Scintillation Detectors integrated with Silicon Photomultiplier (SiPM)

As more scintillation detectors are shifting to silicon photomultipliers (SiPMs) from photomultiplier tubes (PMTs) due to the inherent advantages of compactness, ruggedness, low voltage and magnetic field insensitivity, Luxium Solutions has developed unique integrated solutions to truly leverage the value of SiPMs.

Flexible design:

Luxium Solutions SiPM based sensors have been designed for maximum flexibility with multiple options to meet your needs. Products range from upgraded versions of basic detectors with PMTs and integrated analog electronics to fully integrated, plug and play detectors with MCAs and a digital readout. Options include:

- **Functionality ranging from basic counters to analog and digital spectroscopy**
- **Modular construction to add capability to meet connectivity and environmental requirements**
- **Wide range of performance levels (power, resolution, etc.)**
- **Scalable for range of sensor sizes and applications**

Fully Optimized Total Sensor Solution:

Using our expertise with detector processing and packaging and optical analysis, Luxium Solutions has developed cost effective solutions to provide excellent performance, including optimization of:

- **Number and location of SiPMs for required performance**
- **Detector packaging to match SiPM configuration**
- **Gain compensation over a wide temperature range**
- **TTL Output with factory selectable threshold levels for counting applications**

Ruggedness:

Luxium Solutions, an acknowledged leader in building long lasting, rugged radiation detectors, has leveraged our expertise to develop industry-leading SiPM integrated solutions. Features include:

- **Designed for and evaluated under ANSI N42.34, 2021**
- **Option for water tight package and connectors**
- **Long lasting hermetic sealing technology**

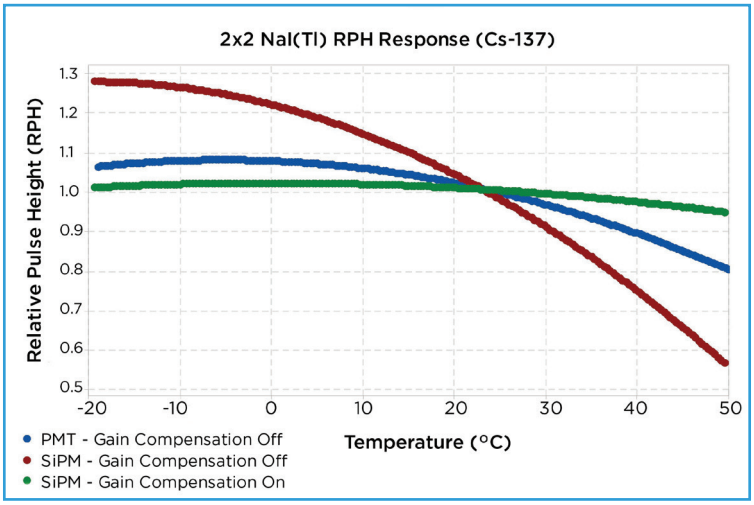
Luxium Solutions has the SiPM integrated solution to meet your needs, ranging from standard configurations to highly customized applications

Size comparison of 2"x2" NaI detector with PMT and voltage divider to equivalent SiPM and electronics package

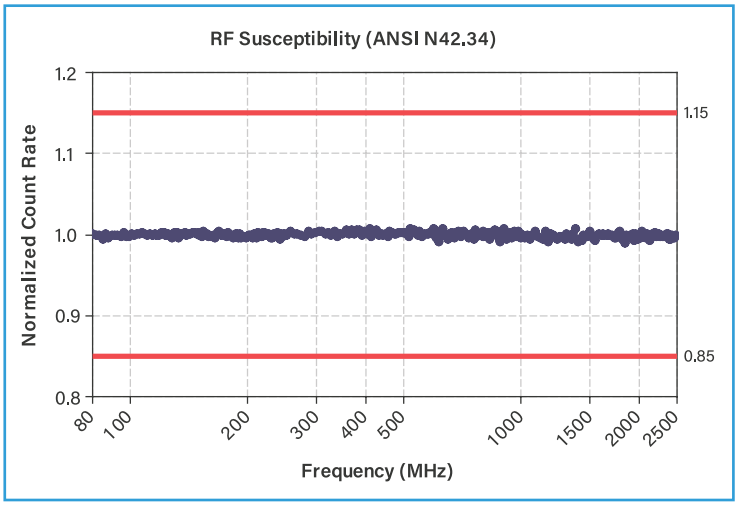
LUXIUM SOLUTIONS

Scintillation Detectors Integrated with SiPM

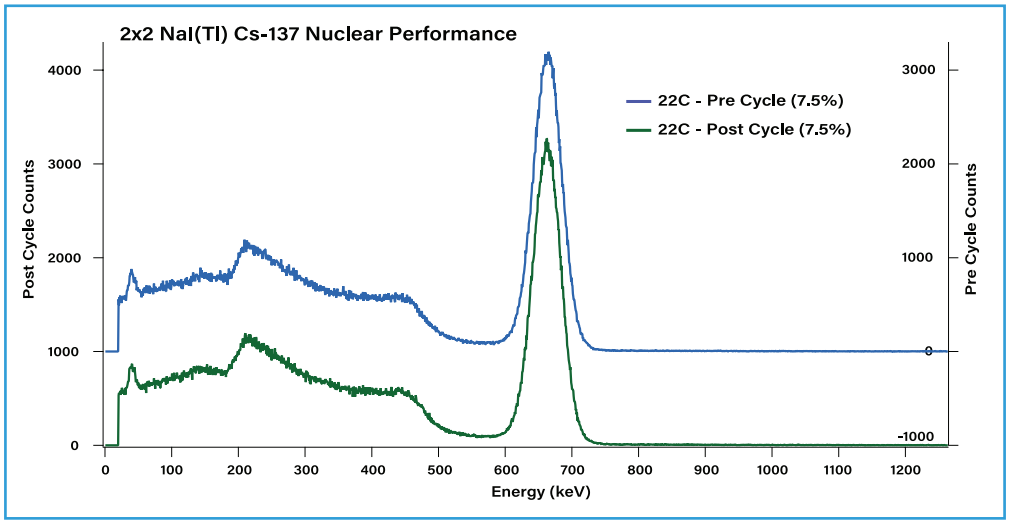
Luxium Solutions SiPM based technology has been successfully evaluated under the following ANSI N42.34, 2021 conditions:	
Temperature (-20°C to 50°C)	Section 7.1 and 7.2
Humidity (to 93% relative)	Section 7.3
Moisture & Dust Ingress	Section 7.4
Marine Environment (Salt Fog)	Section 7.5
Radiated Immunity (10V/m @ 80MHz to 1GHz, 3V/m @ 1GHz – 2.5GHz)	Section 8.1
Radiated Emissions	Section 8.2
Magnetic Field Immunity (100A/m @ 60Hz)	Section 8.3
Electrostatic Discharge	Section 8.4



Gain compensation technique addresses the SiPM temperature dependence and closely matches the PMT curve. This allows for a plug and play compatibility with existing control schemes. Gain compensation parameters can also be adjusted to address specific customer needs.



Performance of SiPMs and low noise electronics is unaffected when exposed to a RF field of 10V/m from 80MHz to 2500MHz.



Cs-137* nuclear performance before and after ANSI N42.34 thermal cycling (-20°C to 50°C @ 8C/hr).

*Tested with a Cs-137 encapsulated metal source.

Standard Offering

Detector Ratings		Comments
Operating Voltage	5V	USB Power
Current Draw	20mA	
Max Count Rate	130kHz / 225kHz	Charge Sens / I-V
Decay Time	50µs / 700ns	Charge Sens / I-V
Rise Time	110ns	
Bandwidth	20db	
Output	≈ 0.25 mV / keV	
Proportionality	≈ 3.8	NaI(Tl), 2.6MeV/662keV
Drift	<1%	Short term and long term
Gain Compensation	<±10%	-20°C to +50°C
Noise Edge	<8keV	@ 20°C
Signal Noise	$<1mV_{pp}$	
Output Impedance	50Ω	
Gain	2.5mV/pC	
Dynamic Range	9keV – 6MeV	

LUXIUM SOLUTIONS

www.luxiumsolutions.com