Driving the Absolute Best From EMCCD Technology

Andor’s iXon 897 back-illuminated EMCCD has single photon detection capability combined with > 90% QE. This highly popular 512 x 512 frame transfer format delivers unequaled thermoelectric cooling down to -100°C, industry-lowest clock induced charge noise, and operates at 35 frames/sec (full resolution). New EX2 technology offers extended Quantum Efficiency performance.

Andor’s ‘overclocked’ vertical shift capability offers distinct speed advantages and minimizes vertical smear. EMCCD and conventional CCD readout modes provide heightened application flexibility.

The iXon 897 benefits from an advanced set of user-requested features, including OptAcquire, Count Convert, Spurious Noise Filters, Cropped Sensor Mode, Signal Averaging and enhanced Photon Counting capability. Patented EMCAL™ and RealGain™ provide sustained quantitative EM gain calibration.

Specifications Summary

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active pixels</td>
<td>512 x 512</td>
</tr>
<tr>
<td>Pixel size (W x H)</td>
<td>16 x 16 μm</td>
</tr>
<tr>
<td>Active area pixel well depth</td>
<td>180,000 e⁻</td>
</tr>
<tr>
<td>Gain register pixel well depth</td>
<td>800,000 e⁻</td>
</tr>
<tr>
<td>Maximum readout rate</td>
<td>10 MHz</td>
</tr>
<tr>
<td>Frame rate</td>
<td>35 – 7,980 fps</td>
</tr>
<tr>
<td>Read noise</td>
<td>&lt; 1e⁻ with EM gain</td>
</tr>
<tr>
<td>Maximum cooling</td>
<td>-100°C</td>
</tr>
</tbody>
</table>
# Advanced Performance Specifications

<table>
<thead>
<tr>
<th>Dark current and background events</th>
</tr>
</thead>
</table>
| Dark current (e^-/pixel/sec) @ -85°C | 0.001  
| Spurious background (events/pix) @ 1000x gain / -85°C | 0.005  
| Active area pixel well depth | 180,000 e^-  
| Gain register pixel well depth | 800,000 e^-  
| Pixel readout rates |  
| Electron Multiplying Amplifier |  
| 10, 5, 3, 1 MHz |  
| Without Electron Multiplication |  
| 1 MHz through EMCCD amplifier | 49  
| 5 MHz through EMCCD amplifier | 42  
| 3 MHz through EMCCD amplifier | 32  
| 1 MHz through EMCCD amplifier | 21  
| Conventional Amplifier |  
| 3 & 1 MHz |  
| With Electron Multiplication |  
| 1 MHz through conventional amplifier | 6  
| Linear absolute Electron Multiplier gain | 1 - 1000 times via RealGain™ (calibration stable at all cooling temperatures)  
| Linearity | Better than 99%  
| Vertical clock speed | 0.3 to 3.3 µs (variable)  

## Frame Rates (Standard Mode)

<table>
<thead>
<tr>
<th>Binning</th>
<th>Array size</th>
</tr>
</thead>
<tbody>
<tr>
<td>512 x 512</td>
<td>256 x 256</td>
</tr>
<tr>
<td>1 x 1</td>
<td>35</td>
</tr>
<tr>
<td>2 x 2</td>
<td>68</td>
</tr>
<tr>
<td>4 x 4</td>
<td>131</td>
</tr>
<tr>
<td>8 x 8</td>
<td>231</td>
</tr>
</tbody>
</table>

## Frame Rates (Cropped Sensor Mode)

<table>
<thead>
<tr>
<th>Binning</th>
<th>Array size</th>
</tr>
</thead>
<tbody>
<tr>
<td>256 x 256</td>
<td>128 x 128</td>
</tr>
<tr>
<td>1 x 1</td>
<td>69</td>
</tr>
<tr>
<td>2 x 2</td>
<td>136</td>
</tr>
<tr>
<td>4 x 4</td>
<td>260</td>
</tr>
<tr>
<td>8 x 8</td>
<td>483</td>
</tr>
</tbody>
</table>
Quantum Efficiency Curves

![Quantum Efficiency Curves](image)

QE vs. Fluorophores Curve

![QE vs. Fluorophores Curve](image)

Stability Plot

![Stability Plot](image)

Application Image

![Application Image](image)

Composite triple color image of a microtubule protein (EB1-GFP) imaged with objective-type TIRFM (60x 1.45NA), using the 897 model. The different colors reveal the dynamics of the microtubules over time: frame 1 = red; frame 10 = green; frame 20 = blue.

Courtesy of Dr Derek Toomre, CINEMA laboratory, Dept. Cell Biology, Yale University.
Creating The Optimum Product for You

How to customise the iXon 897:

**Step 1.**
Simply select from the 2 digitisation options that best suit your needs from the selection opposite.

**Step 2.**
Please indicate if you require a shutter fitted to your iXon 897.

**Step 3.**
The iXon 897 comes with 5 options for sensor types. Please select the sensor which best suits your needs.

**Step 4.**
Please indicate alternative window option if required.

**Step 5.**
Please indicate which software and controller card you require.

**Step 6.**
For compatibility, please indicate which accessories are required.

**DU-897 D - C S 0- (EXF)** example shown

**Step 1.**
Choose digitisation option
- D: 10, 5, 3 & 1 MHz readout @ 14 bit
- E: 10, 5, & 3 MHz readout @ 14 bit and 1 MHz @ 16 bit

**Step 2.**
Choose shutter option
- S: Standard built-in mechanical shutter
- 0: No shutter

**Step 3.**
Choose sensor finish option
- #BV: Back-illuminated, standard AR coated
- BVF: Back-illuminated, standard AR coated with fringe suppression
- UVB: Back Illuminated, standard AR with additional lumogen coating
- #EX: Back-illuminated, EX2 dual AR coated
- EXF: Back-illuminated, EX2 dual AR coated with fringe suppression

**Step 4.**
Select alternative camera window (optional)
The standard window has been selected to satisfy most applications. However, other options are available. The alternative camera window code must be specified at time of ordering.

To view and select other window options please refer to the ‘Camera Windows Supplementary Specification Sheet’ which gives the transmission characteristics, product codes and procedure for entering the order. Further detailed information on the windows can be found in the Technical note – ‘Camera Windows: Optimizing for Different Spectral Regions’.

**Step 5.**
The iXon 897 requires a controller card and one of the following software options:

- CCI-24 PCIe Controller card.
  
  **Note:** The CCI-24 PCIe controller card is not compatible with PCs with Intel C612 chipsets.

- Solis Imaging A 32-bit and fully 64-bit enabled application for Windows (XP, Vista, 7 and 8) offering rich functionality for data acquisition and processing. AndorBasic provides macro language control of data acquisition, processing, display and export.

- Andor SDK A software development kit that allows you to control the Andor range of cameras from your own application. Available as 32 and 64-bit libraries for Windows (XP, Vista, 7 and 8), compatible with C/C++, C#, Delphi, VB6, VB.NET, LabVIEW and Matlab. Linux SDK compatible with C/C++.

- Andor iQ A comprehensive multi-dimensional imaging software package. Offers tight synchronization of EMCCD with a comprehensive range of microscopy hardware, along with comprehensive rendering and analysis functionality. Modular architecture for best price/performance package on the market.

**Third party software compatibility**
Drivers are available so that the iXon3 range can be operated through a large variety of third party imaging packages. See Andor web site for detail: andor.com/software/
Product Drawings
Dimensions in mm [inches]

- Position of pixel 1,1
- Weight: 3.4 kg [7 lb 8 oz]

Connecting to the iXon3

**Camera Control**
Connector type: PCI or PCIe

**TTL / Logic**
Connector type: SMB, provided with SMB - BNC cable
Fire (Output), Shutter (Output), Arm (Output), External Trigger (Input)

**I²C connector**
Compatible with Fischer SC102A053-130, pinouts as follow:
1 = I²C Clock, 2 = I²C Data, 3 = Ground, 4 = +5 Vdc

Minimum cable clearance required at rear of camera
90 mm

Typical Applications

- Single Molecule Detection
- Super Resolution (PALM, STORM)
- TIRF Microscopy
- Spinning Disk Confocal Microscopy
- Selective/Single Plane Illumination Microscopy (SPIM)
- Calcium Flux
- Whole Genome Sequencing
- FRET / FRAP
- Microspectroscopy / Hyperspectral Imaging
- Lucky Astronomy
- Single Photon Counting
Order Today

Need more information? At Andor we are committed to finding the correct solution for you. With a dedicated team of technical advisors, we are able to offer you one-to-one guidance and technical support on all Andor products. For a full listing of our local sales offices, please see: andor.com/contact

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Fax +1 (860) 290 9566

China
Beijing
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Fax +86 (10) 6445 5401

Items shipped with your camera:
- 1x PCI or PCIe controller card + SATA adapter*
- 1x Controller card splitter/fly-lead (if required)
- 1x 3m iXon3 detector cable
- 2x 2m SMB - BNC connection cables
- 1x Power supply with mains cable
- 1x Quick launch guide
- 1x CD containing Andor user manuals
- 1x Individual system performance booklet
- 1x Disposable ESD wrist strap

Footnotes:

Specifications are subject to change without notice

1. Assembled in a state-of-the-art cleanroom facility, Andor’s UltraVac™ vacuum process combines a permanent hermetic vacuum seal (no o-rings), with a stringent protocol to minimize outgassing, including use of proprietary materials.

2. Figures are typical unless otherwise stated.

3. The dark current measurement is averaged over the sensor area excluding any regions of blemishes.

4. Using Electron Multiplication the iXon3 is capable of detecting single photons, therefore the true camera detection limit is set by the number of ‘dark’ background events. These events consist of both residual thermally generated electrons and Clock Induced Charge (CIC) electrons (also referred to as Spurious Noise), each appearing as random single spikes above the read noise floor. A thresholding scheme is employed to count these single electron events and is quoted as a probability of an event per pixel. Acquisition conditions are full resolution and max frame rate (10 MHz readout; frame-transfer mode; 0.5 µs vertical clock speed; x 1000 EM gain; 10 ms exposure; -85°C).

5. The EM register on CCD97 sensors has a linear response up to ~400,000 electrons and a full well depth of ~800,000 electrons.

6. Readout noise is for the entire system. It is a combination of sensor readout noise and A/D noise. Measurement is for Single Pixel readout with the sensor at a temperature of -75°C and minimum exposure time under dark conditions. Under Electron Multiplying conditions, the effective system readout noise is reduced to sub 1e- levels.

7. Linearity is measured from a plot of counts vs exposure time under constant photon flux up to the saturation point of the system.

8. All measurements are made with 0.3 µs vertical clock speed. It also assumes internal trigger mode of operation.

9. Quantum efficiency of the sensor at 25°C, as supplied by the sensor manufacturer.

Recommended Computer Requirements:
- 3.0 GHz single core or 2.6 GHz multi core processor
- 2 GB RAM
- 100 MB free hard disc to install software (at least 1 GB recommended for data spooling)
- PCI 2.2 or PCIe slot*
- 10,000 rpm SATA hard drive preferred for extended kinetic series
- Windows (XP, Vista, 7 and 8) or Linux

* Note: The CCI-24 PCIe controller card is not compatible with PCs with Intel C612 chipsets.

Operating & Storage Conditions
- Operating Temperature: 0°C to 30°C ambient
- Relative Humidity: < 70% (non-condensing)
- Storage Temperature: -25°C to 50°C

Power Requirements
- 100 - 240 VAC, 50/60 Hz

Footcover image: A large scale 3D STORM image of a cultured hippocampal neuron colored in z. Courtesy of Melike Lakadamyali, Institute of Photonic Sciences, ICFO, Barcelona, Spain and Hazen Babcock from Harvard University, Cambridge, MA