Key Features and Benefits

- **1600 × 200 or 1600 × 400 EMCCD sensor**
  16 × 16 μm pixel size for high spectral resolution

- **25.6 × 3.2 mm or 25.6 × 6.4 mm image area**
  Ideal for high-speed or multi-track spectroscopy

- **Back- and front-illuminated**
  BIQX Technology with enhanced QE below 450 nm

- **Deep thermoelectric cooling**
  Air or liquid circulation to minimize dark current

- **Dual readout modes**
  EMCCD or CCD for a broad range of light conditions

- **Readout rates up to 3 MHz**
  Acquires more than 1600 spectra per second

- **Single fused-silica vacuum window**
  Minimizes reflection losses from UV to near-IR

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**Key Applications**

- Raman spectroscopy
- SERS, TERS
- Multi-track spectroscopy
- Transient spectroscopy
- Single-molecule spectroscopy

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**Synapse EM-BIQX provides enhanced QE for UV Raman laser line**

*Compared to conventional back-illuminated sensor*
## Synapse EM Specifications

### Sensor
- **Front-illuminated (FI), back-illuminated (BI), scientific grade 1**

### Active pixels
- 1600 × 200
- 1600 × 400

### Pixel size
- 16 μm × 16 μm

### Image area
- 25.6 mm × 3.2 mm
- 25.6 mm × 6.4 mm

### Output node well capacity
- **High Sensitivity mode**
  - EM off: 300,000 e⁻
  - EM on: 1,300,000 e⁻
- **Electron Multiplying mode**
  - EM off: 450,000 e⁻
  - EM on: 800,000 e⁻

### Register Well Depth
- **High Sensitivity mode**
  - EM off: 300,000 e⁻
  - EM on: 1,300,000 e⁻
- **Electron Multiplying mode**
  - EM off: 450,000 e⁻
  - EM on: 800,000 e⁻

### Non-linearity
- (measured at all readout speeds)
- < 0.75%

### Readout Noise (e⁻ / pixel/s)

<table>
<thead>
<tr>
<th>Speed</th>
<th>FI (Typ.)</th>
<th>EM off (Typ.)</th>
<th>EM on (Typ.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 kHz</td>
<td>2.7 (5)</td>
<td>6.1 (9)</td>
<td>8.5 (12)</td>
</tr>
<tr>
<td>1 MHz</td>
<td>8.0 (15)</td>
<td>23 (35)</td>
<td>38 (50)</td>
</tr>
<tr>
<td>3 MHz</td>
<td>&lt; 1</td>
<td>&lt; 1</td>
<td>&lt; 1</td>
</tr>
</tbody>
</table>

### Dark Current at —60°C (e⁻ / pixel/s)

<table>
<thead>
<tr>
<th>Mode</th>
<th>FI</th>
<th>BI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; 0.002</td>
<td>&lt; 0.01</td>
</tr>
</tbody>
</table>

### Maximum spectra per second

<table>
<thead>
<tr>
<th>Mode</th>
<th>Full vertical bin</th>
<th>ROI mode 20 rows</th>
<th>ROI mode 8 rows</th>
</tr>
</thead>
<tbody>
<tr>
<td>FI</td>
<td>616</td>
<td>1475</td>
<td>1613</td>
</tr>
<tr>
<td>BI</td>
<td></td>
<td>376</td>
<td></td>
</tr>
</tbody>
</table>

### Software-adjustable gain (e⁻ / count)

- **High Sensitivity mode**
  - Selectable from 0.6 to 4.0
- **Electron Multiplying mode**
  - Selectable from 3.6 to 25

### Electron multiplier gain
- 1 to 1000, software-controlled

### Digitization
- 16-bit ADC

### Power requirements
- **AC-DC power supply (provided)**
  - AC input 90–264 VAC, 47–63 Hz
  - DC output +9 V, 6.44 A maximum

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(1) Region Of Interest (ROI) mode 8 rows
(2) Measured at -60°C
(3) Measured at all read-out speeds for each camera
(4) Some decrease in CTE may be observed at faster speeds.

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