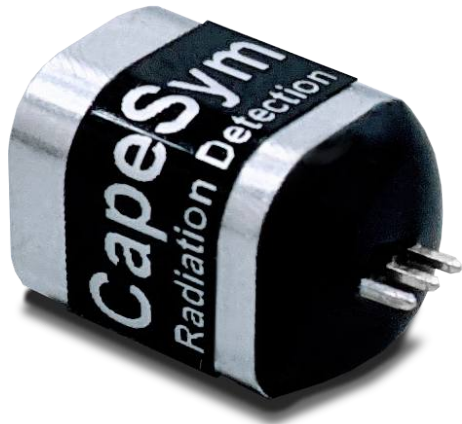


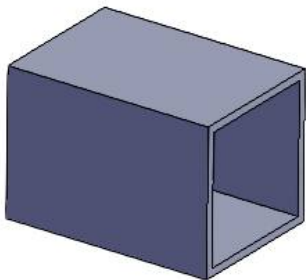
# Elpasolite nEL-6x6c-SiPM



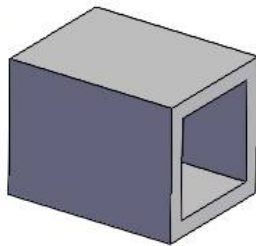
Elpasolite nEL-6x6c-SiPM

## Benefits

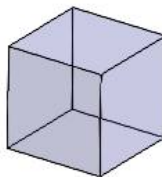
- Sensitive to gamma and neutron radiation
- Ultra compact design
- Fully solid state detector not sensitive to magnetic field
- Low bias requirements: 26-32V
- No international shipping restrictions
- Operating temperature: -40 to 55 °C



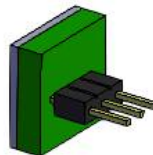
Aluminum housing  
(0.5 mm thk)



Reflector



Elpasolite  
Crystal  
6x6x6 mm



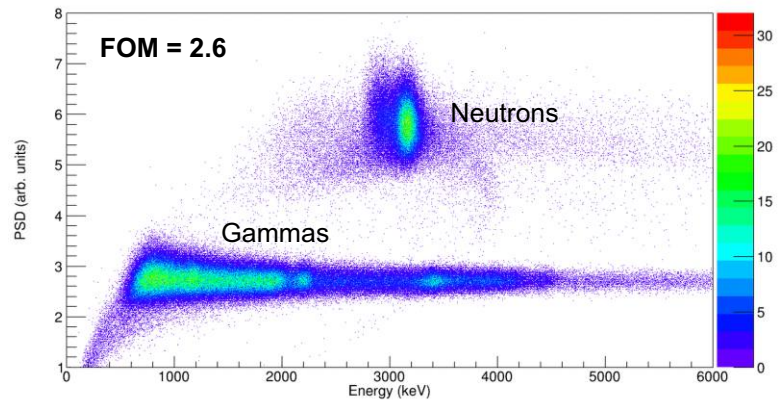
SiPM  
readout

## Description

**Elpasolite™** nEL-6x6c-SiPM is a new gamma neutron CLYC(Ce)-based solid state radiation detector made in the USA. Our proprietary crystal growth and encapsulation processes improve excellent properties of CLYC(Ce) and combine them with all the benefits of cutting edge SiPM technology. Build-in temperature sensor allows precise monitoring of SiPM/crystal temperature. nEL scintillator has a light yield of about 20,000 ph/MeV of gamma energy and 70,000 ph/neutron while energy resolution is about 5% with SiPM readout. A longer decay time of nEL under neutron excitation allows for easy discrimination between the neutron and gamma radiation using well-know pulse shape discrimination algorithms.

## Specifications

|  |                                    |
|--|------------------------------------|
| Shape  | Cuboid                             |
| Detector type  | Cs <sub>2</sub> LiYCl <sub>6</sub> |
| Detector size  | 6x6x6 mm                           |
| Energy range   | From 10 keV                        |
| Typical resolution   | 5% at 662 keV                      |
| Typical sensitivity to gamma radiation, cps/(μSv·h <sup>-1</sup> ) | 4 ( <sup>137</sup> Cs)             |
| Neutron detection  | Yes                                |
| Readout  | 6 mm SiPM                          |
| Dimensions   | 9x9x16 mm                          |
| Weight   | 3 g                                |
| Additional Features  | Fast and standard outputs          |

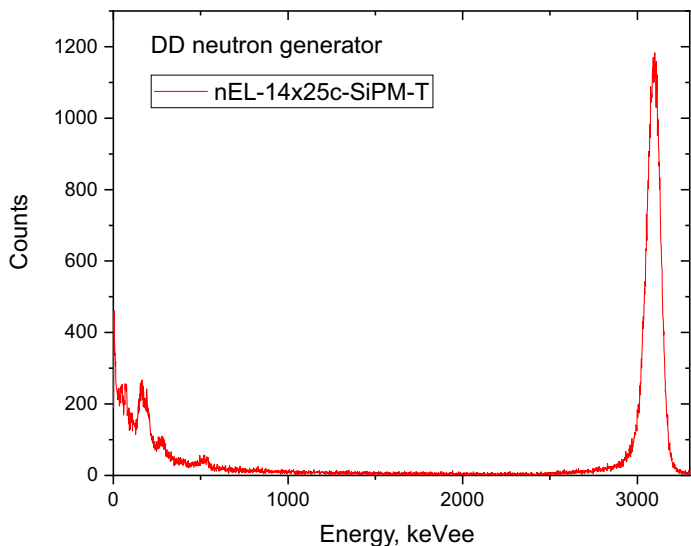
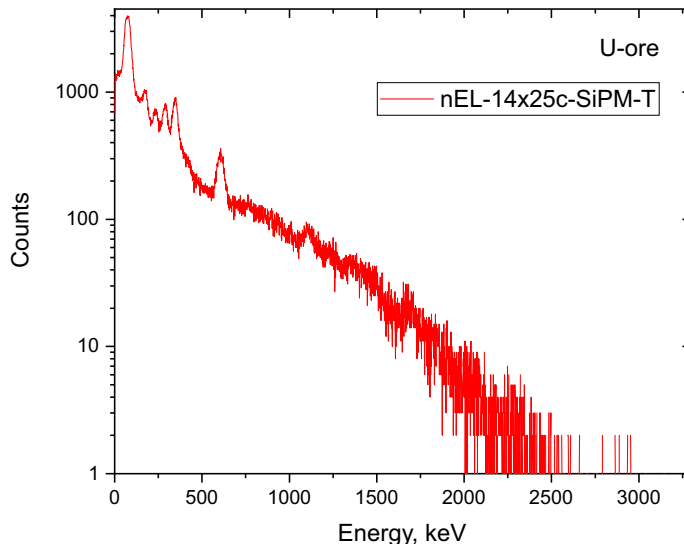
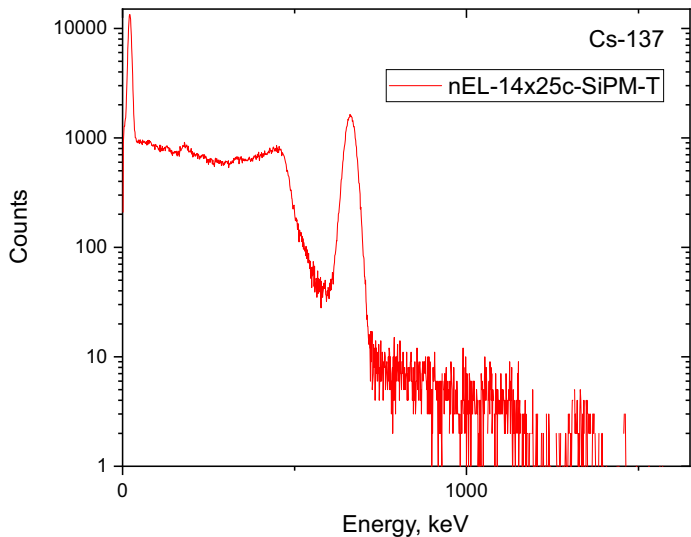
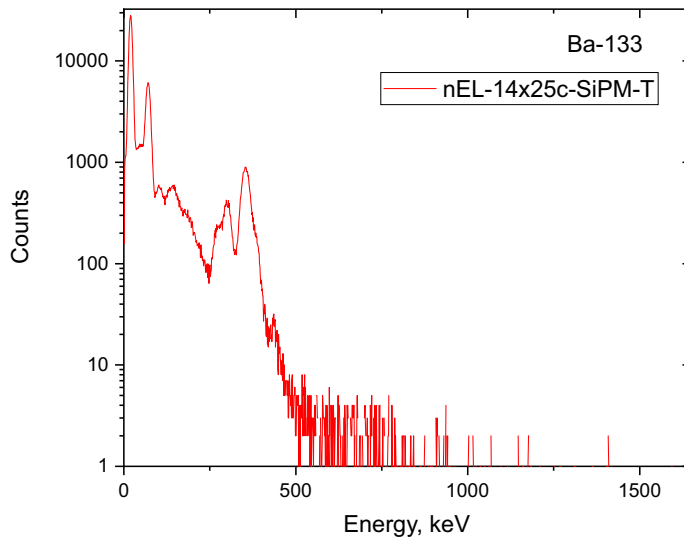
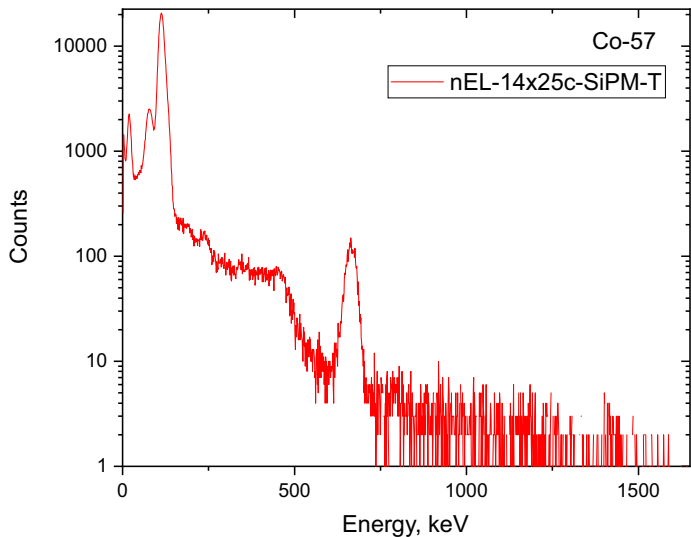


nEL crystals incorporate 7% 6-Li permitting thermal neutron detection, while Cl-35 enables fast neutron detection. The emission of nEL is comprised of fast core-valence luminescence (CVL) and Ce related emission resulting in two main decay components. Absence of CVL under neutron excitation allows for easy discrimination between the neutron and gamma radiation. An FOM value of 2.6 was achieved using a Pu/Be neutron source.

# ElpasLight nEL-6x6c-SiPM



## Unambiguous Identification with ElpasLight\*

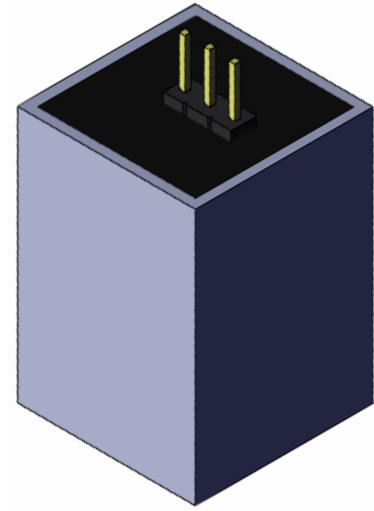
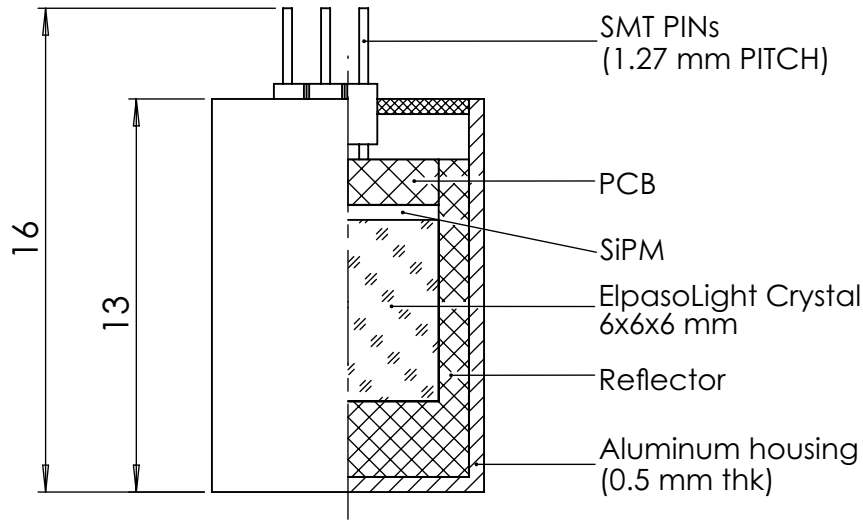


\* Presented spectra have been measured with nEL-14x25c-SiPM-T and can be different for other detector configurations.

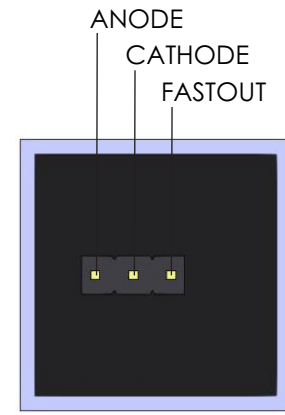
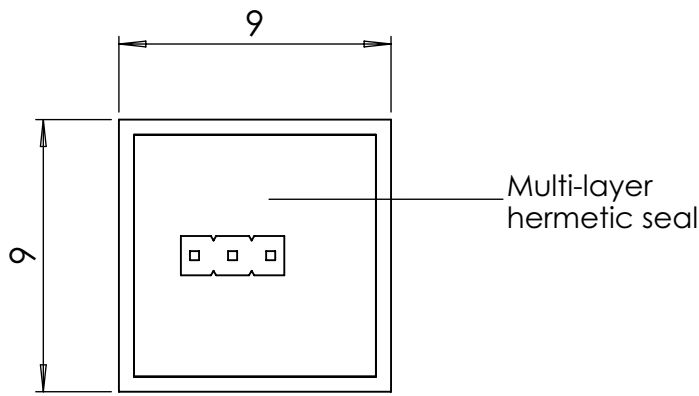
# ElpasLight nEL-6x6c-SiPM



## 2D drawing

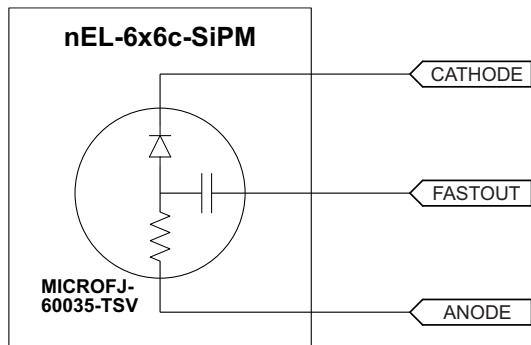


SCALE 4:1

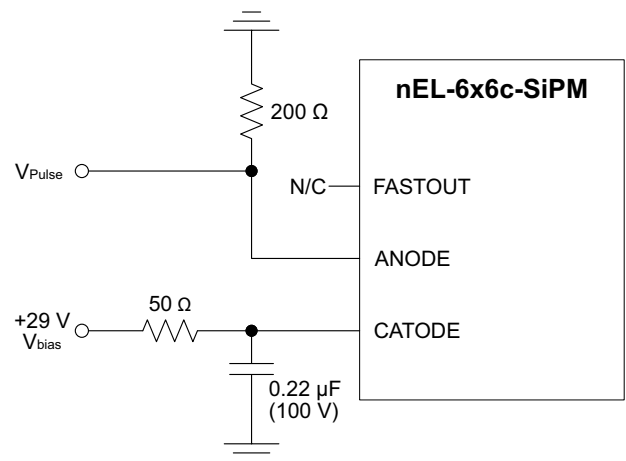


SCALE 4:1

## Block Diagram



## Typical Application



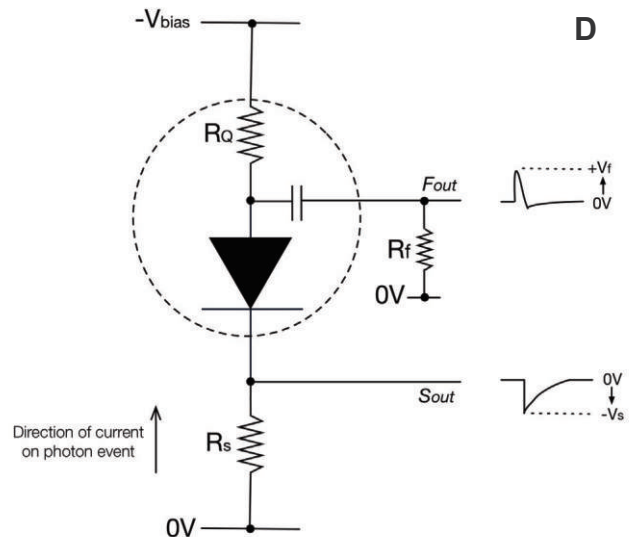
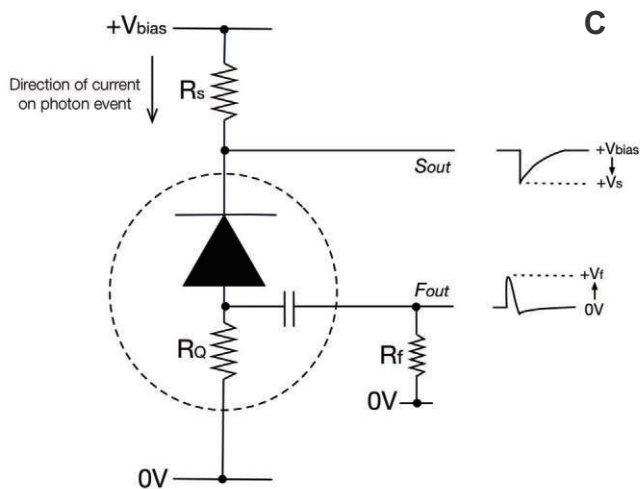
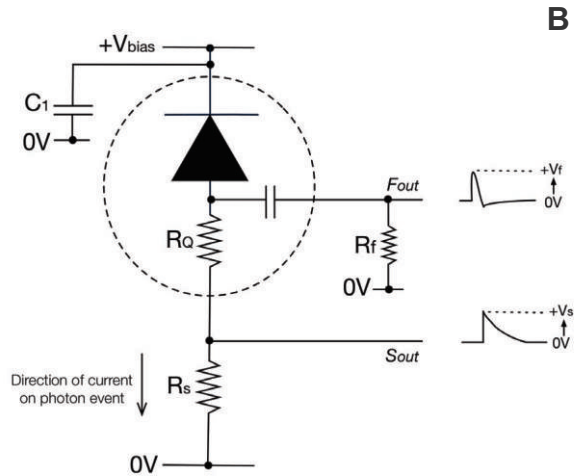
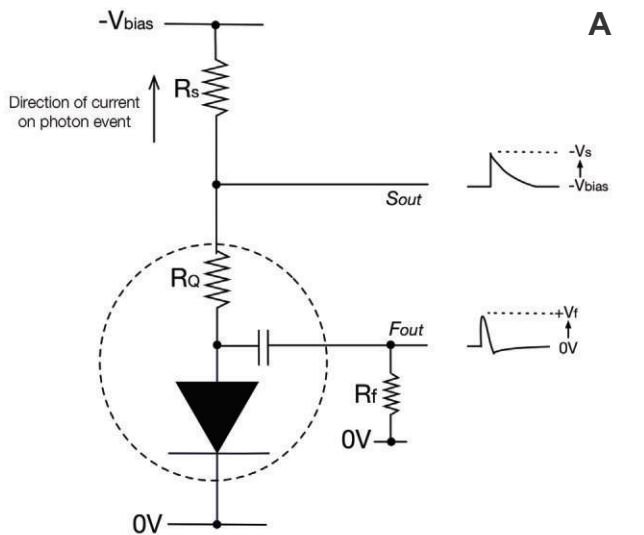
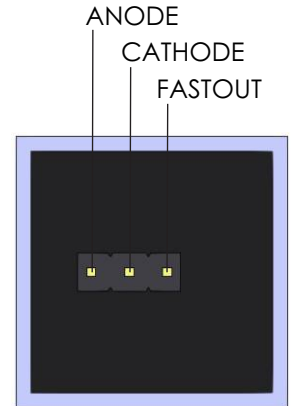
# Elpasolight nEL-6x6c-SiPM



## Biasing Alternatives & Signal Polarity

This Appendix lists all of the possible ways in which a J-Series SiPM can be biased. For each biasing arrangement, the standard and fast signal polarities are given. **A** and **B** are the recommended configurations. **C** and **D** will work, but are not recommended for use with the fast output. The following abbreviations are used throughout:

- $V_{bias}$  = bias voltage
- $S_{out}$  = standard output
- $F_{out}$  = fast output
- $R_s$  = load resistor for the standard output
- $R_f$  = load resistor for the fast output
- $V_s$  = standard output voltage
- $V_f$  = fast output voltage
- $R_Q$  = quench resistor (included on the SiPM die)
- $C_1$  = decoupling capacitor 10nF (50V), low ESR, ceramic



Ref.: J-Series High PDE and Timing Resolution, TSV Package, Datasheet, SensL

# Elpasolight nEL-6x6c-SiPM



## Application note: How to use “traditional” analog electronics with MacroPixel

To start acquiring spectra with MacroPixel is easy and straight-forward. The following example is for SC-14x25c-SiPM-T ScintiClear detector, but a similar approach can be utilized for all MacroPixel detectors. All you need is the following “traditional” analog electronics available in many labs dealing with scintillators and radiation measurements:

1) Stable programmable current source, capable of providing ripple-free bias up to +30 V and limited to 0.5 mA or three 9 V batteries. Apply this bias to the cathode of the MacroPixel. Additional filter can be used to minimize the noise coming from the power supply and connection lines (Figure 1).

2) There is no need to use a preamplifier. Signal can be monitored directly from the anode of the MacroPixel connected to the ground through a 50 Ohms resistor (Figure 2). At +30 V bias a typical pulse corresponding to 3000 keV deposited energy is about 200mV in amplitude and 20  $\mu$ s long for SC-14x25c-SiPM-T.

3) Shaping spectroscopy amplifier. The most commonly available models are: Ortec 671, 672, and 673, and Canberra 2025 or 2026.

4) Multi-channel analyzer (MCA) with a software. In our example we used Ortec’s Easy MCA with Maestro (Figure 3) but any other MCA can be used.

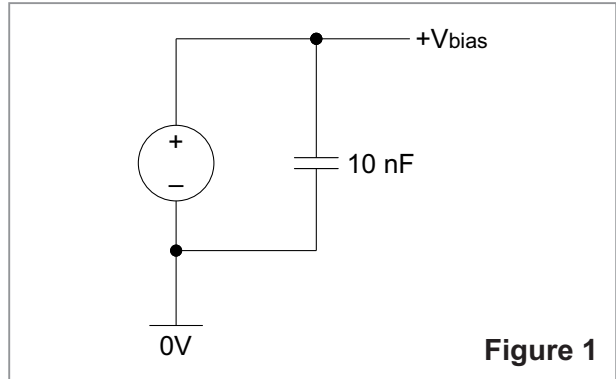


Figure 1

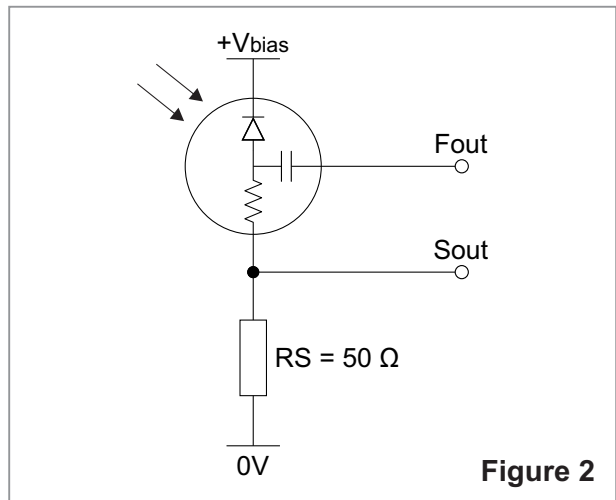


Figure 2

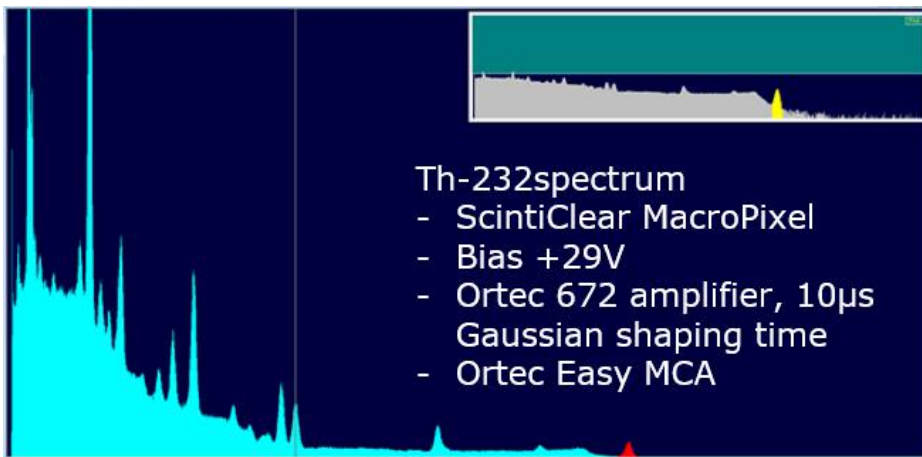


Figure 3

Th-232 emission spectrum measured with ScintiClear MacroPixel and “traditional” analog electronics. Bias +29 V, Ortec 672 amplifier, 10  $\mu$ s Gaussian shaping time, “+ NORM” input, 20 coarse gain





### About CapeScint

CapeScint is a subsidiary of CapeSym, Inc. a multi-faceted company with 100+ years of combined experience in scintillators, semiconductors, and radiation detection instruments. CapeScint has its warehouse facilities and customer support staff located in Greater Boston Area, Massachusetts, USA.

Founded in 1992 as Cape Simulations, CapeSym, Inc. is now a multi-faceted company offering novel technical crystals and detectors for nuclear detection, including ScintiClear™ SrI<sub>2</sub>(Eu) and Elpasolight™ CLYC(Ce) scintillators. In addition, CapeSym offers radiation detection instruments and equipment through [www.zievert.com](http://www.zievert.com).



Our ongoing R&D leverages decades of experience in crystal growth, solid state physics, analytical chemistry, materials science, thermo-fluid transport, and engineering design. CapeScint as a subsidiary of CapeSym, Inc. has a long history working with the US Government as a contractor and as a supplier of essential goods and services. During the last 30 years CapeSym, Inc. and supported missions of multiple US Government agencies including NASA, MDA, USAF, DoE, DTRA, NIH, CWMD, and US Navy.



*Design and specifications are subject to change without notice*