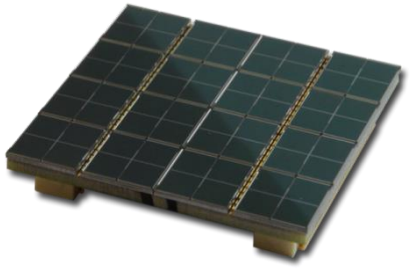
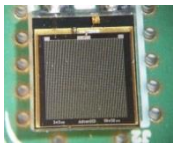
SCIONIX

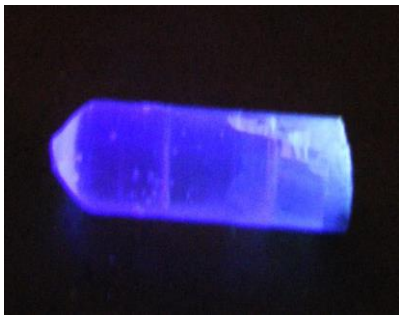
Data Sheet

Scintillators with Silicon Photomultiplier readout

Silicon photomultipliers







An alternative to the readout of scintillation crystals with photomultiplier tubes is the use of so-called silicon photomultipliers (SiPms)

- Low voltage operation (25-30 V)
- Insensitive to magnetic fields
- High gains (10^6)
- Mechanically compact
- Elements 3x3 of 6x6 mm

SiPm elements can be combined into matrices. SiPms can be operated up to 60 degrees C.

Disadvantages of SiPms are :

- Linearity of pulse height spectrum strongly depending on bias and scintillator speed
- Temperature dependent gain
- noise at higher temperatures
- Cost per cm^2

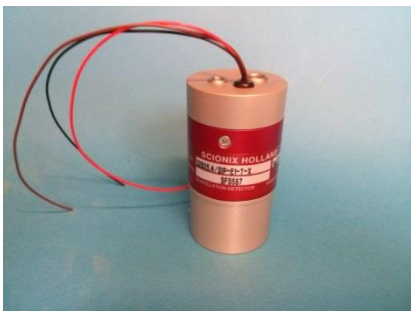
For applications where small size and low voltage operations are required, SiPm readout of scintillators can be a good choice.

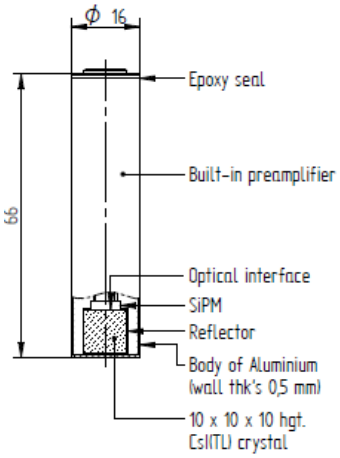
SiPms behave totally different from classical photomultiplier tubes, as well with respect to signal processing as to spectroscopic behavior.

The gain of SiPms is a very strong function of the bias voltage which should be chosen carefully depending on the actual application of the detector.

The number of SiPms needed on a scintillation crystal depends on the requirements.

SCIONIX has developed a range of sensors equipped with SiPms for a great variety of applications.



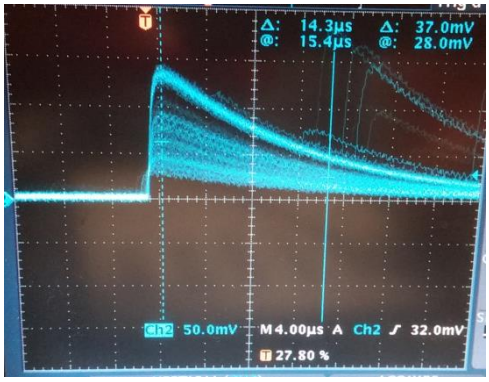


The energy resolution and noise level achievable with SiPm readout depends on the crystal dimenions, type of scintillator and area covered by the SiPm; some examples

Crystal size and type	**Energy resolution (662 keV)**
NaI(Tl) 32 x 25 mm	< 8.0 %
CsI(Tl) 25 x 25 mm	< 7.0 %
CsI(Tl) 35 x 51	< 7.5 %
CsI(Tl) 48 x 35 mm	< 7.5 %

Signal shapes

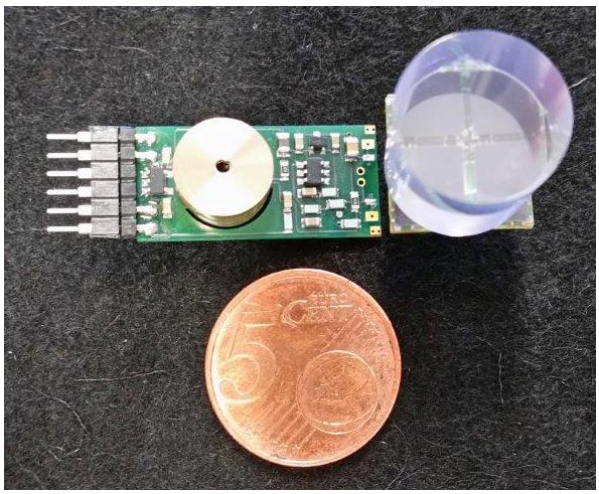
The signal of a SiPm detector depends very strongly on the termination resistor.
A typical example of a bare NaI(Tl) SiPm signal is shown below.



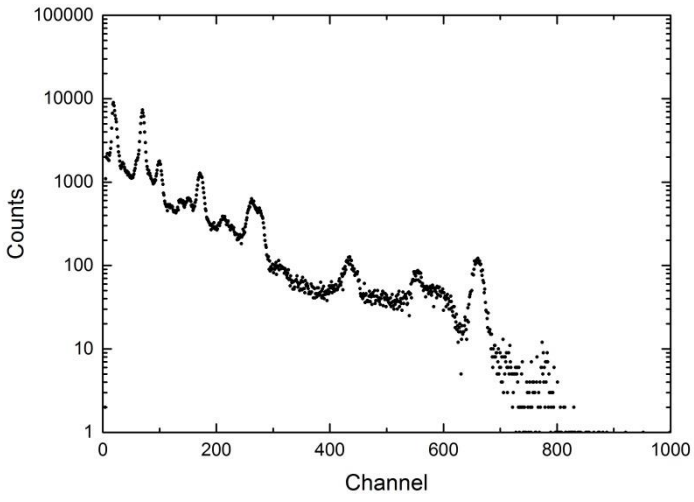
1 MΩ termination

50 Ω termination

SCIONIX has developed bias generator / preamplifier modules for SiPm scintillation detectors. The gain drift as a function of temperature is internally corrected. Such modules operate at voltage 5.2 – 16V and consume less than 30 mW.



Bias generator / preamplifier for SiPms CsI(Tl)



Thorium spectrum of 35x51 mm SiPm detector

Scionix Holland B.V.
P.O. Box 143
3980 CC Bunnik
The Netherlands

Tel: + 31 30 657 03 12
Fax: +31 30 656 75 63
Website: www.scionix.nl
E-mail: sales@scionix.nl