ANDOR
an Oxford Instruments company

cellSens Dimension
Software Guide

Version 1.3 rev 21 May 2014

for the iXon Ultra 897 & iXon3 897

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INTRODUCTION

This document explains how to install and setup Olympus cellSens Dimension for use with the iXon Ultra 897 and iXon$_3$ 897.

Important Information about using cellSens Dimension

cellSens Dimension 1.9 is compatible with Windows 7 and 8, 32 and 64-bit operating systems.

iXon3 and iXon Ultra 897 cameras from Andor Technology require 'High End Camera Solution' from Olympus in order to work with cellSens Dimension software. Please contact your local Olympus representative for more information. This is a separate module to the cellSens Dimension license.

Trademarks and Patent Information

Front page image courtesy of Prof. Jan Liphardt and Dr. Alan Lowe, University of California, Berkeley, USA.

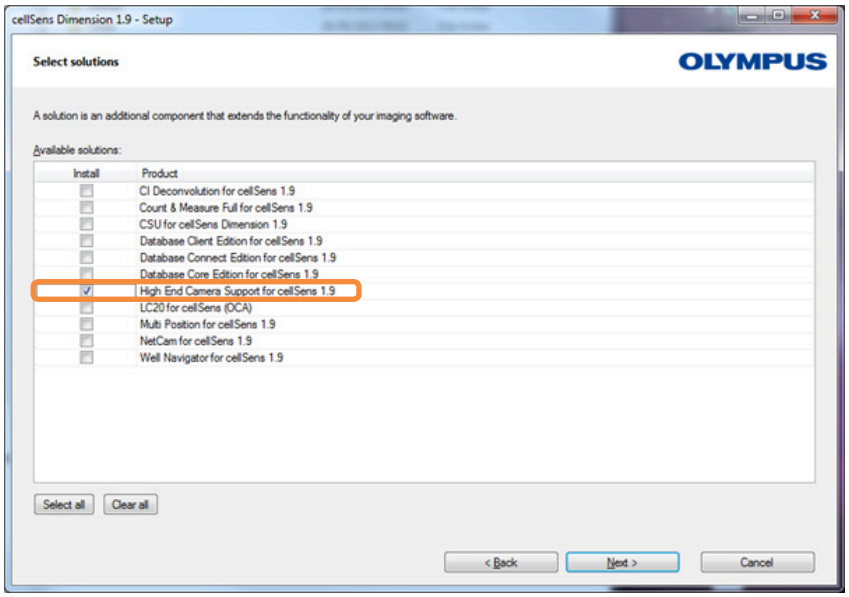
Revision History

Version	Released	Description
1.0	12 Nov 2013	Initial Release
1.1	22 Nov 2013	Added information regarding High End Camera Support requirement (Section 1.1) Added additional Driver installation information (Section 1.1)
1.2	12 May 2014	Added Software feature matrix (Section 2.7) Updated presentation (All Sections)
1.3	21 May 2014	Minor edit to text in table for consistency (Section 2.7)

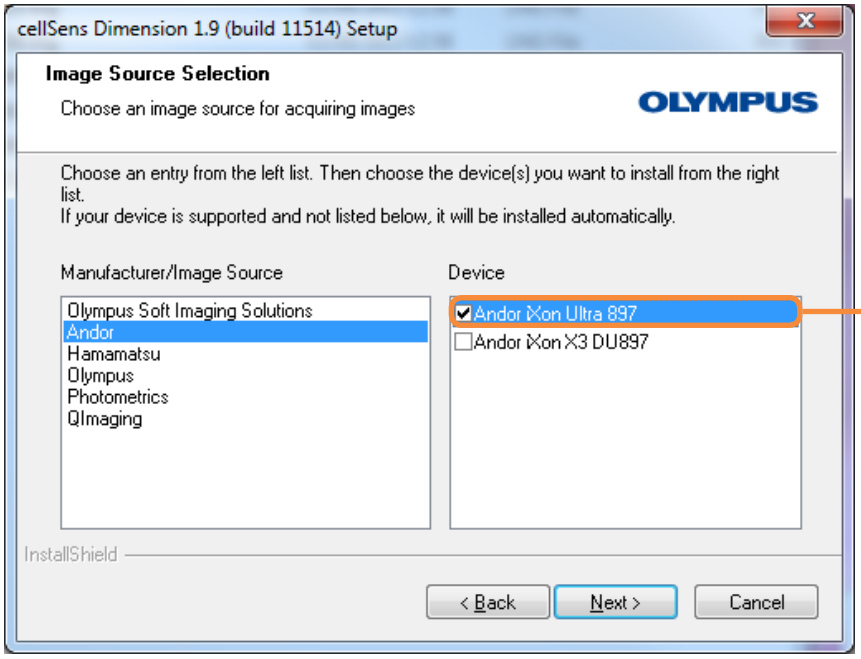
SECTION 1: INSTALLATION OF CELLSENS DIMENSION

1.1 Installing cellSens Dimension to run the iXon Ultra 897 and the iXon3 897 for the first time

1. Install cellSens Dimension following the steps in the installer.
2. Ensure '**High End Camera Support for cellSens 1.9**' is selected*



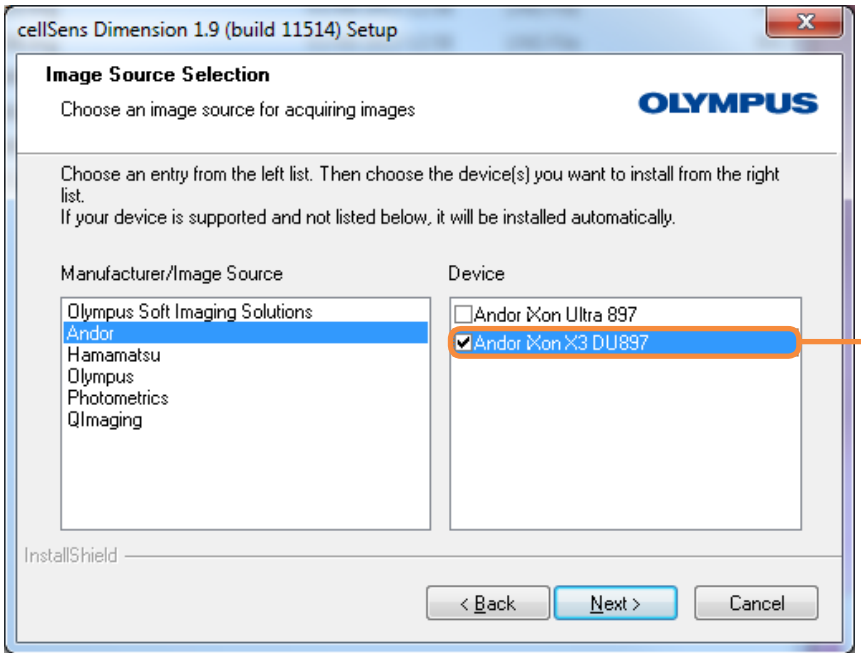
3. At the Image Source Selection, ensure the correct camera is selected e.g. **Andor iXon Ultra 897** as shown below.



Andor iXon Ultra 897

* 'iXon3 and iXon Ultra 897 cameras from Andor Technology require 'High End Camera Solution' from Olympus in order to work with cellSens Dimension software. Please contact your local Olympus representative for more information' This is a separate module to the cellSens Dimension license.

or **Andor iXon X3 DU 897** as shown here:



4. Click '**Next**'.
5. Follow the steps to complete the installation.
6. After the cellSens installer has completed - it places a HTML file on the Windows Desktop called '**Driver Information.html**'. Open this file and follow the instructions to install the device drivers for the iXon$_3$ 897 and the iXon Ultra 897.
7. To install the driver for your Andor iXon camera, follow these steps:

For Andor iXon Ultra 897 camera:

1. Execute the file '**setup.exe**'.
2. On the welcome page click '**Next**'.
3. On the **Select Destination Location** page accept the default location and click '**Next**'
4. On the **Select Components** page select '**Install 64-bit drivers onto your PC'.** Only select if you intend to use a 64-bit compiler and click '**Next**'.
5. On the **Camera Types** page accept the default '**iXon Ultra (USB)**' and click '**Next**'.
6. On the **Ready to Install** page click '**Install**'
7. On the **Completing the Andor SDK 2.94.30007.0 Setup Wizard** page accept the default '**Yes, restart the computer now**' and click '**Finish**'.
8. Now connect your Andor iXon Ultra 897 camera to your computer and switch it on.
9. Windows will now install the driver for the camera (This will take a while).
10. Now the camera is ready for use.

For Andor iXon X3 DU897 camera:

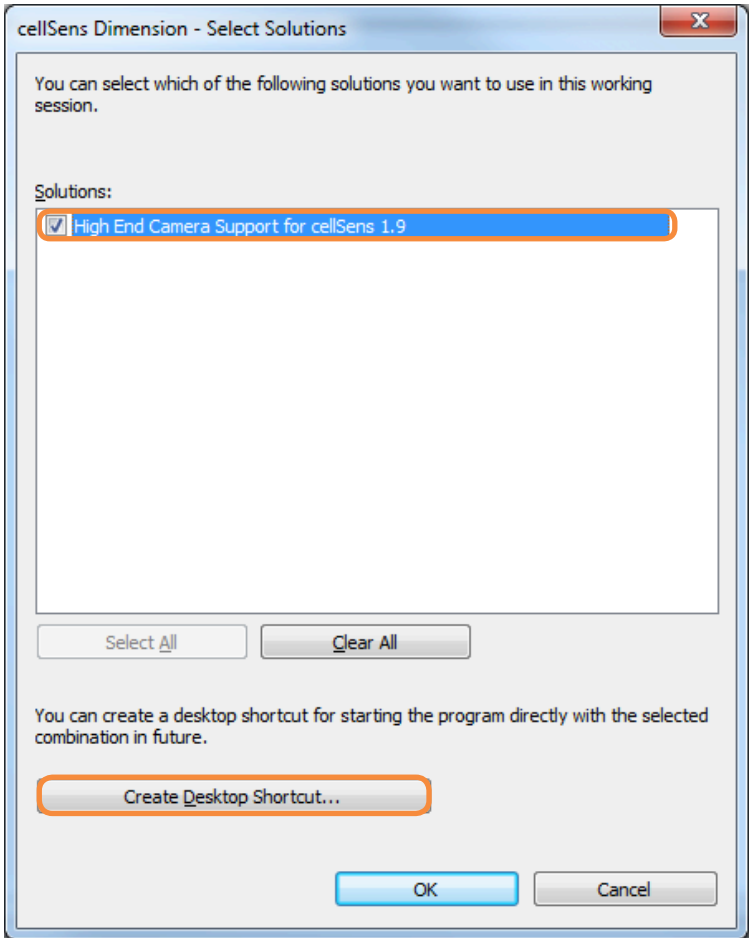
1. Execute the file '**setup.exe**'.
2. On the welcome page click '**Next**'.
3. On the **Select Destination Location** page accept the default location and click '**Next**'.
4. On the **Select Components** page select '**Install 64-bit drivers onto your PC**'. Only select if you intend to use a 64-bit compiler and click '**Next**'.
5. On the **Camera Types** page accept the default '**iXon (PCI)**' and click '**Next**'.
6. On the **iXon Systems** page accept the default '**All other systems**' and click '**Next**'.
7. On the **Ready to Install** page click '**Install**'.
8. On the **Completing the Andor SDK 2.94.30007.0 Setup Wizard** page accept the default '**Yes, restart the computer now**' and click '**Finish**'.
9. The computer will now reboot.
10. After the reboot go to the MS Windows **Device Manager**. (Please consult the MS Windows help on how to do this for your version of MS Windows). Select **Other Devices\PCI Data Acquisition and Signal Processing Controller**.
11. Right-click '**PCI Data Acquisition and Signal Processing Controller**' and select '**Update Driver Software**'.
12. In the next dialog select '**Browse my computer for driver software**'.
13. In the next dialog click '**Browse**' and navigate to the directory '**Andor SOLIS\Drivers**' in your program files directory.
14. Click '**Next**'.
15. Confirm the next dialog by clicking '**Install**'.

After successful installation there is a new section '**Andor**' in the '**Device Manager**'.

SECTION 2: USING CELLSENS DIMENSION WITH THE IXON ULTRA 897 & IXON3 897

2.1 Running the iXon Ultra 897 or the iXon3 897 for the first time in cellSens Dimension

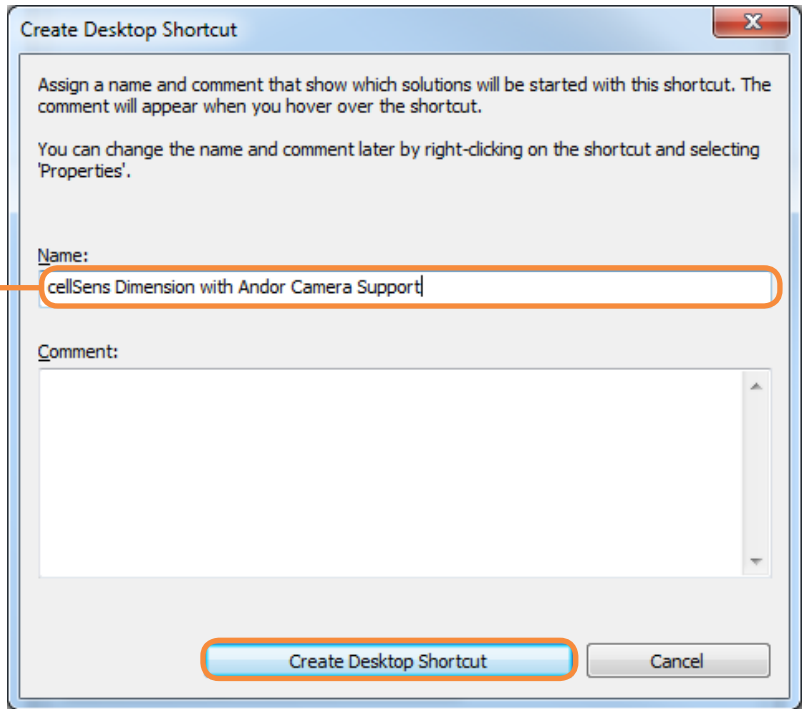
1. Open the cellSens application, using Desktop Shortcut or from **Start>All Programs>cellSens Dimension>cellSens Dimension**.
2. Select '**High End Camera Support for cellSens 1.9**'.



3. Click **Create Desktop Shortcut**, this ensures that the Andor cameras are always available.

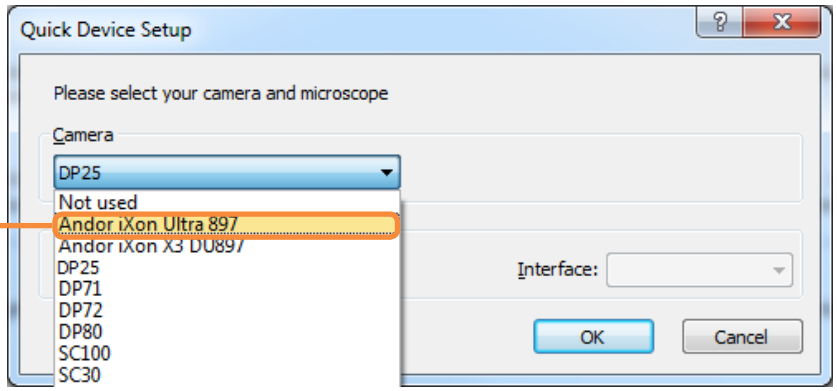
4. Create a name and enter a comment for the Shortcut so you will always know what solution/camera will start with this shortcut.

Enter suitable Name for the Shortcut

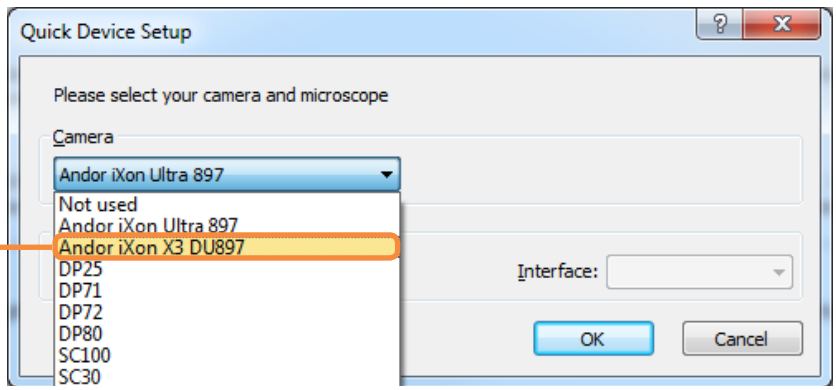


5. On first run Quick Device Setup will automatically appear, select **Andor iXon Ultra 897** or **Andor iXon X3 DU897** as required:

Andor iXon Ultra 897



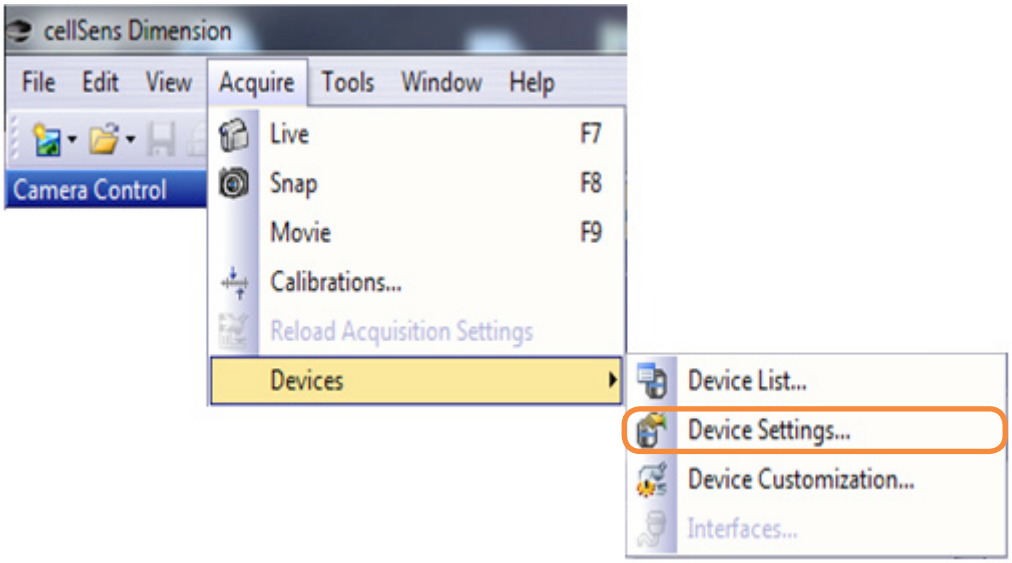
Andor iXon X3 DU897



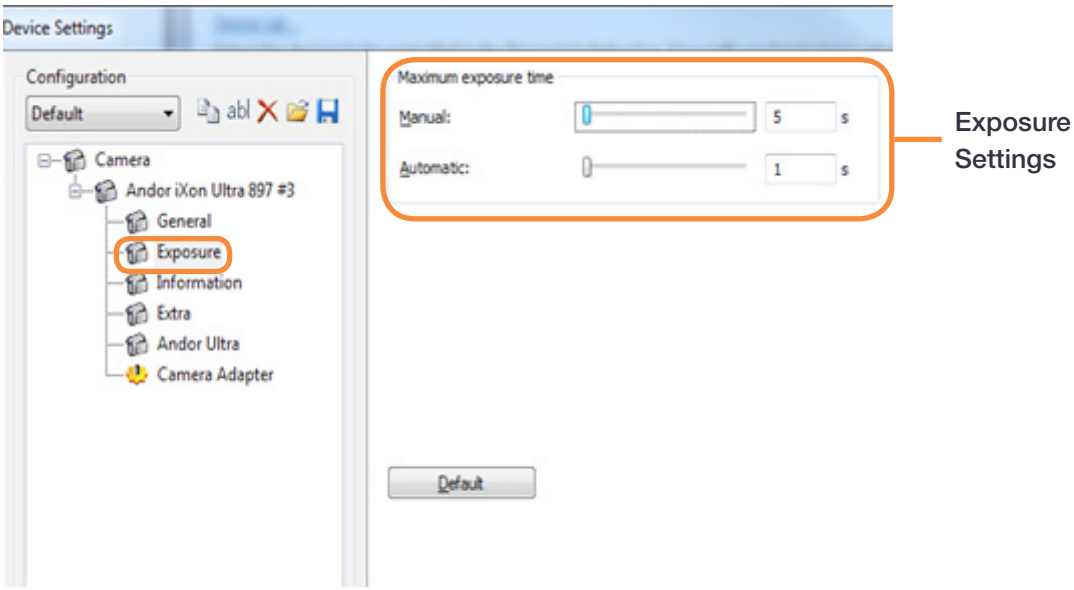
6. Your iXon Ultra 897 or iXon$_3$ 897 is now ready to use in cellSens Dimension.

2.2 Setting the acquisition parameters

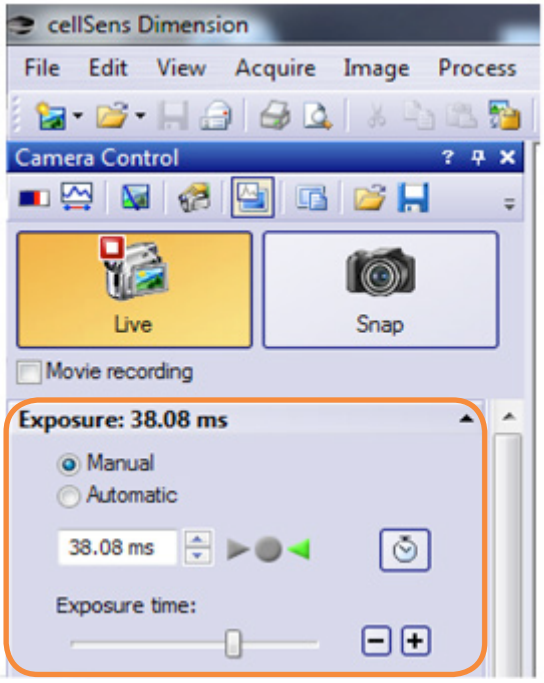
1. To access camera settings and set up acquisition parameters, open the **Acquire** tab on the main toolbar and click on **Devices > Device Settings**.



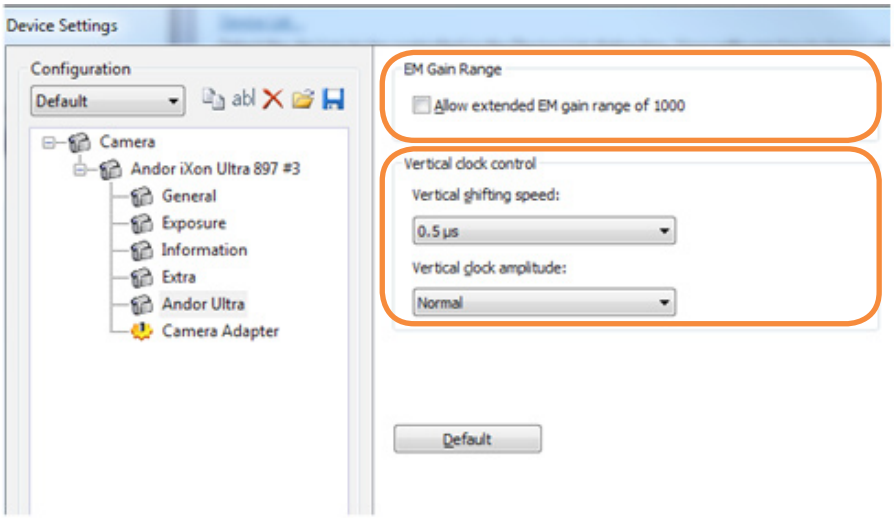
2. Choose '**Exposure**' which will allow the maximum exposure to be set.

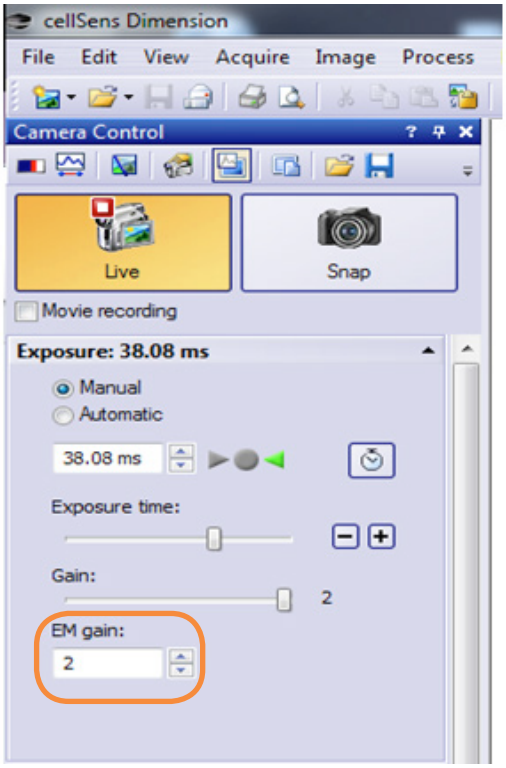


For shorter exposures use the **Exposure** control in the **Camera Control** window.

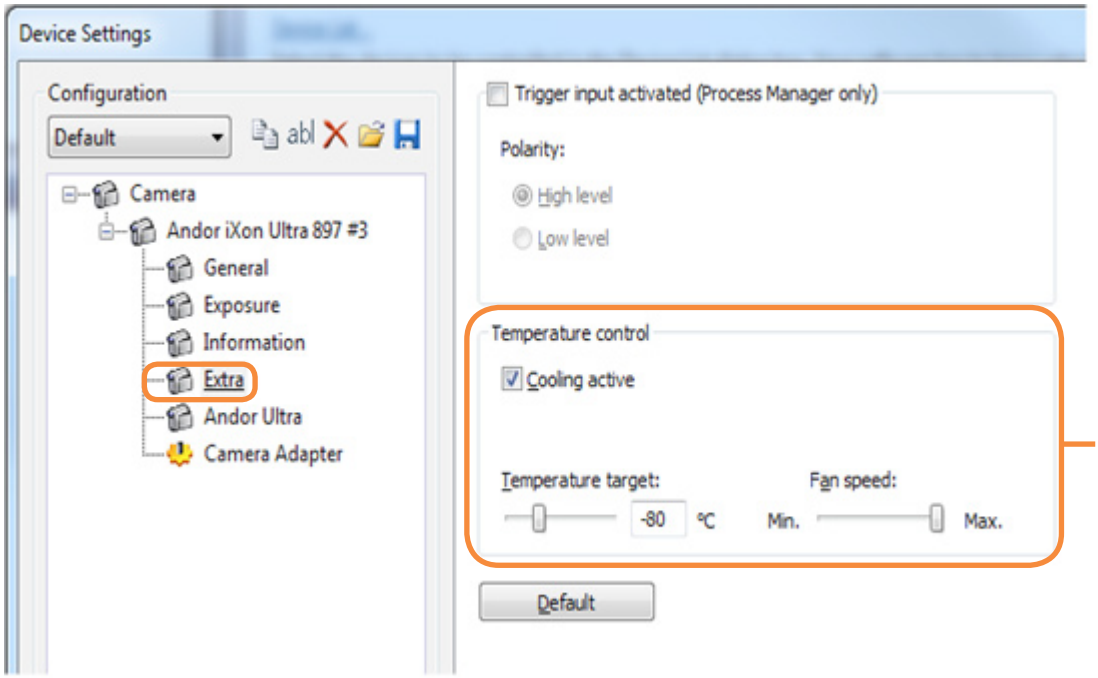


3. To set the vertical shift speed and the vertical clock amplitude choose '**Andor Ultra**'. This is also where extended EM gain control can be accessed. EM gain can also be controlled in the **Camera Control** window (shown below right).

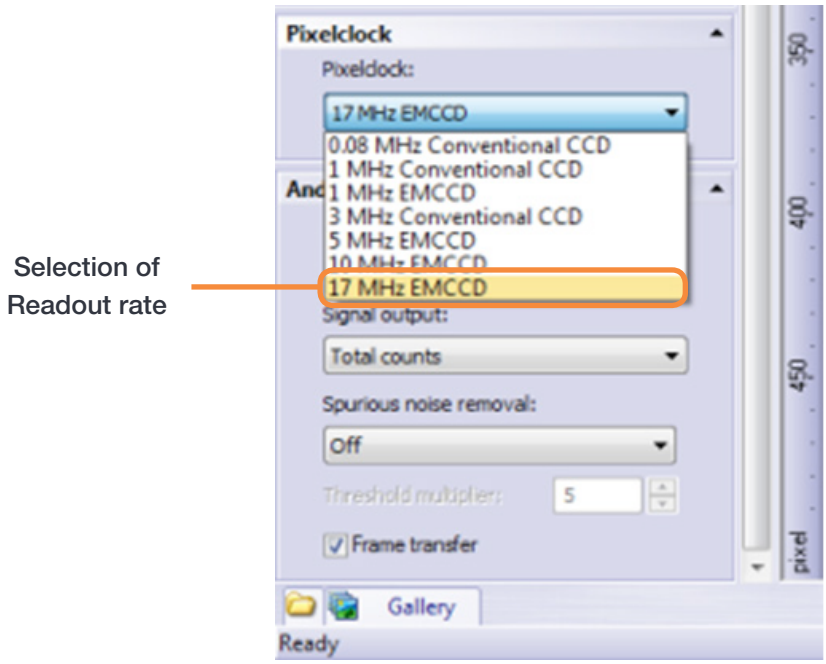




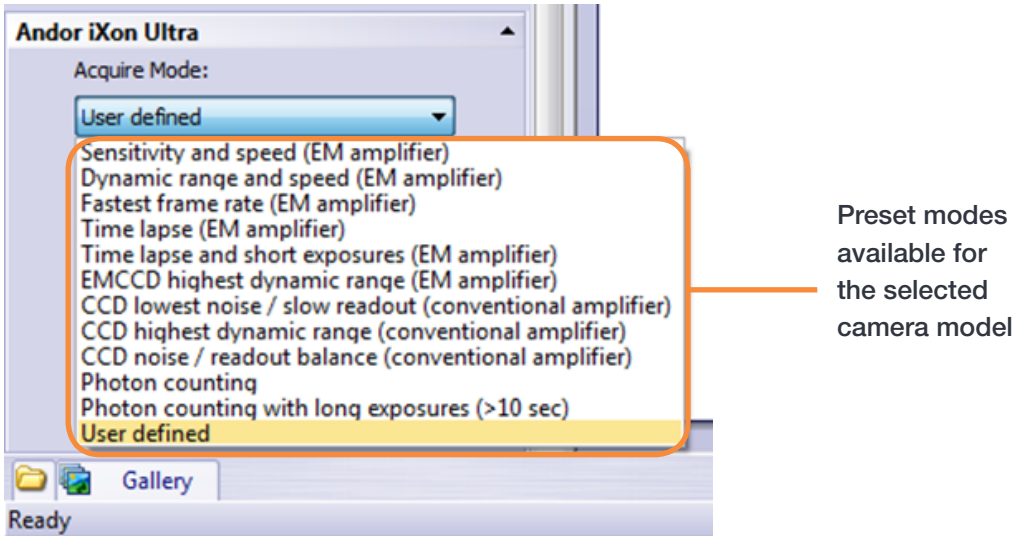
4. To control the cooling temperature and the fan speed choose '**Extra**' and adjust as required.



5. The readout rate can be set in the **Camera Control** window. In this example, '**17 MHz EMCCD**'.



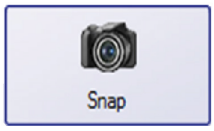
6. **OptAcquire** is a unique control interface, whereby a user can conveniently choose from a pre-determined list of set-up configurations, each designed to optimize the camera for different experimental acquisition types, thus removing complexity from the extremely adaptable control architecture of the iXon Ultra and iXon$_3$ 897. These preset modes can be accessed in the **Camera Control** window.



Note: Camera preset modes for the iXon Ultra (11), iXon$_3$ 897 (9). Note also user defined option is available in addition to the preset modes.

2.3 Continuous Live View and Snapshot

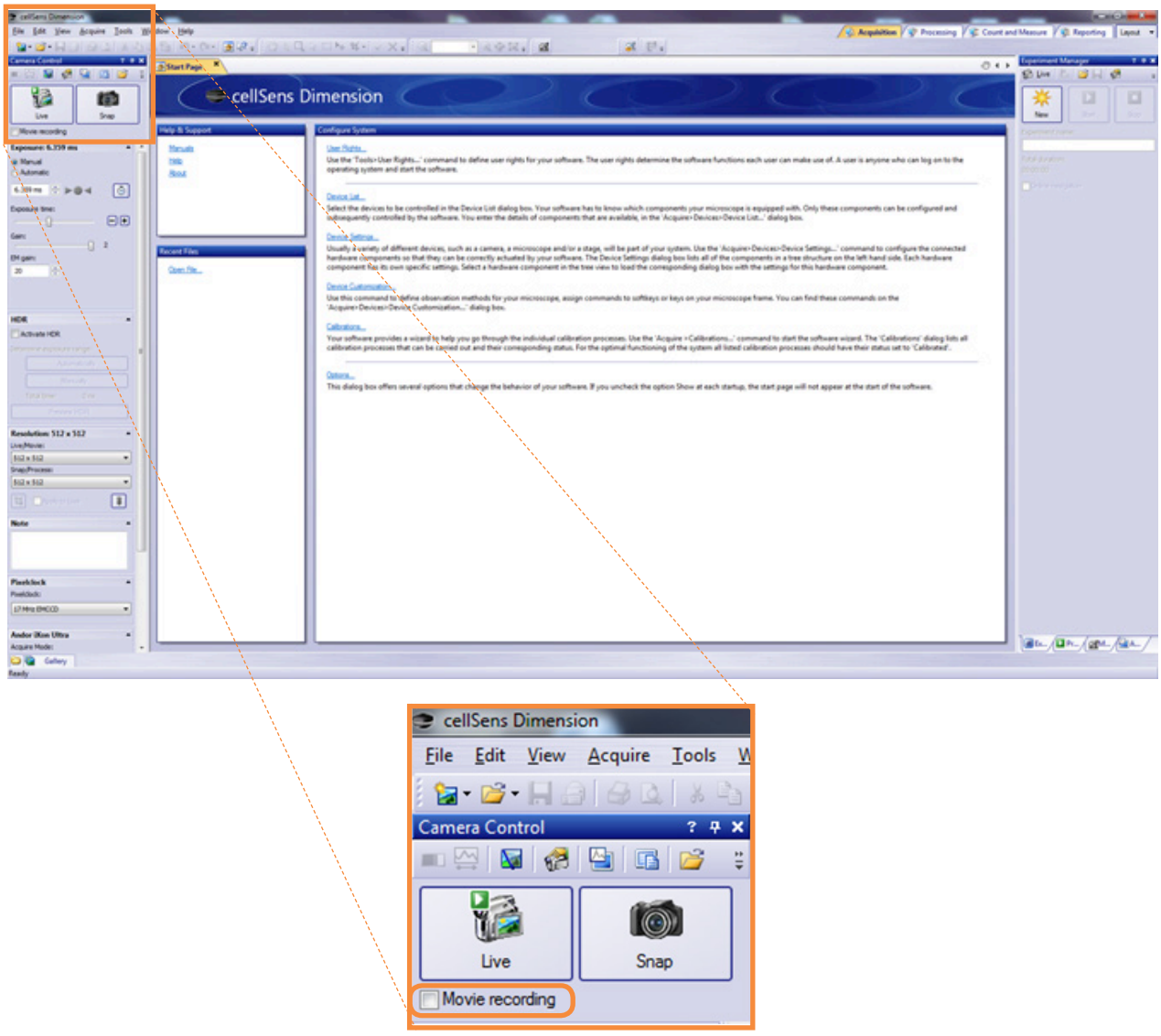
For a continuous live view press the 'Live' icon in the **Camera Control** window or go to the **Acquire** tab and choose '**Live**'.



To acquire a snapshot press the '**Snap**' icon in the **Camera Control** window or go to the **Acquire** tab and choose '**Snap**'.

2.4 Setting up a Kinetic Series in cellSens

1. Configure acquisition settings using the **Camera Control** tab or go to the **Acquire** tab and choose '**Snap**'.



2. Select '**Movie recording**' which is located under the '**Live**' button.

3. Once you select '**Movie recording**', the '**Snap'** button updates to '**Movie**'.

'**Snap**' button updates to '**Movie**'

4. Click '**Movie**' to begin the acquisition.

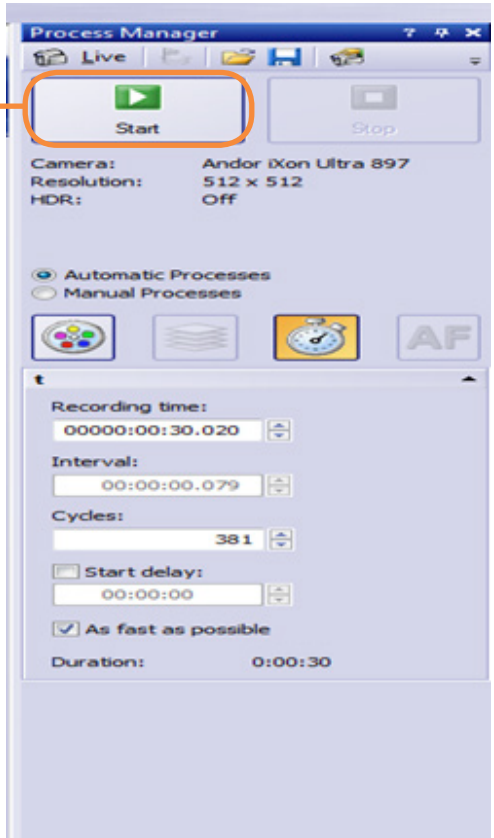
Note: The Movie button updates to to show that an acquisition sequence is being recorded.

2.4.1 Setting up a Timelapse in cellSens Dimension

Use the '**Process Manager'** on the right hand side of the main cellSens window to define the number of frames you wish to acquire and to set an interval between frames. In addition, you can set a delay at the start of an acquisition. This is important, if for example, photoactivation of a sample is required before acquisition.

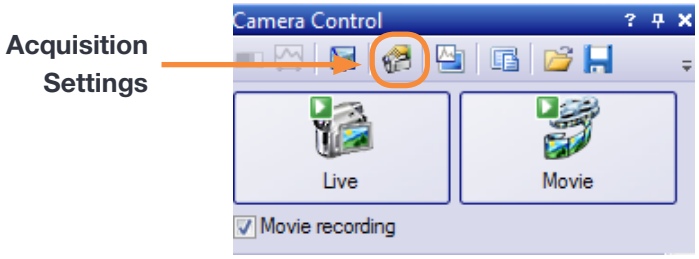
When all experimental parameters have been set press the '**Start**' button to begin acquisition

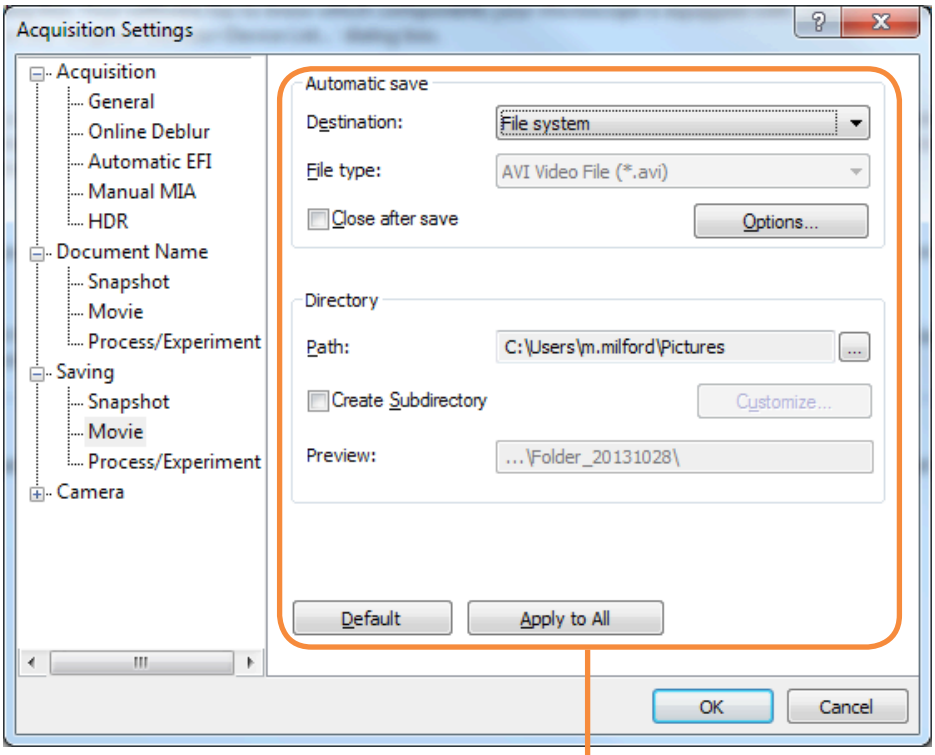
Press the 'Start' button to begin acquisition



2.4.2 Saving a Kinetic Series

cellSens Dimension automatically saves the image acquisition files in avi format directly to disk in the **My Pictures** folder. The default save options can be modified in **Acquisition settings > Saving > Movie** if required.



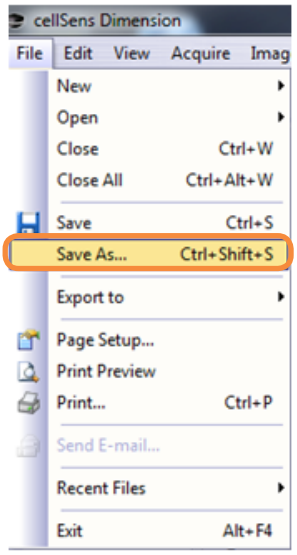


Adjust the save settings as required

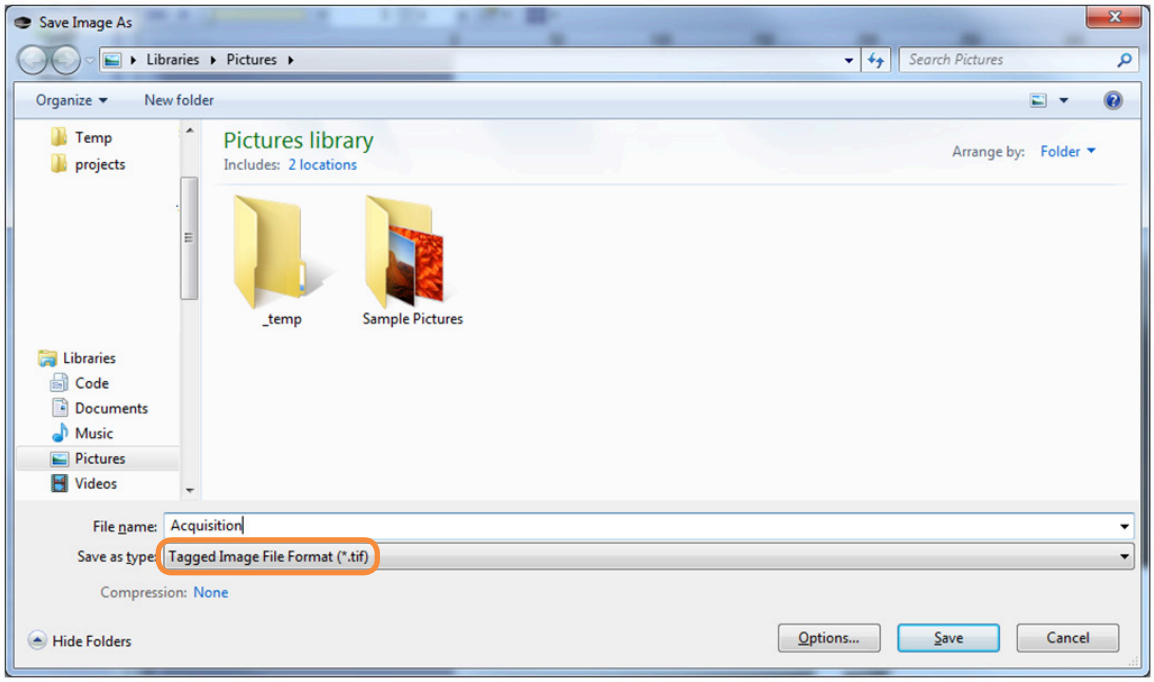
2.4.3 Saving a Kinetic series as a Multi-page tiff File

The kinetic series can also be saved as a multi-page tiff file after acquisition if required. To do this follow the steps below:

1. Select '**File' > 'Save as**'.



2. Choose the location to save your image files to and choose **.tiff** as the file type.



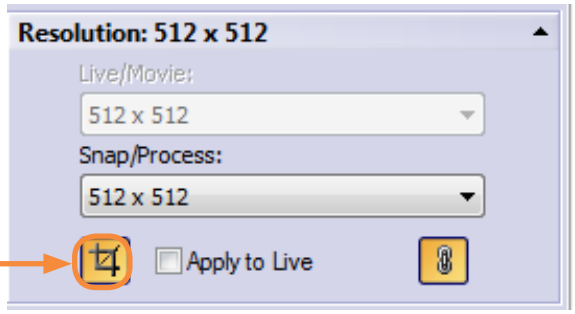
3. Click '**Save**'.

2.5 Setting a Custom Region Of Interest (ROI) in cellSens Dimension

To define a custom ROI follow the instructions below:

1. Start live mode to see the full field of view.
2. To define the ROI go to the '**Resolution**' part of the camera control window. Click on the '**Toggle sub-array**' button.

The **Toggle sub-array** button



3. The dimensions of the ROI can be adjusted in the live window.

2.6 iXon Ultra 897 Frame Rates in cellSens Dimension

The frame rates for the iXon Ultra 897 in cellSens dimension software are shown in the following figure. Please note that the Cropped mode feature is not available in cellSens Dimension.

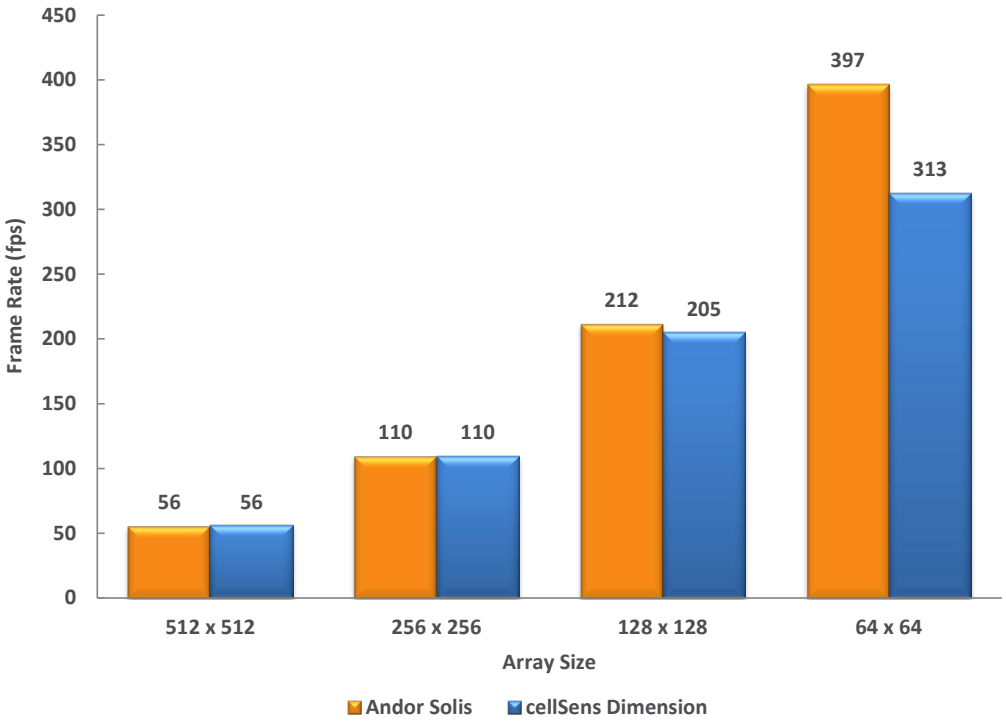


Figure 1: Comparison of the Frame Rates of the iXon Ultra 897 for different ROI sizes

2.7 iXon Ultra 897 Feature Matrix in cellSens Dimension

	iXon Ultra 897
Trigger Modes	
Internal	✓
External	✓
External Exposure	✓
Software Trigger	✓
Fast External	×
External Start	×
Acquisition Modes	
Single image	✓
Continuous - camera acquires until aborted	✓
Kinetic Series - Frame number and Rate Control	✓
Accumulate mode - specify number and rate to accumulate images	×
Fast Kinetics - Increase frame rate for user defined rows (requires masked area)	×
Readout Modes	
Imaging - Full Image Readout from Sensor	✓
Overlap - also called Frame Transfer (Selected modes only)	✓
Full Vertical Binning (FVB)	×
Multi Track - User defined depth of vertically binned rows at user defined spacings	×
Crop mode (Corner tethered and Optically Centered)	×
ROI - Arbitrary size region anywhere on sensor	✓
Camera Binning - User Defined*	×
Readout Parameters	
Exposure Time	✓
EM Pixel Readout Rate - 17MHz, 10Mhz, 5Mhz, 1MHz	✓
Conventional Pixel Readout Rate - 3MHz, 1MHz, 0.08MHz	✓
Pre Amp Gain - 1,2 and 4	✓
Vertical Shift Speed (3.3µS, 1.7µS, 0.9µS, 0.5µS and 0.3µS)	✓
Vertical Clock Amplitude (Normal, +1,+2, +3, and +4)	✓
Electron Multiplying Mode - Real gains from x2 to 300, - Real gains (x1000 in extended mode)	✓
Optaquire	
Enable Specific Mode	✓
Add/Delete user defined mode	×
iCam	
Change Exposure Time during acquisition - (Limitations apply, see manual)	×
Change EM gain and control	×
Metadata	
Timestamp Clock (current timestamp reading on camera) +/- 10ns and time of subsequent frames	×

	iXon Ultra 897
For USB cameras FIFO fill level recorder in Meta data	×
Image Processing	
Spurious Noise Filter (Median, Level above, Interquartile Range) -on camera correction	✓
Data Averaging Filter	✓
Shutter Control**	
Open/Closed/Auto (open on power up)	×
Fan Control	
High, Low, Off	✓
Operating System Support	
Windows 7 & 8, 32-bit & 64-bit	✓
Recommended Application Features	
Image Flip - Horizontal and Vertical (conventional and EM registers readout raw data in a different order by default)	✓
Image Rotation - 90 degrees clockwise, 90 degrees anticlockwise	×
Image Streaming to disk at all sustained frame rates	×
Supported File formats should contain all acquisition information in header	×

*** Fixed Binning Options 1, 2, 4, 8 & 16 available**

****Shutter is opened upon initialization of camera, closed upon de-initialization**