

# photodetector module

## PDM04-9111-USB data sheet (provisional)

### 1 description

The PDM04-9111-USB is a plug-and-play photon counting module incorporating a high sensitivity, low noise, 25mm diameter photomultiplier, fast counting electronics and a low-power high voltage supply. The counting electronics consist of an amplifier/discriminator with an adjustable threshold and a multi-channel scaler/counter timer which records and stores data as a function of time. There is a choice of three software configurable counting modes: pre-set number of channels, pre-set total measurement period, or continuous. HV level and data retrieval are controlled by dedicated application software.

The spectral range of the PDM04-9111-USB is 280-630nm. Other versions are available with a wider range, for example the PDM04-9111W-USB, which extends the UV sensitivity, or the PDM04-9113-USB for applications requiring red/ir response.

The combination of an effective photosensitive diameter of 22mm, and a dark count of typically 100cps at 20°C, results in a unique detection capability. The module is also very easy to use, the only additional requirement being a PC or laptop with a free USB port.

A positive-polarity high-voltage supply is used for maximum count-rate stability at very low light levels and a mumetal\* rectangular housing provides a high degree of immunity to external magnetic fields.

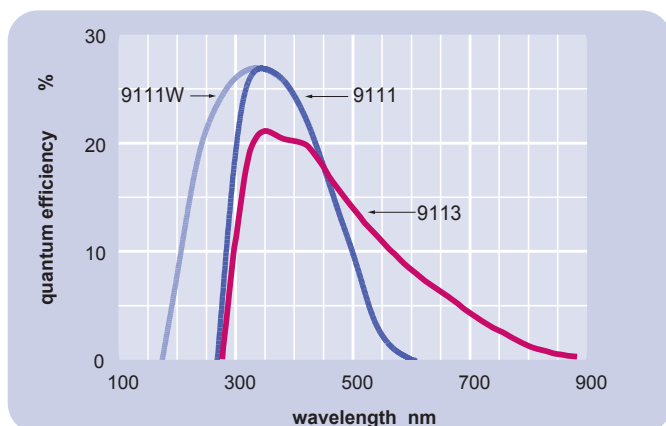
### 2 applications

The PDM04-9111-USB is suitable for all applications involving photon-counting mode light detection down to single photons. Typical uses are time-resolved fluorescence, luminescence and similar investigations.

### 3 features

- easy plug-and-play operation
- wide dynamic range
- no external power supply required
- magnetic and electrostatic shielding
- spectral range options
- 22mm diameter detection area
- low noise
- fibre coupling possible

### 4 photocathode spectral response



### 5 characteristics

|                                        | unit | min               | typ  | max    |
|----------------------------------------|------|-------------------|------|--------|
| photocathode: bialkali                 |      |                   |      |        |
| active diameter                        | mm   |                   | 25   |        |
| spectral response range - 9111         | nm   | 280               |      | 630    |
| spectral response range - 9111W        | nm   | 170               |      | 630    |
| quantum efficiency (peak) - 9111/9111W | %    |                   | 28   |        |
| spectral response range - 9113         | nm   | 280               |      | 850    |
| quantum efficiency (peak) - 9113       | %    |                   | 21   |        |
| output:                                |      |                   |      |        |
| interface type                         |      | USB 2.0 or higher |      |        |
| connector type                         |      | Micro USB Type B  |      |        |
| signal:                                |      |                   |      |        |
| pulse-pair resolution                  | ns   |                   | 25   |        |
| dead time                              | ns   |                   | 25   |        |
| count rate:                            |      |                   |      |        |
| without dead-time correction           | cps  |                   |      | 30M    |
| with dead-time correction              | cps  |                   |      | 100M   |
| channel width                          |      | 0.2ms             |      | 999hrs |
| discriminator level (adjustable)       | mV   | 2                 |      | 8      |
| dark count rate at 20°C - 9111/9111W   | cps  |                   | 100  | 200    |
| dark count rate at 20°C - 9113         | cps  |                   | 3000 |        |
| supply (from USB connection)           |      |                   |      |        |
| voltage                                | V    | 4.5               |      | 5.5    |
| current:                               |      |                   |      |        |
| no signal                              | mA   |                   | 40   |        |
| signal = 100Mcps                       | mA   |                   | 120  |        |
| operating voltage                      | V    | 100               |      | 2000** |
| warm-up time                           | s    |                   | 1    |        |
| temperature (operating)                | °C   | 5                 |      | 55     |
| temperature (storage)                  | °C   | -40               |      | 60     |
| weight                                 | g    |                   | 180  |        |

\*\*subject to not exceeding maximum rated gain of the pmt

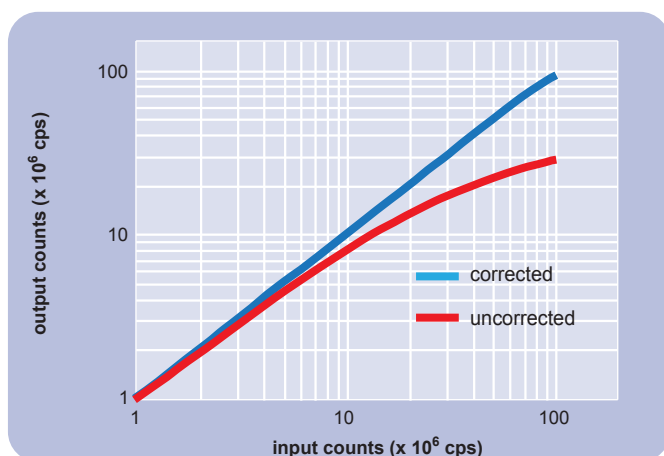
## 6 dynamic range

Extended dynamic range can be obtained by dead time correction to compensate for departure from linearity at high count rates due to pulse pile-up. Dead time may be corrected for, as follows:

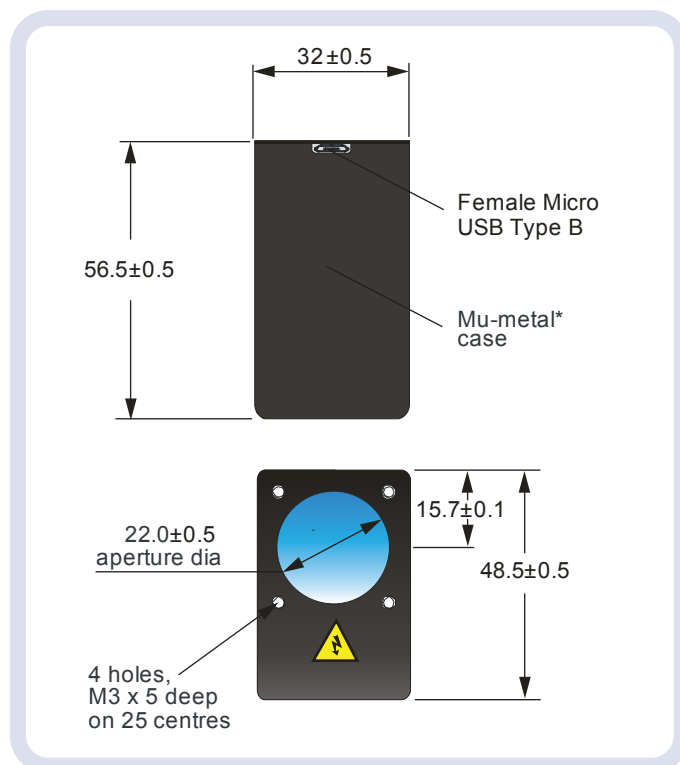
$$N = n/(1-nT)$$

where:  $N$  is the true count rate (cps),  
 $n$  is the measured count rate (cps),  
 $T$  is the count rate correction factor ( $25 \times 10^{-9}$ s),

Using this correction, deviation from linearity is typically within  $\pm 5\%$  at 100Mcps.



## 8 outline drawing mm



\*Mu-metal is a registered trademark of Magnetic Shield Corporation

## 7 installation and operation

Each module is supplied with test data. Wherever possible, installation should be carried out in subdued light. Exposure to strong lights, particularly those containing a high UV content, can result in a temporary increase in dark counts during subsequent operation.

Remove the protective cap or cover from the package. If necessary, the photomultiplier window can be cleaned using a lens tissue moistened with alcohol. Do not use any other solvent.

Mount the module in a light-tight enclosure with the light source to be measured and install the application software by downloading from the ET Enterprises Limited website ([www.et-enterprises.com](http://www.et-enterprises.com)). Connect the USB cable to the PC or laptop and run the application. Further details are given in the user manual which can also be downloaded from the ET Enterprises website.

## 9 ordering information

|                        |                           |
|------------------------|---------------------------|
| <b>PDM04-9111-USB</b>  | visible range (280-630nm) |
| <b>PDM04-9111W-USB</b> | extended UV (170-630nm)   |
| <b>PDM04-9113-USB</b>  | visible range (280-850nm) |

## 10 warning

No attempt must be made to repair or dismantle this product. High voltage used within the module may present an electric shock hazard.

**ET Enterprises Limited**  
 45 Riverside Way  
 Uxbridge UB8 2YF  
 United Kingdom  
 tel: +44 (0) 1895 200880  
 fax: +44 (0) 1895 270873  
 e-mail: [sales@et-enterprises.com](mailto:sales@et-enterprises.com)  
 web site: [www.et-enterprises.com](http://www.et-enterprises.com)

**ADIT Electron Tubes**  
 300 Crane Street  
 Sweetwater TX 79556 USA  
 tel: (325) 235 1418  
 toll free: (800) 399 4557  
 fax: (325) 235 2872  
 e-mail: [sales@electron tubes.com](mailto:sales@electron tubes.com)  
 web site: [www.electrontubes.com](http://www.electrontubes.com)

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 DS\_PDM04-9111-USB Issue 2 (10/04/17)