ORTEC®
AMETEK®

Actinide-85
HPGe Lung Monitor Detector

- **85-mm diameter and 30-mm thick HPGe detector with a Stable, Thin Front Contact (STFC) optimized for Actinide Bioassay measurements.**
- **Large frontal active area with excellent photon sensitivity for photon energies above 3 keV.**
- **Warranted Energy Resolution (FWHM) equal to or better than 500 eV at 5.9 keV.**
- **Warranted Energy Resolution (FWHM) equal to or better than 700 eV at 122 keV.**
- **Warranted Energy Resolution (FWHM) equal to or better than 1.9 keV at 1332 keV.**
- **Warranted Peak to Compton ratio >55:1.**
- **FW 0.1M/FWHM typically <2.0, FW0.2M/FWHM typically <2.9.**
- **Can be used with LN_2 free ICS Integrated Cryocooling System.**

ACTINIDE-85 is a high-resolution, high-purity germanium detector designed specifically for lung burden and whole body counting applications. It is based on the PROFILE S8530 which employs a proprietary stable, thin front contact in order to maximize low-energy efficiency.

The unique detector design combines large area and excellent energy resolution across a wide range of energy, with excellent peak shape, so important in analysis of complex spectra. 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.

The large frontal area (>54 cm^2) of ACTINIDE-85 provides high geometrical detection efficiency and superior resolution performance in the lower energy range of actinides such as Pu, Am and U, below around 400 keV, while the crystal depth of 30 mm means good stopping power and excellent relative efficiency at higher energies. The excellent warranted energy resolution at 1.33 MeV, combined with exceptionally good peak shapes, means that the ACTINIDE-85 is the ideal detector solution for analysis of fission products as well.

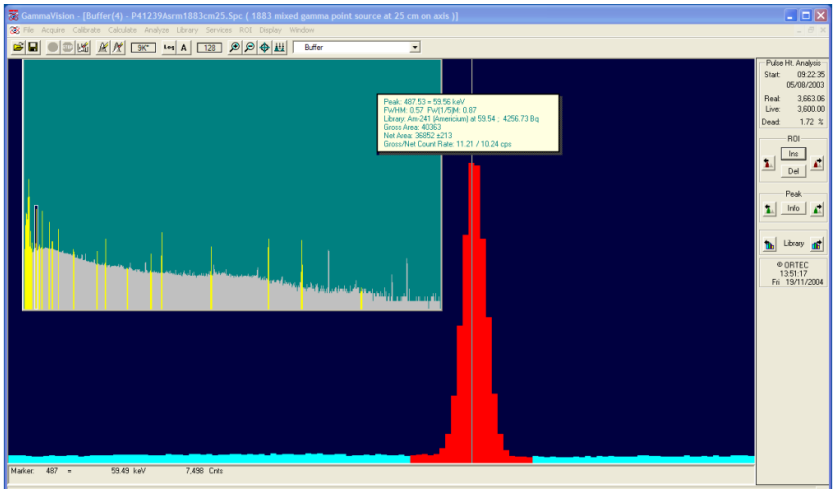

Figure 1. Mixed Isotope Spectrum from ACTINIDE-85 Detector.
59 keV Am-241 Peak Expanded

In lung burden measurements, large diameter detectors allow better coverage of the lung; with ACTINIDE-85, critically important energy resolution is maintained. The detector cryostat is made of selected and qualified low background material, based not only on radioactive background characteristics, but also on long-term reliability. The detector endcap is made of an ultra-low background, high-strength carbon fiber composite which provides greater than 85% transmission for photon energy above 15 keV and nearly 100% transmission for photon energy above 20 keV. To further assure and verify low background quality, each detector is placed inside a graded-Z shielding and a background spectrum is taken for 100,000 seconds after assembly. This spectrum is delivered with the detector.

Positioning

ORTEC ACTINIDE-85 detectors may be ordered in a variety of configurations to meet a variety of requirements for lung burden, body burden, and whole-body counting programs. ORTEC lung burden assessment systems allow independent detector positioning which provide for optimum detector placement and measurement efficiency. In general, positioning mechanisms should be made of carefully screened low-background materials and designed for ease of use and reliability.

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Mechanical Cooling Options

The ORTEC ICS Integrated Cryocooling System can be employed as an alternative to liquid nitrogen to cool the ACTINIDE-85 detector.

The use of LN_2 is costly, time consuming, and (of particular concern for lung burden assessment) is potentially hazardous. In addition, the presence of LN_2 can be intimidating to personnel.

Investment in the ICS can be recovered in two to three years, yet the long lifetime and excellent reliability of the ICS will make the cooler last nearly as long as the detector itself.

Consult the factory for resolution performance with ICS Integrated Cryocooling Systems.

Specifications

			Resolution			Peak Shape				
Model	Crystal Diameter mm Nominal	Crystal Length mm Minimum	@ 5.9 keV keV FWHM Maximum	@ 122 keV keV FWHM Maximum	@1.33 MeV keV FWHM Maximum	FW.1M/ FWHM Typical	FW.02M/ FWHM Typical	Peak-to-Compton Ratio Minimum	Relative Efficiency % Nominal	Endcap Diameter mm Nominal
ACT85	85	30	0.50	0.70	1.9	2.0	2.9	55:1	50	108

Notes

1) FWHM = Full Width at Half Maximum; FW.1M = Full Width at One-Tenth Maximum; FW.02M = Full Width at One-Fiftieth Maximum; total system resolution measured at the factory in accordance with ANSI/IEEE Std. 325-1996.
2) Measured at optimal shaping time using an ORTEC DSPEC-50A.
3) The proprietary contact employed in the S-, SP- and C-Series detectors offer exceptionally high transmission at energies below 40 keV. While the best practice is to keep a germanium detector cold, warm storage will not degrade the transmission efficiency from the front contact.
4) Guaranteed resolution performance may degrade with electromechanical or hybrid coolers. Check the cooler brochure for details about guaranteed performance.

Ordering Information

Model	Description
ACT85P4-RB	ACTINIDE-85 detector in reduced background PopTop capsule with Carbon Fiber endcap.
Options	
-SMP	SMART-1 detector option for positive bias detector, add “-SMP” to the model number [e.g., ACT85-SMP or ACT85P4-RB-SMP].

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Specifications subject to change
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