ANDOR
an Oxford Instruments company

MetaMorph Software Guide

MetaMorph®

for Andor sCMOS

MetaMorph

TABLE OF CONTENTS

INTRODUCTION

This Software Guide explains how to install and setup MetaMorph for use with the Neo 5.5, Zyla 5.5 and Zyla 4.2 Camera Link and USB 3.0 camera models.

TRADEMARKS AND PATENT INFORMATION

Andor®, the Andor logo and Solis are trademarks of Andor Technology. Andor is an Oxfords Instruments® company. MetaMorph® is a registered trademark of Molecular Devices, LLC. All other marks are property of their owners.

Front page image courtesy of Philipp Keller, Howard Hughes Medical Institute, Janelia Farm Research Campus

REVISION HISTORY

| Version	Released	Description
1.0	20 Sep 2012	Initial Release of Neo MetaMorph Software Guide
1.1	02 Jul 2013	General updates to improve presentation and procedures throughout. Combined both Neo and Zyla information. Updated frame rate data.
1.2	02 Oct 2013	Revised SDK3 installation procedure Updates to enable access to additional Neo and Zyla functionality through MetaMorph.
1.3	02 Oct 2013	Corrected Andor Driver Pack version to 3.6.30008 (Section 1.3)
1.4	14 Oct 2013	Updated to show reference to Andor 5.5 sCMOS models
1.5	18 Feb 2014	Added updates for support of Zyla 4.2 model.
1.6	11 Apr 2014	Added updates for centralised regions of interest (Section 3.2)
1.7	14 Apr 2014	Added further content to show both pre-defined and user defined regions of interest (Section 3.2)
1.8	28 Apr 2014	Added Feature Matrix (Section 3.4) Updated document template to enhance presentation
1.9	09 Oct 2014	Updated to show support applies to Zyla 4.2 USB 3.0 model.
1.10	13 Jan 2015	Added Frame rate data for USB 3.0 models (Section 3.3)
1.11	08 Sep 2015	SDK3 driver install added (Section 1.3)
1.12	19 Nov 2015	SDK driver install steps updated (Section 1.3)

SECTION 1: INSTALLATION STEPS

This section outlines how to install MetaMorph on your PC for use with the Neo 5.5, Zyla 5.5 and Zyla 4.2 Camera Link and USB 3.0 camera models.

1.1 INSTALLING METAMORPH FOR THE FIRST TIME

Updates available from http://www.meta.moleculardevices.com/updates/

1. Install the latest full version of MetaMorph (MetaMorph 7.8.4) from the installation CD.

2. Download the latest update (MM 7.8.8 for Zyla 4.2 USB 3.0 support) and save the zip file to the desktop.

3. In order to update the full release of MetaMorph, go to the Meta Imaging Series 7.8.4 folder which contains the Updater program. Select the Updater and browse for the MetaMorph zip file you have just downloaded.
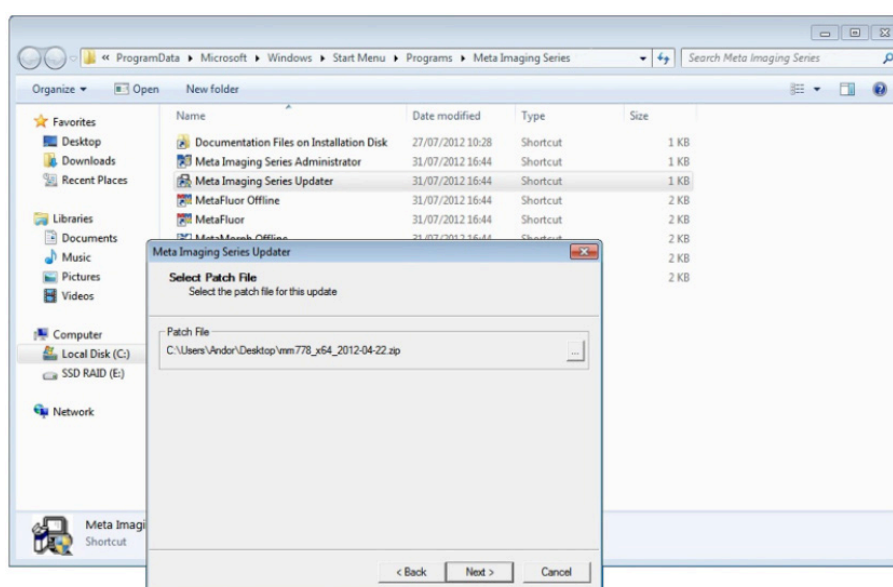
4. Follow the steps in the Updater menu until all the files are extracted and the application files are configured.
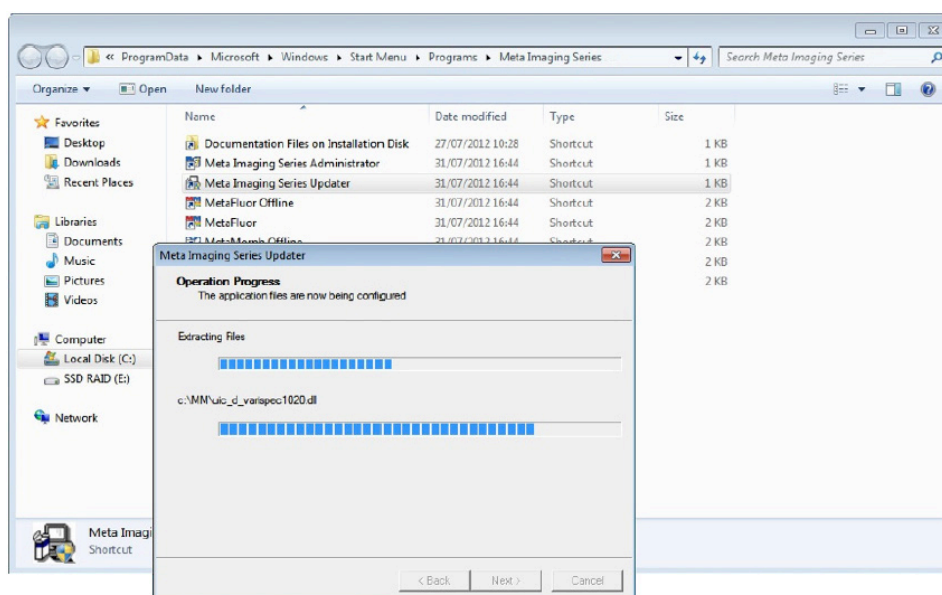

5. The software is now updated to the latest release.

1.2 METAMORPH ALREADY INSTALLED

1. If MetaMorph is installed already, ensure that the latest version is installed.

2. The latest version can be downloaded from http://www.meta.moleculardevices.com/updates/. Use the Updater program as described in **Section 1.1 Installing MetaMorph for the first time.**

1.3 INSTALLING THE ANDOR DRIVER PACK

1. Download and install the latest Andor Driver Pack for sCMOS from the following link: http://www.andor.com/downloads?src=drivers
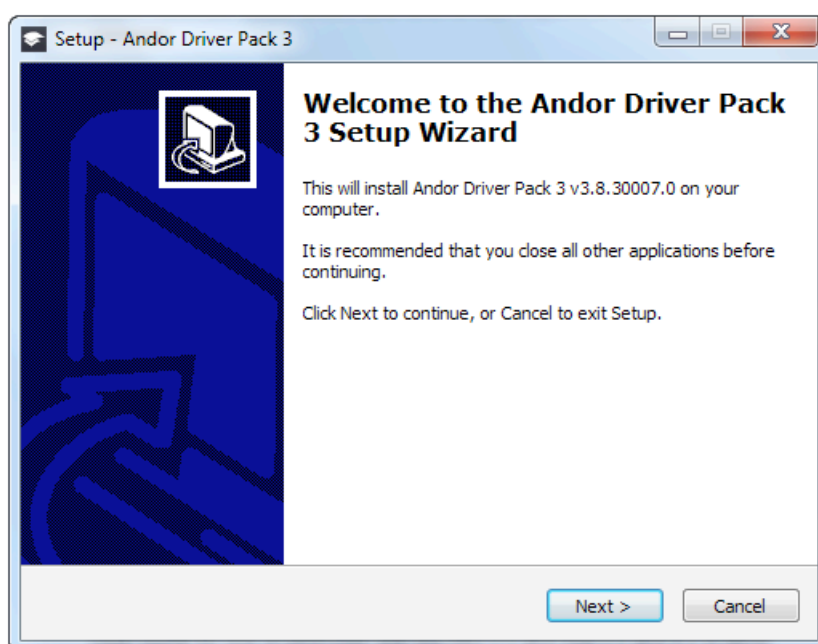
2. Complete the installation steps and click Finish.

SECTION 2: CONFIGURING METAMORPH

1. Power on your Neo 5.5 , Zyla 5.5 or Zyla 4.2 camera.

2. Run the Meta Imaging Series Administrator to set up the configuration for acquisition.

3. Select MetaMorph-Default, then click 'Configure Hardware'.

4. Click 'Create New Setting', to create a new setting, and call this setting 'Neo 5.5', 'Zyla 5.5' or 'Zyla 4.2' as required.

Click 'Configure Acquisition' after the new setting has been created
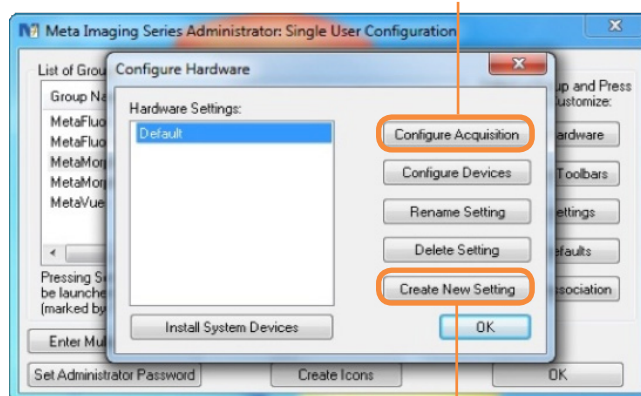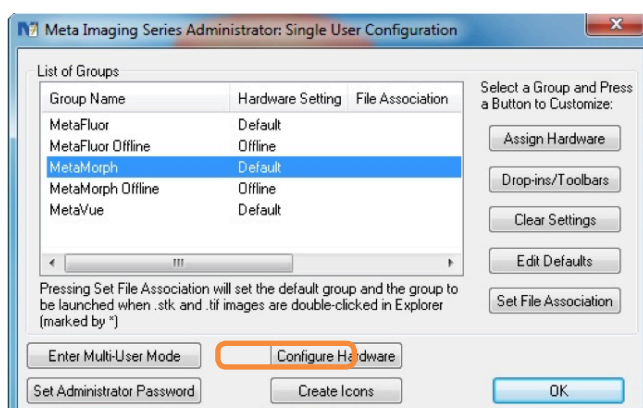
Click 'Create New Setting' first

5. Click 'Configure Acquisition'.

6. Select the AndorSdk3 driver from the list of Available Drivers.
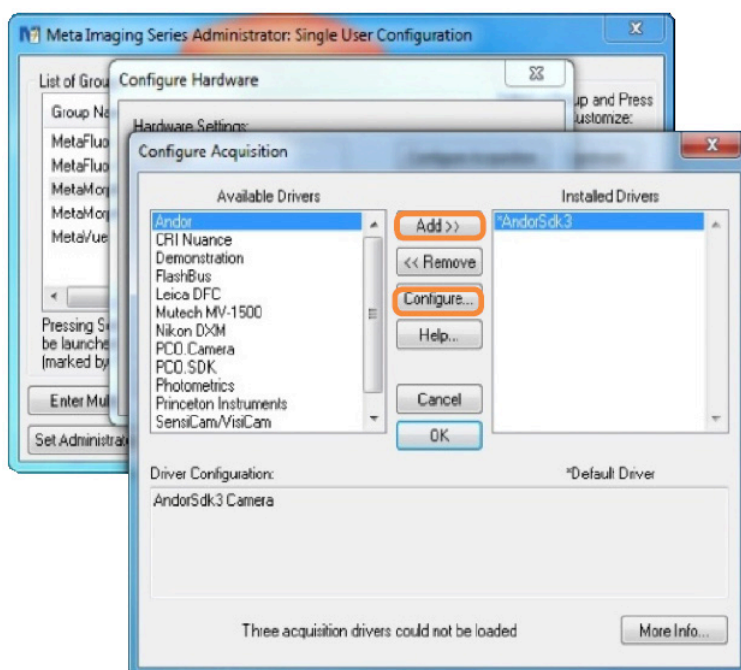
7. Click 'Add >>'.

8. Then click 'Configure...'.

Version 1.12 rev 19 Nov 2015

9. Check that the 'Flip Vertically' checkbox is checked. If this is unchecked, MetaMorph will process the image data during the acquisition and cause unnecessary slowdown. In addition, ensure the "Generate Debug output" is off i.e. not checked.

Ensure that the Flip Vertically checkbox is checked

Ensure that the Generate Debug Output is not checked

10. Adjust the Internal Frame Buffer Size to approximately half of the computer RAM. Also, ensure the "Enable software binning" is off.

Ensure that the Enable software binning is not checked

11. Once the configuration is complete, click 'OK' to leave the Meta Series Administrator and go to the MetaMorph Application (be sure to select your newly created Neo 5.5, Zyla 5.5 or Zyla 4.2 setting by selecting "Assign Hardware" before leaving the Administrator).

SECTION 3: USING METAMORPH TO CONTROL YOUR SCMOS CAMERA

3.1 SETTING PROCESSING PREFERENCES AND ACQUISITION PARAMETERS

1. Open the MetaMorph application.

2. Go to **Edit - Preferences** and select **Processing** to open the '**Processing Preferences**' menu.

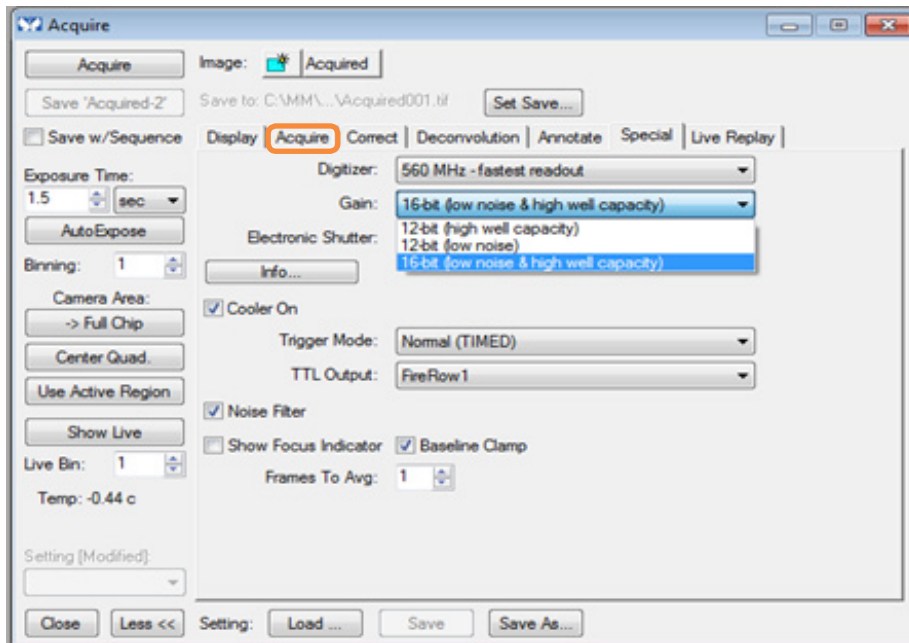3. Check the 'Enable CPU usage compatibility mode' checkbox.
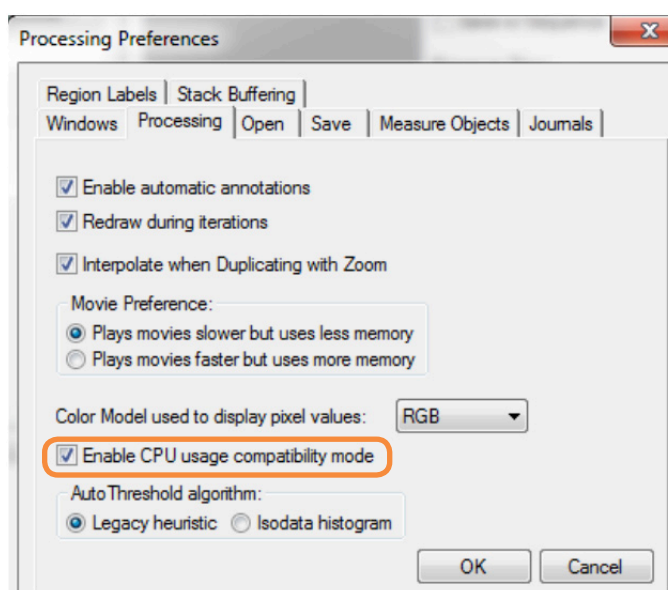
4. To access camera settings and set up the acquisition parameters, open the '**Acquire**' window which is accessed via the **Acquire** menu or the Acquire icon.
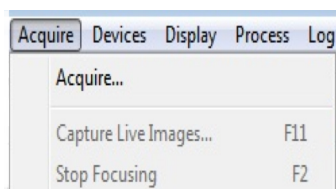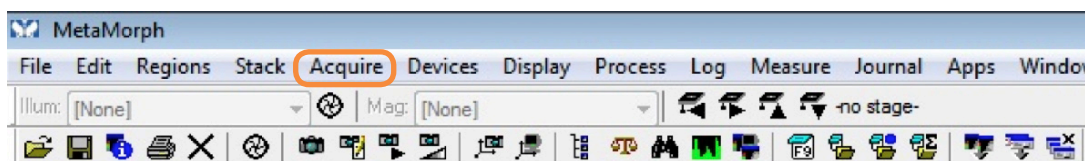
5. Set the Readout Speed, Gain setting, Shutter and Trigger parameters in the '**Special**' tab of the '**Acquire**' menu.

6. For a continuous live view press '**Show Live**' in the '**Acquire**' window or the '**Live**' icon on the toolbar. To acquire a snapshot press the '**Acquire**' button on the '**Acquire**' window.

|		
	Acquire	Acquire a Snapshot Image
	Live	Continuous Live View

3.1.1 SETTING UP A KINETIC SERIES

To set up a kinetic series go to the **Acquire** option on the main MetaMorph toolbar and choose 'Stream Acquisition...'. In the Stream Acquisition menu the number of frames/time-points to be acquired can be selected as well as where the data will be streamed to i.e. the RAM/Hard Disk location.

3.1.1.1 BURST MODE KINETIC SERIES (NEO 5.5 ONLY)

For **Burst Mode** kinetic series i.e. those that are equal to or less than 4GB (the Neo 5.5 on-head memory) choose to '**Stream to RAM**' as this will allow the fastest acquisition speeds.
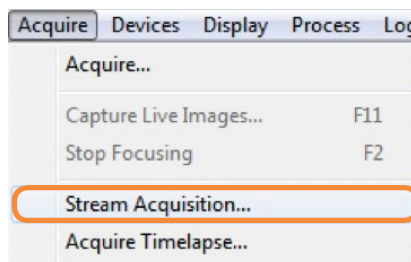
An example of a typical good set-up for 'burst mode' for the Neo 5.5
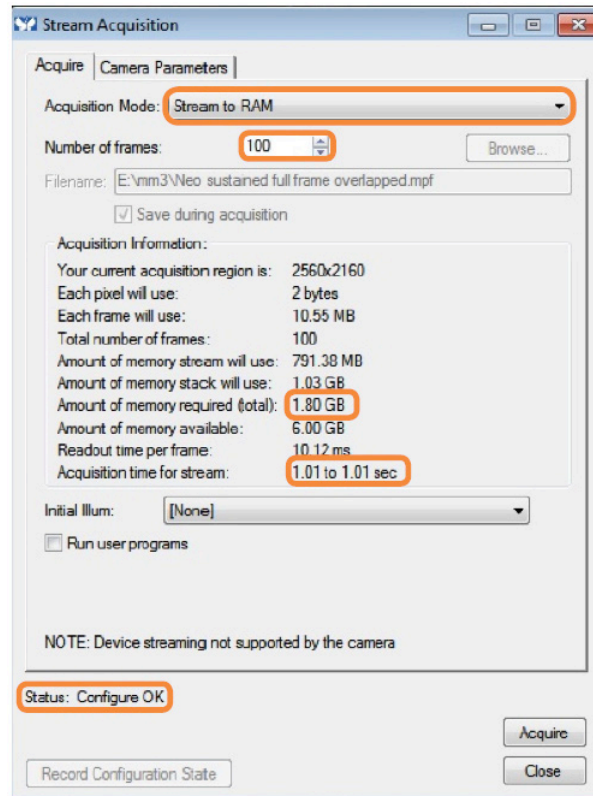
If you have set the number of frames too high for 'Stream to RAM' a warning will appear at the bottom of the window as shown in the figure below. If this happens, reduce the number of frames, or switch to 'Stream to Hard Disk' to resolve the issue.
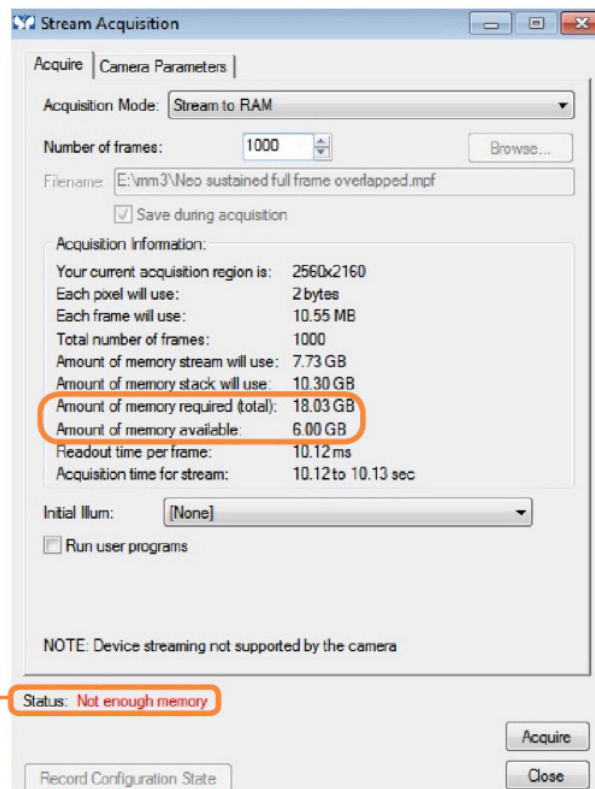
Insufficient memory warning message

3.1.1.2 SUSTAINED KINETIC SERIES

For **sustained** kinetic series, choose to '**Stream to Hard Disk**' and ensure there is a large storage device available to Stream the data to e.g. a 1TB SSD. Acquisition information is supplied in this window relating to the amount of memory your data will require and the length of time for the acquisition.
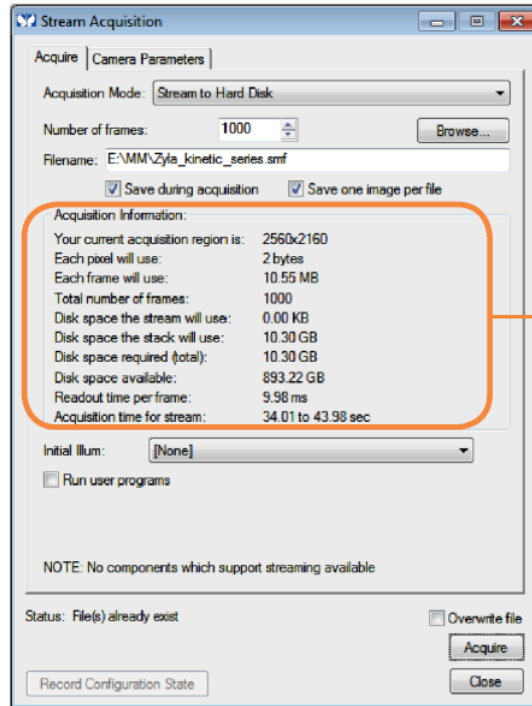
File memory requirement and acquisition time information

## 3.1.1.3 OBTAINING THE FASTEST ACQUISITION SPEEDS (OVERLAPPED MODE)

To achieve the fastest speeds with the Neo 5.5, Zyla 5.5 and Zyla 4.2 in MetaMorph set the camera state to **overlapped mode**. Overlapped mode is where the sCMOS sensor is being exposed and readout simultaneously; hence the faster speeds when in this mode. Having overlap on will make a difference to the frame rates when the exposure time is longer than the readout at a specific ROI. The exposure setting when acquiring sustained frame rates is longer than the readout at each ROI and therefore having the overlapped mode on here will increase the frame rates.
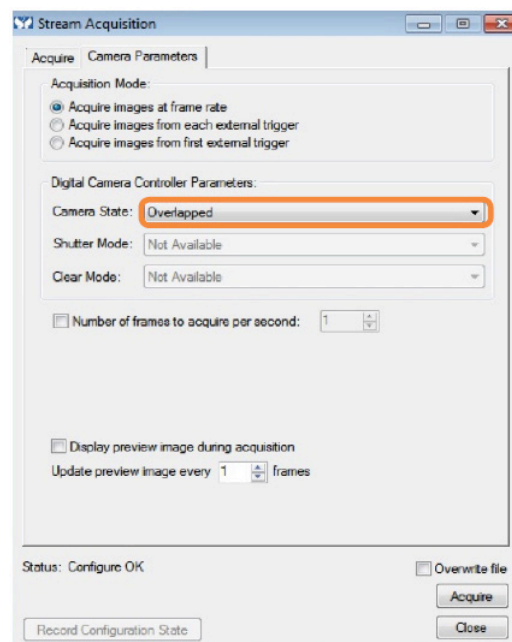
3.1.2 Saving your Image Data

When 'Stream to Hard Disk' is selected you have the option to save the images during the acquisition by ticking the 'Save during acquisition' box in the Stream Acquisition window. This should always be ticked as you want to guarantee that all your data will be saved if there is a crash during the acquisition. You can also indicate the file location where you want the files saved to.

- A sustained kinetic series on the Neo 5.5, Zyla 5.5 and Zyla 4.2 will generate a very large amount of data so the storage device and location should be a large SSD (at least 1TB).

- You can also choose a filename at this point. **For the file-type choose *.smf.**
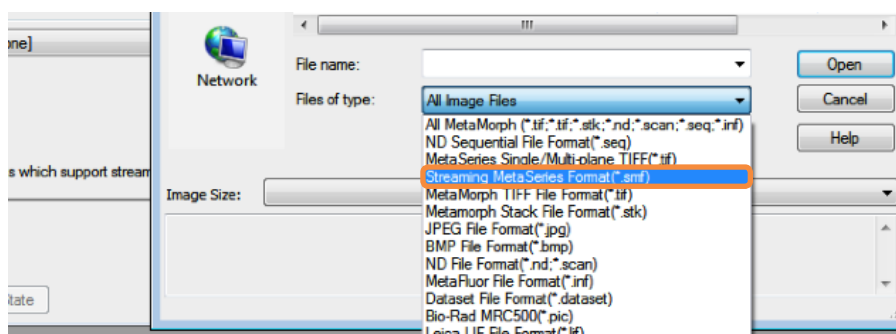
Once you are happy with your settings press the 'Acquire' button and acquisition will begin.

3.1.3 Viewing Acquired Image Files/Data Series

To view the acquired kinetic series/time lapse experiment go to File-->Open Special-->Build Stack and choose one of the four options available:

- The '**Quick**' option will allow you to select the first file of the series and will automatically open all of the frames sequentially. This can take a significant amount of time if you have a long kinetic series e.g. 30,000 frames with the full chip.

- In '**Numbered Names**' and '**Numbered Extensions**' you can choose what the first and last frame will be and therefore you can limit the size of the series to open.

- In '**User defined**' you can select which frames you want to see by selecting them from a list.

- Whatever way you choose to open them you have the option then of exporting/saving as a .avi file.
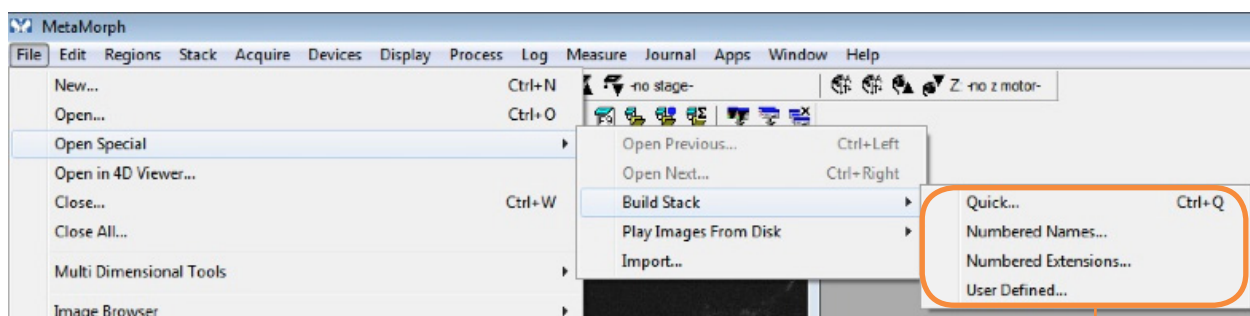
File viewing options
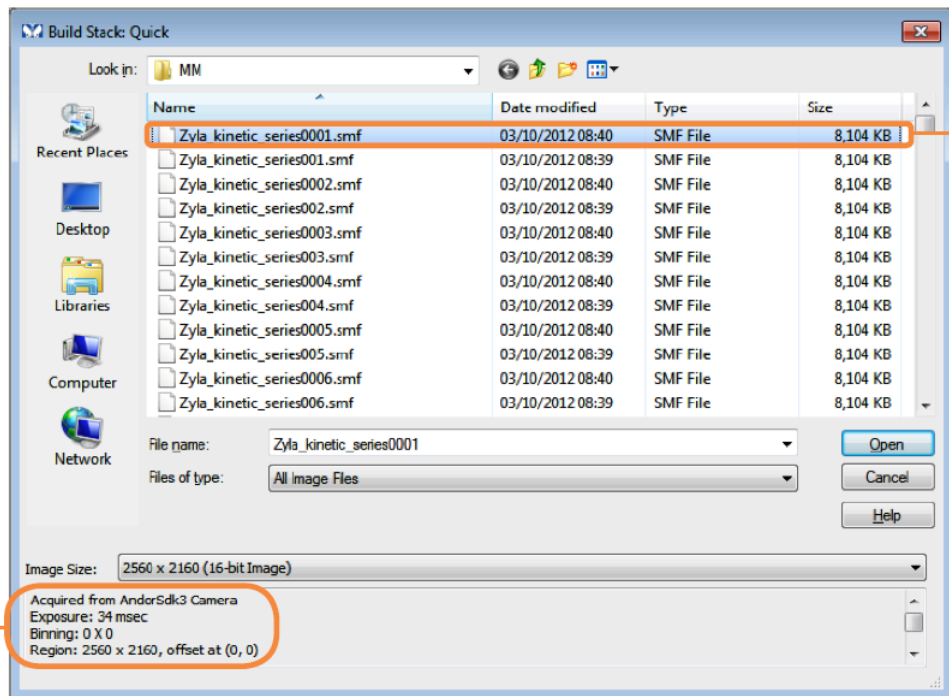
First file of the kinetic series

Information summary for the related kinetic series

## 3.2 SETTING A CUSTOM REGION OF INTEREST (ROI) IN METAMORPH

In order to achieve the fastest frame rates at any ROI in MetaMorph the ROI selected must be centred on the sensor.

### 3.2.1 USING CENTRALISED PREDEFINED REGIONS OF INTEREST (ROI)

1. Go Live to see the full field of view and snap an image.

2. Download and install the MetaMorph centralised ROI's (sCMOS) installer from **MyAndor>Software> Drivers and 3rd Party**. This installer file contains the predefined centralised ROI's for the Neo & Zyla 5.5 and the Zyla 4.2.
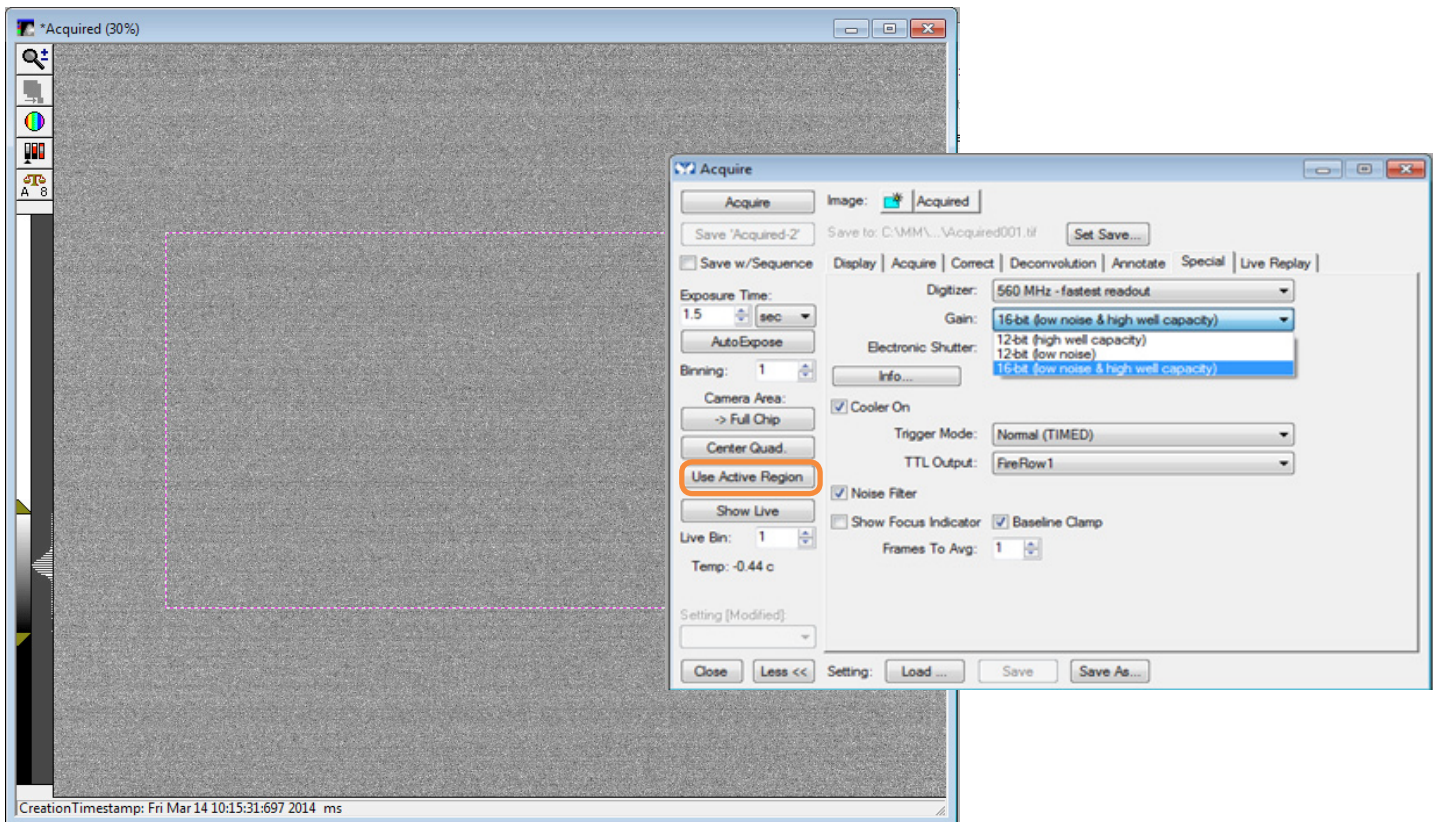

3. Ensure this is installed to the MM directory folder.
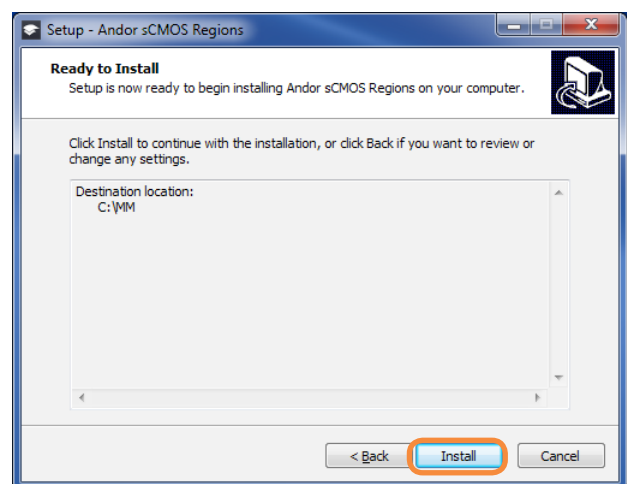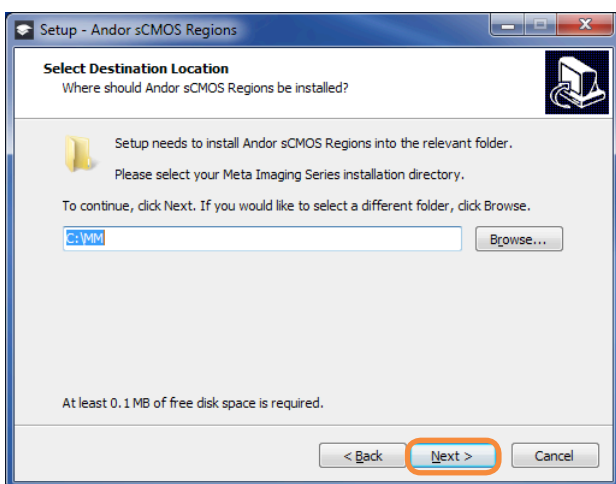
4. To use a predefined ROI go to the main tool bar and select **Regions>Load Regions...** This will open a window where a predefined ROI's can be selected.
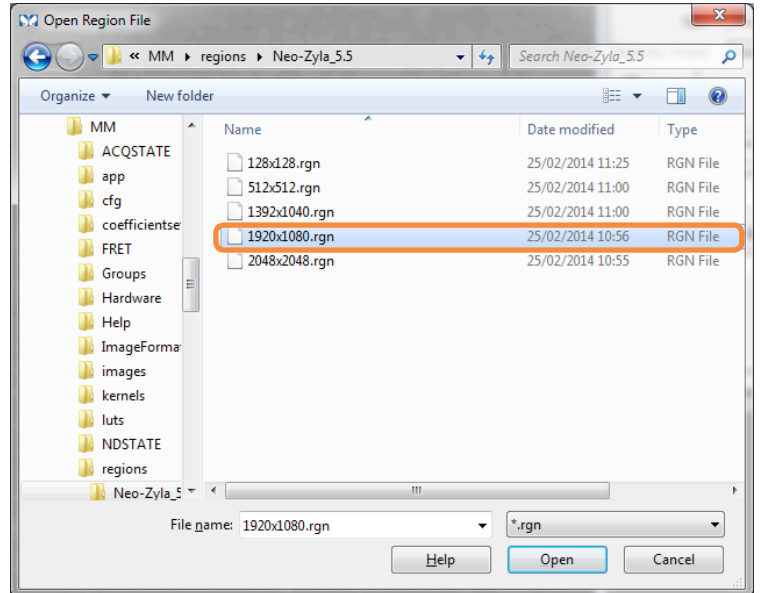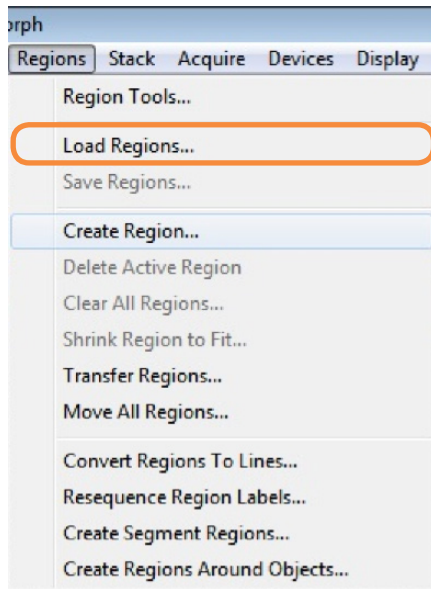

5. Select the ROI of interest (For example, 1920 x 1080 as shown above).

6. An outline of the new central region will now be visible on the full resolution of the chip.
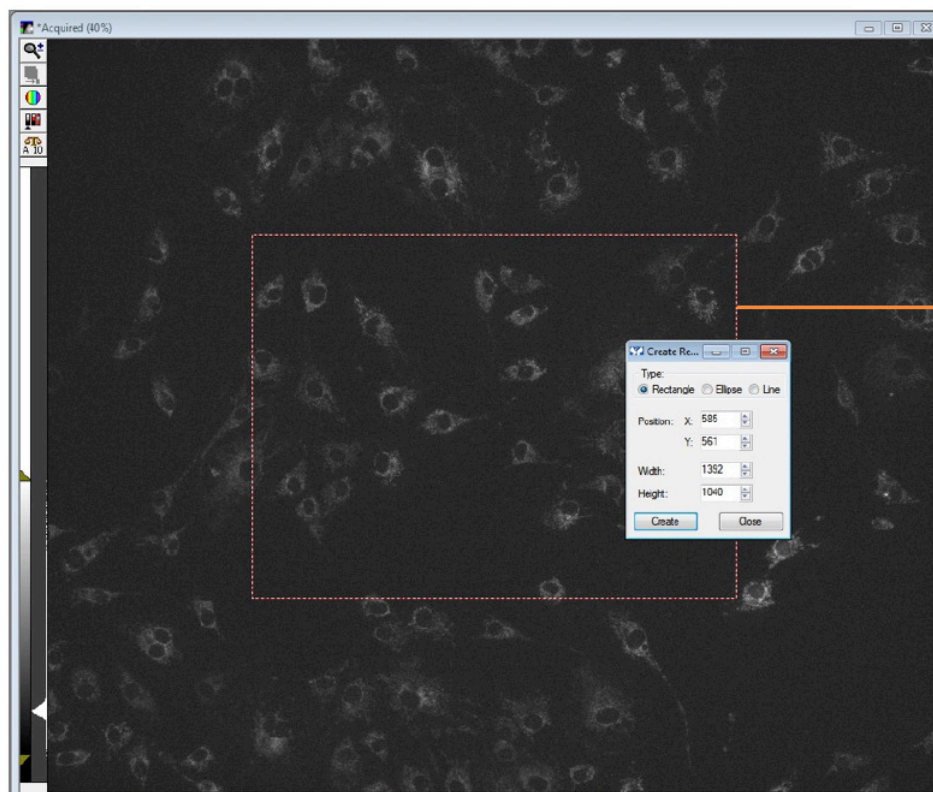

7. To select the new region click the '**Use Active Region**' button in the '**Acquire**' window and the new region you have defined will appear in a new window.

3.2.2 DEFINING A CUSTOM REGION OF INTEREST

1. Go Live to see the full field of view and snap an image.

2. To define the ROI go to the main tool bar and select **Regions>Create Region**. This will open a new window where you can set the height and width and x and y position on the sensor.
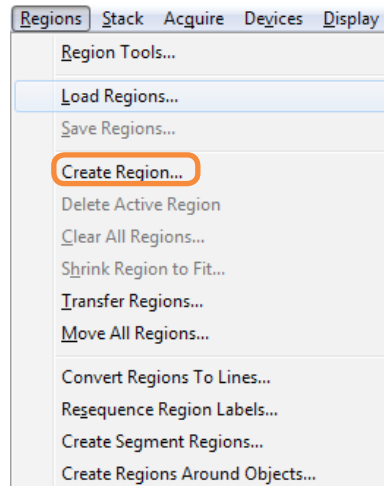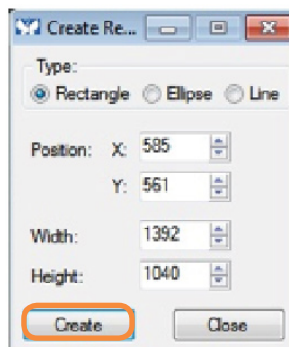

3. Select the width, height, x and y position for the ROI (You will see an outline of the new region on the full resolution of the chip).
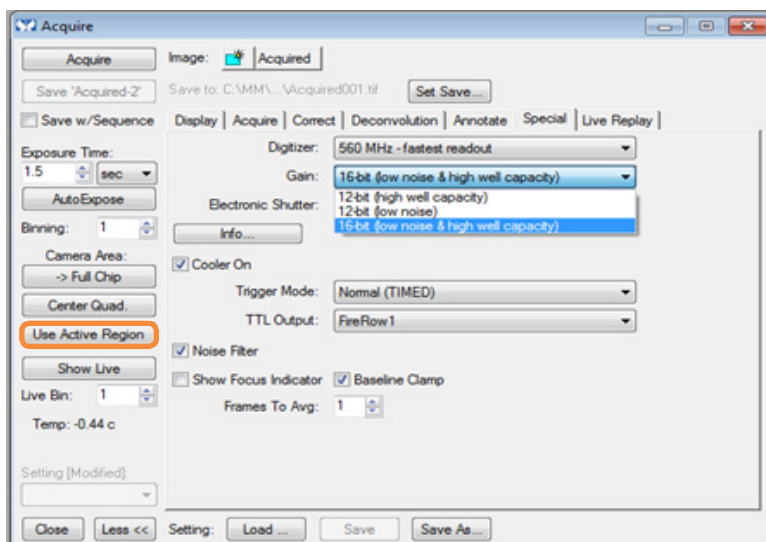

Preview of the selected region of interest

4.   Once you have defined the required region, click 'Create'.

5.   To select the new region click the 'Use Active Region' button in the 'Acquire' window and the new region you have defined will appear in a new window.
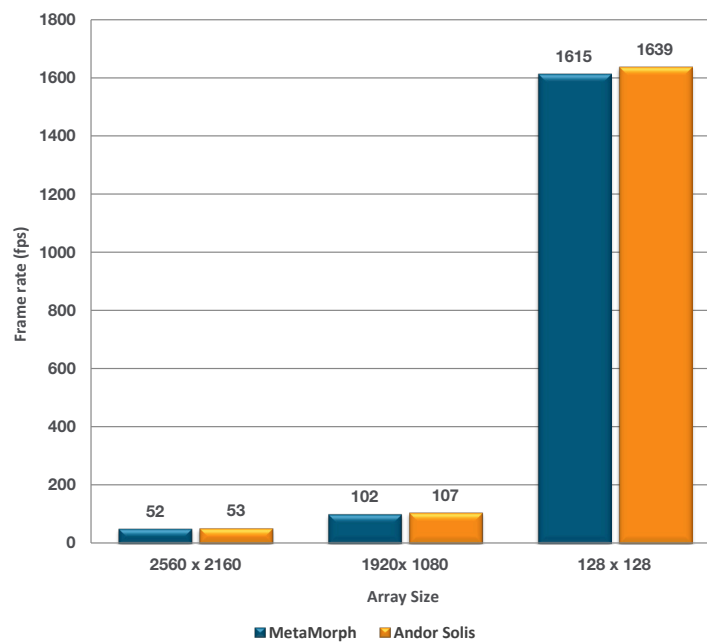
3.3 SUSTAINED FRAME RATES FOR THE NEO AND ZYLA IN METAMORPH.

The following graphs show the typical sustained frame rates for a number of pre-defined ROIs using MetaMorph and Andor Solis.
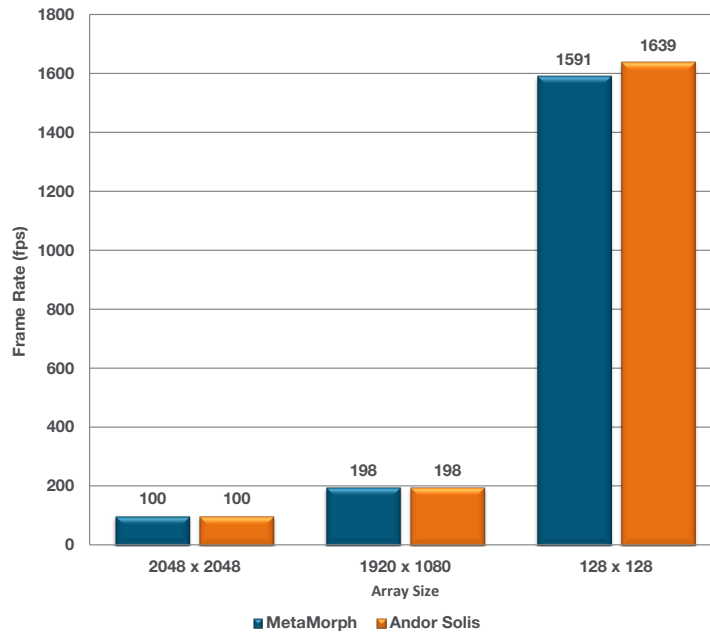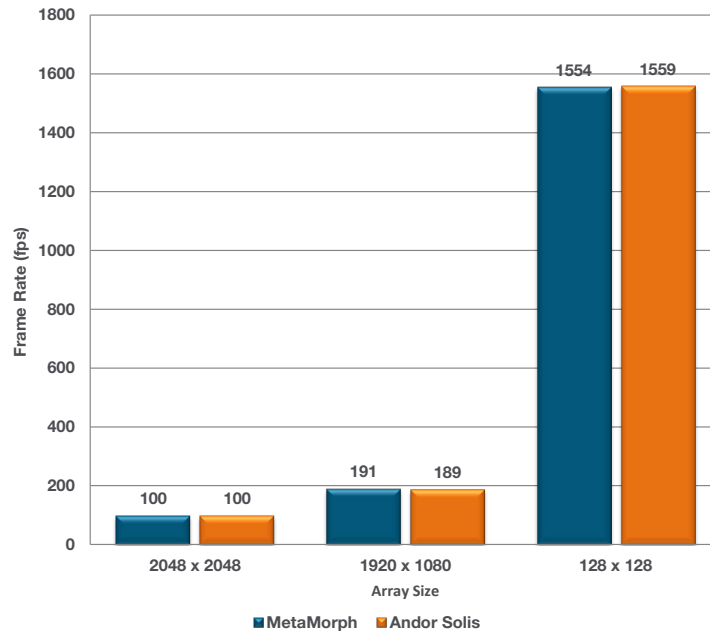
NEO 5.5
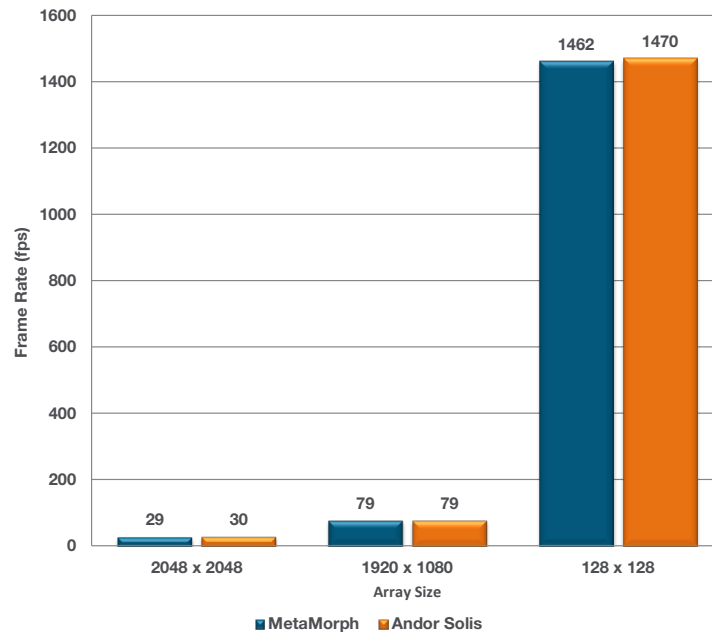
ZYLA 5.5 USB 3.0
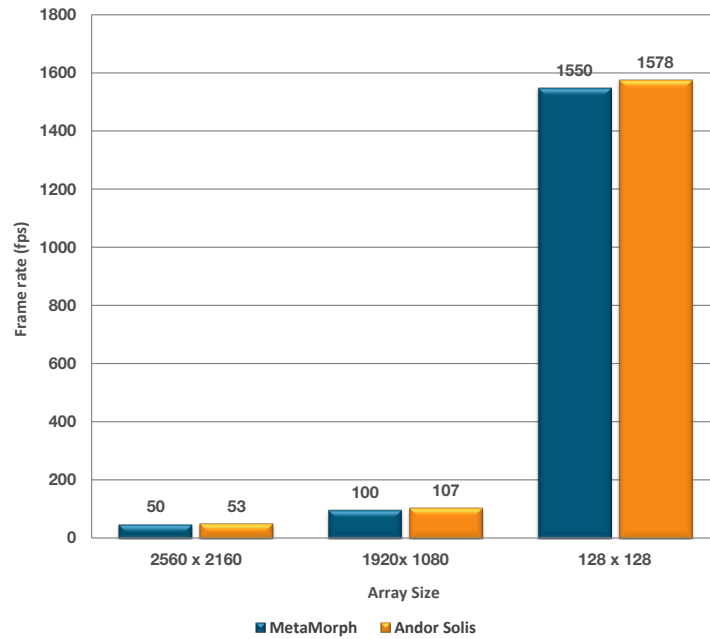
Zyla 5.5 10-tap

Zyla 4.2 10-Tap

ZYLA 4.2 USB 3.0

3.4 Neo & Zyla Feature Matrix in MetaMorph

	Neo 5.5	Zyla 5.5	Zyla 4.2
Trigger Modes			
Internal	✓	✓	✓
External	✓	✓	✓
Software	✓	✓	✓
External Start	✓	✓	✓
External Exposure	✓	✓	✓
Acquisition Modes			
Fixed length - specify the number of images required	✓	✓	✓
Continuous - camera acquires until aborted.	✓	✓	✓
Frame Rate Control	✓	✓	✓
Software Accumulation - specify number of images to accumulate	✗	✗	✗
Readout Modes			
Imaging - Full Image Readout from Sensor	✓	✓	✓
Fixed ROI support (centred)* - 2048x2048, 1920x1080, 512x512, 128x128	✗	✗	✗
ROI - Single Arbitrary Region of Interest Selection on sensor	✓	✓	✓
Camera Binning - 1x1, 2x2, 3x3, 4x4, 8x8	✓	✓	✓
Metadata			
Timestamp	✓	✓	✓
On-Camera Correction			
Spurious Noise Filter	✓	✓	✓
Fan Speed Control			
On, Off	✓	✓	✓
High, Low	✓	✗	✗
Operating System Support			
Windows 7 - 32-bit	✓	✓	✓
Windows 7 - 64-bit	✓	✓	✓
Recommended Application Features			
Easy Vertical Centering of ROI for fastest acquisition	✗	✗	✗

*can be setup with supplied region files