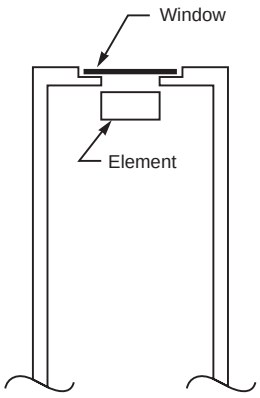
Ultra-LEGe Detector

Features

- Spectroscopy from 300 eV to 300 keV
- High efficiency
- Good peak shape
- High peak/background ratio
- Optional polymer film window



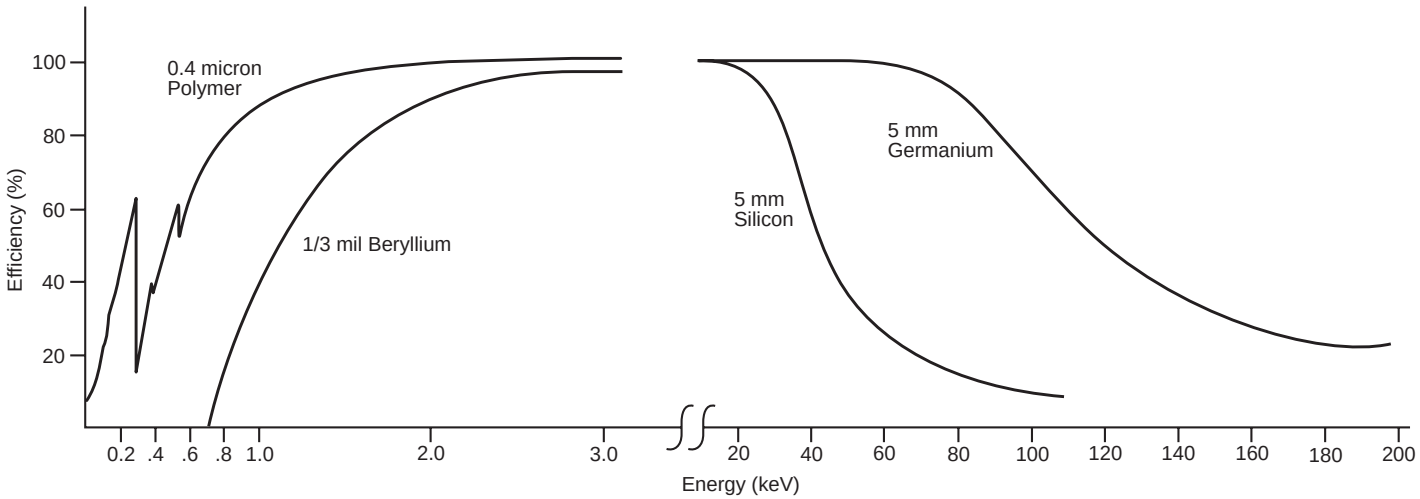
Description

The Canberra Ultra-LEGe detector extends the performance range of Ge detectors down to a few hundred electron volts, providing resolution, peak shape, and peak-to-background ratios once thought to be unattainable with semiconductor detectors. The Ultra-LEGe retains the high-energy efficiency intrinsic to germanium detectors because of the high atomic number (Z) and thus covers a wider range of energies than any single-photon detector on the market.

Conventional Ge detectors, including those made especially for low energies, suffer from poor peak shape and efficiency below 3 keV. This characteristic, once thought to be fundamental to Ge, prohibited use of Ge detectors in most analytical x-ray applications. Canberra has developed detector fabrication techniques which have eliminated these problems. The resulting detector, the Ultra-LEGe, delivers the intrinsic efficiency and resolution advantages of germanium without the disadvantages of the conventional germanium detector.

Because of the detector structure pioneered by Canberra and employed in all LEGe detectors, the Ultra-LEGe offers excellent performance over a wide range of detector sizes. The resolution, for example, of a 100 mm^2 Ultra-LEGe is less than 150 eV (FWHM) at 5.9 keV. The very best Si(Li) detectors of this size have resolution in excess of 175 eV (FWHM).

To take full advantage of the low energy response of the Ultra-LEGe, Canberra offers the option of a polymer film cryostat window. This polymer window is a multilayer film which is supported by a ribbed silicon support structure. The film spans silicon ribs that are about 100 µm apart and 0.3 mm thick and act as a collimator accordingly. On horizontal cryostats, the support rib orientation can be chosen by designating the appropriate window model-number suffix: V for vertical ribs and H for horizontal ribs. The support structure is 75% open so the effective detector area is reduced by 25% from the total area. The total film thickness is about 340 nm, 40 nm of which is an aluminum layer which reduces sensitivity to ambient light. Note that the curves below do not show the effect of the support structure but of the window film itself.



Comparison of Window Transmission – Polymer vs. Beryllium

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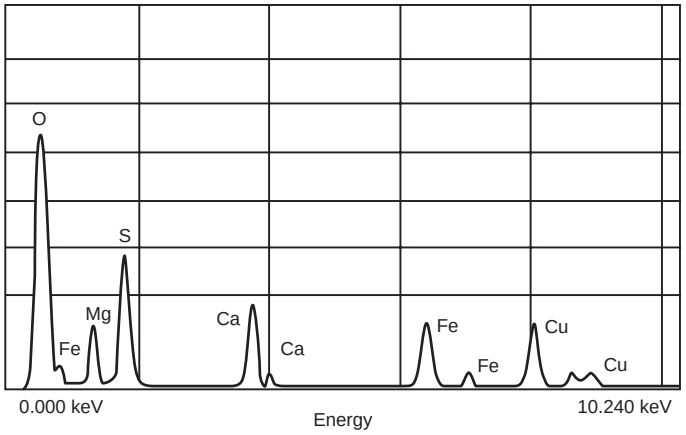
The adjacent spectrum of x rays from NIST 2063 Thin Film Standard Glass illustrates the excellent resolution, peak shape and low noise of the Ultra-LEGe. This spectrum was taken with an Ultra-LEGe equipped with a polymer window using electron beam excitation in a Scanning Electron Microscope.

ULTRA-LEGe DETECTOR
General Specifications and Information
Standard Configuration Includes:

- Vertical dipstick cryostat with Be window and 30 liter Dewar
- Pulsed optical feedback preamplifier with cooled FET and 3 meter bias, signal and power cables

Specify cryostat option from table below
Resolution (FWTM) less than or equal to 2 X resolution (FWHM)

Model Number	Area (mm^2)	Thickness (mm)	Be Window Thickness mm (mils)	Resolution (eV FWHM)	
				5.9 keV	122 keV
GUL0035	30	5	0.025 (1)	150	550
GUL0035P	30	5	0.025 (1)	140	550
GUL0055	50	5	0.025 (1)	150	550
GUL0055P	50	5	0.025 (1)	140	550
GUL0110	100	10	0.025 (1)	160	550
GUL0110P	100	10	0.025 (1)	150	550



Spectrum from NIST 2063 Thin Film Standard Glass

Cryostat Options

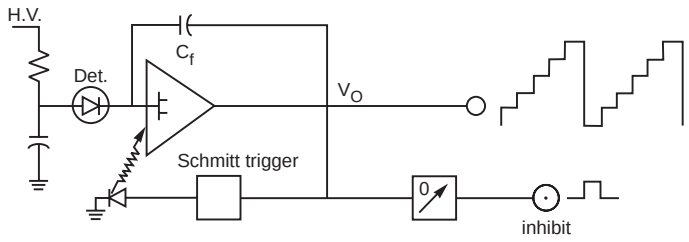
Model	Type	End Cap (cm)
7500	Vertical Dipstick	2.5 ϕ x 10
7905-7.5	Horizontal Integral	2.5 ϕ x 10
7906-7.5	Vertical Integral	2.5 ϕ x 10
7905-R	Retractable	see spec sheet
7905-WR	Windowless Retractable	see spec sheet
7905-BWR	H.V. Windowless Retractable	see spec sheet

Window Options

Model	Description	For Size
BW-0.3	1/3 mil Beryllium	30, 50
PW-0.4H	0.4 micron Polymer (horizontal support)	30
PW-0.4V	0.4 micron Polymer (vertical support)	30
PW-0.4LH	0.4 micron Polymer (horizontal support)	50, 100
PW-0.4LV	0.4 micron Polymer (vertical support)	50, 100

Note: Polymer windows are not light tight. Detectors equipped with this window must be used in a darkened environment.

PULSED-OPTICAL FEEDBACK PREAMPLIFIER
Charge impulses (Q_{in}) from the detector result in equivalent charge stored on feedback capacitor C_f producing step function $V_o = Q_{in}/C_f$. Subsequent impulses increase the output to a limit at which point the comparator fires an LED directed at the FET. The light pulse momentarily shorts out the FET gate-source junction thus discharging C_f and resetting the preamplifier. An adjustable width mono-stable multivibrator provides a pulse which can be used to gate off the MCA during the transient reset time.



Block Diagram – Pulsed Optical Feedback Preamp