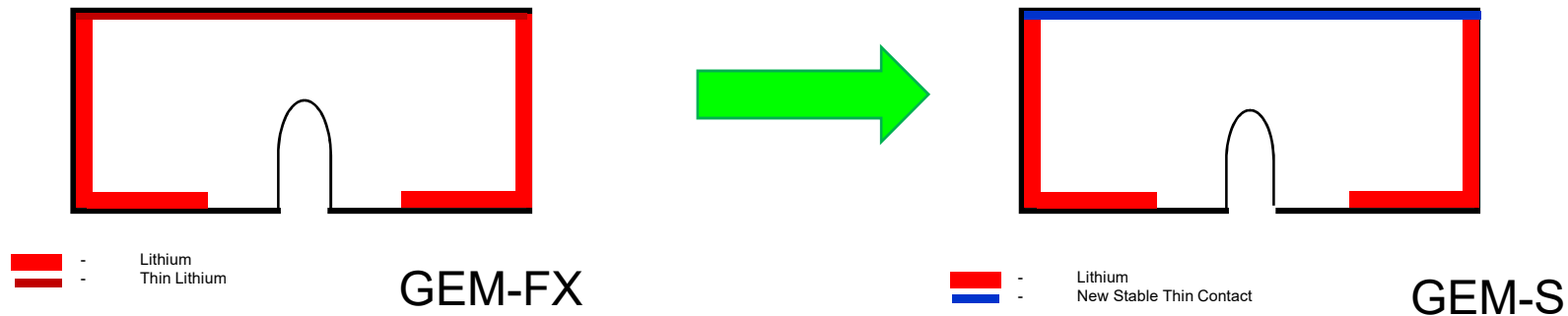


- Lithium
- New Stable Thin Contact

GEM-C

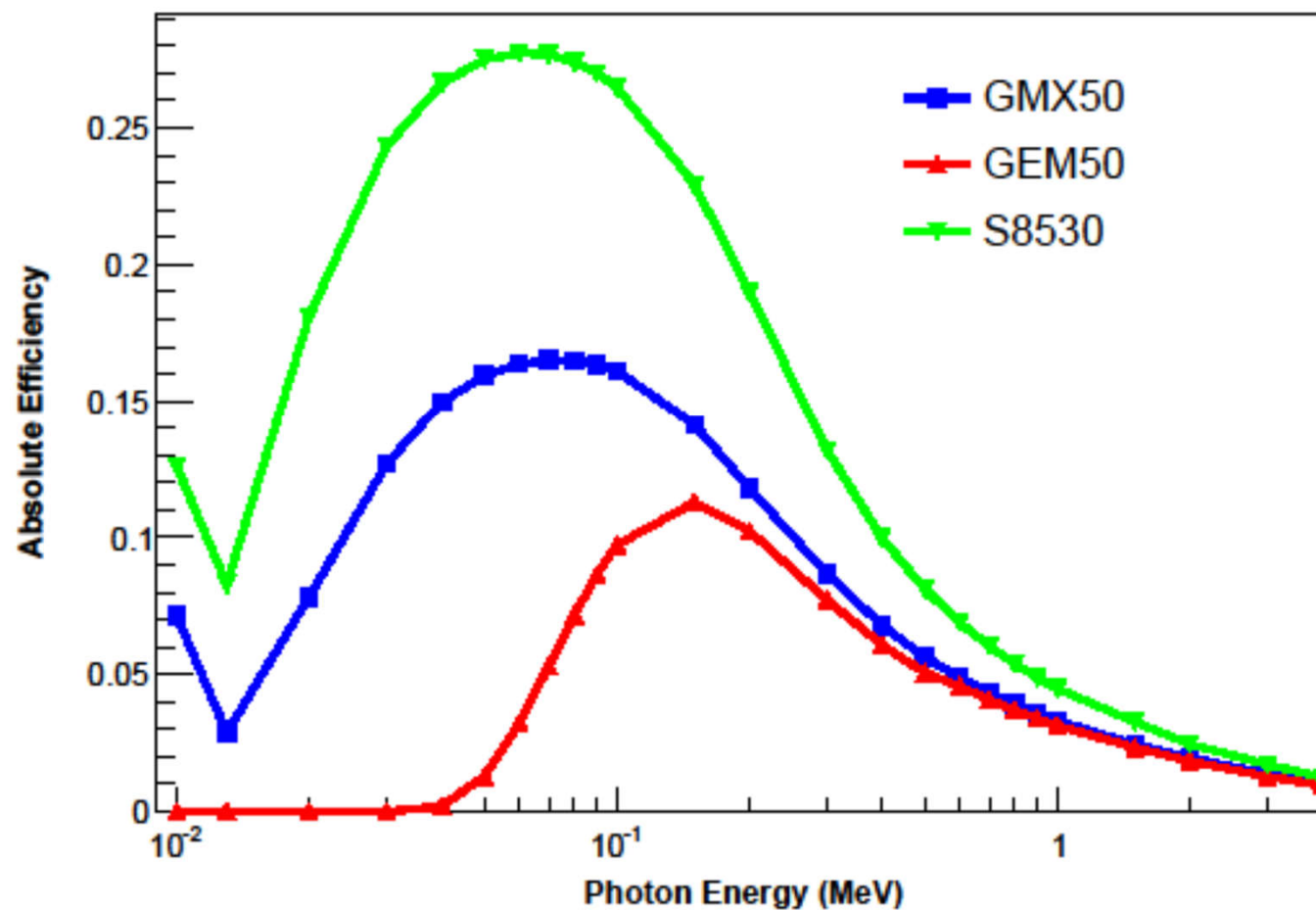
Change:

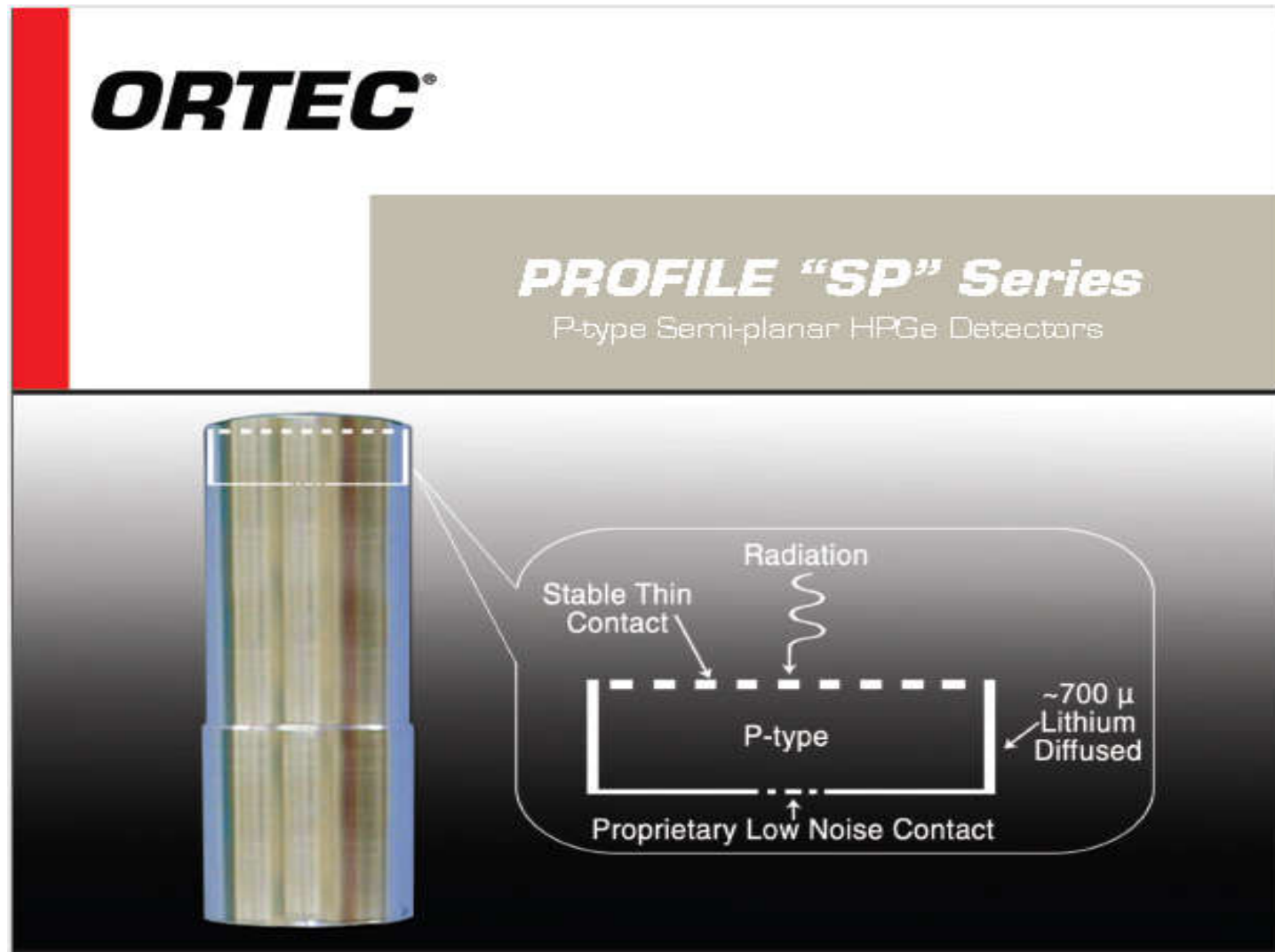
- Front contact is replaced by a stable thinner proprietary contact

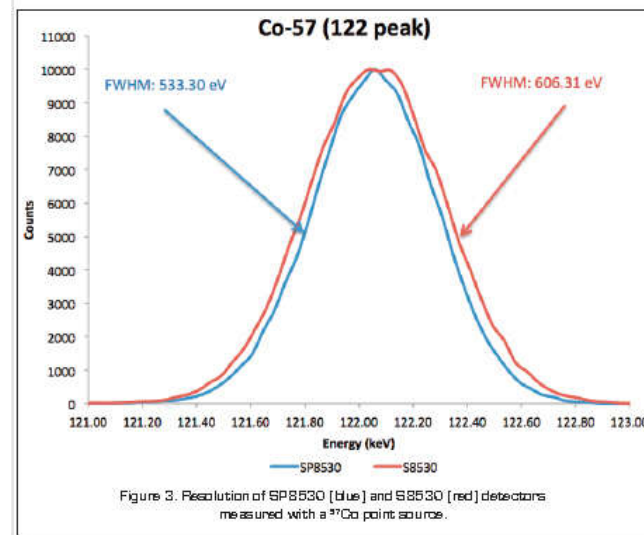
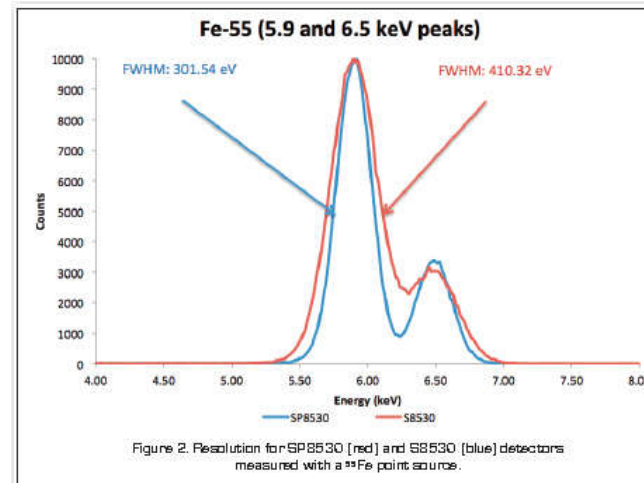
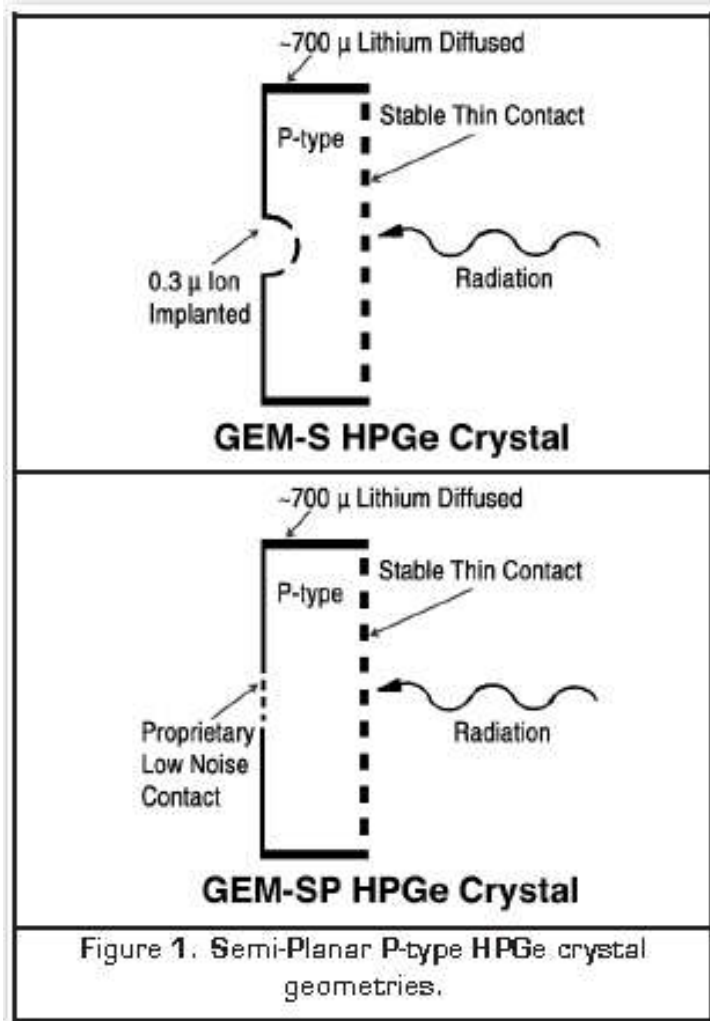
Profile FX  **Profile S (Semiplanar)****Change:**

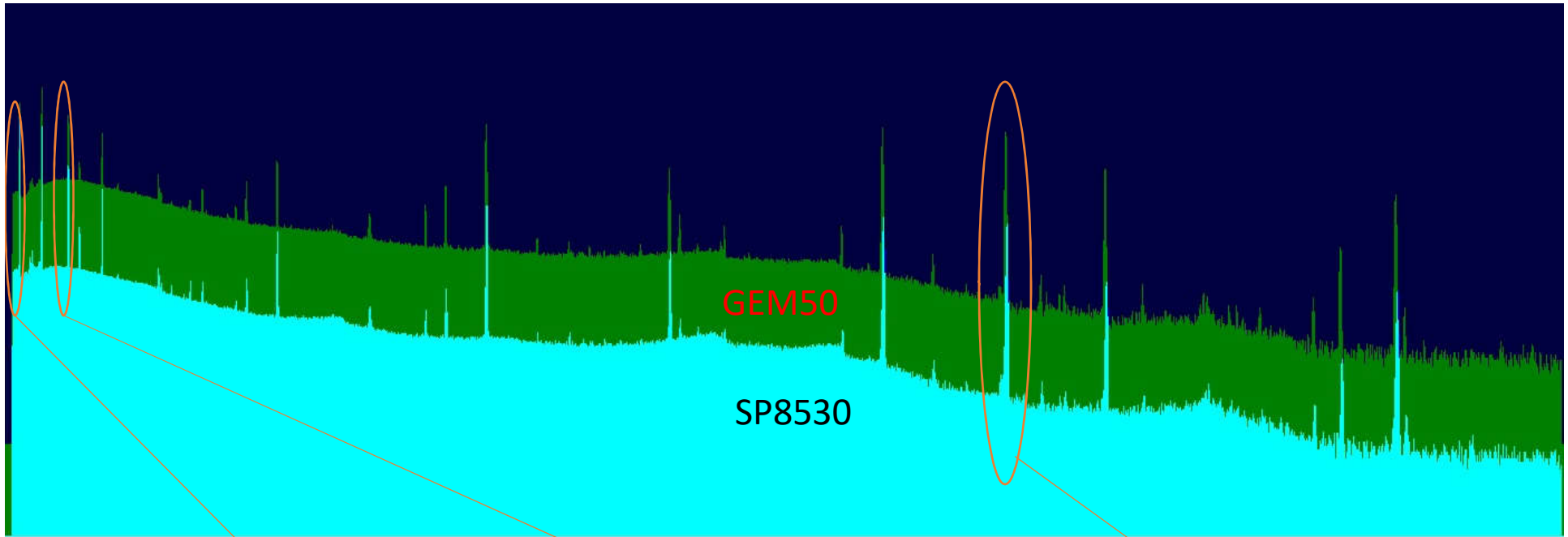
- Front contact is replaced by a stable thinner proprietary contact

Efficiency vs Photon Energy for a Filter Paper Source on Endcap

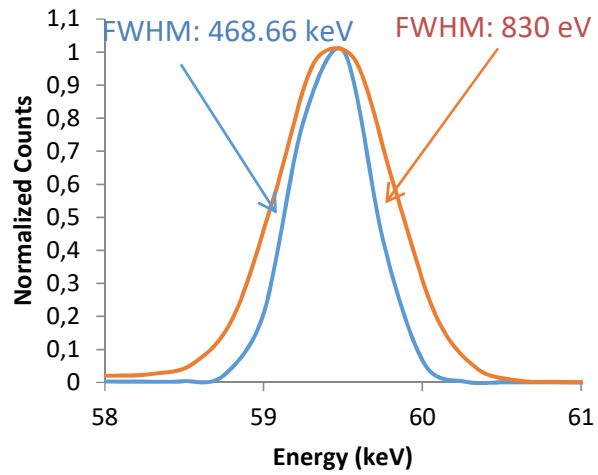






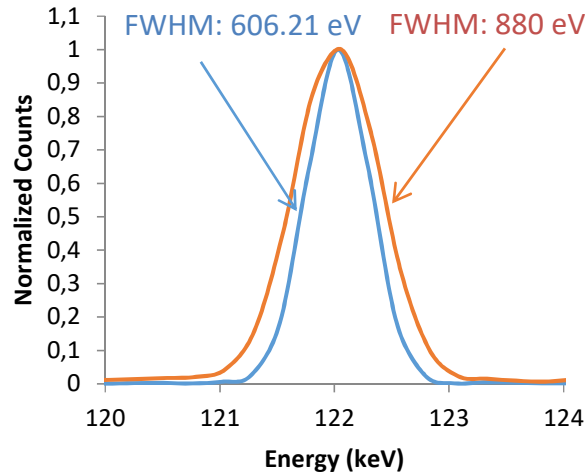


Am-241 (59.5 keV peak)



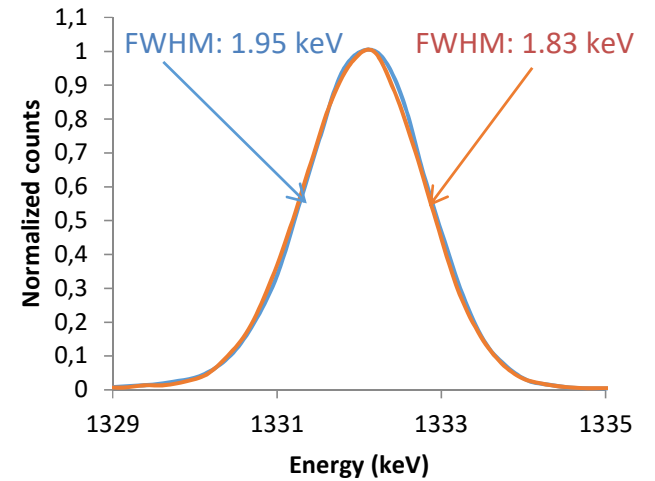
— SP8530 — GEM50

Co-57 (122keV peak)



— SP8530 — GEM50

Co-60 (1332keV peak)



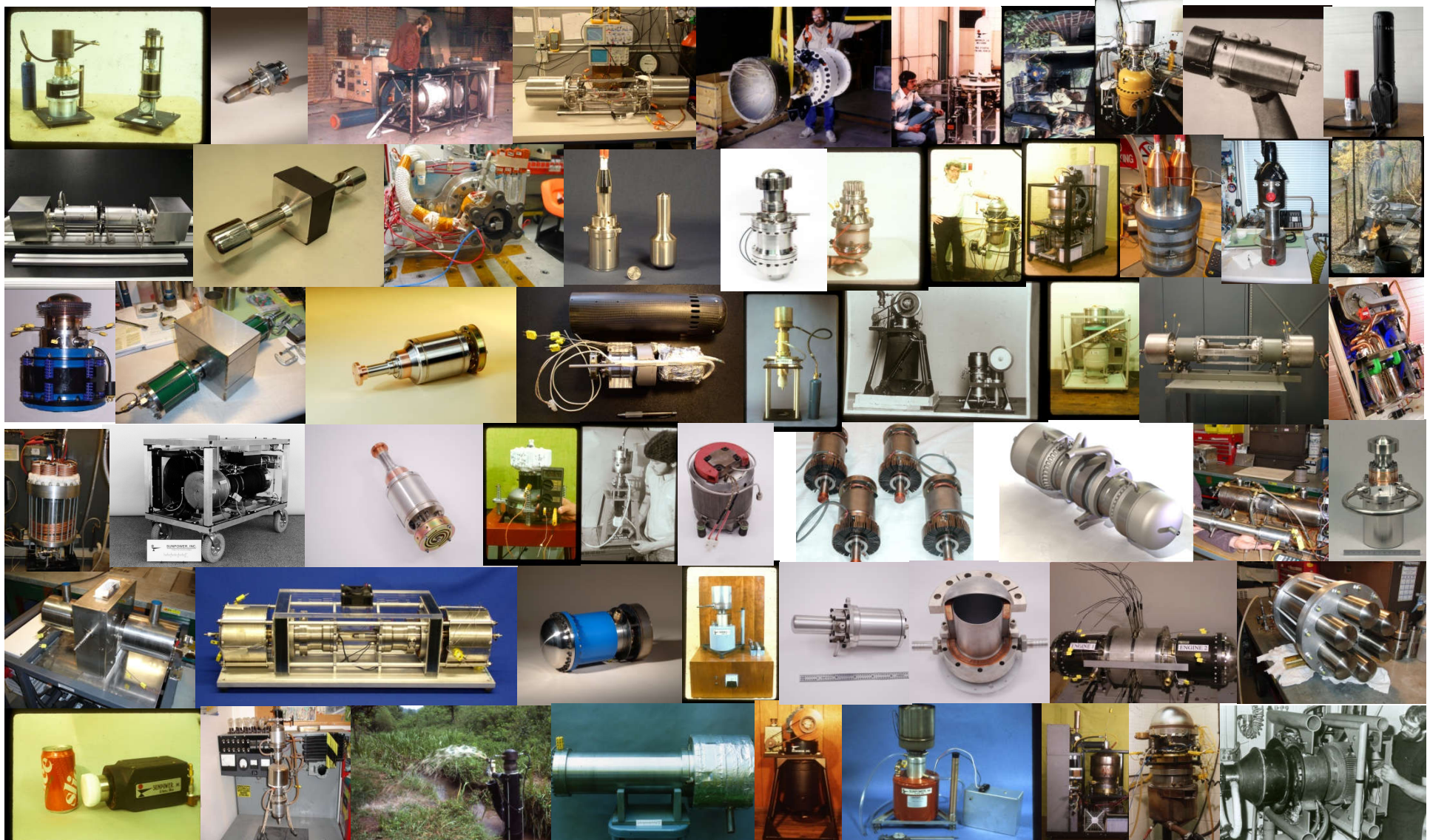
— SP8530 — GEM50

- Using Liquid Nitrogen as cooling method has significant drawbacks:
 - It is a hazardous material.
 - It is costly both in terms of man-hours used in filling operations and the actual cost of the LN₂.
 - Detector performance is degraded during filling
 - It is not always available, thus limiting the applications for HPGe detectors

AMETEK

SUNPOWER®

ORTEC®



Portable Coolers

ORTEC[®]

- Micro-trans-Spec/ Micro-UF6
 - 13% efficiency P-type detector, weighs 7kg
- Trans-Spec-DX-100T
 - 45% efficiency P-type detector, weighs 11kg
- Trans-Spec-N **(New)**
 - 50% efficiency N-type detector, weighs 11kg
- IDM-200-V **(New)**
 - 50% efficiency P-type large area detector, weighs 18kg



Stationary/Transportable Coolers

ORTEC[®]

- X-COOLER-III

- Pop-Top compatibility
- All attitude detector/cold-head

- LDM-1

- Complete Spectrometry Solution
- All attitude operation / includes stand

- MOBIUS (released July 2013)

- LN₂ recycler
- > 2 years between LN₂ fills

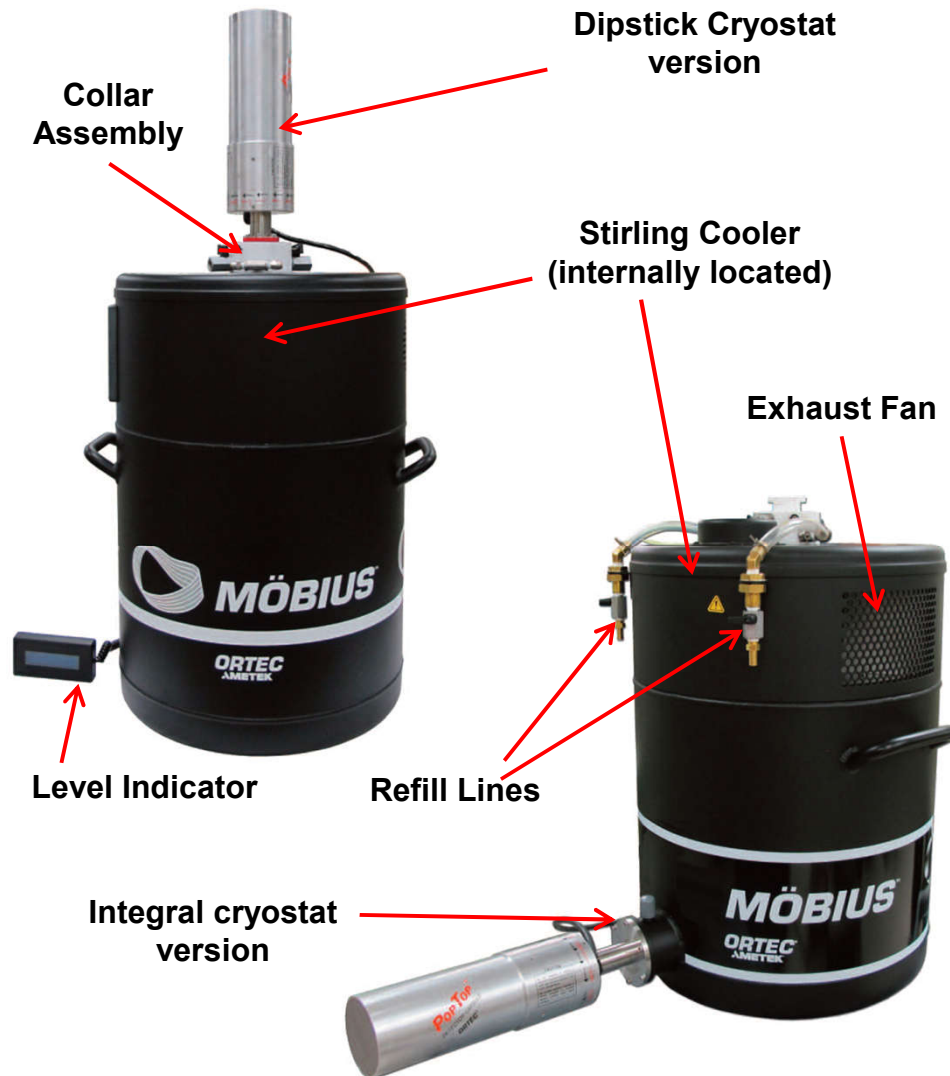
- ICS

(Vacuum Hardened released September 2014)
(PopTop released November 2016)

- Integrated Stirling cooler
- All attitude operation
- LN₂ equivalent energy resolution above 100 keV



Industry leading LN₂ recycling cooling system for HPGe detectors



Key Drivers

- LN₂ cryocooling for premium HPGe detector resolution and simultaneously minimizing the cost and hazards associated with frequent refilling.

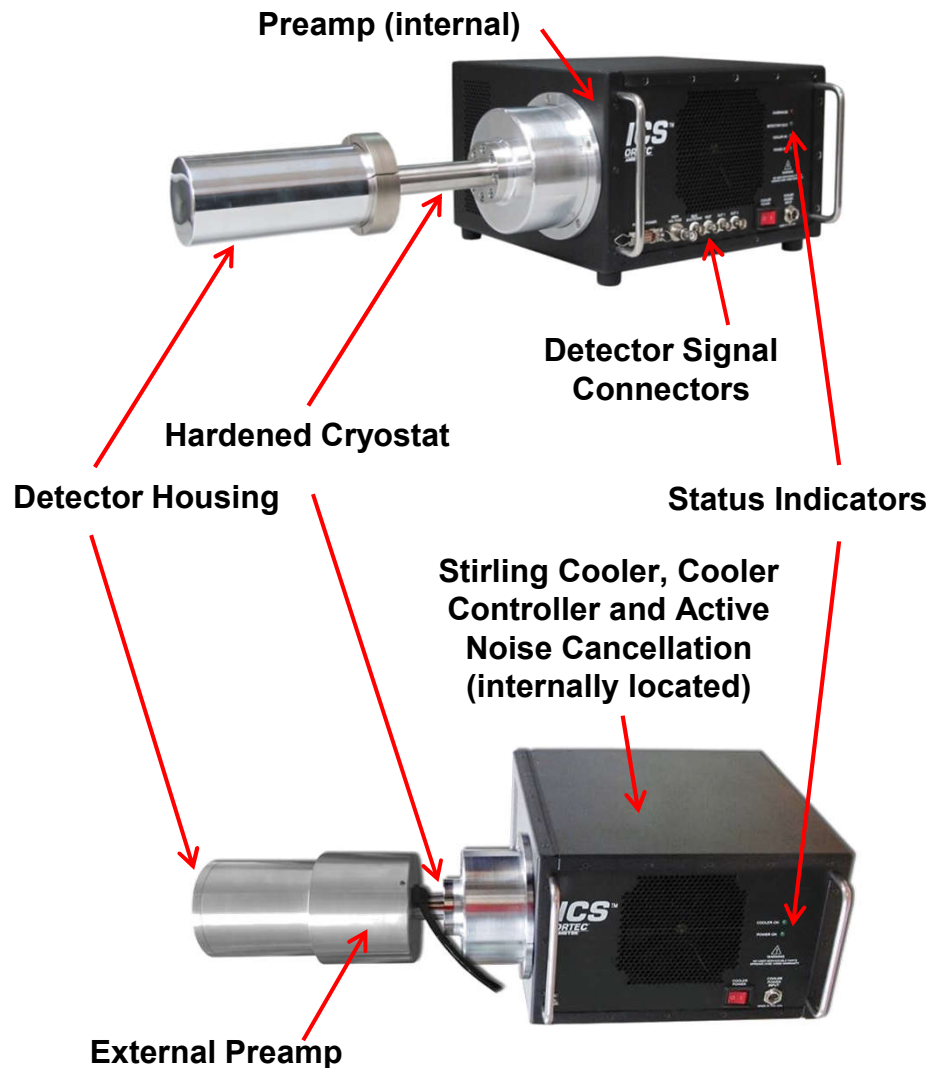
Technology / Product Implementation and Solution

- Integrated dewar and electrical cryocooler that recondenses LN₂ vapor
 - Up to two or more years without the need for LN₂ refills under normal operating conditions
- Sunpower CryoTel[®] GT Stirling cooler
 - High reliability 200,000 hour MTTF cryocooler
 - Low power consumption, < 50% of alternatives
- 28 liter dewar provides extended run-time
 - 7 to 10 days holding time upon power loss with full dewar
- System monitoring and diagnostic tools

ICS[®] Integrated Cryocooling System

ORTEC[®]

Superior electro-mechanical cooling system for HPGe detectors



Key Drivers

- Premium, LN₂ like resolution performance without using LN₂, with improved operational ease-of-use, application flexibility, and superior system uptime

Technology / Product Implementation and Solution

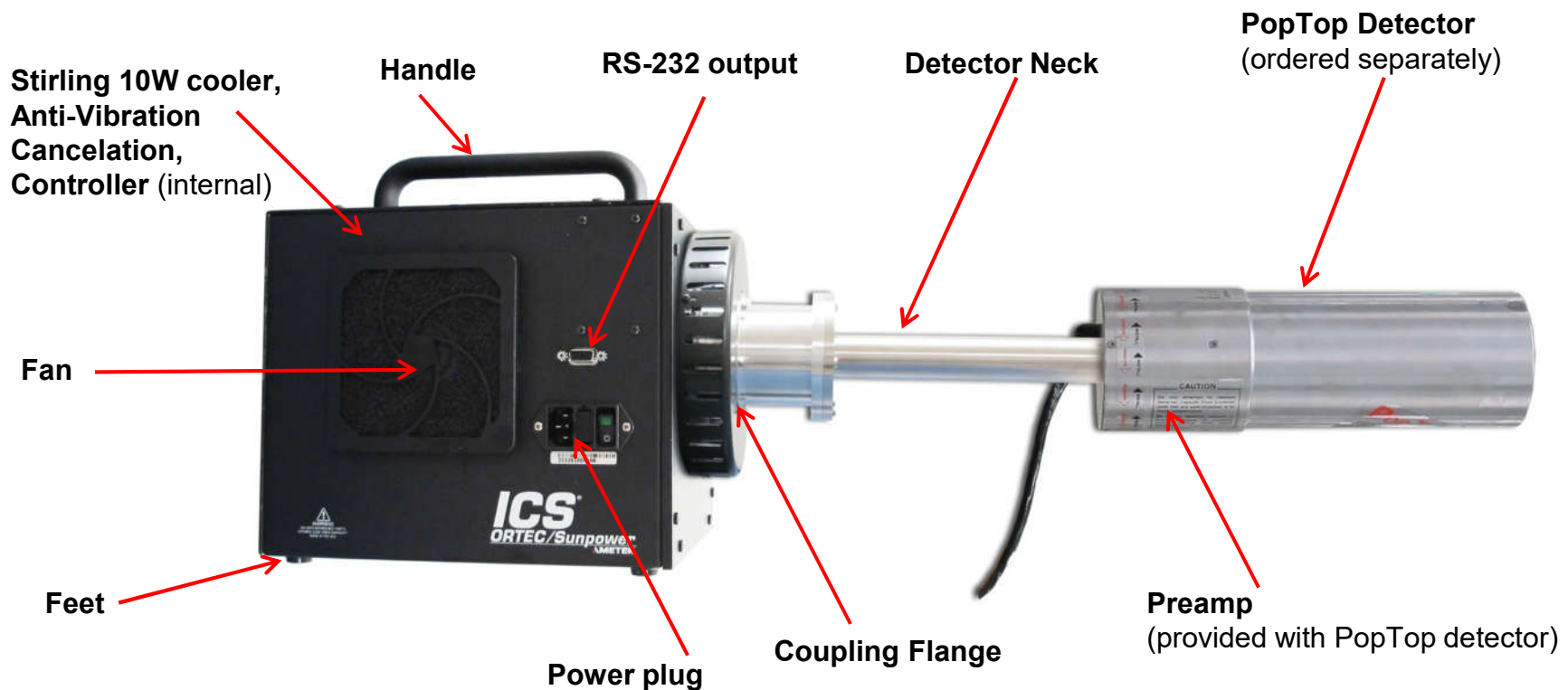
- Delivers LN₂ like resolution for a variety of HPGe detector models
- Fully integrated Sunpower Stirling cryocooler incorporates Active Vibration Cancellation technology and provides excellent cooler MTTF
- Vacuum hardened cryostat for superior vacuum integrity and no thermal cycling
- Ultra-quiet design in a small, compact, single unit footprint provides installation flexibility

PopTop[®] -ICS[®] (ICS-P4)

ORTEC[®]

Key Differences From Vacuum Hardened version

- Conventional cryostat
- Field Upgradable
- Higher power consumption
- Lower weight



RADEAGLE Update

ORTEC[®]



High Performance Low-Medium resolution RIIID

RADEAGLE Key Advantages

ORTEC®

RADEAGLE is the fastest, most accurate, and lightest handheld radioisotope identification device in its class with the fewest false alarms.

Combining a large⁽¹⁾, high sensitivity^(2,3), NaI(Tl) crystal with an intelligent algorithm, RADEAGLE can correctly ID up to six isotopes simultaneously, even in complex shielded or masked scenarios in under 30 seconds.

At ~2500g, the RADEAGLE is the lightest of all NaI(Tl), high performance RIIDs, and incorporates a simple touchpad user interface and intuitive, multi-functional software. The RADEAGLE's simplistic operation enables even novice users to be fully capable of performing sophisticated ID measurements.



(1) 3.0" (76.2mm) x 1.0" (25.4mm)

(2) > 2500 cps per uSv/h @ 662keV ¹³⁷Cs

(3) < 7.2% FWHM @ 662keV ¹³⁷Cs

Total Life Cycle Costs Include:

- **Upfront Capital Costs**
- **Calibration Costs**
 - *No Calibration Costs with RadEagle (saves \$3-4K /yr or every two years).*
- **Maintenance Costs**
 - *Minimal maintenance costs and ability to repair units in house*
- **False Alarm Costs**
 - *False Positives require costly responses from multiple government agencies*
 - *False Negative cost would be inconceivable.*



RadEagle is lowest Total Life Cycle Cost Option

RADEAGLE – capabilities update



WI-FI Dongle

- System can be connected to any WI-FI network
- System can open a Access-Point, so devices (PC, Mobile phone, Ipad, ...) can be connected easily
- Load Spectra, create report, change settings and etc. via Web-Interface



USB to Ethernet adapter

- System can be connected to any local Ethernet
- Load Spectra, create report, change settings and etc. via Web-Interface



USB – Stick

- Spectra data can be copied to the data stick
- Easy data exchange between System and PC



USB cable to PC

- Direct connection to Web-Interface on the PC
- Easy data exchange
- Live data

And finally – our New Website

ORTEC®

ORTEC **AMETEK**
ADVANCED MEASUREMENT TECHNOLOGY

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Research and Education

Research and Education

ORTEC supports teaching laboratories across a wide range of disciplines.

[Read More >](#)

ORTEC AT A GLANCE

ORTEC is an industry leader in the design and manufacture of leading radiation detectors, nuclear instrumentation, analysis software, and integrated systems. Our technologies, products, and services are instrumental in materials analysis for radiological content. Key industry segments include nuclear power, nuclear security and materials safeguard, academia and research, environmental management, and health physics.

RECENT NEWS



ORTEC introduces ICS-P4 Integrated Cryocooling System for HPGe P-type Detectors. ORTEC Products Group has released the ICS-P4, adding a new model to its highly successful Integrated Cryocooling System product line. The ICS-P4 extends liquid nitrogen (LN₂)-free cooling to PopTop® High-Purity Germanium (HPGe) detectors, while simultaneously delivering premium detector resolution and high reliability.

PRODUCT SPOTLIGHT



ICS
The most advanced electro-mechanical cooler for High Purity Germanium detectors is now compatible with PopTop detectors. New PopTop detectors benefit from LN₂-like resolution performance above 100keV energy and only 10% resolution degradation below 100keV. ICS-P4 uses numerous field proven ICS features and components offering more than double the lifetime of older cryocooler technologies.



ANGLE V4
The latest version of ANGLE advanced efficiency calculation software for High Purity Germanium and Sodium Iodide detectors includes multi-language support, geometry correction files, and XML File formats.

ORTEC **AMETEK**
ADVANCED MEASUREMENT TECHNOLOGY

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HPGe Radiation Detector Types and How to Choose

Introduction to HPGe Radiation Detector Types and How to Choose

GEN P-type Coaxial High Purity Germanium (HPGe) Radiation Detectors

PROFILE GEM P-type Coaxial and Semi-Planar HPGe Radiation Detectors

Genex-X (D-K) N-type High Purity Germanium (HPGe) Coaxial Radiation Detectors

QWL (NMI) P-type Reverse Coaxial Radiation Detectors

GLP-Series Planar HPGe Low Energy Radiation Detectors

Application Specific Radiation Detectors

Special Radiation Detectors

PROFILE GEM P-type Coaxial and Semi-Planar HPGe Radiation Detectors

ORTEC PROFILE Series of P-Type High Purity Germanium (HPGe) detectors match the crystal dimension to your application for optimal counting geometry and results.

PROFILE GEM Series detectors feature:

- Stable, thin front contact.
- Standard carbon fiber, or optional Beryllium window.
- Efficiencies to 150%, higher on request.
- Excellent energy resolution and peak symmetry.
- Specified crystal dimensions in Profile models.
- SMART bias options.
- Health Environment option.
- Low background carbon fiber endcap options.
- PLUS preamplifier option for ultra-high-rate applications.
- Extensive configuration flexibility, PopTop, Streamline and mechanically cooled options.

Literature

More Information

- "Application-Matched" P-type HPGe Detectors, optimized for specific sample types, gamma energy ranges and measurement geometries.
- Know how your new HPGe detector will perform before you buy it!
- Best absolute efficiency for the given IEEE standard relative efficiency in your counting geometry.
- Stable thin front contact, no front dead layer growth if stored warm (PROFILE GEM S, SP, and C Series).
- Warranted Crystal Dimensions ensure measurement performance.
- Reproducible dimensions mean reproducible performance... no surprises.
- Full range of PopTop Cryostats and options.

The ORTEC PROFILE Series of P-Type High Purity Germanium (HPGe) detectors offers specific crystal dimensions from which you can choose the best solution in YOUR application. Nominal relative efficiency specifications are provided in order to help relate relative efficiency to terms of crystal dimensions. The resolution is measured according to the IEEE standard. If a particular PROFILE series detector is available from the ORTEC website www.ortec-online.com, then the ACTUAL MEASURED specifications may be inspected before purchase.

F-Series PROFILE GEM Detectors

- F-Series PROFILE detectors employ "over-square" (diameter > length) coaxial structures. This crystal geometry is often referred to as semi-planar structure. For a given relative (IEEE) efficiency, the F-Series represents the "best" use of germanium material producing the maximum absolute counting efficiency for on-endcap or "close geometry" extended samples, such as:
- Point sources on-endcap
 - Filter paper samples on-endcap
 - Samples presented in bottles and pots on-endcap
 - Bio-assay applications (e.g., lung monitoring)
 - Waste drum monitoring

In addition, the over-square geometry helps improve low-energy resolution by reduced crystal capacitance.

PROFILE GEM P-type Coaxial and Semi-Planar HPGe Radiation Detectors

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Literature

PROFILE Series GEM HPGe Radiation Detector Configuration Guide

PROFILE S and C Series GEM HPGe Radiation Detectors

PROFILE SP Series GEM HPGe Radiation Detectors

Overview of Semiconductor Photon Detectors

Review of the Physics of Semiconductor Detectors

More Information

Options

Ordering Information

Suggestions and feedback on the new website will be appreciated

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Thanks for your attention !