# SPCM-NIR NIR-Optimized Single Photon Counting Module



Excelitas Technologies' SPCM-NIR is a Single Photon Counting Module specifically selected and performance-optimized for the near infra-red wavelength spectrum.

The SPCM-NIR uses a specially selected SLiK silicon avalanche photodiode with peak single photon detection efficiency typically better than 73% while maintaining uniformity over a 180  $\mu$ m diameter active area. This module achieves enhanced red and NIR sensitivity while maintaining such other performance parameters of the standard SPCM-AQRH, such as outstanding uniformity, overload protection, temperature stability and linearity

This NIR spectrum enhanced device is designed to support long range LIDAR, quantum communication and microscopy, as well as many other applications.

Excelitas' series of photon counting modules are designed and built to be fully compliant with the European Union Directive 2011/65/EU – Restriction of Hazardous Substances in Electrical and Electronic equipment (RoHS).

#### **Key Features**

- Peak photon detection efficiency (PDE) @ 780 nm: 70% typical
- Active area: 180 μm
- Gated output
- Single +5 V supply
- RoHS-compliant
- Linearity over high count rate

#### **Applications**

- LIDAR
  - Quantum Cryptography
  - Photon correlation spectroscopy
  - Astronomical observation
  - Optical range finding
- Adaptive optics
- Ultra-sensitive fluorescence
- Particle sizing
- Microscopy and imaging



## Table 1. Absolute Maximum Ratings

| Supply voltage <sup>(1)</sup>   | 5.5 V   |
|---------------------------------|---|
| Maximum count rate              | Maximum count rate can be sustained if case temperature is maintained within limit specified limits |
| Peak light intensity            | Maximum $10^4$ photons per pulse, pulse width < 1 ns  |
| Case temperature <sup>(3)</sup> | -20°C/+70°C storage, +5°C /+70°C operating  |

## Table 2. Specifications of SPCM-NIR, @ 22 °C, all models; unless otherwise indicated <sup>(1)</sup>

| Parameter  | Min | Тур  | Max                               | Unit               |
|--|-----|------|-----------------------------------|--------------------|
| Active area (diameter) at minimum PDE  | 170 | 180  |                                   | μm                 |
| Photon detection efficiency (PDE)<br>(without FC adaptor) at <sup>(2)</sup> :      |     |      |                                   |                    |
| 780 nm   | 64  | 70   |                                   | %                  |
| 800 nm   | 62  | 68   |                                   | %                  |
| 850 nm   | 54  | 58   |                                   | %                  |
| 900 nm   | 41  | 45   |                                   | %                  |
| Dark Count SPCM-NIR-W0<br>SPCM-NIR-W1<br>SPCM-NIR-W2<br>SPCM-NIR-W3<br>SPCM-NIR-W4 |     |      | 1500<br>1000<br>500<br>250<br>100 | Counts /<br>second |
| Single photon timing resolution (at 825 nm) <sup>(3)</sup>                         |     | 350  |                                   | ps                 |
| Dead time (count rate below 5M/c)<br>Other values can be factory set               |     | 20   | 40                                | ns                 |
| Output count rate before saturation  | 12  | 40   |                                   | Mc/s               |
| Linearity correction factor at 200 Kc/s  |     | 1    |                                   |                    |
| 1 Mc/s   |     | 1.02 |                                   |                    |
| 5 Mc/s   |     | 1.16 |                                   |                    |
| 10 Mc/s  |     | 1.40 |                                   |                    |
| 20 Mc/s  |     | 2.35 |                                   |                    |
| 25 Mc/s  |     | 3.32 |                                   |                    |
| Afterpulsing probability   |     | 1.0  | 3.0                               | %                  |

(1) For other performance characteristics, refer to Operating Instructions, product notes and specifications listed on the standard SPCM-AQRH data sheet.

(2) Minimum photon detection efficiency (PDE) measured and recorded at specific wavelength, refer to Table 3, Ordering Guide.

(3) For timing resolution enhanced module, consult Product Brief for SPCM-AQRH-TR series.

## SPCM-NIR Series NIR-Optimized Single Photon Counting Module

### Table 3. Ordering Guide



## Table 3A. Part Number Selection Guide

| Order Part# | W - Output Pulse Options   |                   |                            | X - Dark Count Rates |          |         |         |         |
|-------------|----------------------------|-------------------|----------------------------|----------------------|----------|---------|---------|---------|
| WX-YY       | Output Pulse<br>Width (ns) | Dead Time<br>(ns) | Output Pulse<br>Height (V) | -W0                  | -W1      | -W2     | -W3     | -W4     |
| SPCM-NIR-1X | 10                         | 22                | 2.2                        | ≤1500 cps            | ≤1000cps | ≤500pcs | ≤250pcs | ≤100cps |
| SPCM-NIR-2X | 18                         | 28                | 2.2                        | ≤1500 cps            | ≤1000cps | ≤500pcs | ≤250pcs | ≤100cps |
| SPCM-NIR-3X | 28                         | 35                | 2.2                        | ≤1500 cps            | ≤1000cps | ≤500pcs | ≤250pcs | ≤100cps |
| SPCM-NIR-4X | 10                         | 22                | 4.4                        | ≤1500 cps            | ≤1000cps | ≤500pcs | ≤250pcs | ≤100cps |
| SPCM-NIR-5X | 18                         | 28                | 4.4                        | ≤1500 cps            | ≤1000cps | ≤500pcs | ≤250pcs | ≤100cps |
| SPCM-NIR-6X | 28                         | 35                | 4.4                        | ≤1500 cps            | ≤1000cps | ≤500pcs | ≤250pcs | ≤100cps |



## Figure 1. Typical Photon Detection Efficiency (PDE) vs. Wavelength

#### Warranty

A standard 12-month warranty following shipment applies. Any warranty is null and void if the module case has been opened. Warranty is null and void if the module input exceeds 5.5V or the polarity of the +5V supply is reversed.

#### Individual Module Test Data

Each module is supplied with test data indicating the module's actual dark count, dead time, pulse width, photon detection efficiency at the chosen wavelength per Ordering Guide, and linearity correction factor.

### **RoHS Compliance**

This series of SPCM module is designed and built to be fully compliant with the European Union Directive 2011/65/EU – Restriction of the use of certain Hazardous Substances (RoHS) in Electrical and Electronic equipment.



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