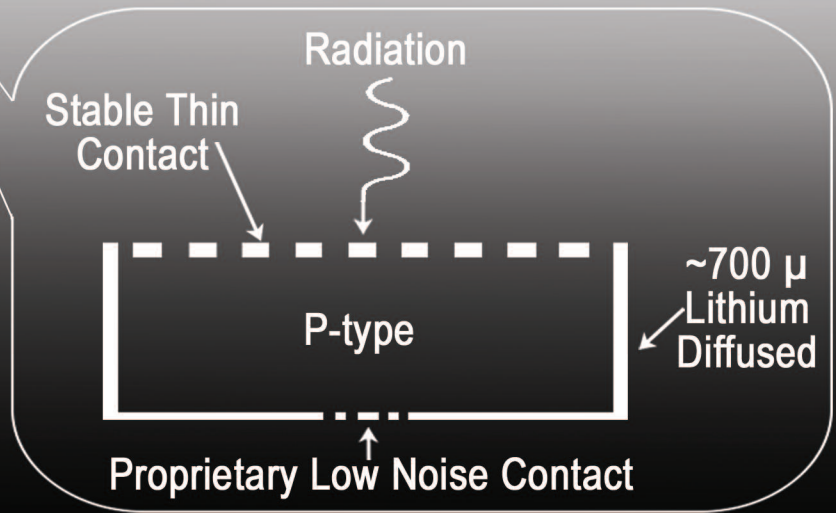
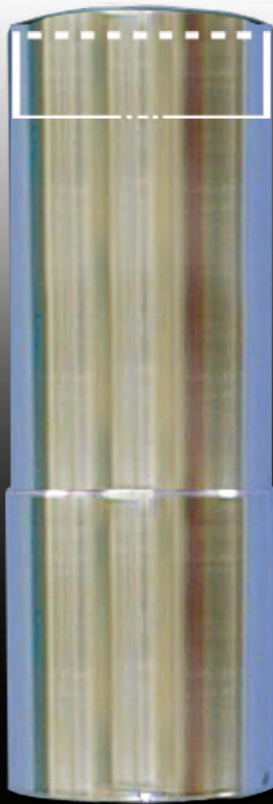


## PROFILE "SP" Series

P-type Semi-planar HPGe Detectors



Premium Resolution Solutions  
for a Wide Range of Energy Applications

# PROFILE "SP" Series

Premium resolution is a crucial requirement to optimize sample identification which improves the accuracy of your results. PROFILE "SP" Series High Purity Germanium (HPGe) detectors offer **UNMATCHED RESOLUTION** to meet this requirement for a wide range of energies between 3 keV and 3 MeV.

The ORTEC PROFILE Series of P-type HPGe detectors match the crystal dimensions to your application for optimal counting geometry and results. The "SP" Series are semi-planar crystals that incorporate a stable, thin front contact which provides excellent gamma transmission for energies as low as 3 keV and warm storage capability. In addition to these features, the "SP" Series offers a proprietary back contact that provides premium low and medium energy resolution performance.

PROFILE-SP Series detectors are designed for use in low count-rate applications.

Benefits	Features
<ul style="list-style-type: none"> <li>• <b>Maximized counting efficiency</b> – lower counting time and lower Minimum Detectable Activity</li> </ul>	<ul style="list-style-type: none"> <li>• Thin front contact</li> <li>• Maximized crystal diameter within the endcap</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Ultimate wide energy nuclide identification</b> – premium resolution with extended lower energy range operations down to 3 keV</li> </ul>	<ul style="list-style-type: none"> <li>• Low noise back contact</li> <li>• Thin front contact</li> <li>• P-type detectors with semi-planar crystal geometry</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Simplified handling and lower storage costs without loss of detector efficiency</b> – warm storage capability</li> </ul>	<ul style="list-style-type: none"> <li>• Stable contact (no "dead layer" growth at room temperature).</li> </ul>

PROFILE SP Series detectors employ "over-square" (diameter > length) semi-planar crystals. Compared to other semi-planar HPGe detectors, the low noise contact of the PROFILE "SP" minimizes capacitance improving energy resolution at lower energies, while supporting resolution at the higher energies. The detector's larger surface area improves low to medium energy efficiency when used for samples such as:

- Point sources on-endcap
- Filter paper or large surface area samples on-endcap
- Samples presented in bottles and pots on-endcap
- Bio-assay applications (e.g., lung monitoring)
- Waste drums or Safeguards monitoring

For a given relative (IEEE) efficiency, PROFILE Series detectors represent the "best use" of germanium material producing the maximum absolute counting efficiency for all geometries.

Efficiency performance advantages associated with a thin, stable front contact and a semi-planar P-type HPGe crystal geometry are described in the PROFILE "S" and "C" Series brochure.

Figure 1 highlights the difference between the PROFILE "S" Series core-hole type contact and the PROFILE "SP" Series proprietary low noise contact. Reduction in capacitance of the back contact dramatically improves resolution at low energies.

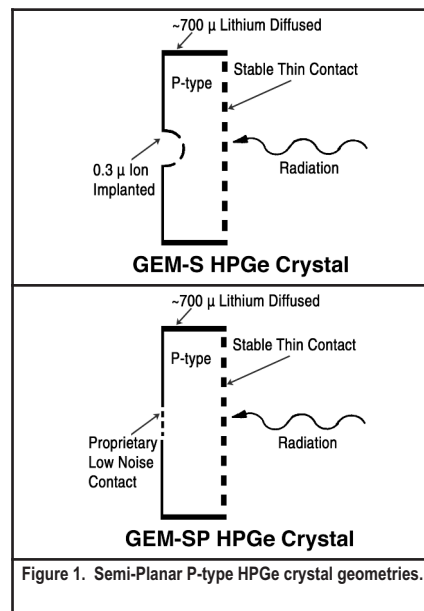


Figure 1. Semi-Planar P-type HPGe crystal geometries.

# PROFILE "SP" Series

The significant resolution improvement using a point source of  $^{55}\text{Fe}$  positioned 25 cm away from the front of the endcap is illustrated in Figure 2. The full width half max (FWHM) resolution at 5.9 keV energy of the SP8530 is 25% lower as compared to the same diameter and thickness S8530 detector. The 5.9 and 6.5 keV peaks measured with the SP8530 detector (shown in blue) have better separation than those measured with the S8530 (shown in red).

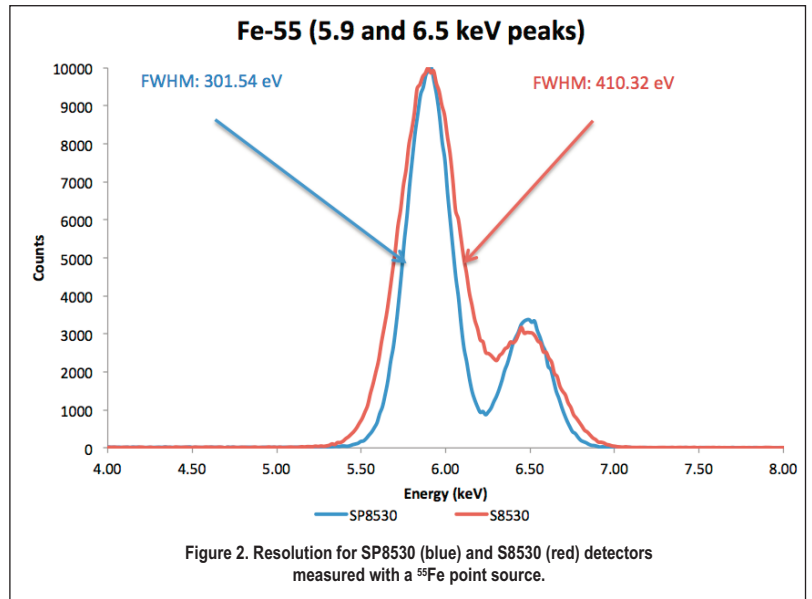
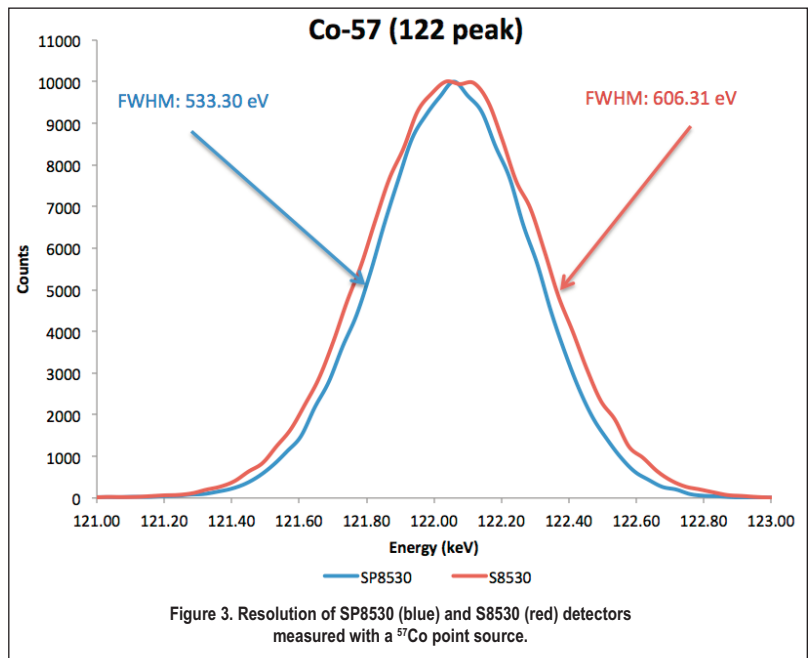
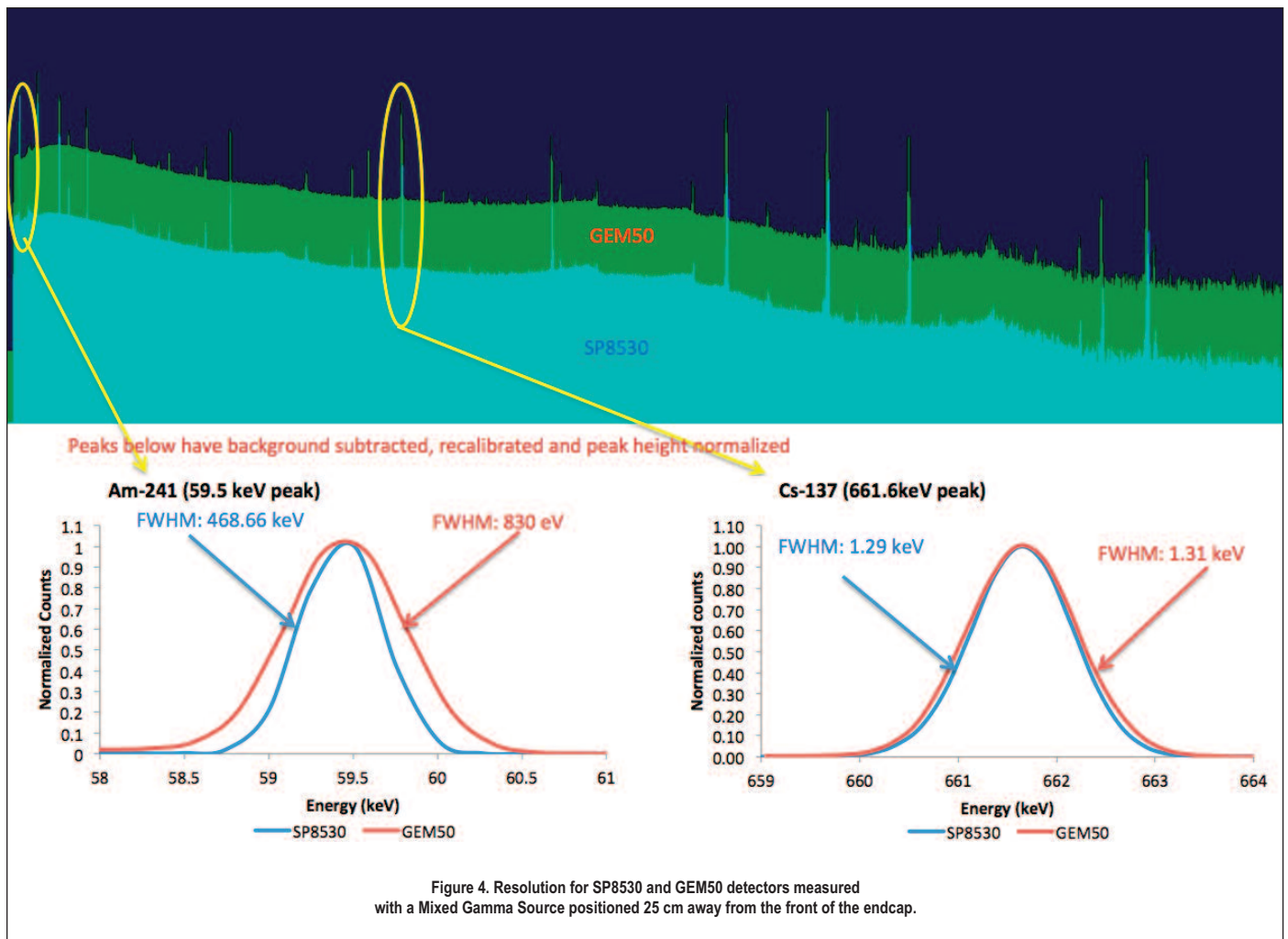


Figure 3 shows improvement in resolution for a  $^{57}\text{Co}$  point source positioned 25 cm from the front of the detector endcap for a PROFILE SP8530 compared to an S-series semi-planar detector. Resolution of the SP8530 is 10% better at 122 keV.

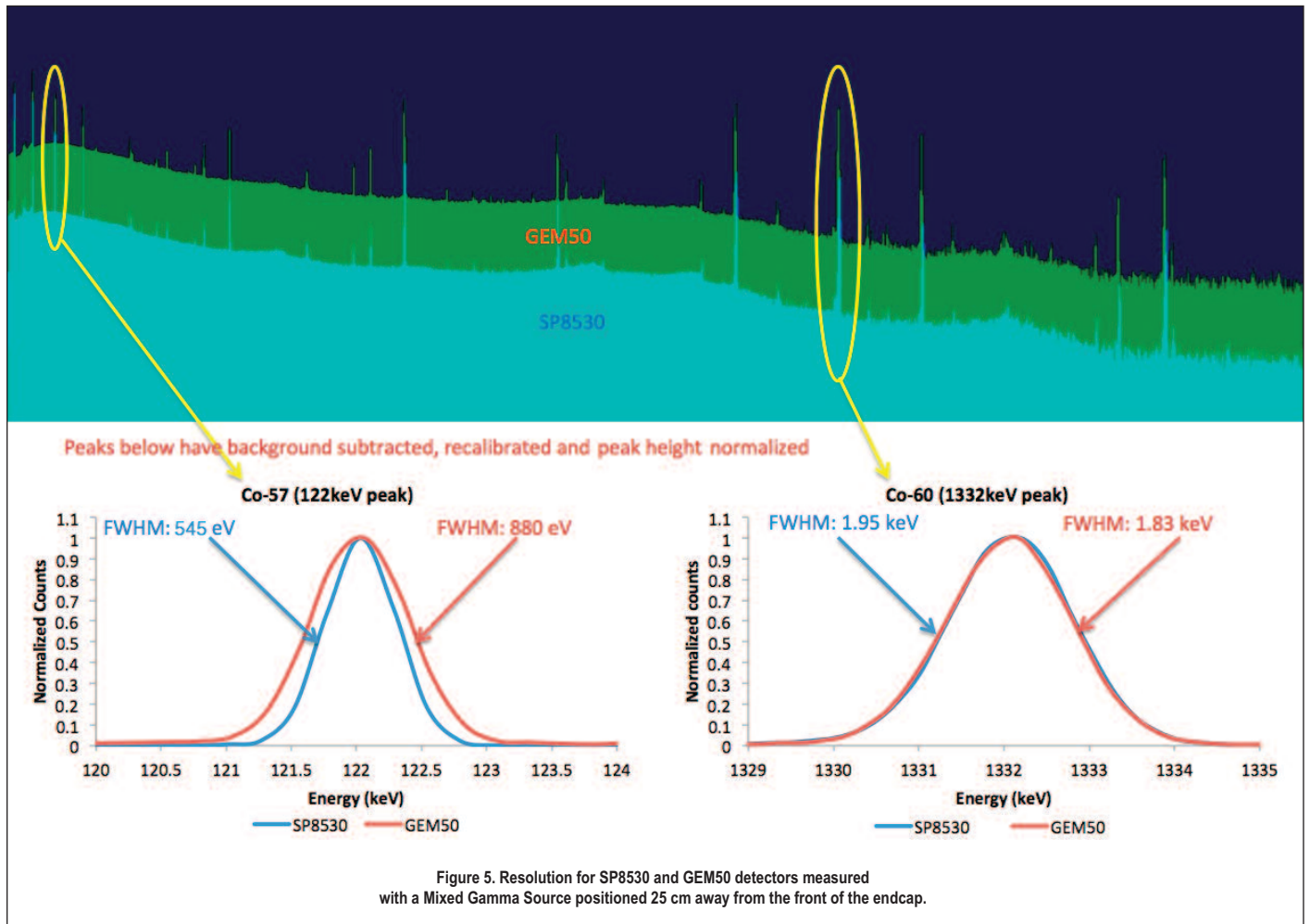


# PROFILE "SP" Series



The improvement is even more dramatic when comparing an SP Series detector to a conventional P-type detector. Figures 4 and 5 display spectra for a mixed gamma source for a PROFILE SP8530 and a GEM 50. Both the SP8530 and GEM50 detectors have relative efficiency specifications of 50%. The resolution of the SP8530, however, is 45% better at 60 keV and is 30% better at 122 keV. At 662 keV, energy resolution performance of the SP8530 is less than 5% better than the GEM50. At 1332 keV, energy resolution performance of the SP8530 and GEM50 detector is very similar.

# PROFILE "SP" Series



Better resolution performance of PROFILE "SP" Series detectors translates into an improved Peak to Background ratio, which in turn implies lowered Minimum Detectable Activity (MDA) and/or shorter counting times.

The premium resolution advantage is also vital for applications using multi-nuclide (multi-peak) identification. Better resolution lowers the number of overlapping peaks and enhances the performance of peak locate algorithms, which leads to fewer false positives.

# PROFILE "SP" Series

## General Guidelines for Choosing a Profile SP Detector

For a close or on-endcap sample, the detector diameter should exceed the sample diameter by 20% or more. Beyond 30% the gain in efficiency is small. In addition, if the detector diameter exceeds the sample diameter by 20% or more, errors due to irreproducibility of the sample position will be minimal.

If budget constraints must be considered, first select the largest diameter in comparison with the optimum diameter. Selection of a deeper detector will further increase the absolute efficiency, specifically at higher energies.

**Table 1. HPGe Detector Selection Guide for Various Counting Geometries Relative to Energies of Interest**

Overall Guidelines on the Choice of High Purity Germanium (HPGe) Detector						
Source Energy (keV)	Marinelli Beaker		Near or Far Point Source		Large Surface Area	
Preference	Efficiency	Resolution	Efficiency	Resolution	Efficiency	Resolution
3 to 3000	GMX	PROFILE C	PROFILE S or SP	PROFILE S or SP	PROFILE S or SP	PROFILE S or SP
3 to 10000	GMX	PROFILE C	PROFILE C	PROFILE C	PROFILE C	PROFILE S or SP
20 to 3000	GMX	PROFILE M	PROFILE F	PROFILE F	PROFILE F	PROFILE F
50 to 5000	GEM	GEM	GEM	GEM or PROFILE F	GEM or PROFILE F	PROFILE F
20 to above 10000	GMX70 or larger	PROFILE C70 or larger	PROFILE C70 or larger	PROFILE C70 or larger	PROFILE C70 or larger	PROFILE C70 or larger
above 5000	GEM70 or larger	GEM70 or larger	GEM70 or larger	GEM70 or larger	GEM70 or larger	GEM70 or larger
Neutron Damage	GMX	GMX	GMX	GMX	GMX	GMX
High Count Rate	small GEM or GMX	small GEM or GMX	small GEM	small PROFILE F or S	small PROFILE F or S	small PROFILE F or S

**Table 2. PROFILE SP Series GEM Detector Specifications**

Model No.	Crystal Dimension		Energy Resolution (FWHM)				Peak Shape		P:C Warranted	Guaranteed Relative Efficiency%	Endcap Diameter (mm)
	Actual Diameter (+0/-2 mm)	Actual Length Minimum	@5.9 keV Warranted (eV) <sup>§</sup>	@14.4 keV Warranted (eV)	@122 keV Warranted (eV)	@1.33 MeV Warranted (keV)	FW.1M/ FWHM Typical	FW.02M/ FWHM Typical			
GEM-SP5020P4	50	20	300	350	585	1.8	1.90	2.55	35	7	70
GEM-SP5825P4	58	25	340	375	585	1.8	1.90	2.65	35	15	70
GEM-SP7025P4	70	25	380	400	585	1.8	1.95	2.75	40	20	83
GEM-SP8530P4	85	30	400	425	630	1.9	2.00	2.90	55	50	108
GEM-SP9430P4	94	30	425	450	630	1.9	2.00	2.90	65	65	108
GEM-SP10530P4	105	30	450	475	630	2.0	2.00	2.90	65	80	121

### 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 for a source at 1000 counts/s measured in accordance with ANSI/IEEE Std. 325-1996, using ORTEC standard electronics.
- 2) Measured at optimum analog or equivalent digital shaping time using ORTEC electronics.
- 3) The proprietary front contact employed in the SP Series detectors offer exceptionally high transmission at energies below 40 keV. Warm storage will not degrade the transmission efficiency of the front contact.
- 4) PROFILE SP detectors come with a standard Carbon Fiber window. For improved performance between 3 and 5 keV select the Beryllium window option.
- §) 5.9 specification only applies with -RB, -B, LB-C, and XLB-C options.

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# ***PROFILE “SP” Series***

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## **Detector Options**

- Harsh Environment Option (-HE)
- Beryllium Window Options (-B)
- Remote Preamplifier Option (-HJ)
- Low-Background Carbon Fiber Endcap Options (-RB, -LB-C, and -XLB-C)
- SMART-1 Option (-SMP)
- See the PROFILE detector configuration guide for more detail.

## **Ordering Information**

See the PROFILE Detector Configuration Guide for complete ordering information.

# *PROFILE "SP" Series*

Specifications subject to change  
070223

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