MetaMorph NX

Molecular Devices

MetaMorph NX

An Introduction to version 2.0

Agenda

- General overview of the MetaMorph NX
- 4D Viewer
- How to use some features in MetaMorph NX

Molecular Devices

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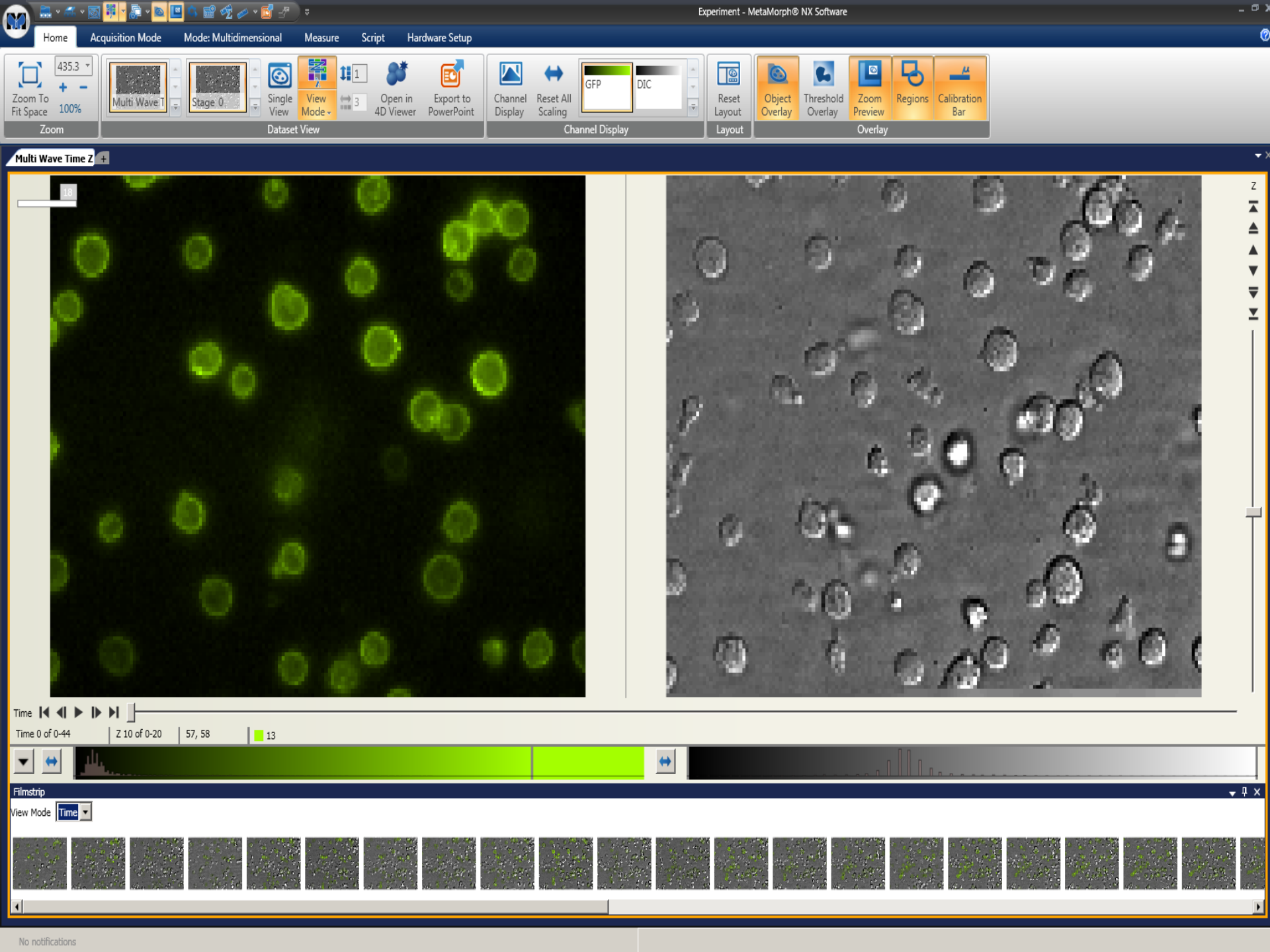
Experiment - MetaMorph® NX Software
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Z 10 of 0-20
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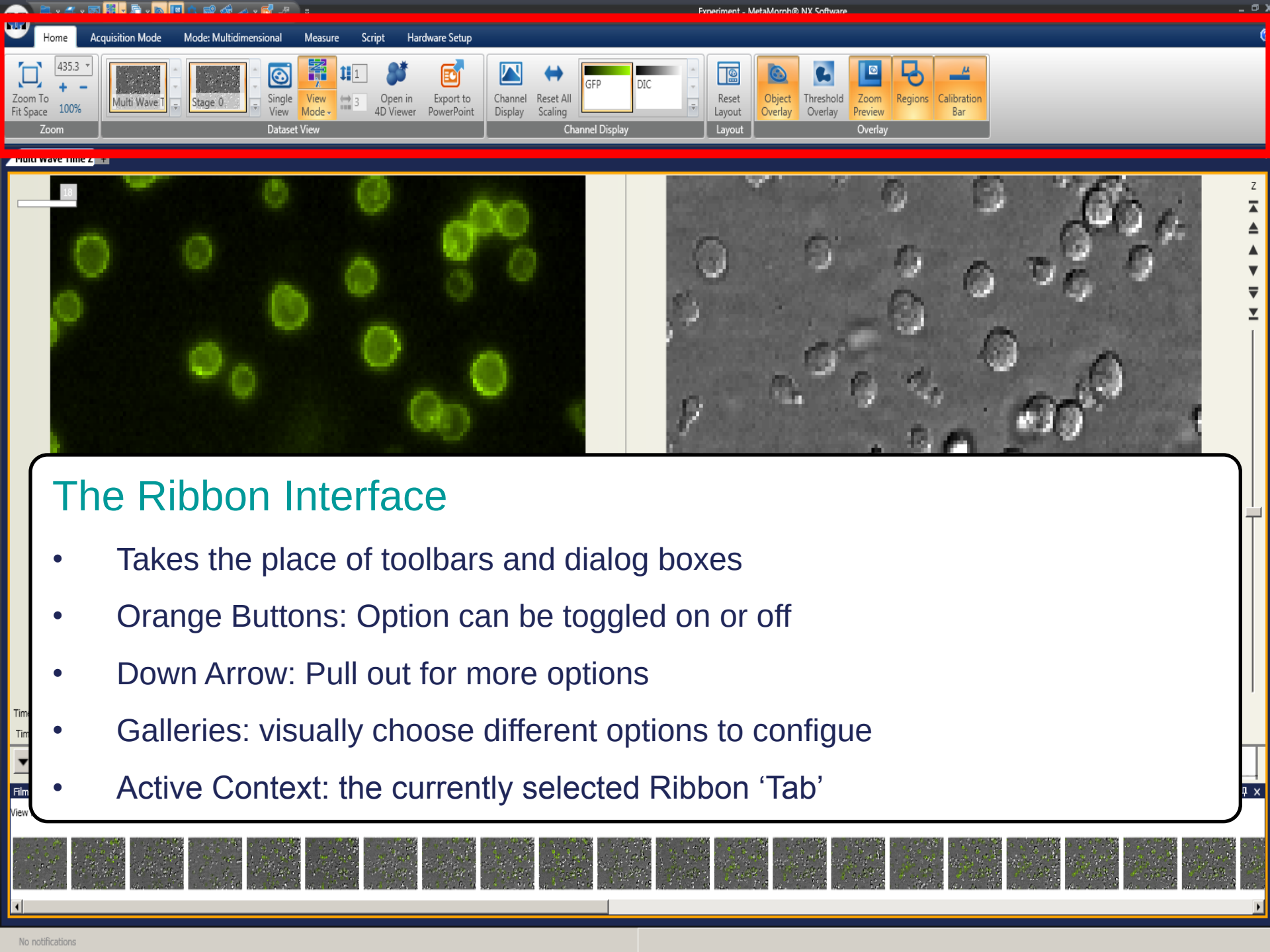
Filmstrip
View Mode
Time
No notifications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• Orange Buttons: Option can be toggled on or off
• Down Arrow: Pull out for more options
• Galleries: visually choose different options to configue
• Active Context: the currently selected Ribbon ‘Tab’
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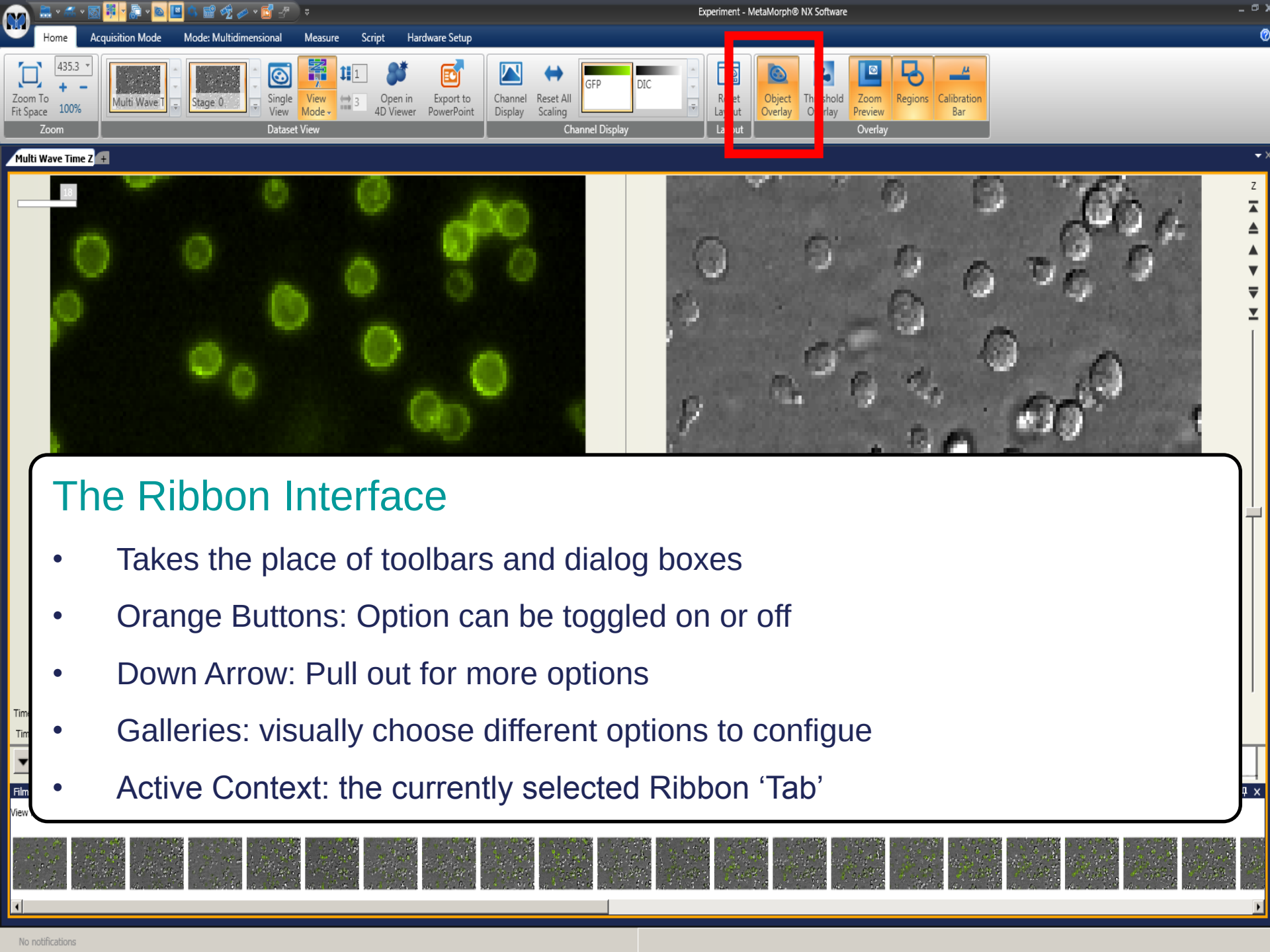
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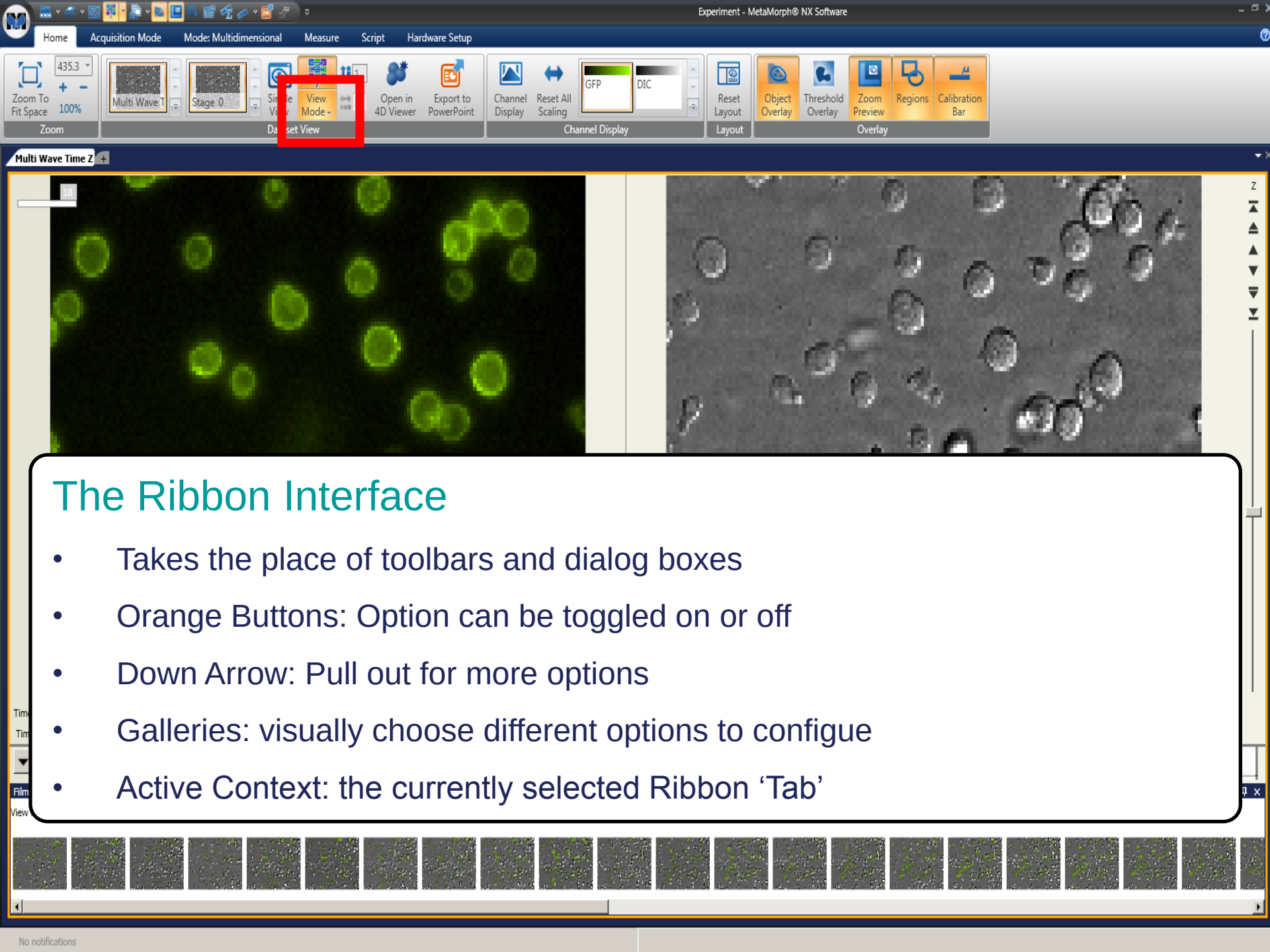

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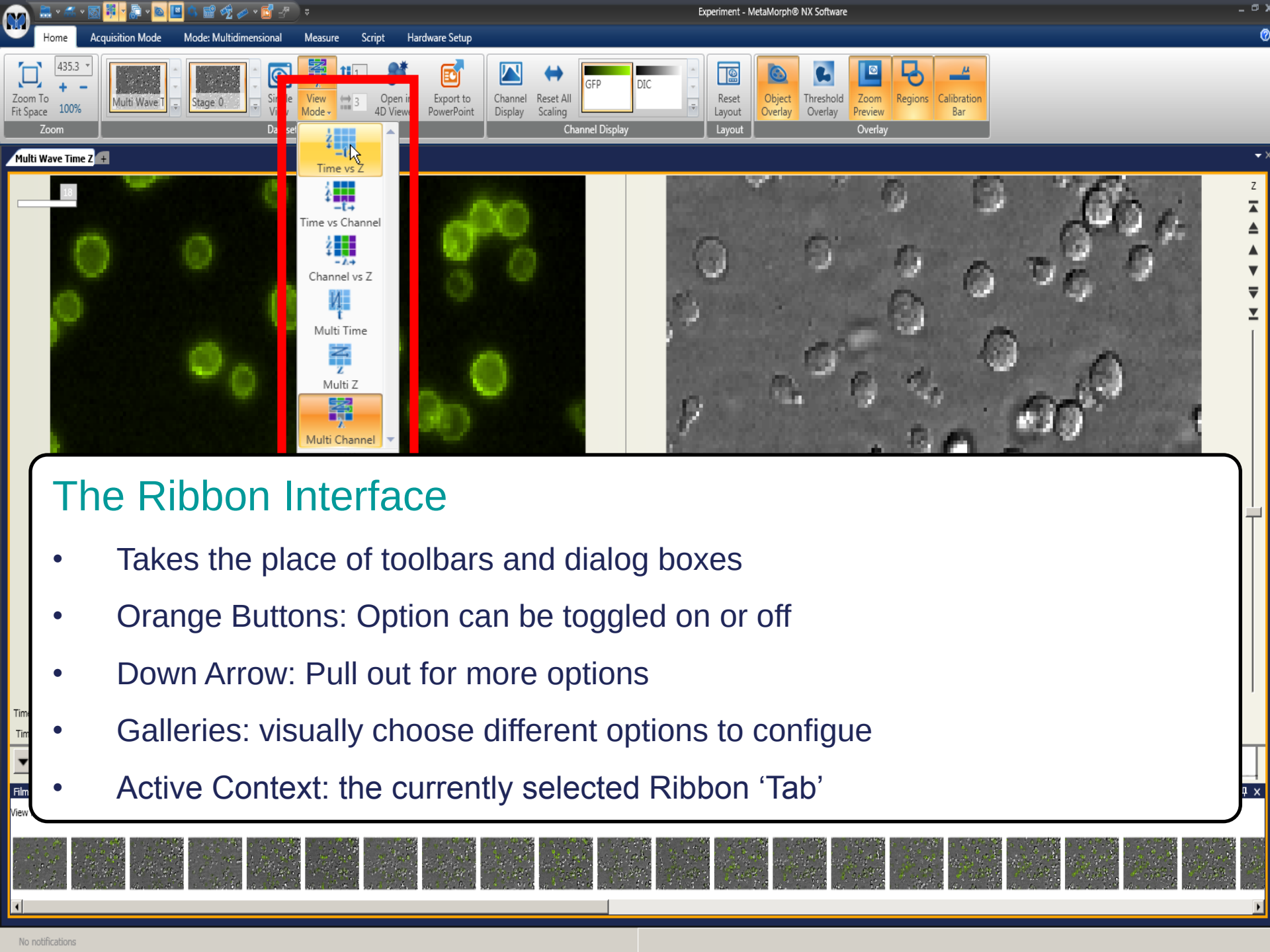

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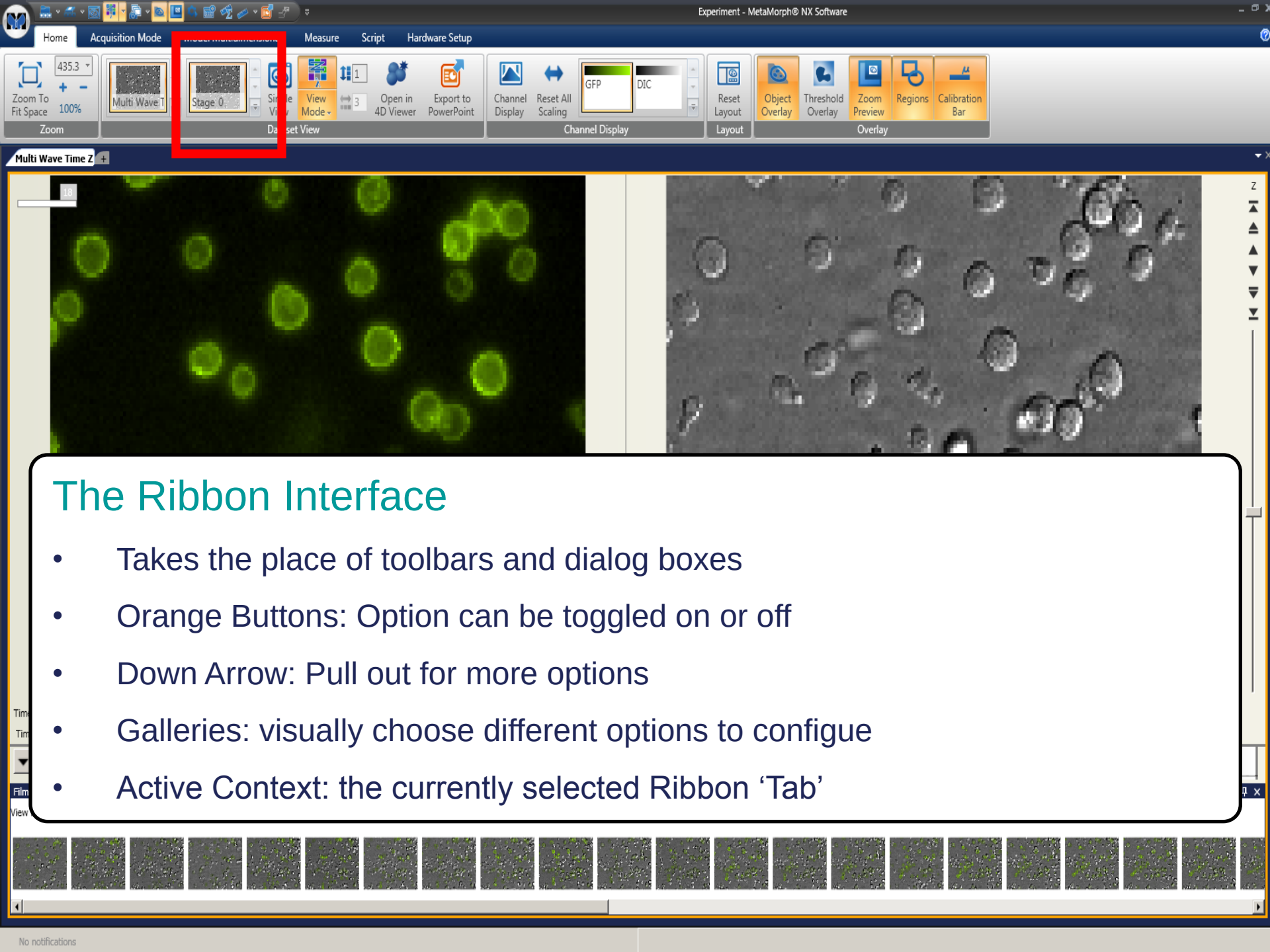
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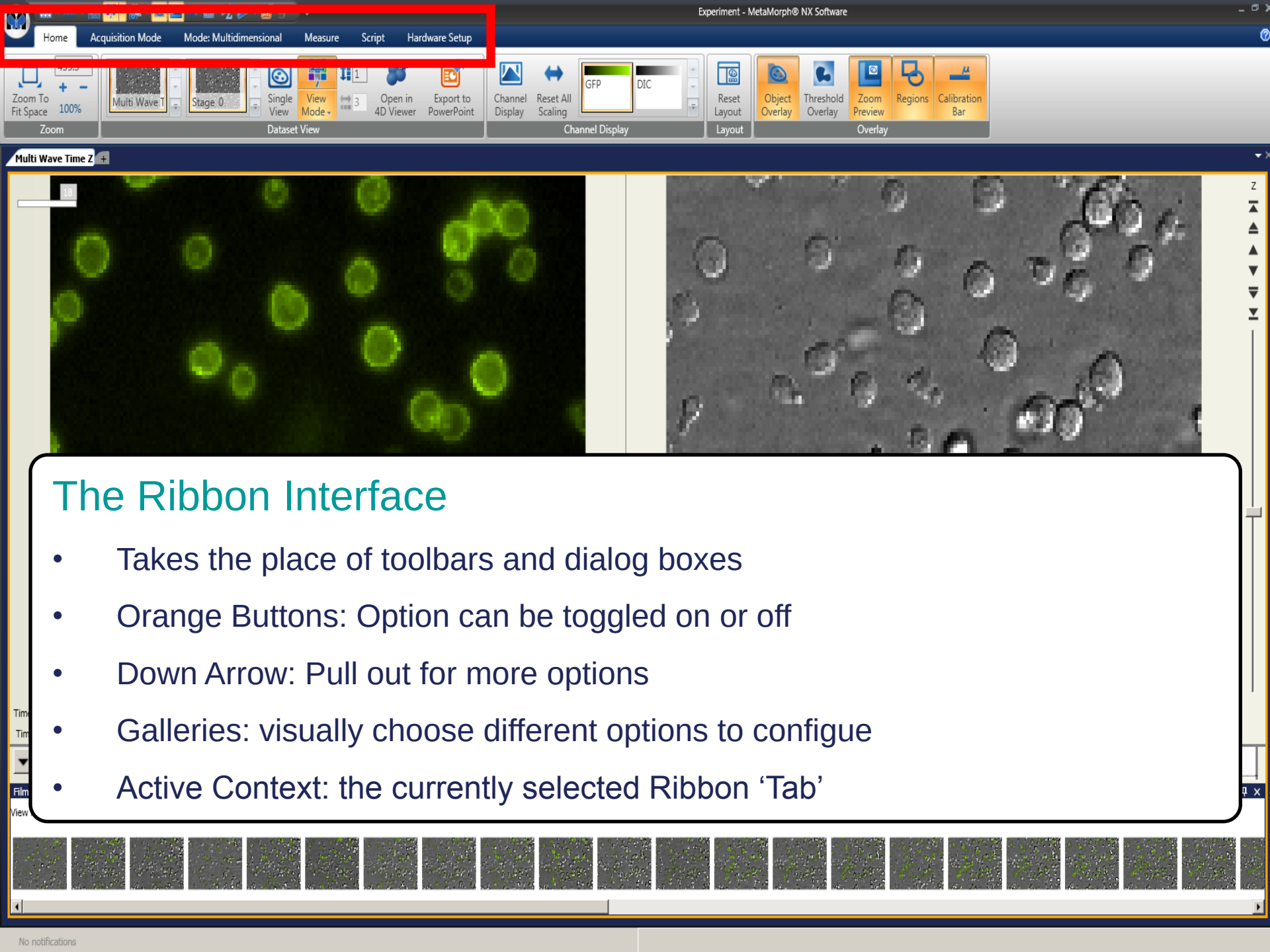
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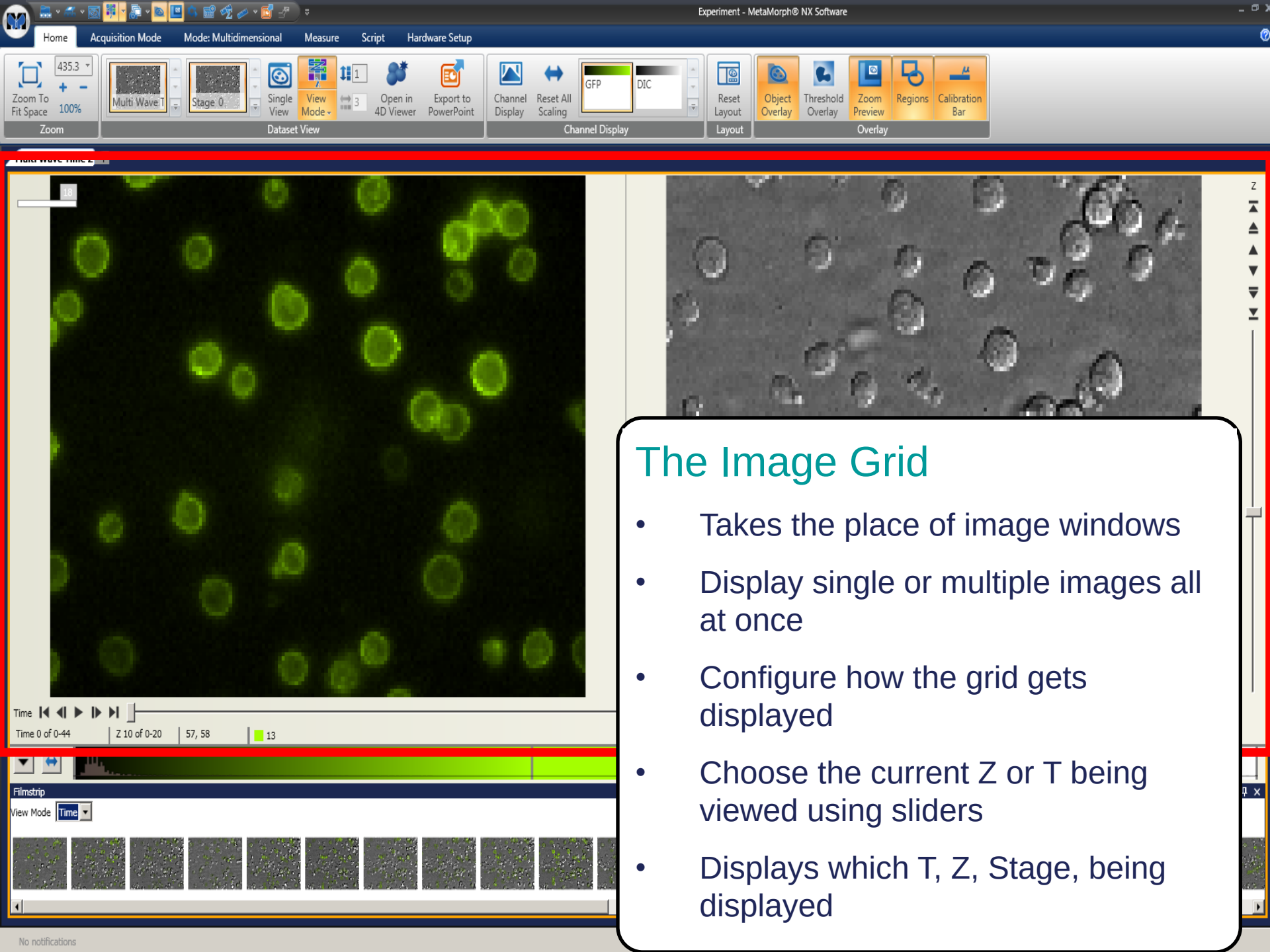
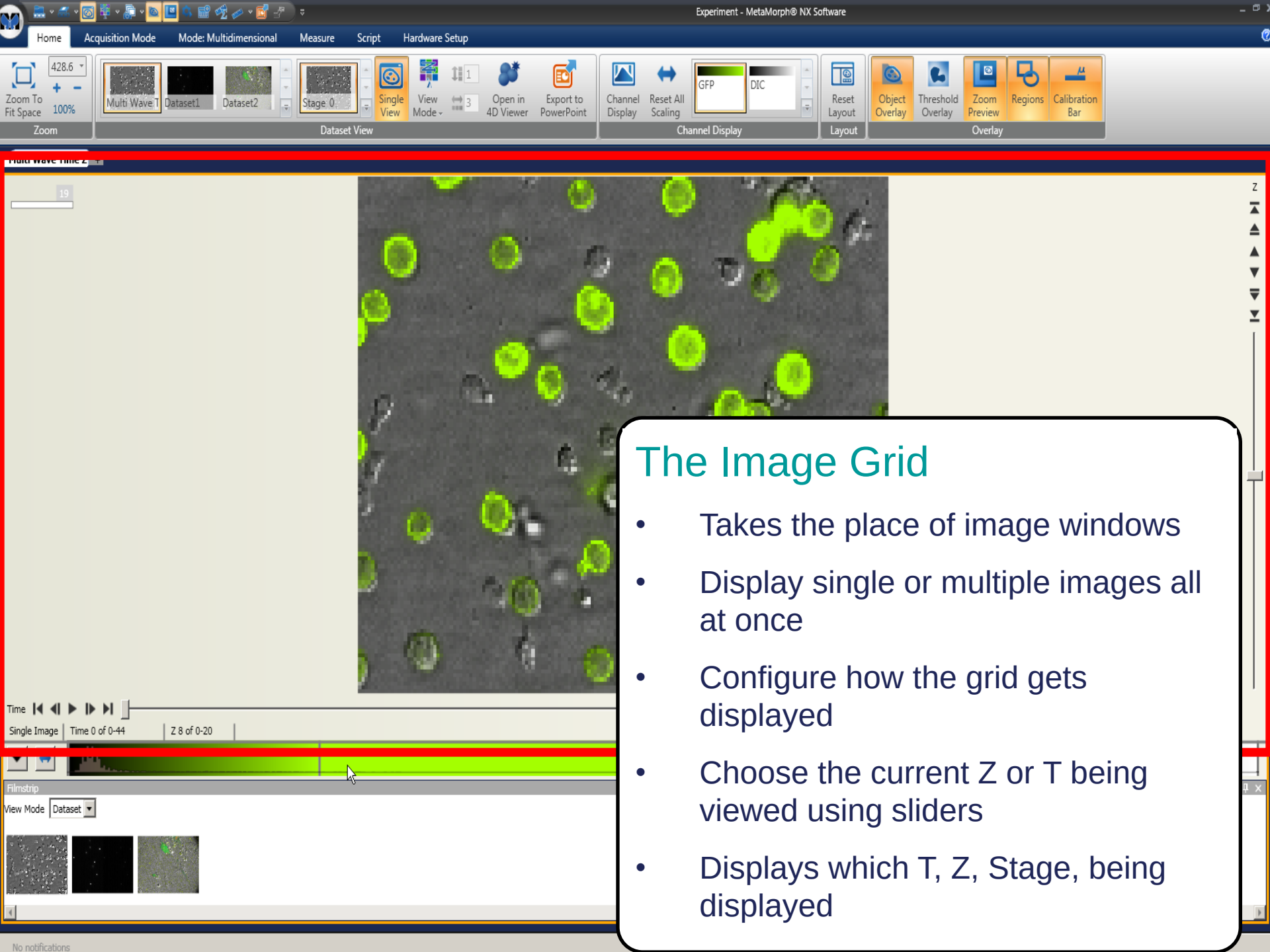


The Image Grid

- Takes the place of image windows
- Display single or multiple images all at once
- Configure how the grid gets displayed
- Choose the current Z or T being viewed using sliders
- Displays which T, Z, Stage, being displayed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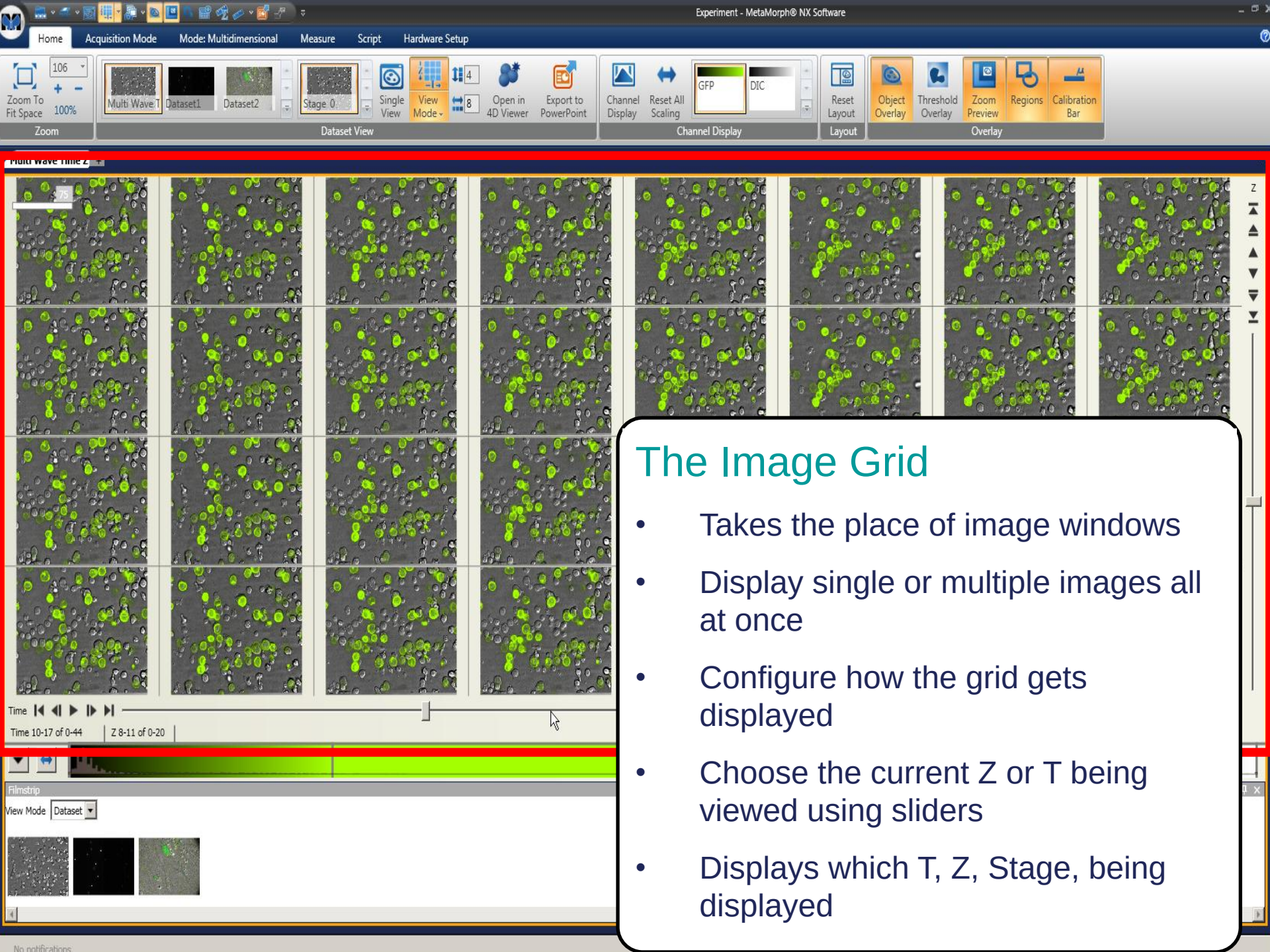

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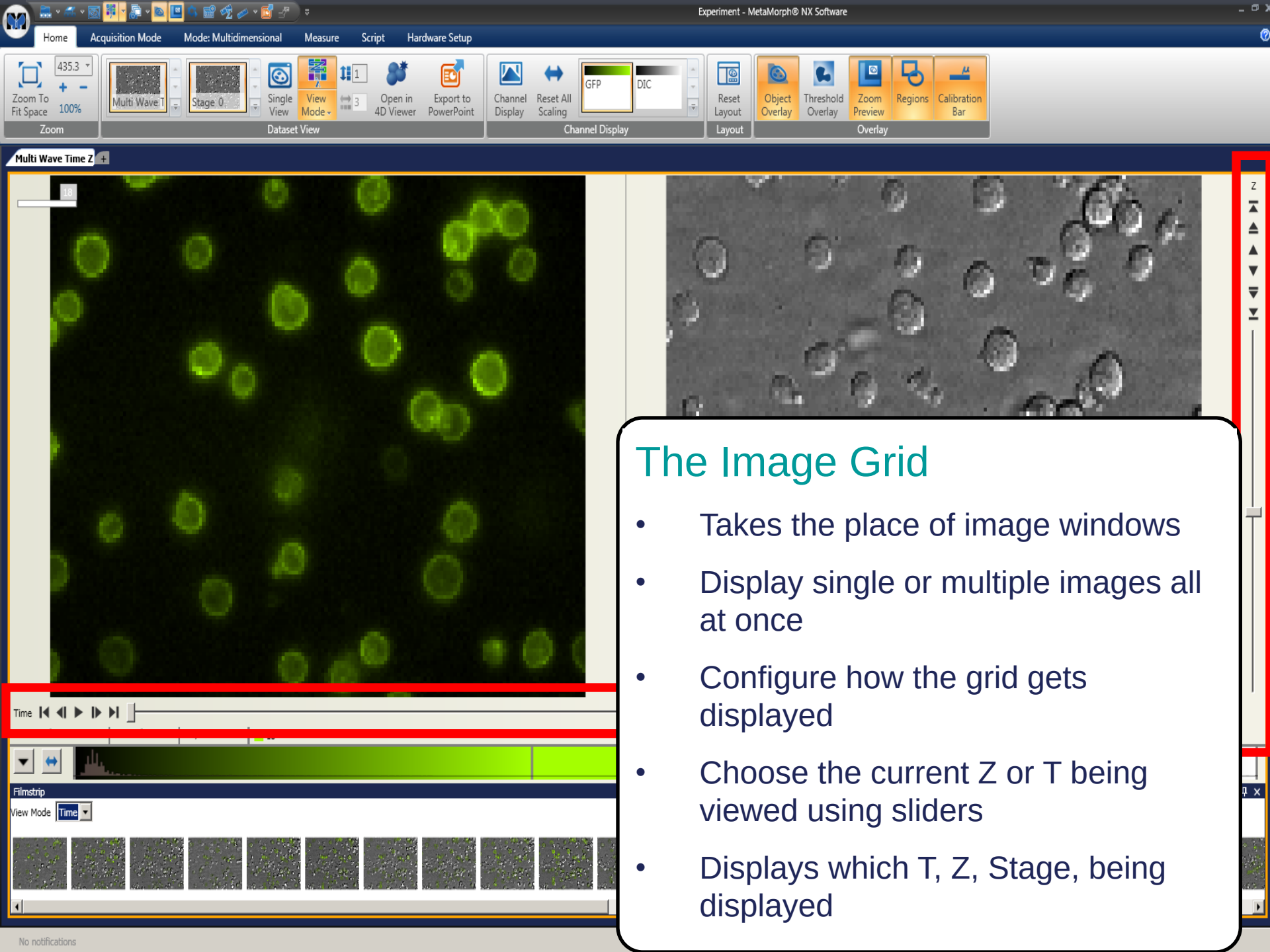

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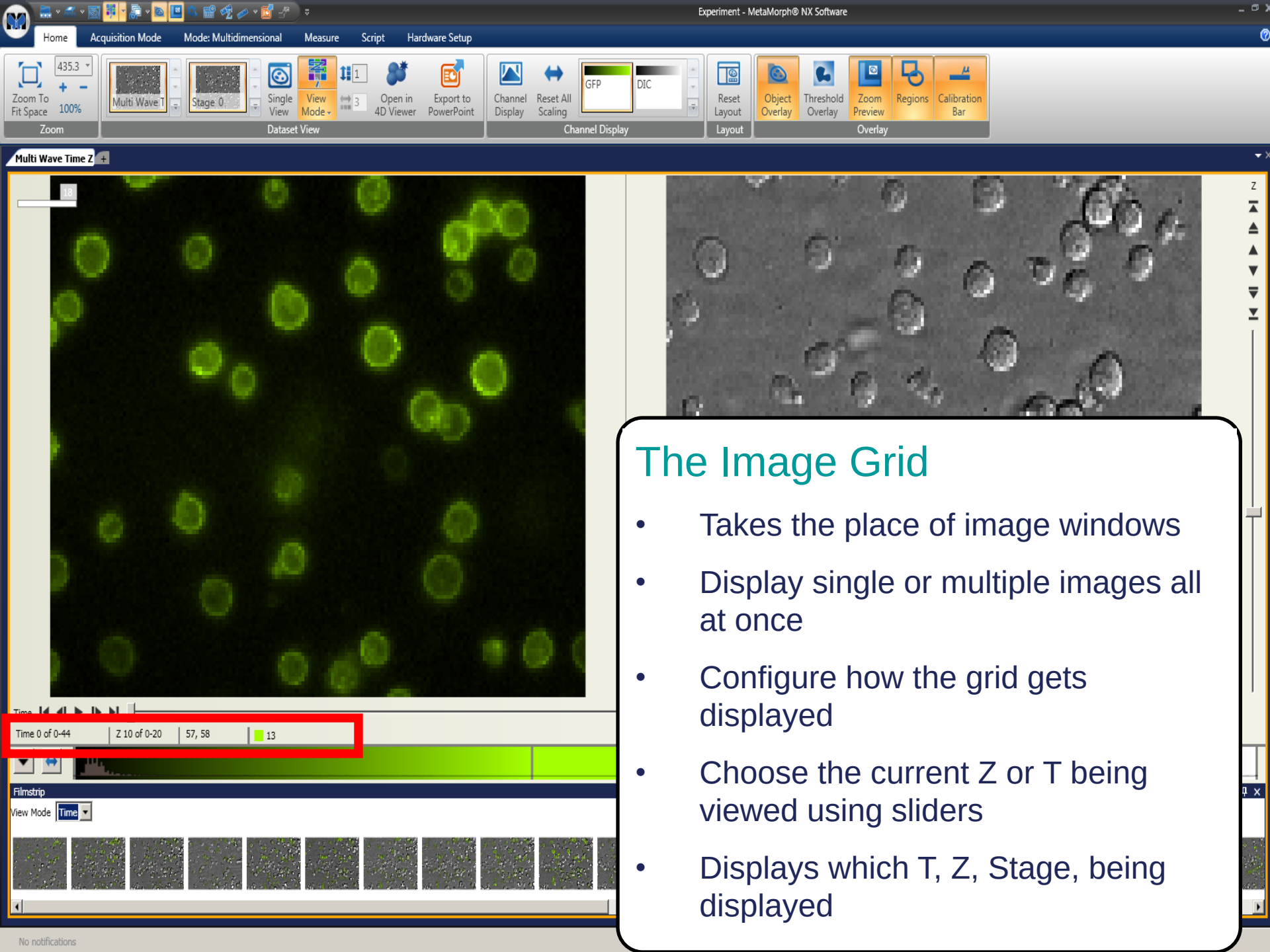

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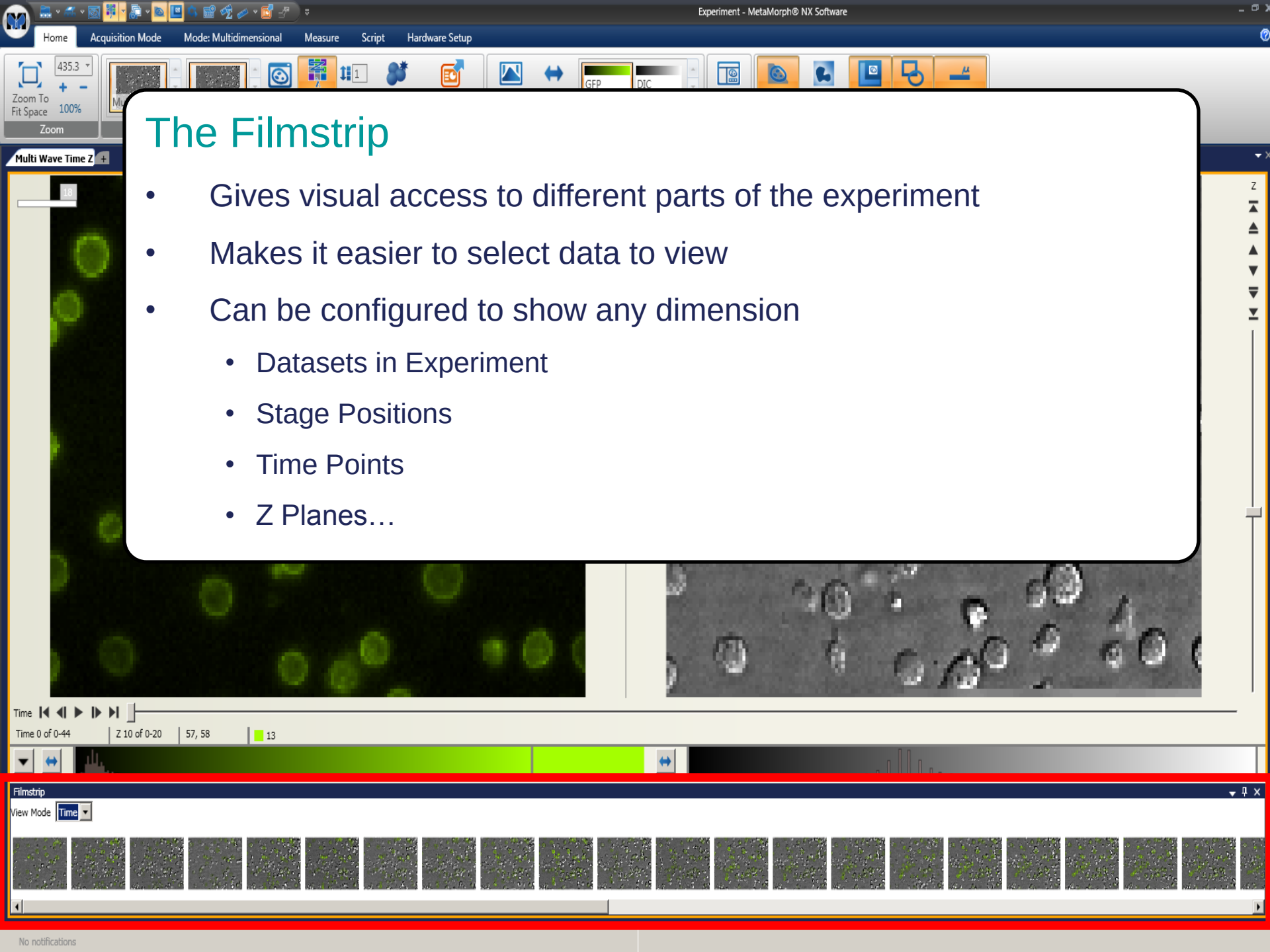
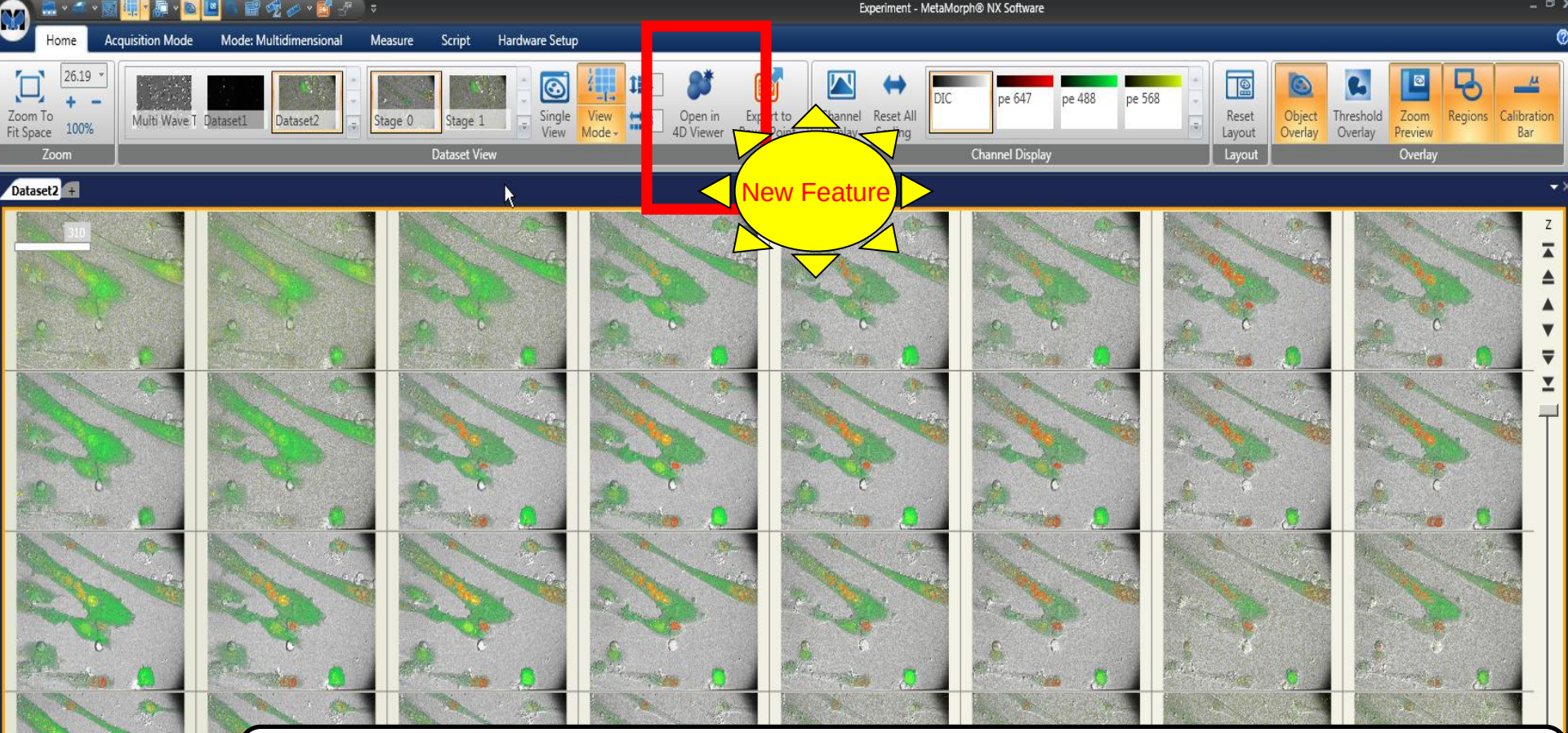
The Filmstrip

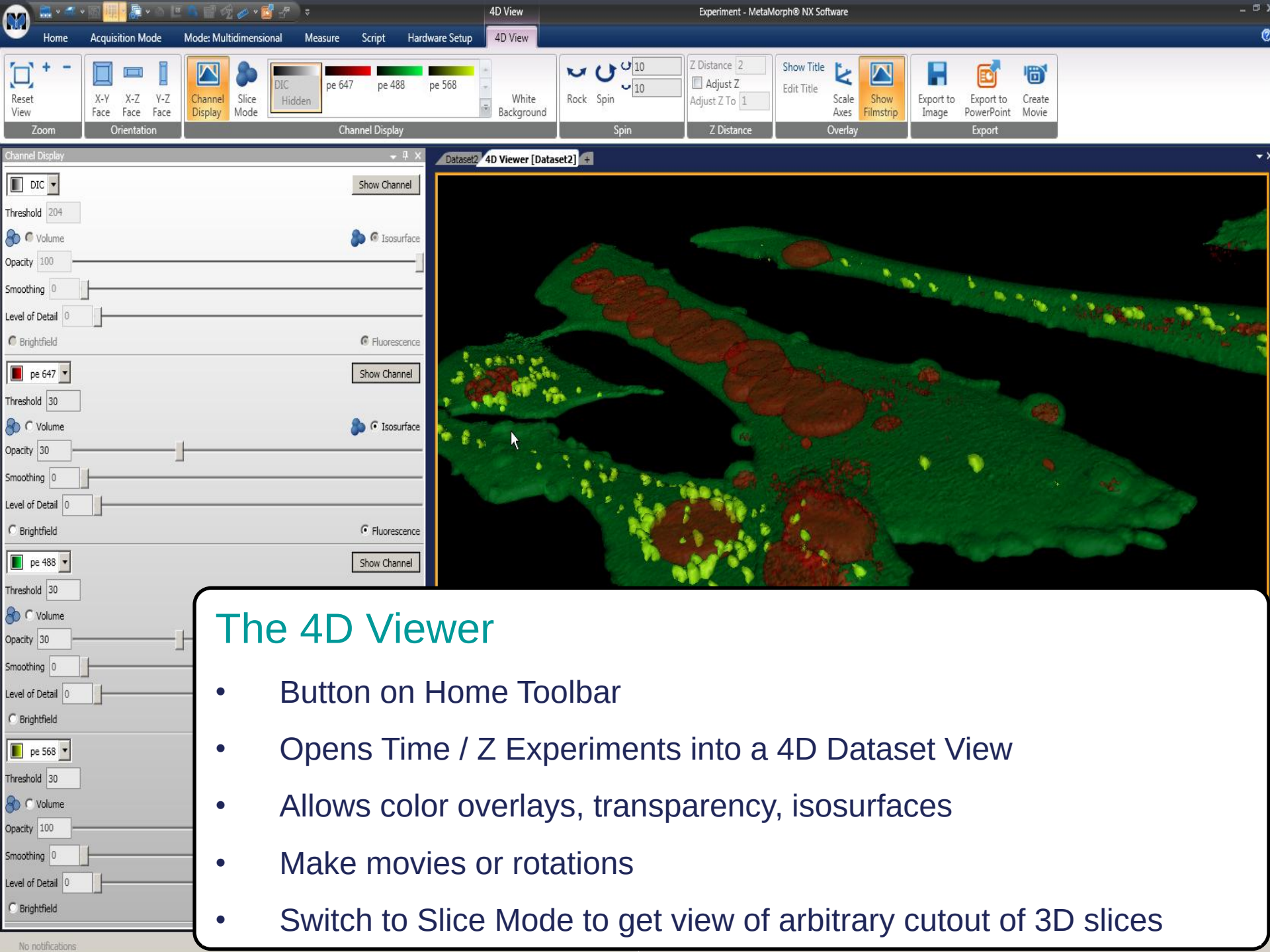
- Gives visual access to different parts of the experiment
- Makes it easier to select data to view
- Can be configured to show any dimension
  - Datasets in Experiment
  - Stage Positions
  - Time Points
  - Z Planes…





The 4D Viewer

- Button on Home Toolbar
- Opens Time / Z Experiments into a 4D Dataset View
- Allows color overlays, transparency, isosurfaces
- Make movies or rotations
- Switch to Slice Mode to get view of arbitrary cutout of 3D slices



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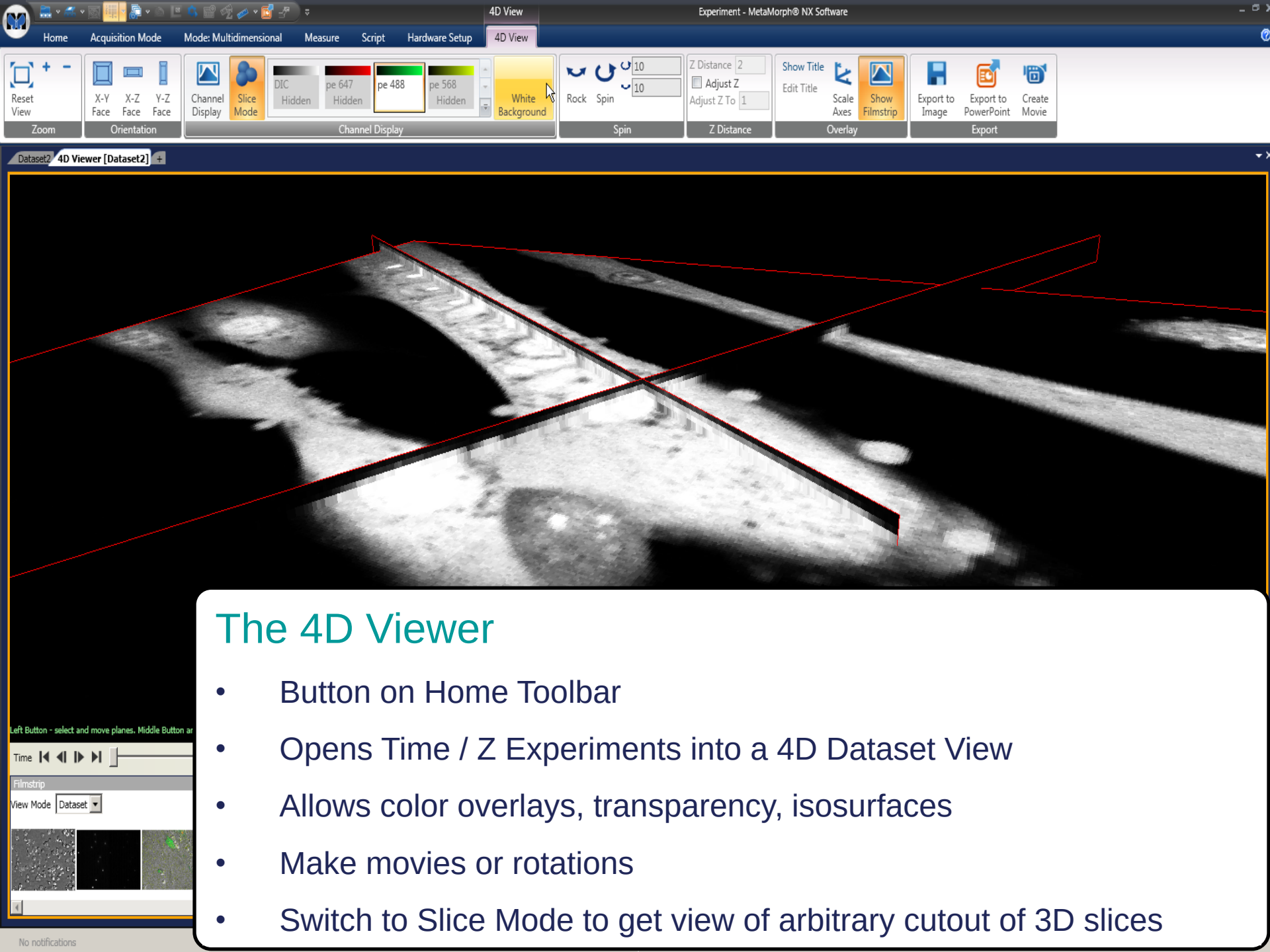

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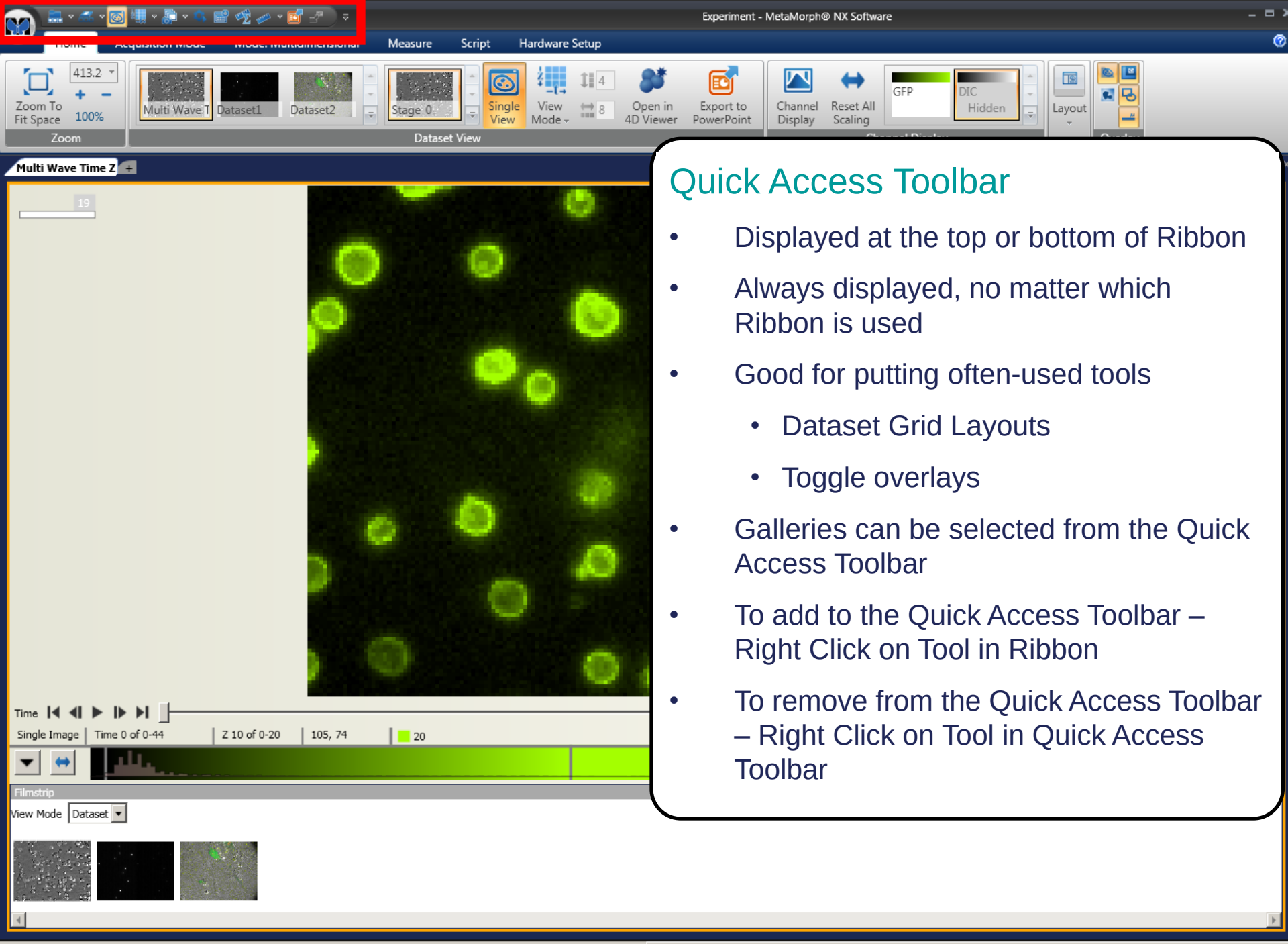

Quick Access Toolbar

- Displayed at the top or bottom of Ribbon
- Always displayed, no matter which Ribbon is used
- Good for putting often-used tools
  - Dataset Grid Layouts
  - Toggle overlays
- Galleries can be selected from the Quick Access Toolbar
- To add to the Quick Access Toolbar – Right Click on Tool in Ribbon
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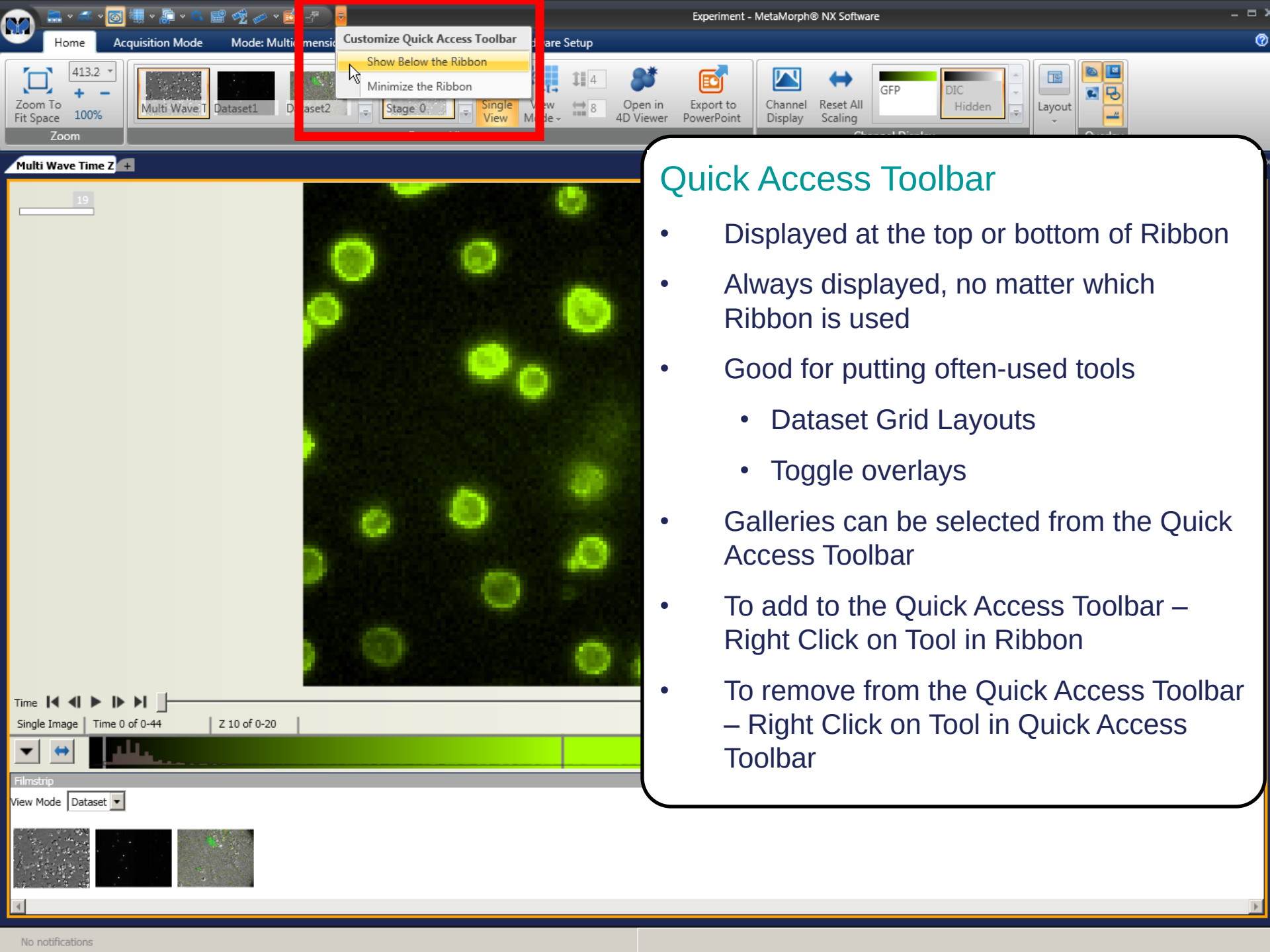

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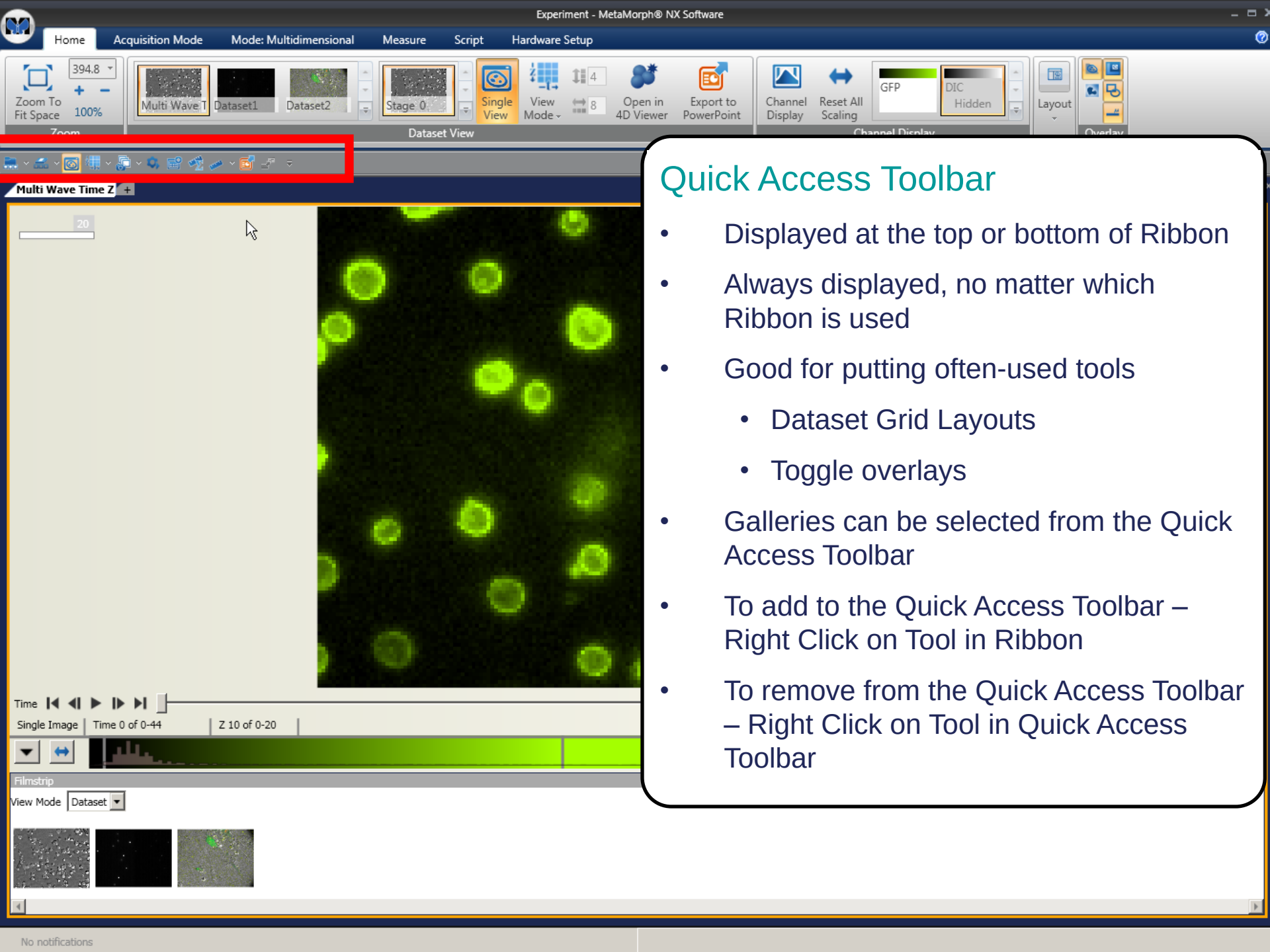

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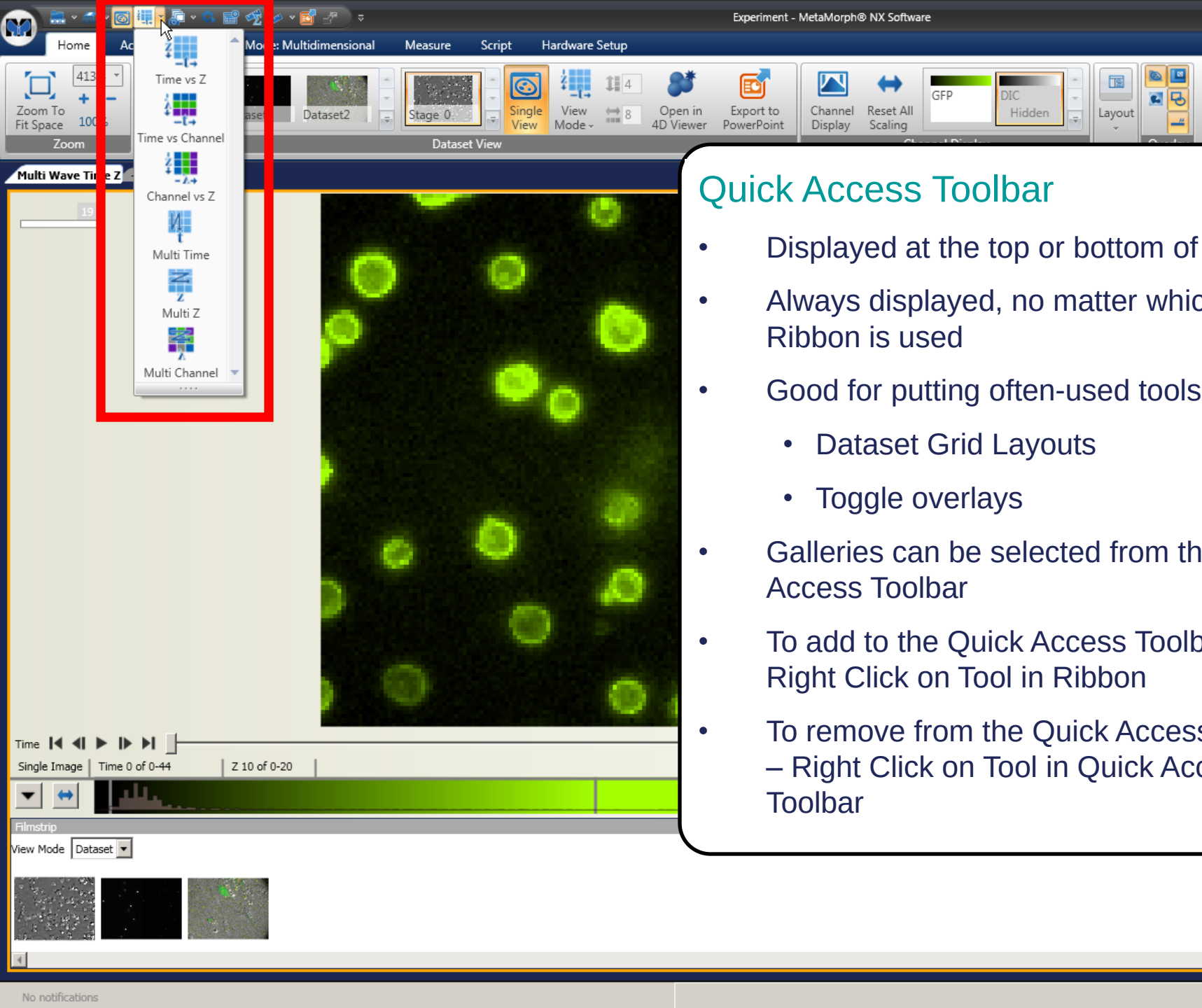

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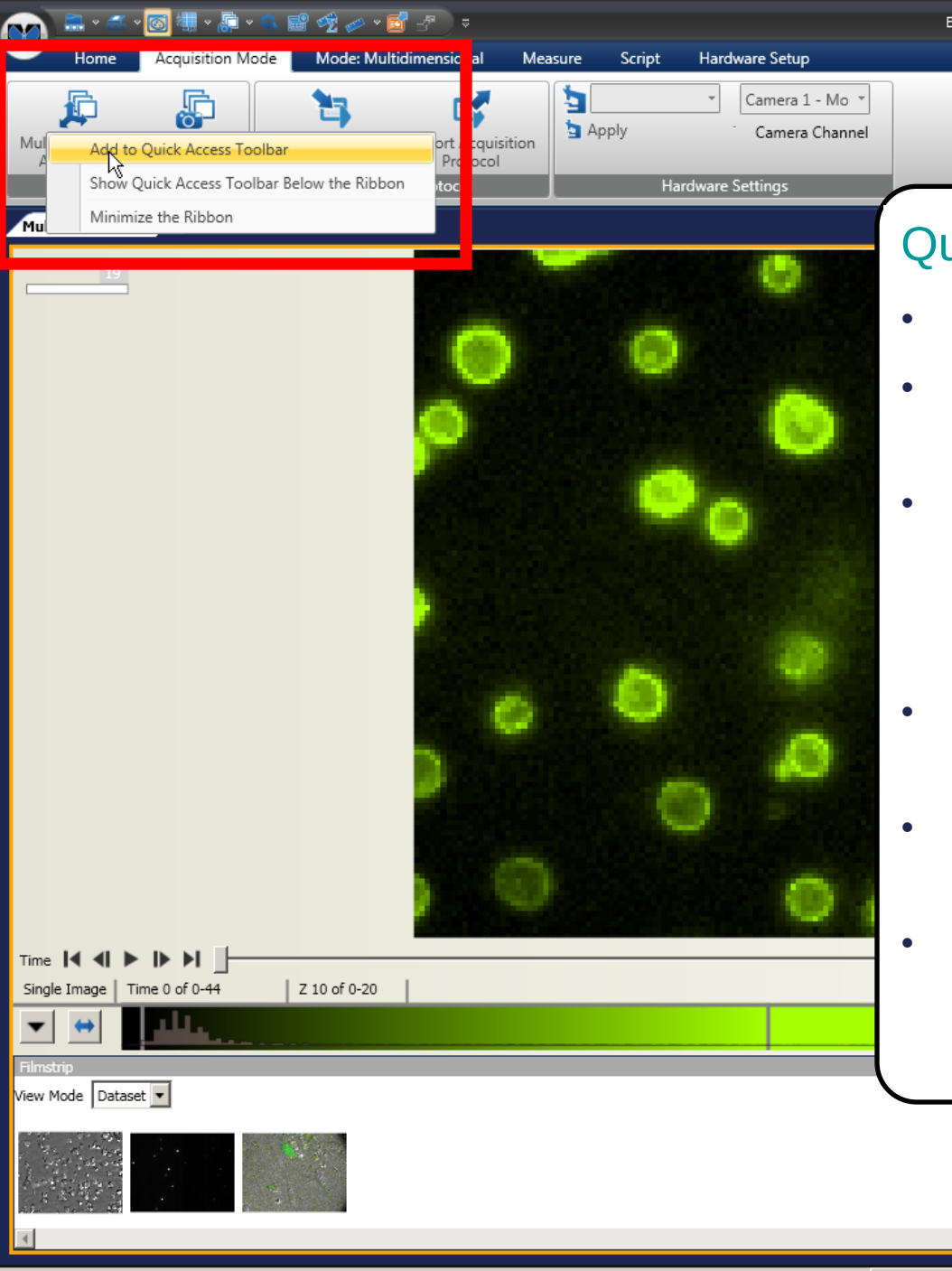

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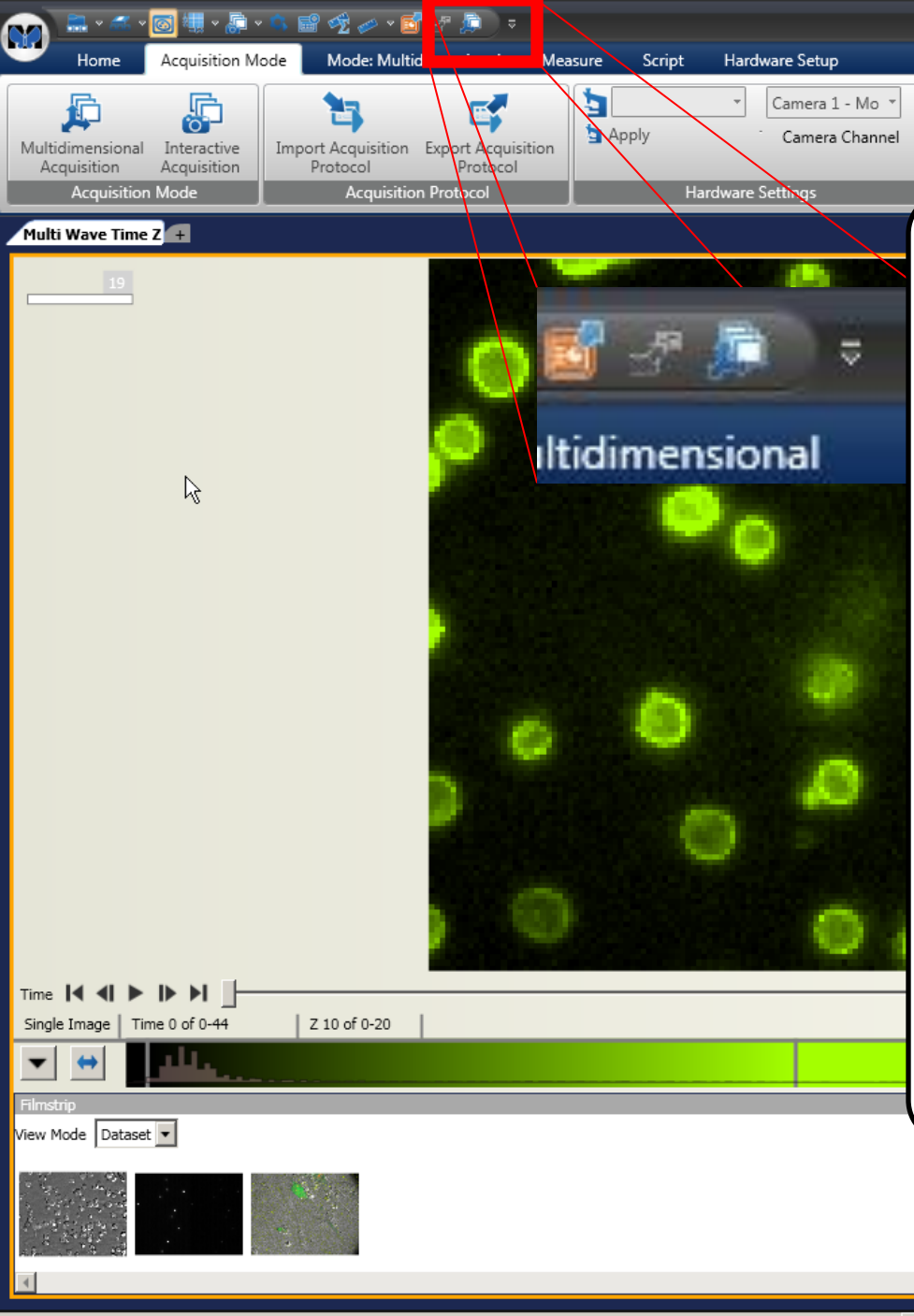

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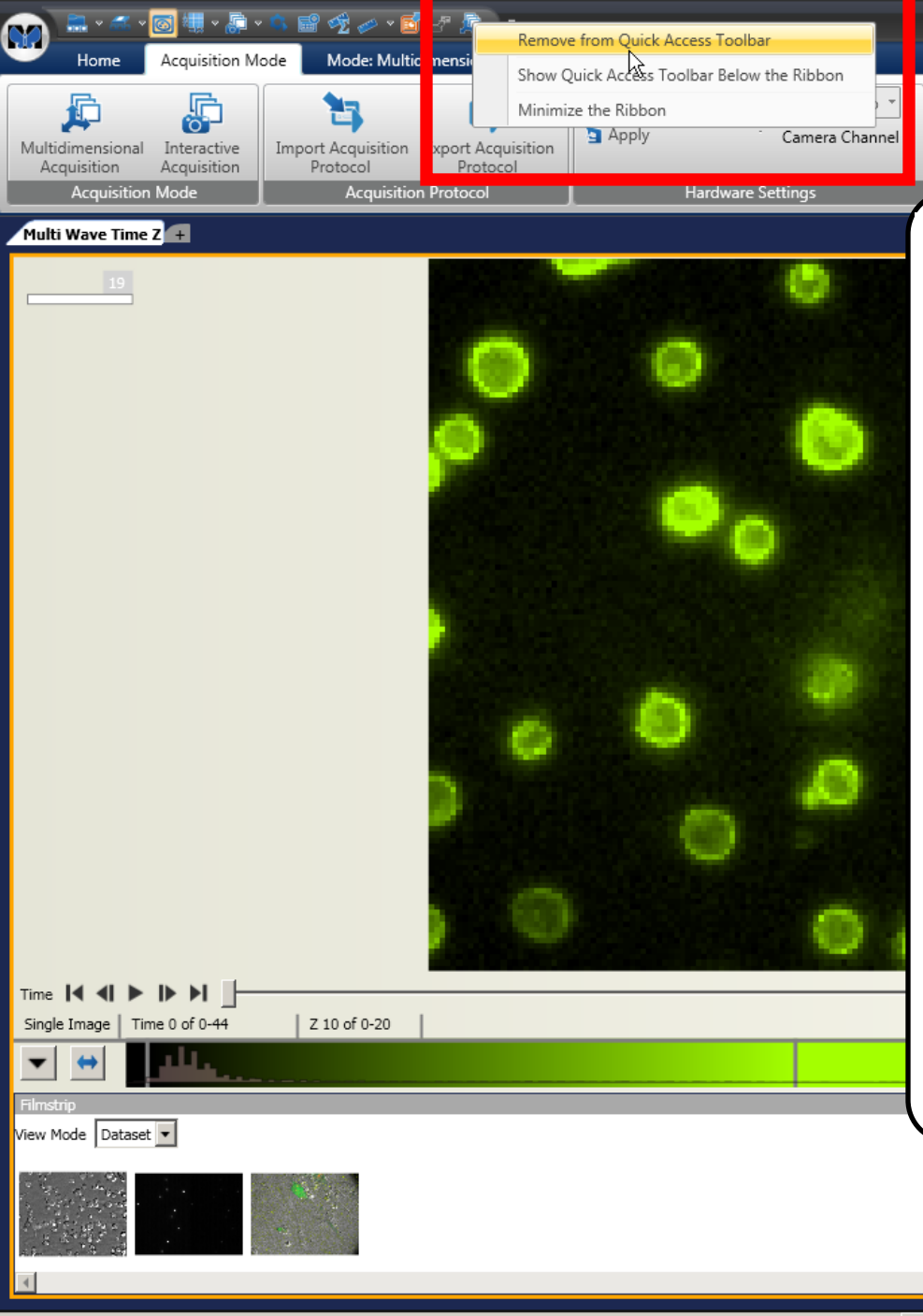

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Using MetaMorph NX

Features of the software to make it easier to use

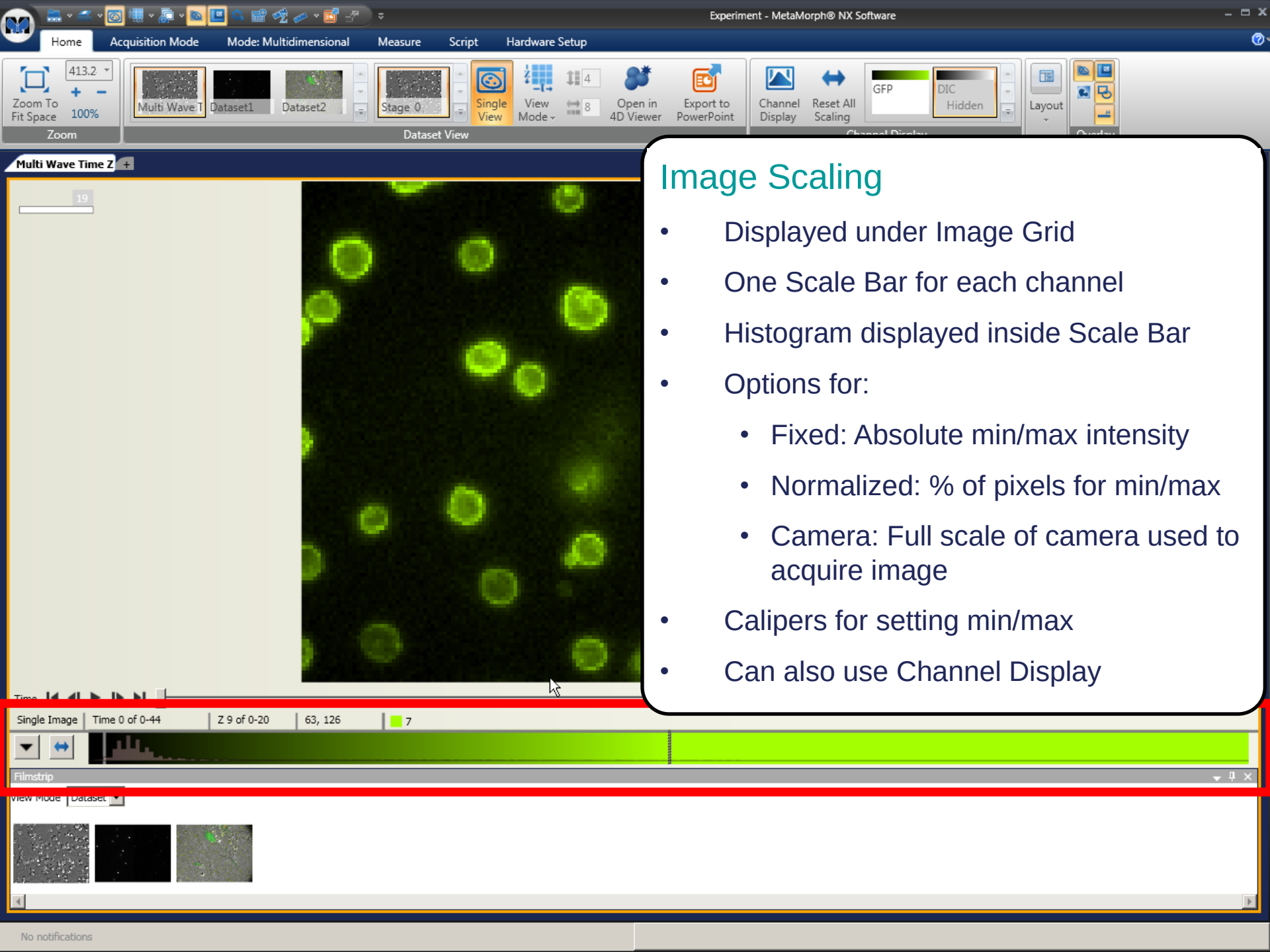
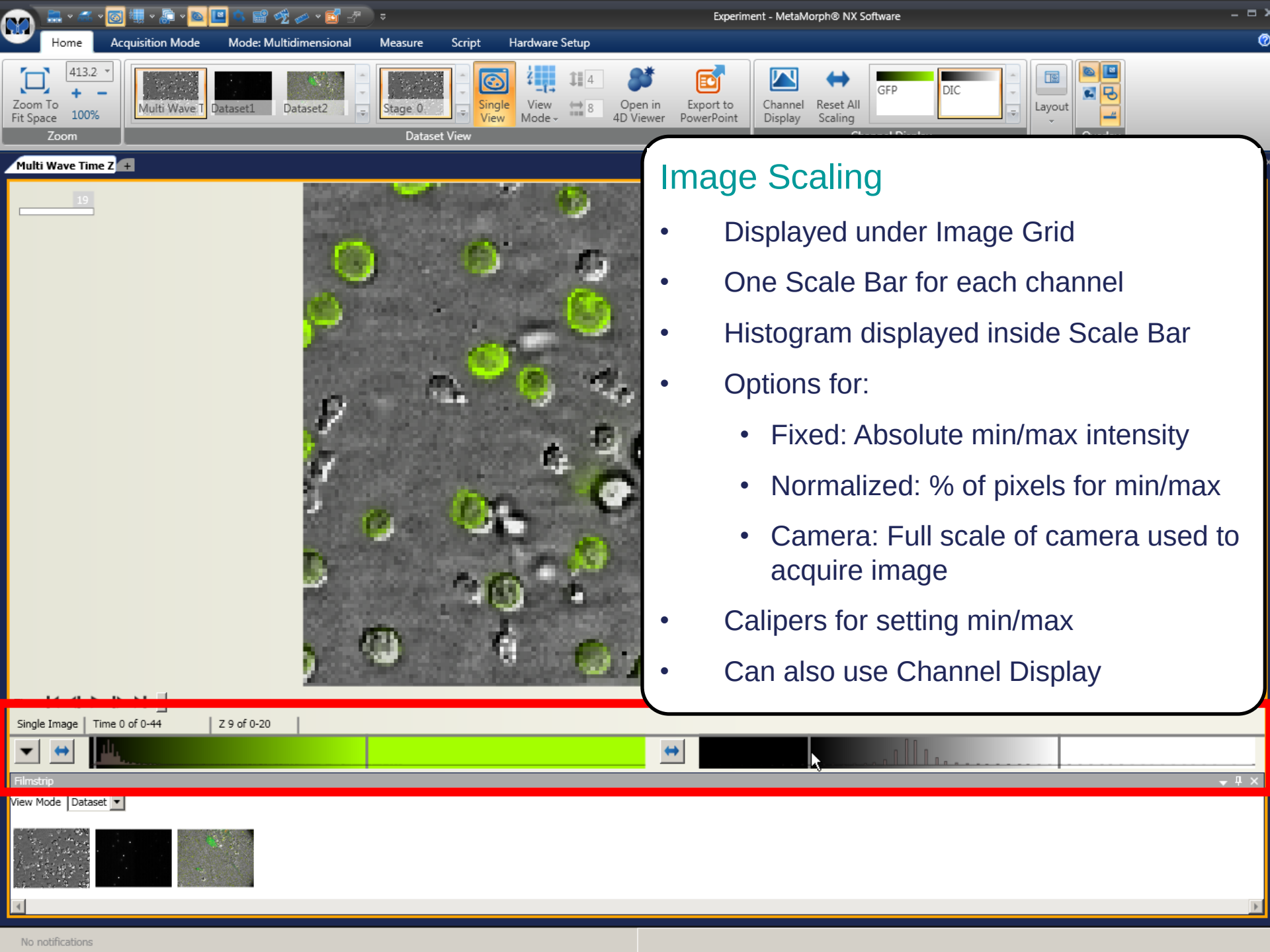


Image Scaling

- Displayed under Image Grid
- One Scale Bar for each channel
- Histogram displayed inside Scale Bar
- Options for:
  - Fixed: Absolute min/max intensity
  - Normalized: % of pixels for min/max
  - Camera: Full scale of camera used to acquire image
- Calipers for setting min/max
- Can also use Channel Display



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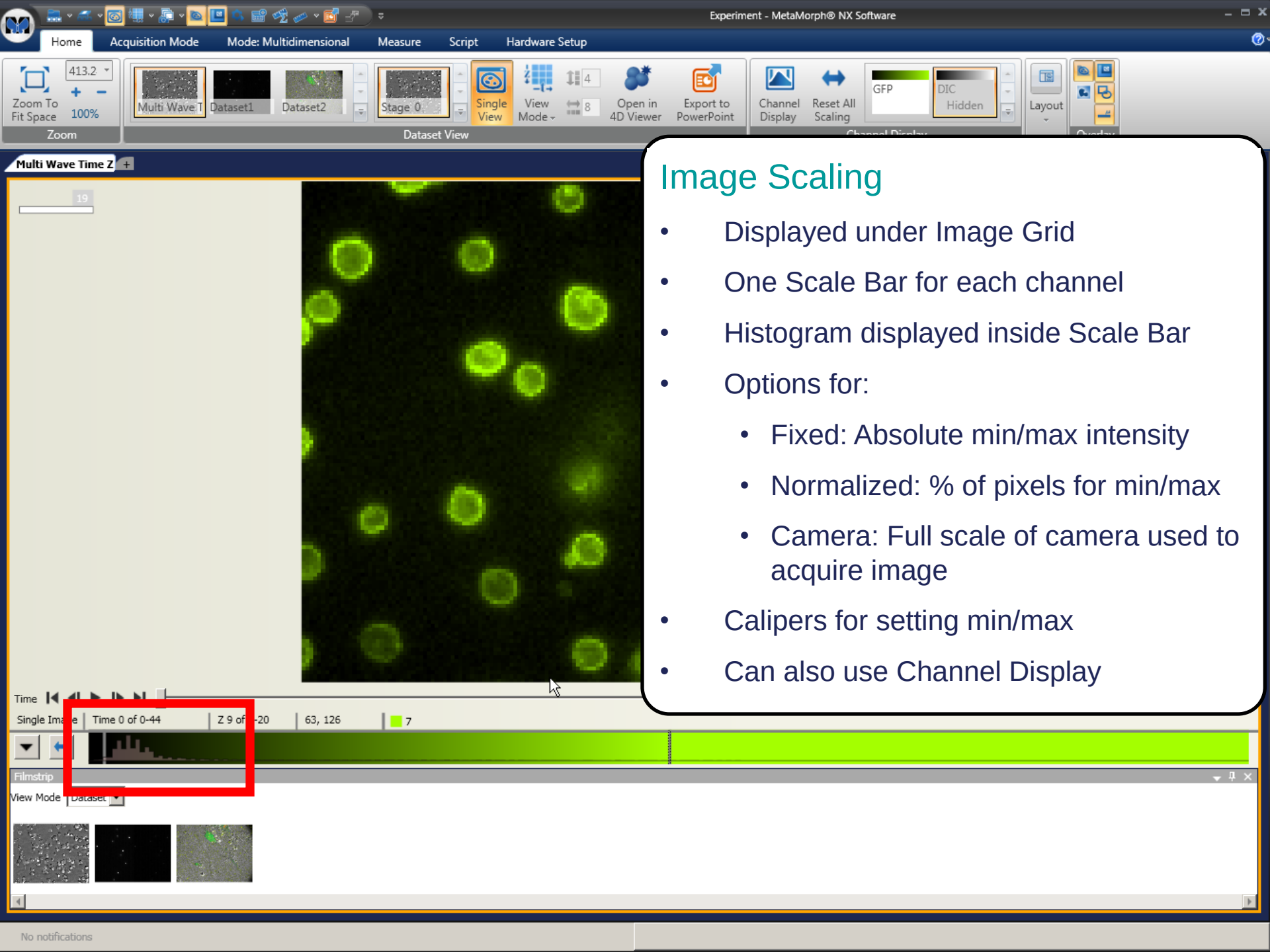

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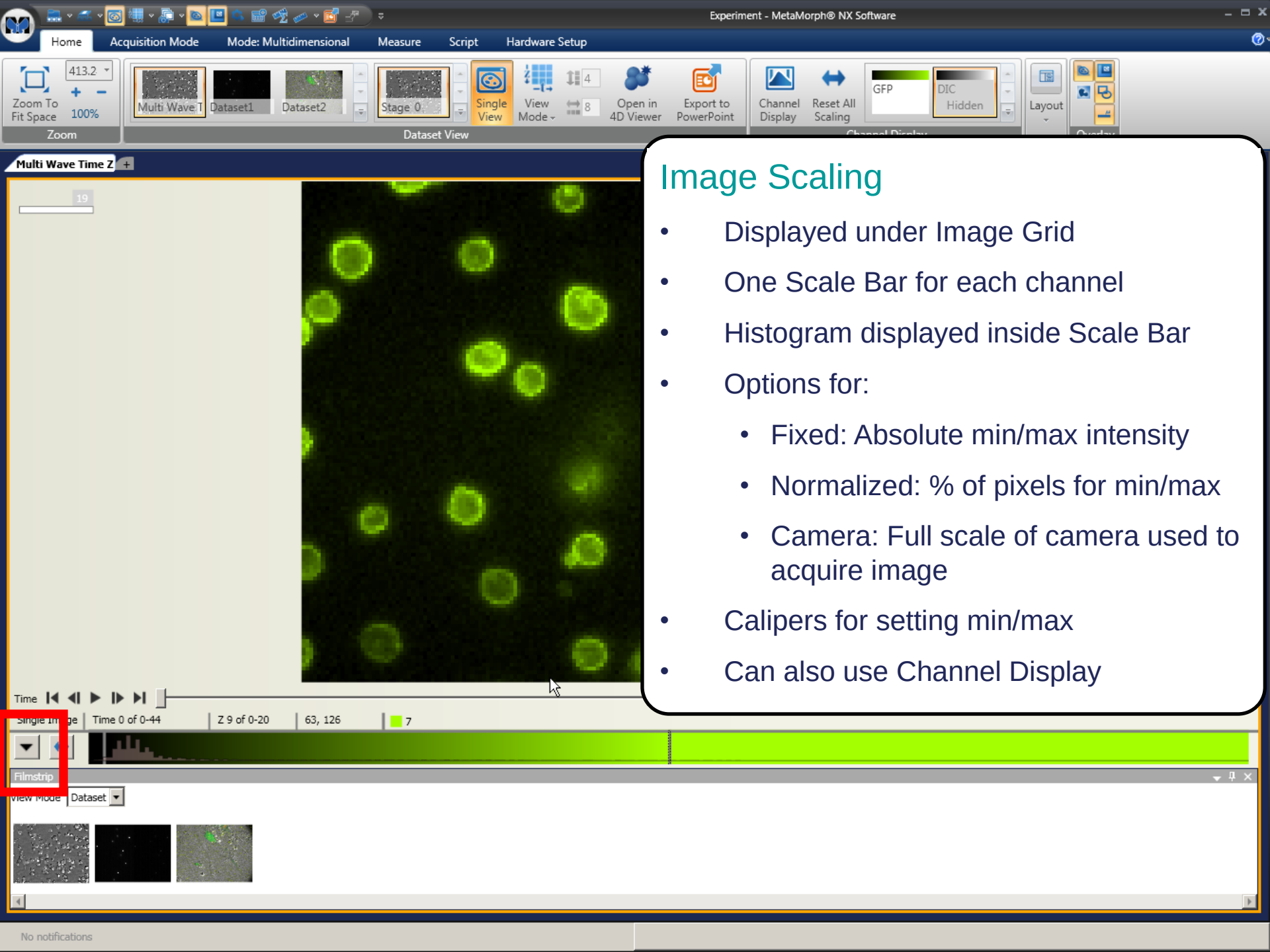

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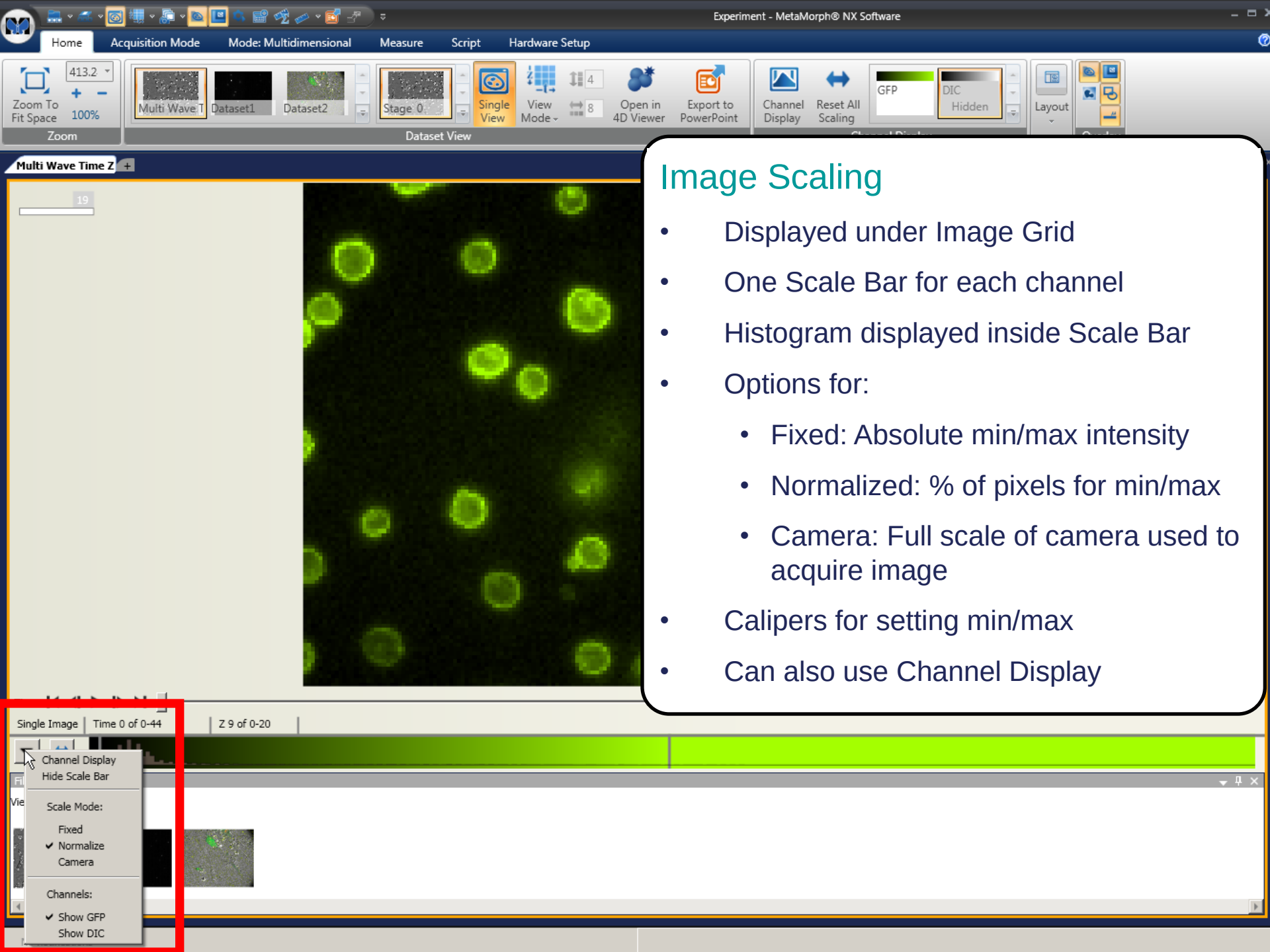

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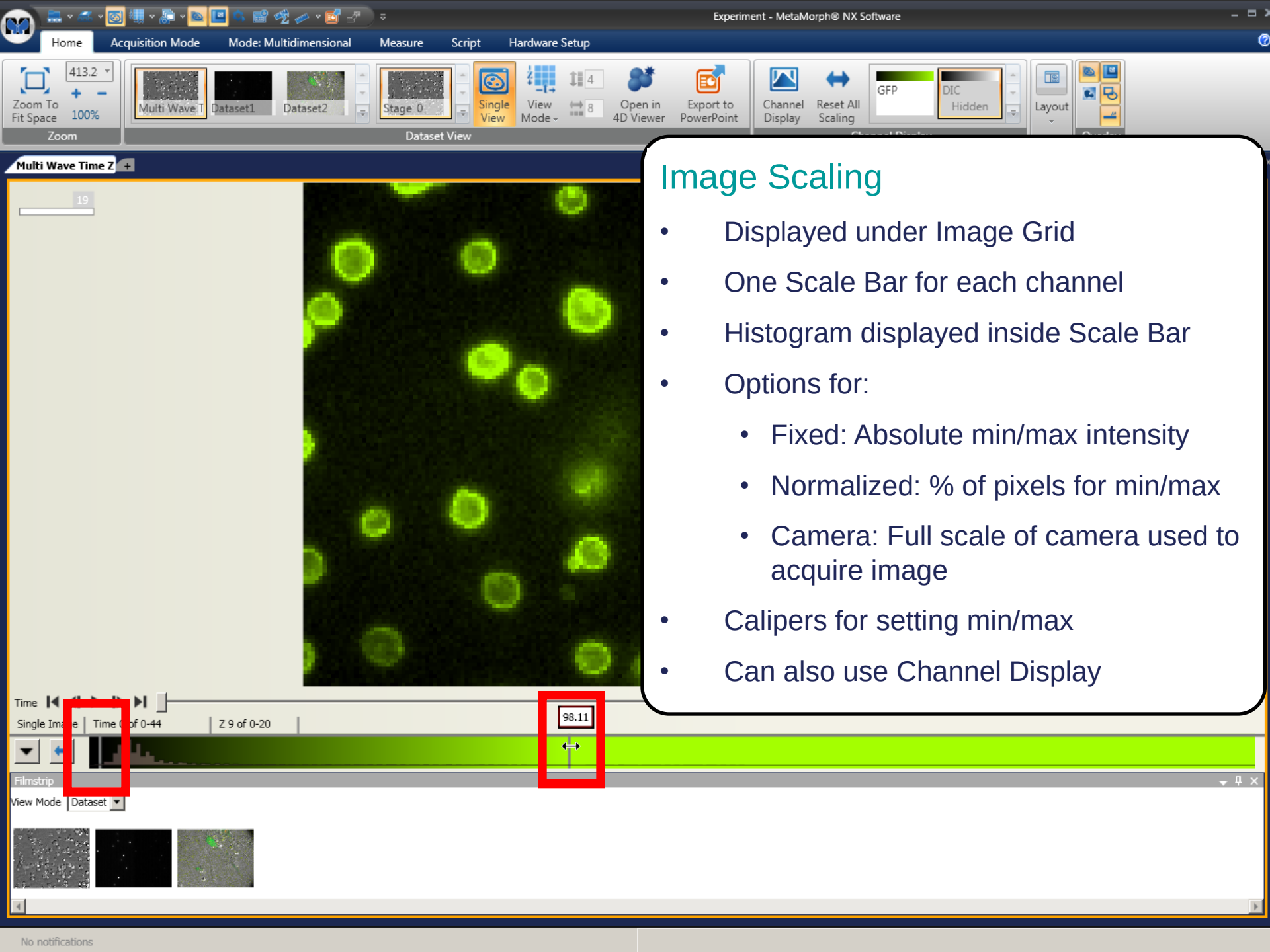

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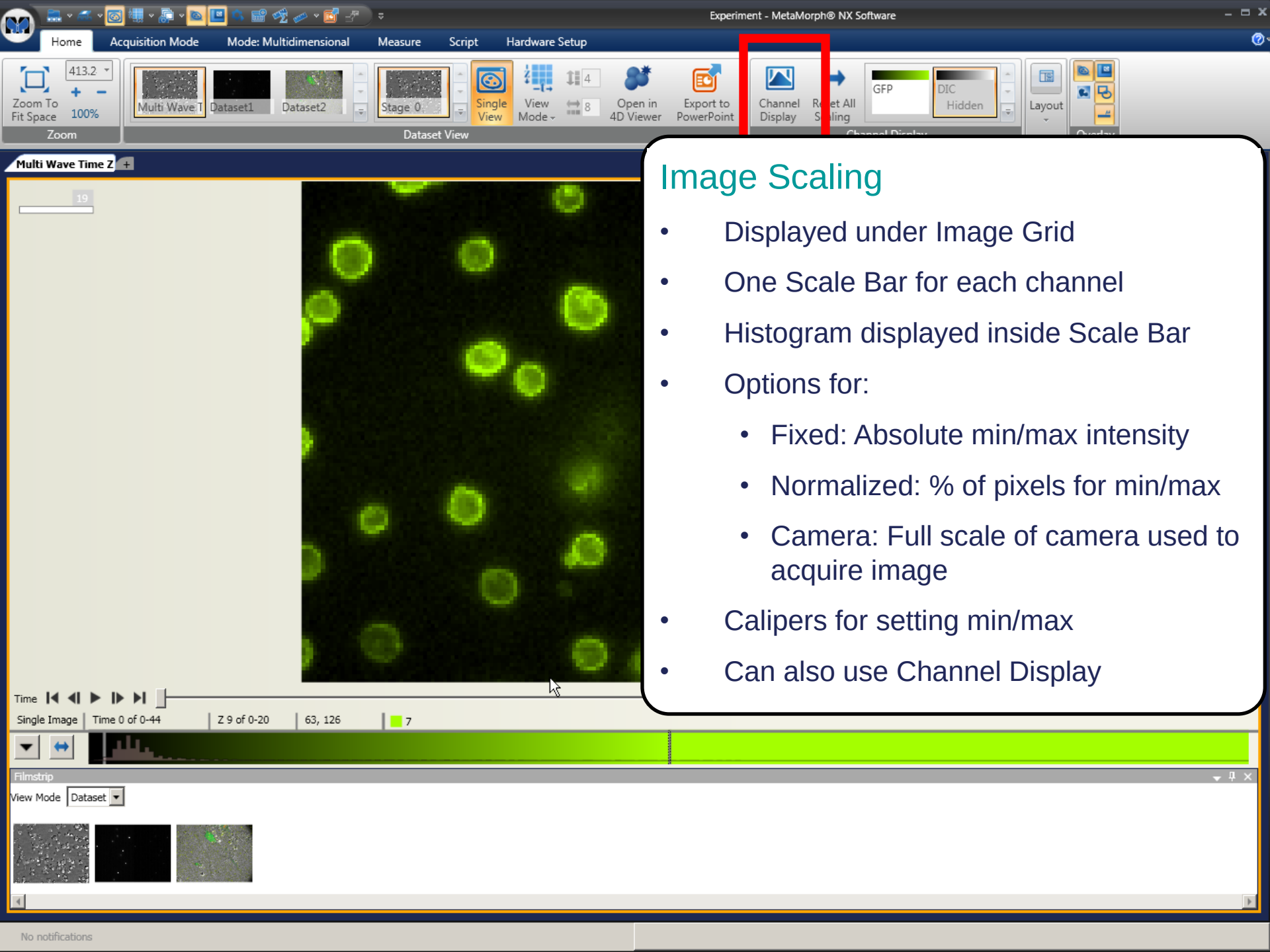

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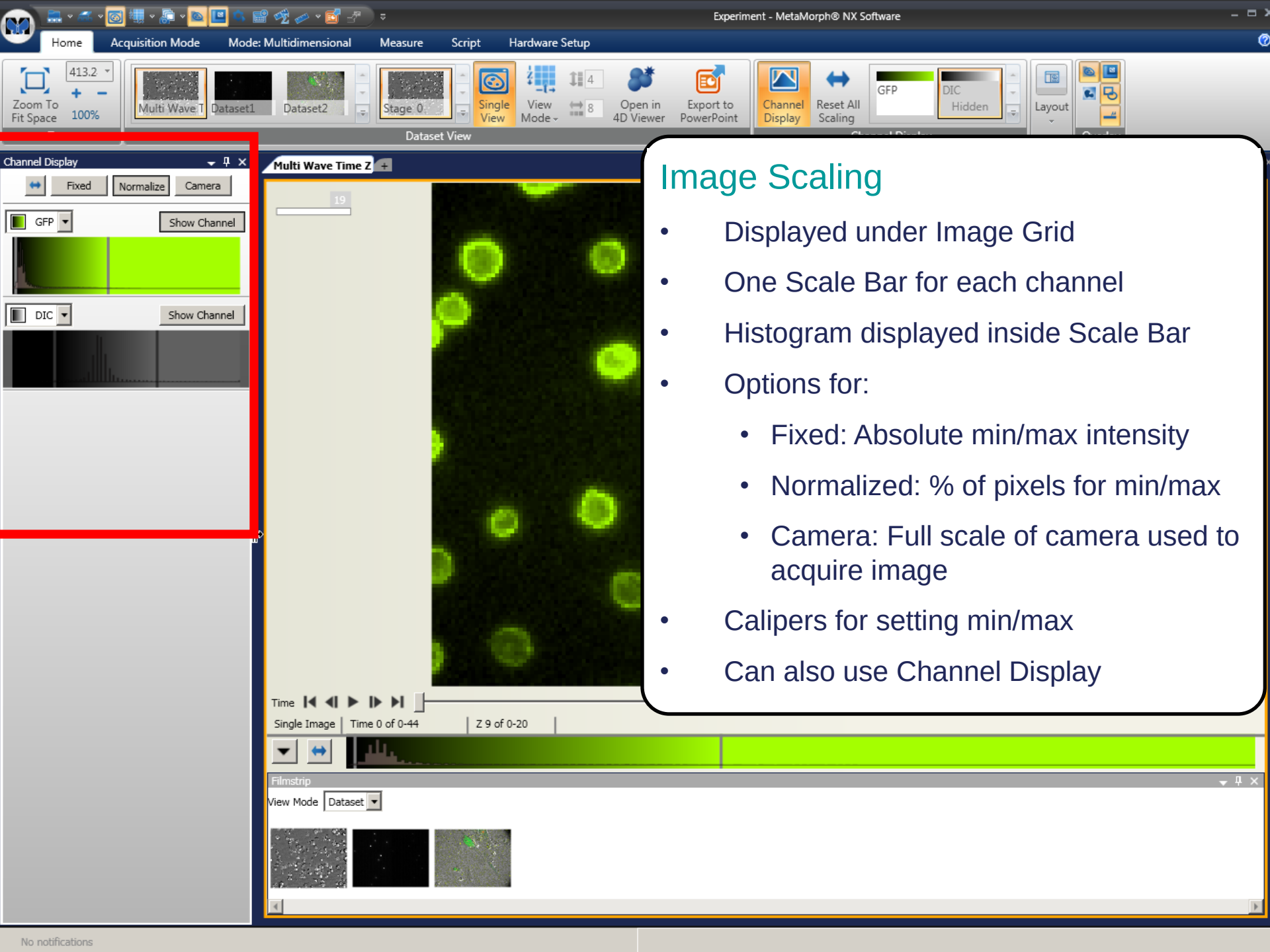

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Image Zoom

- Change Zoom via Mouse
  - Put mouse over image and scroll using mouse wheel
- Home ribbon also has options for zooming
- Zoom overlay appears when the entire image can't be seen in the grid.
- Move the zoomed view window around image using clear part of the zoom overlay
- Zoom overlay can be toggled on and off.

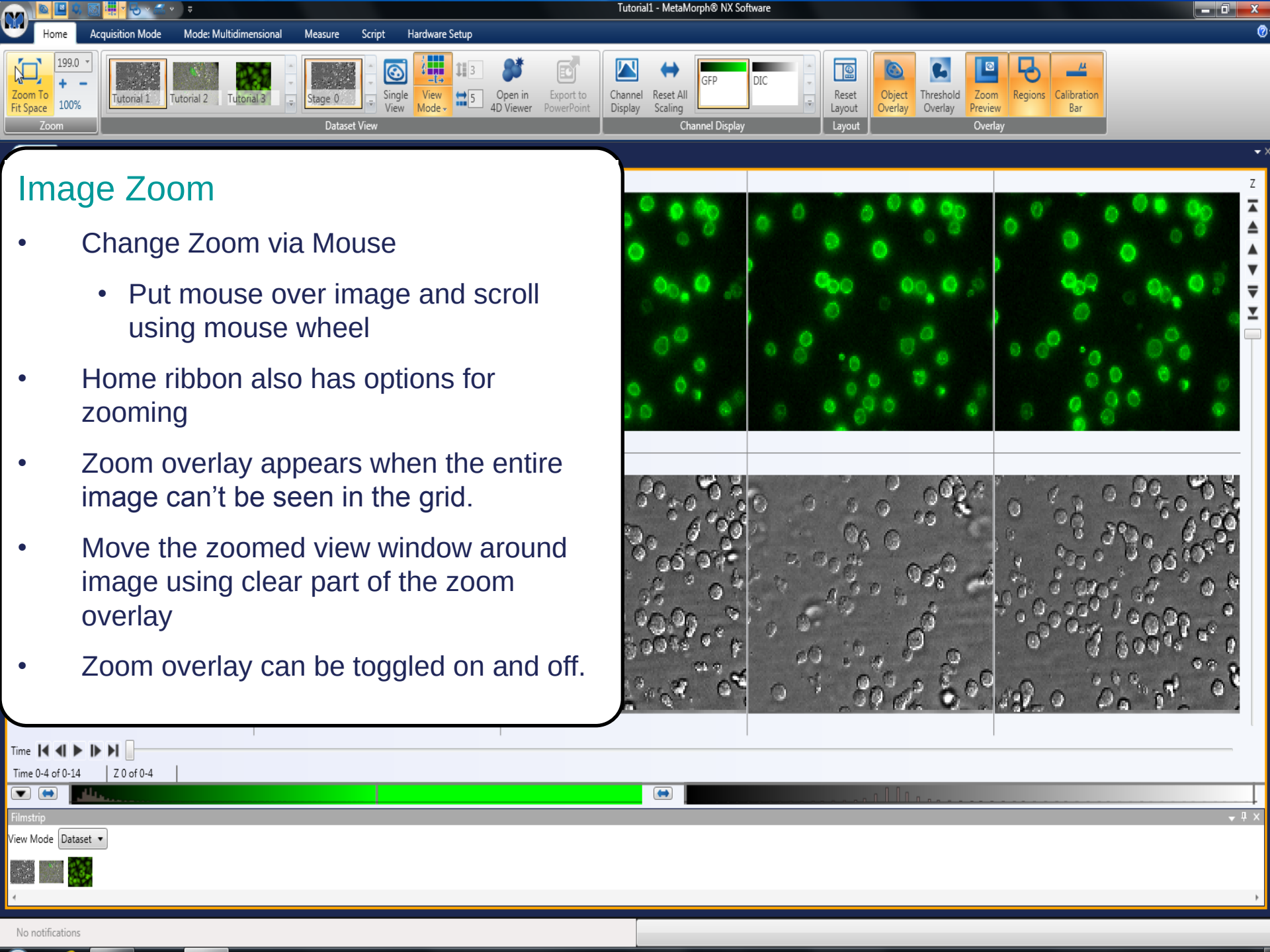

Image Zoom

- Change Zoom via Mouse
  - Put mouse over image and scroll using mouse wheel
- Home ribbon also has options for zooming
- Zoom overlay appears when the entire image can't be seen in the grid.
- Move the zoomed view window around image using clear part of the zoom overlay
- Zoom overlay can be toggled on and off.

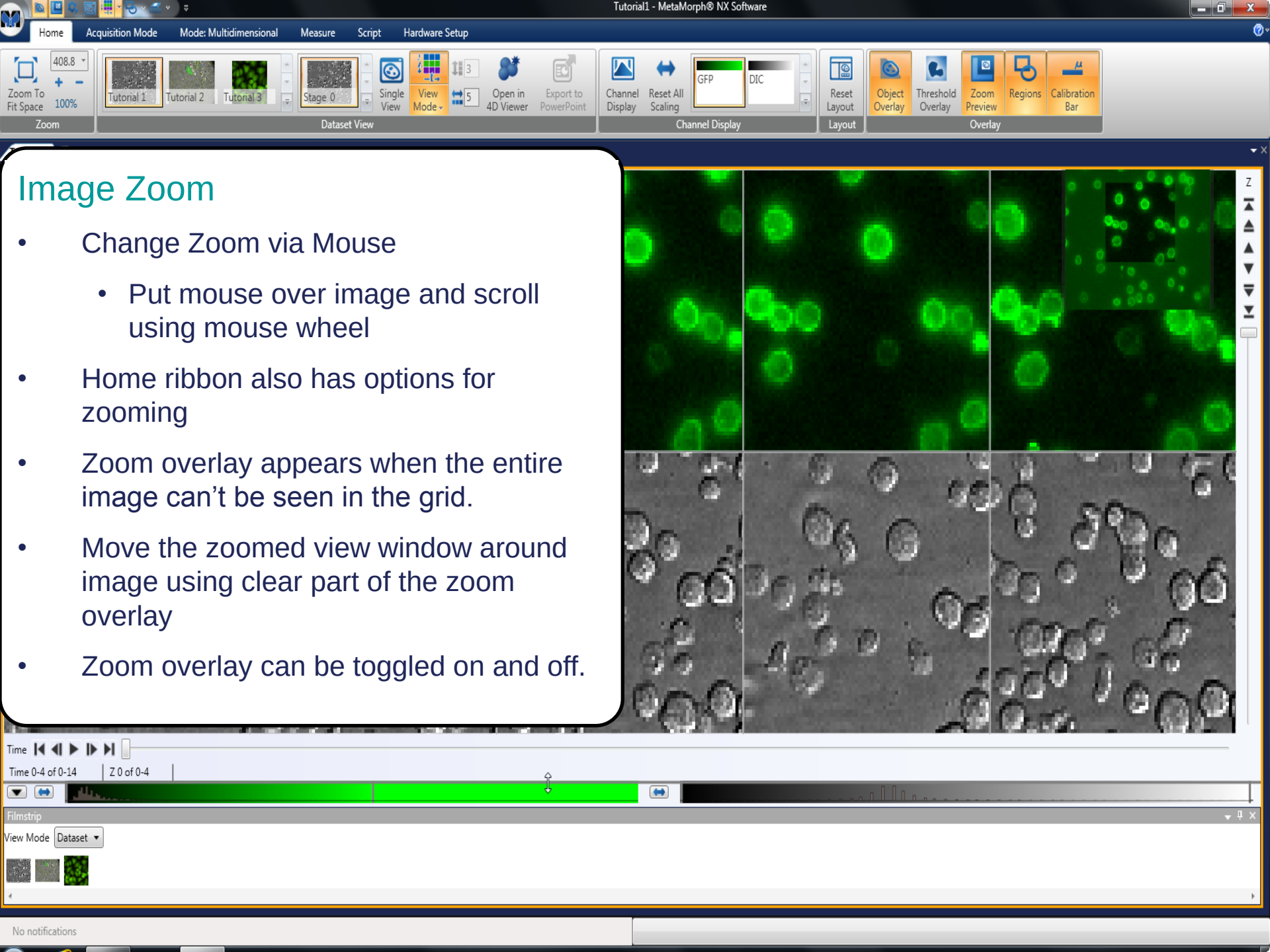

Image Zoom

- Change Zoom via Mouse
  - Put mouse over image and scroll using mouse wheel
- Home ribbon also has options for zooming
- Zoom overlay appears when the entire image can't be seen in the grid.
- Move the zoomed view window around image using clear part of the zoom overlay
- Zoom overlay can be toggled on and off.

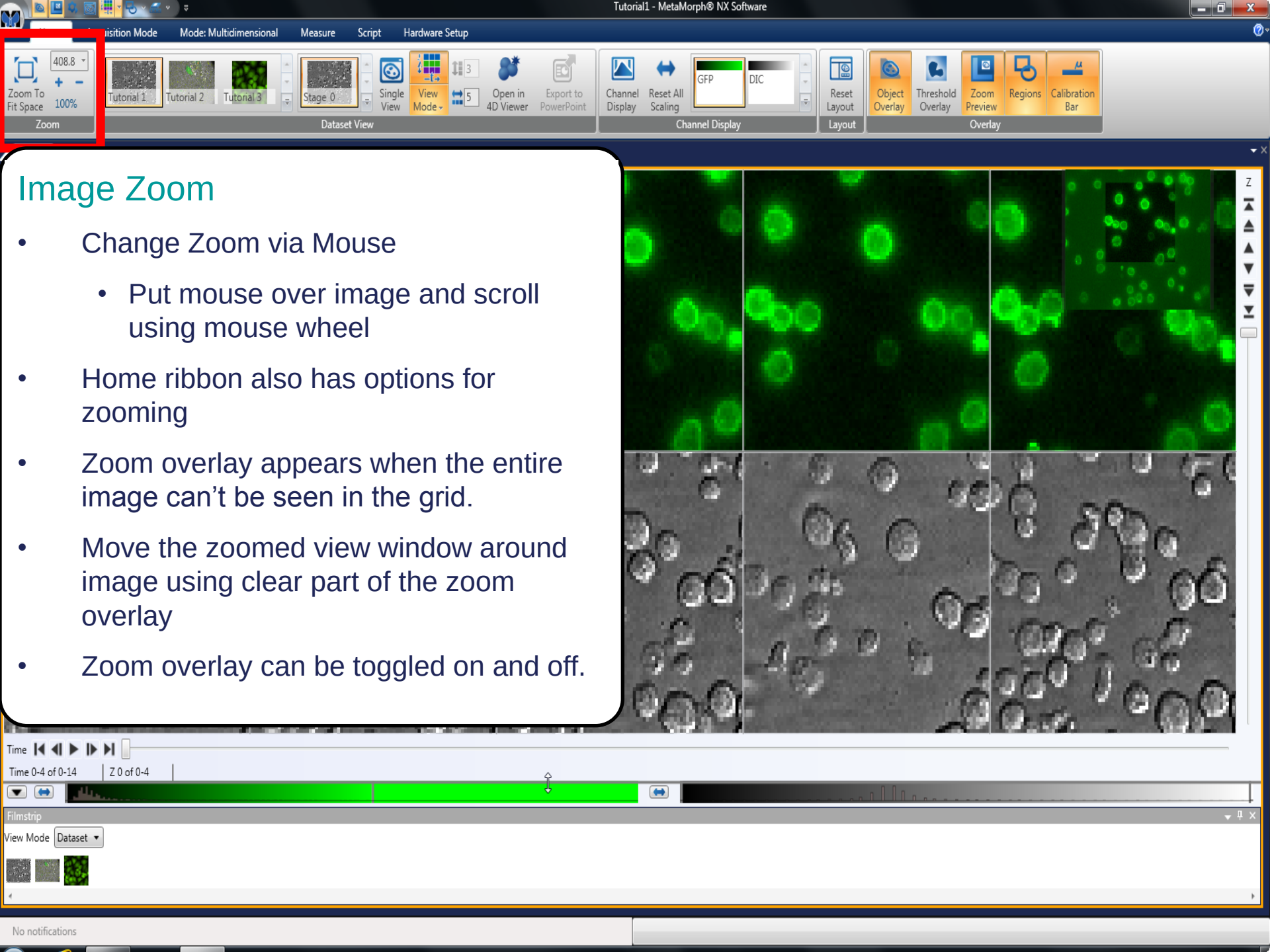

Image Zoom

- Change Zoom via Mouse
  - Put mouse over image and scroll using mouse wheel
- Home ribbon also has options for zooming
- Zoom overlay appears when the entire image can't be seen in the grid.
- Move the zoomed view window around image using clear part of the zoom overlay
- Zoom overlay can be toggled on and off.

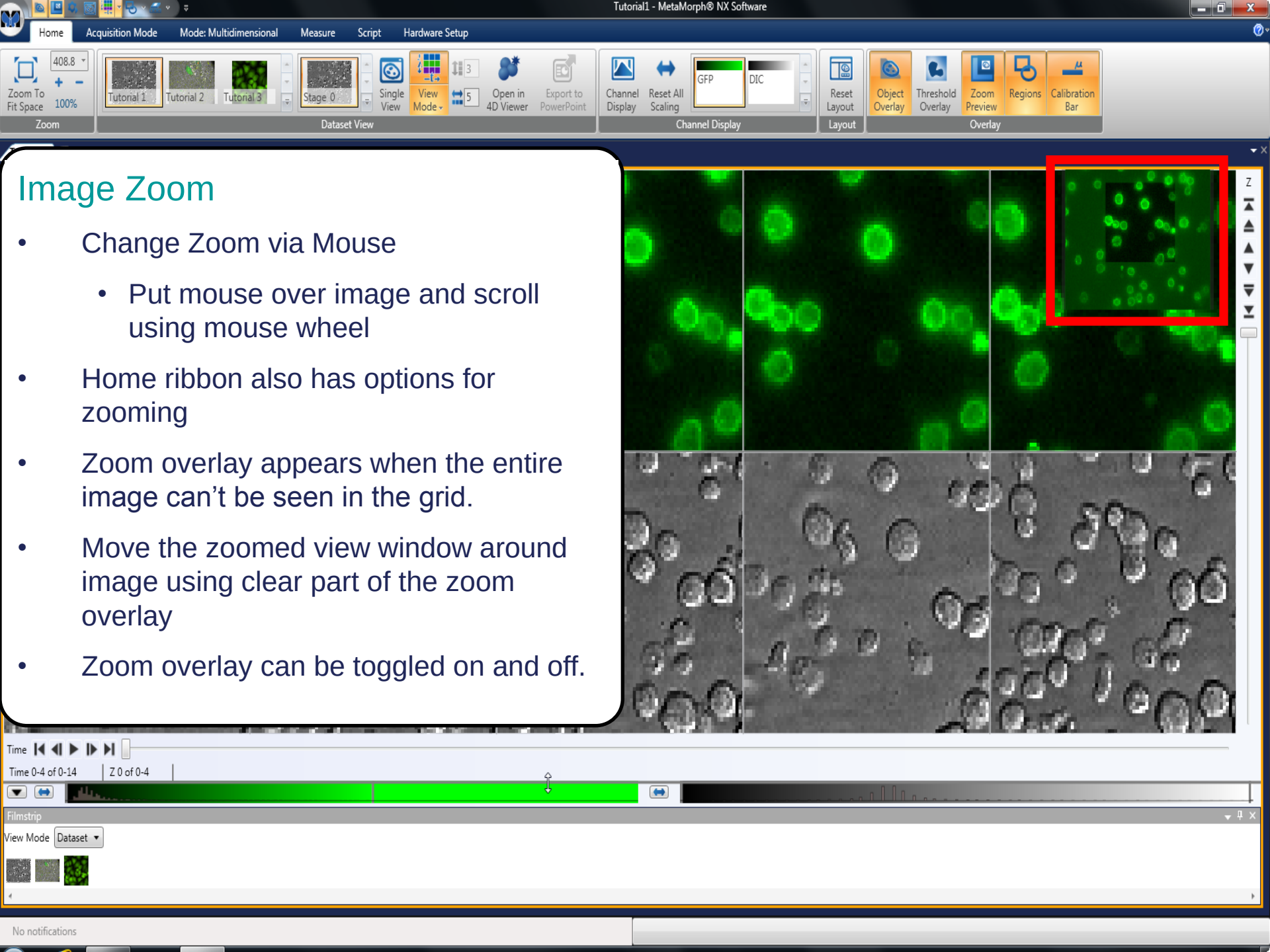

Image Zoom

- Change Zoom via Mouse
  - Put mouse over image and scroll using mouse wheel
- Home ribbon also has options for zooming
- Zoom overlay appears when the entire image can't be seen in the grid.
- Move the zoomed view window around image using clear part of the zoom overlay
- Zoom overlay can be toggled on and off.

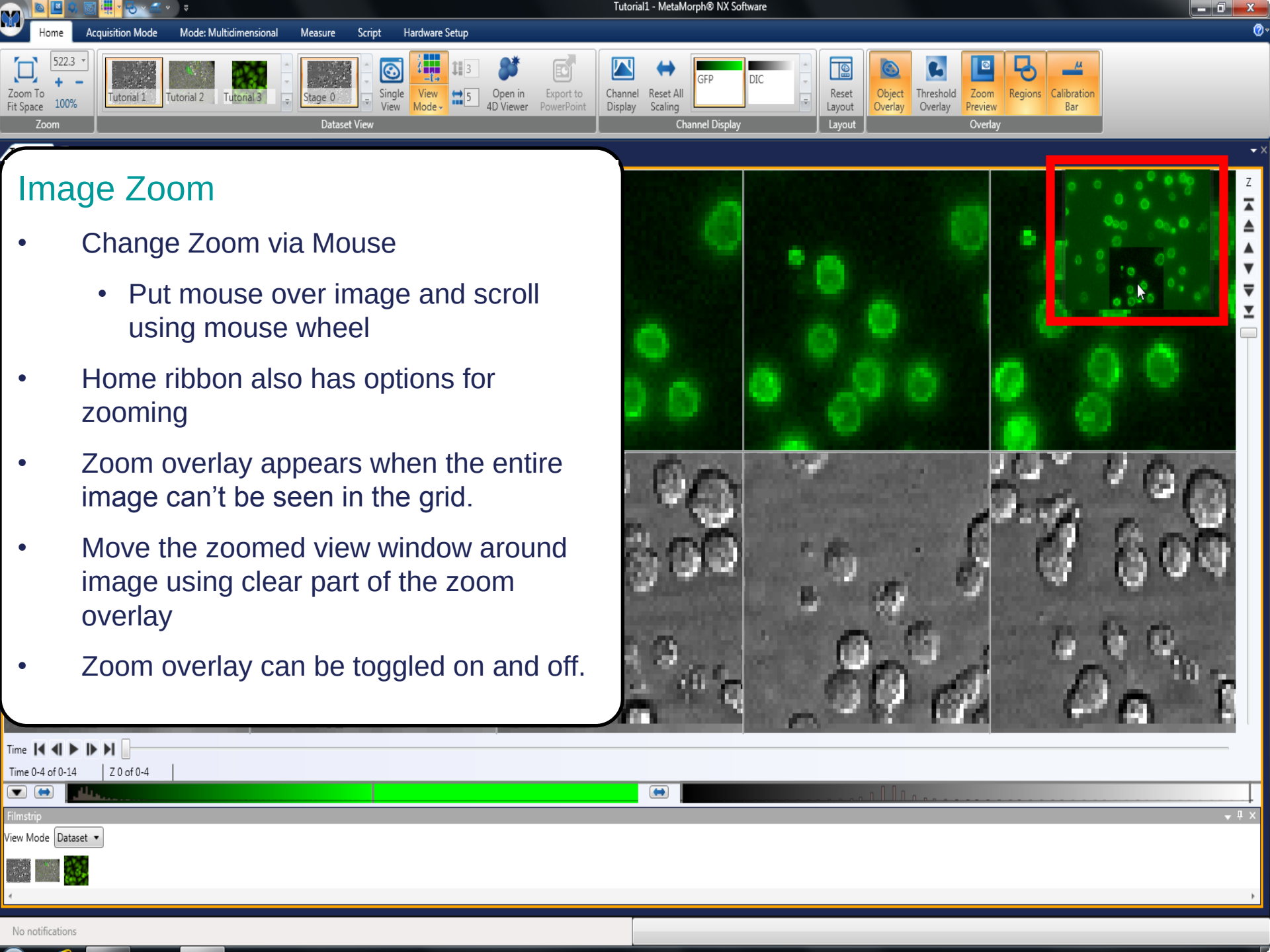

Image Zoom

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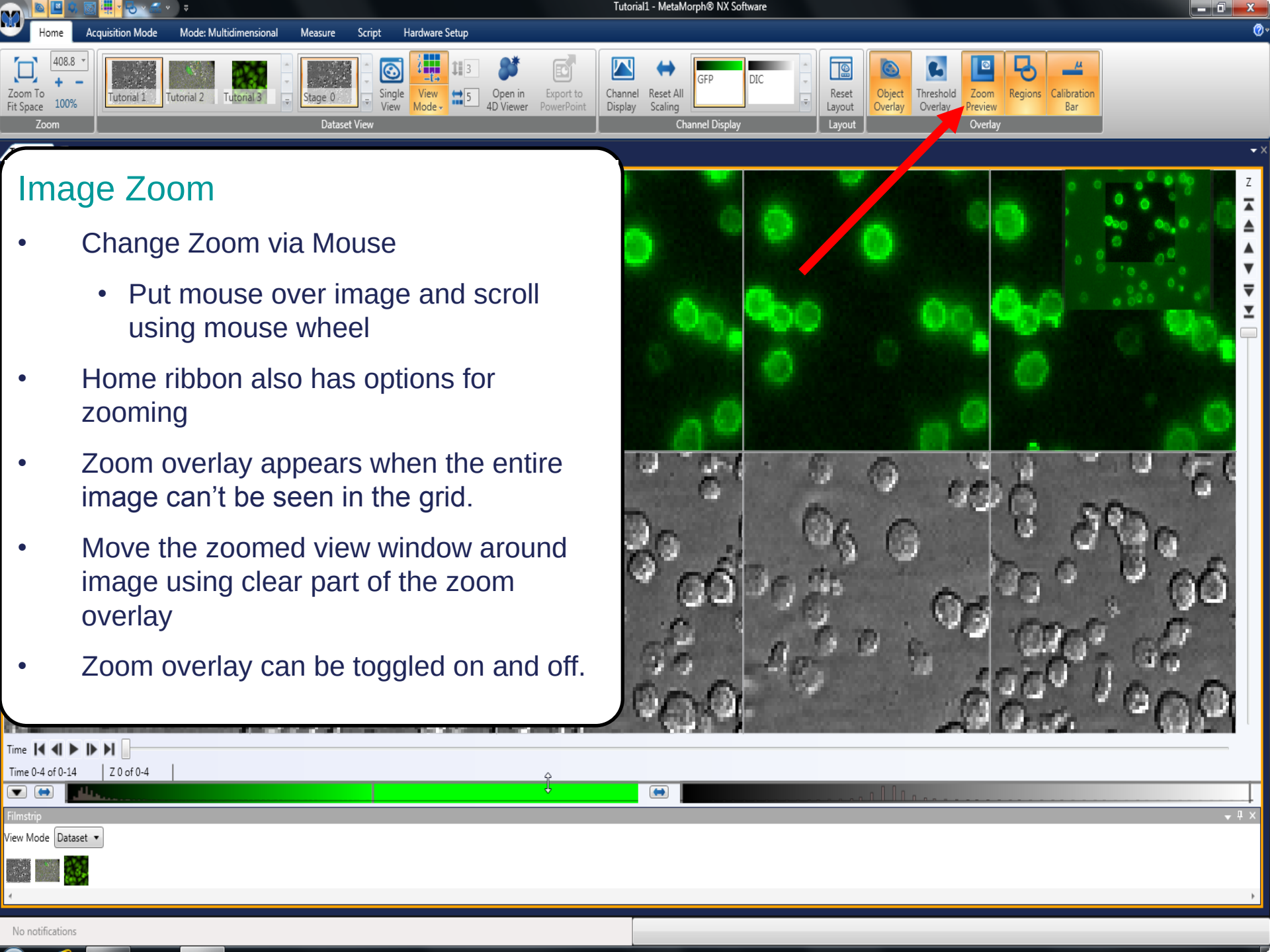
  - Put mouse over image and scroll using mouse wheel
- Home ribbon also has options for zooming
- Zoom overlay appears when the entire image can't be seen in the grid.
- Move the zoomed view window around image using clear part of the zoom overlay
- Zoom overlay can be toggled on and off.



MetaMorph NX

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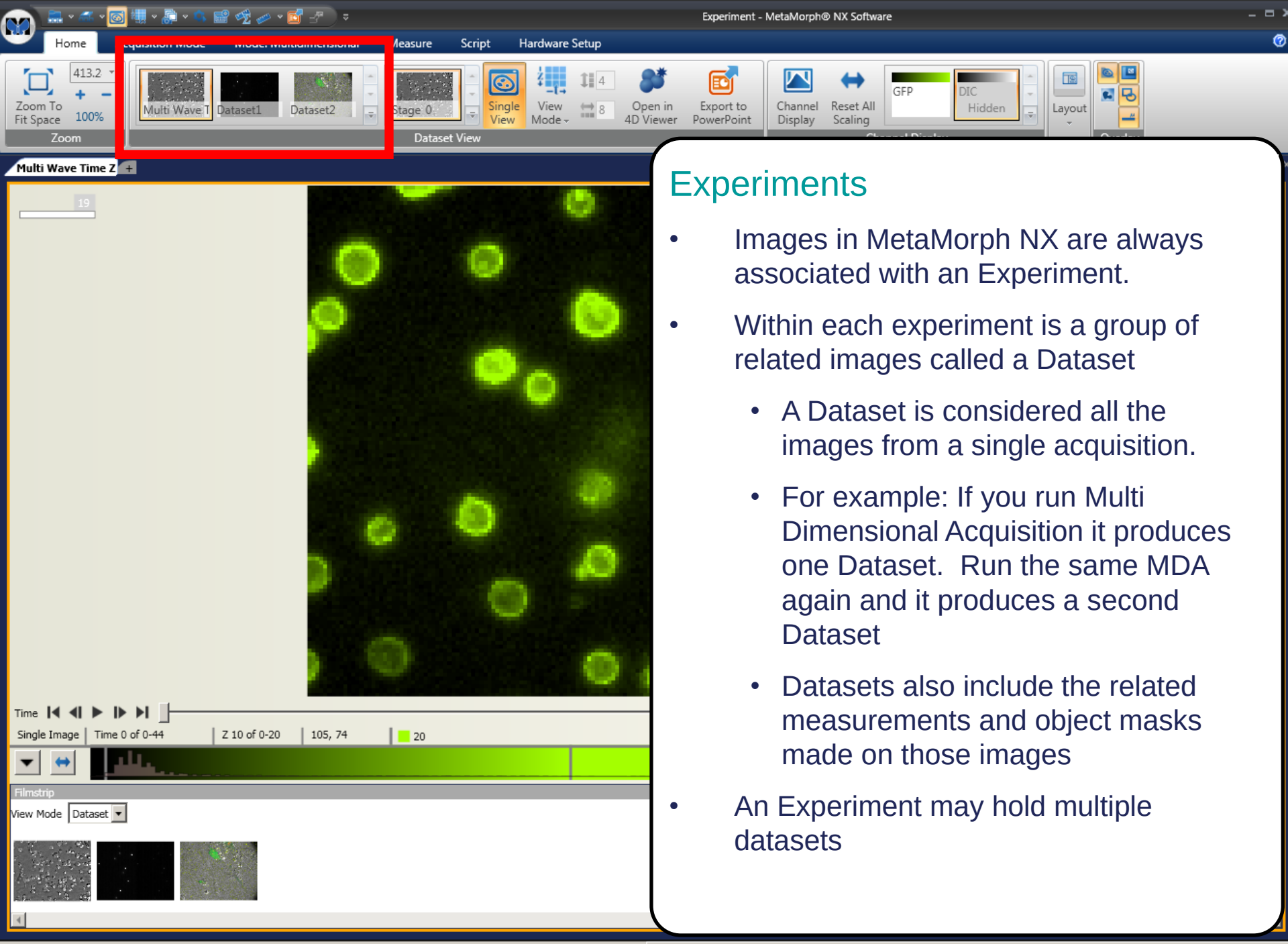
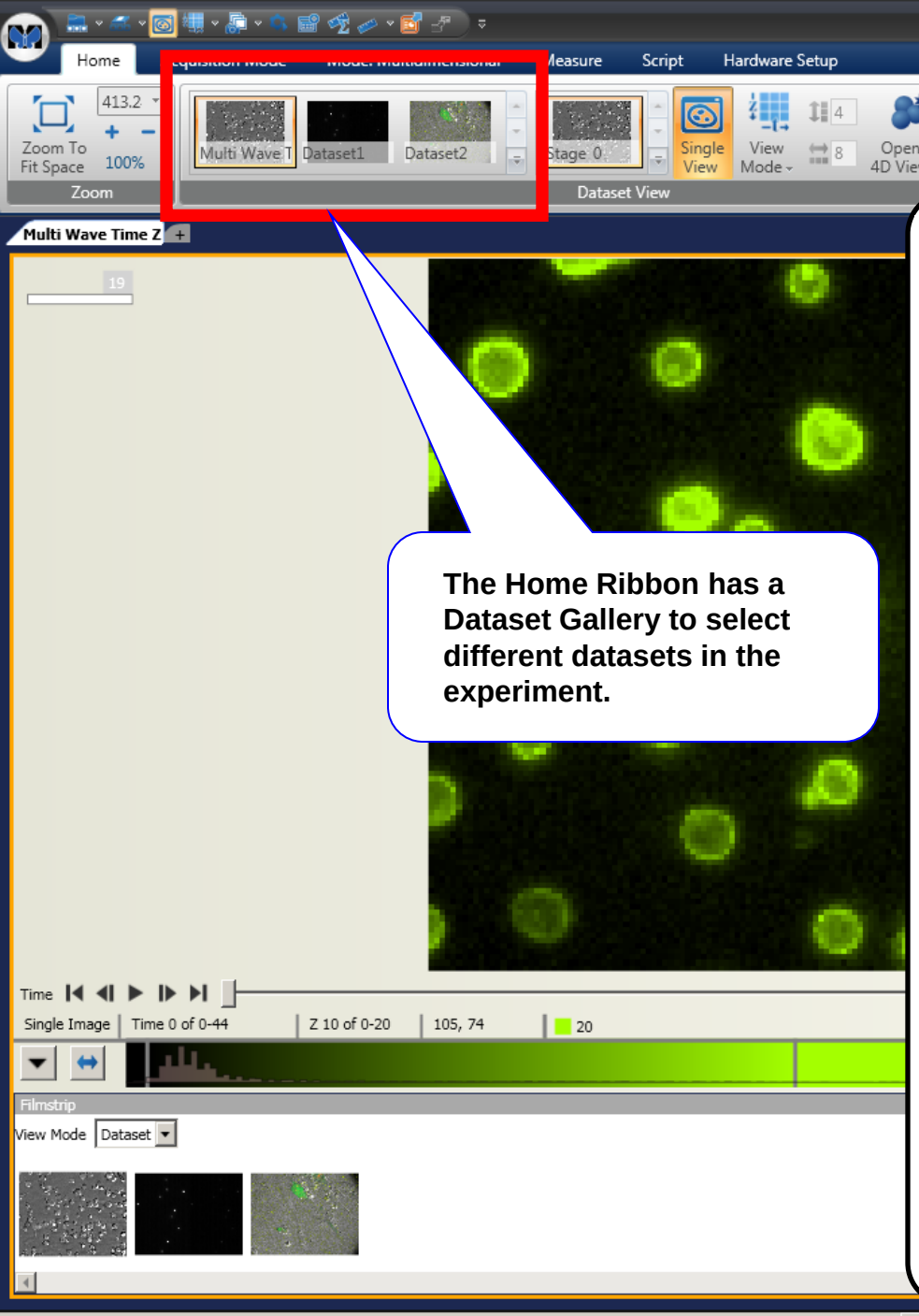
Opening Images in MetaMorph NX

Opening, creating Experiments from external data



Experiments

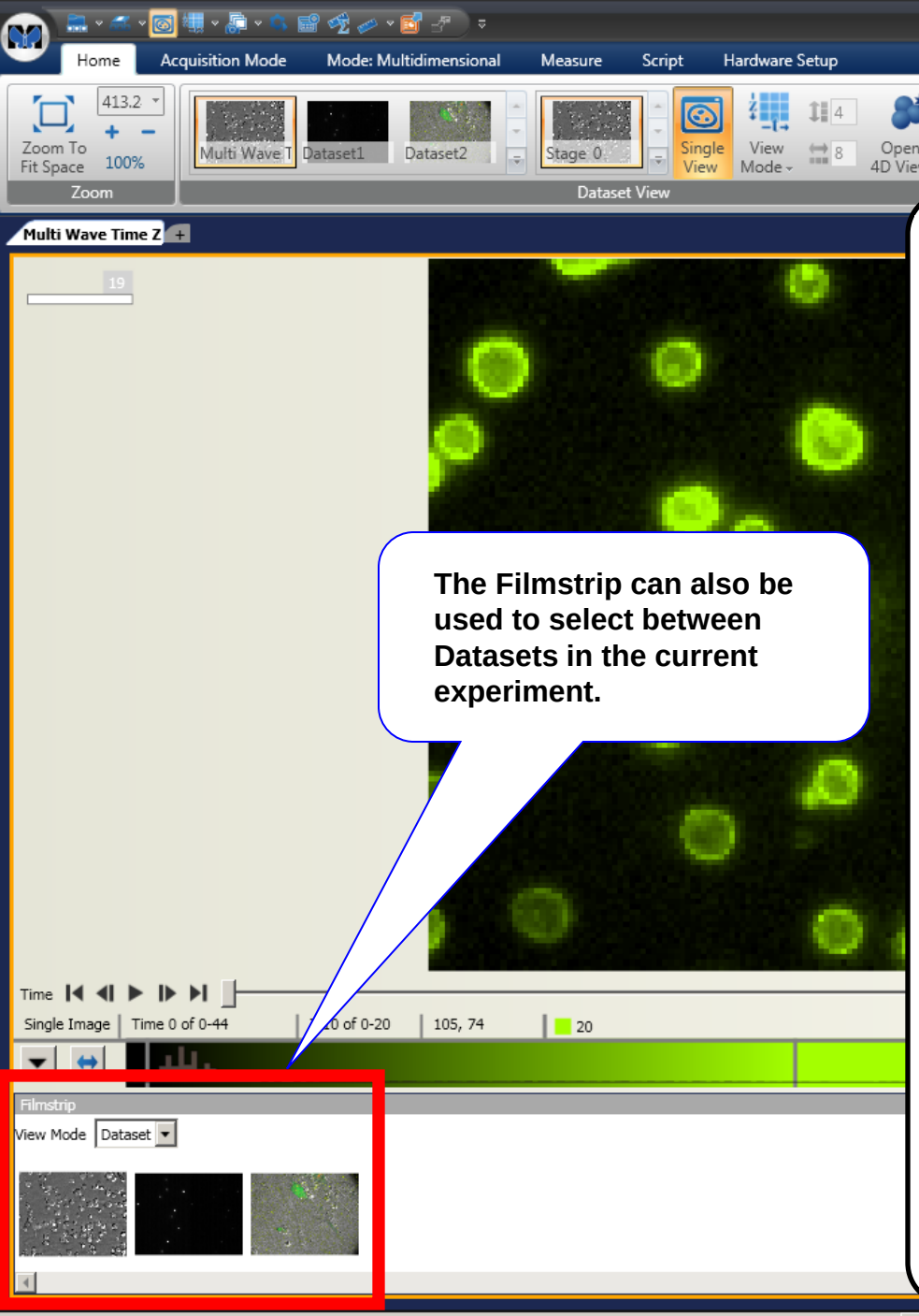
- Images in MetaMorph NX are always associated with an Experiment.
- Within each experiment is a group of related images called a Dataset
  - A Dataset is considered all the images from a single acquisition.
  - For example: If you run Multi Dimensional Acquisition it produces one Dataset. Run the same MDA again and it produces a second Dataset
  - Datasets also include the related measurements and object masks made on those images
- An Experiment may hold multiple datasets



The Home Ribbon has a Dataset Gallery to select different datasets in the experiment.

Experiments

- Images in MetaMorph NX are always associated with an Experiment.
- Within each experiment is a group of related images called a Dataset
  - A Dataset is considered all the images from a single acquisition.
  - For example: If you run Multi Dimensional Acquisition it produces one Dataset. Run the same MDA again and it produces a second Dataset
  - Datasets also include the related measurements and object masks made on those images
- An Experiment may hold multiple datasets



The Filmstrip can also be used to select between Datasets in the current experiment.

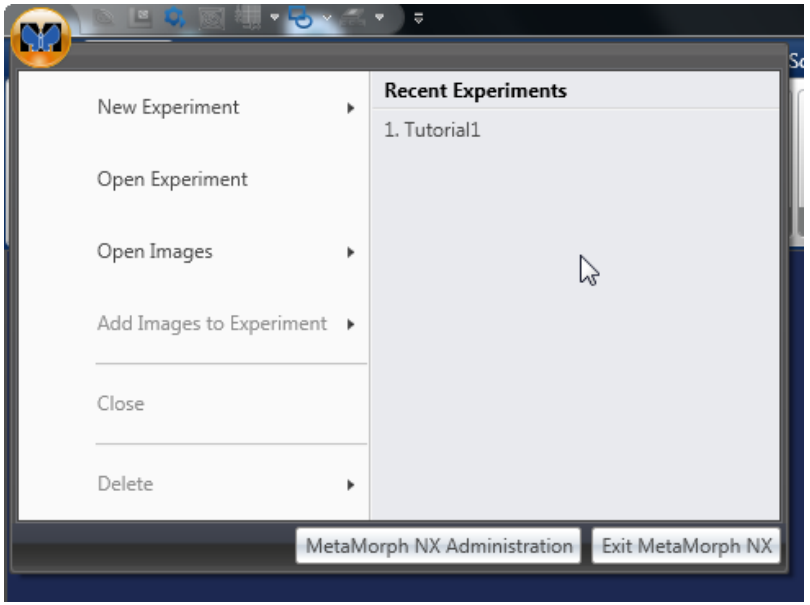
Experiments

- Images in MetaMorph NX are always associated with an Experiment.
- Within each experiment is a group of related images called a Dataset
  - A Dataset is considered all the images from a single acquisition.
  - For example: If you run Multi Dimensional Acquisition it produces one Dataset. Run the same MDA again and it produces a second Dataset
  - Datasets also include the related measurements and object masks made on those images
- An Experiment may hold multiple datasets

Working with experiments

- Application Menu
  - Holds tools for working with the current experiment files
- Also tools for MetaMorph NX Administration.

- New Experiment
  - Create a new experiment
    - Gives details where the experiment will be created
  - Set Experiment Defaults
    - Change the location on disk where experiments are saved
    - Change names given to experiments and datasets



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Working with experiments

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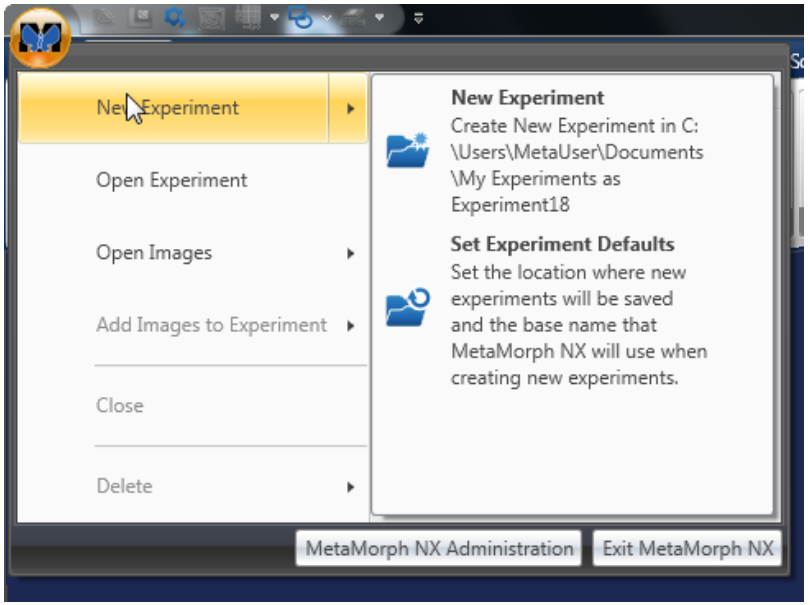

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Working with experiments

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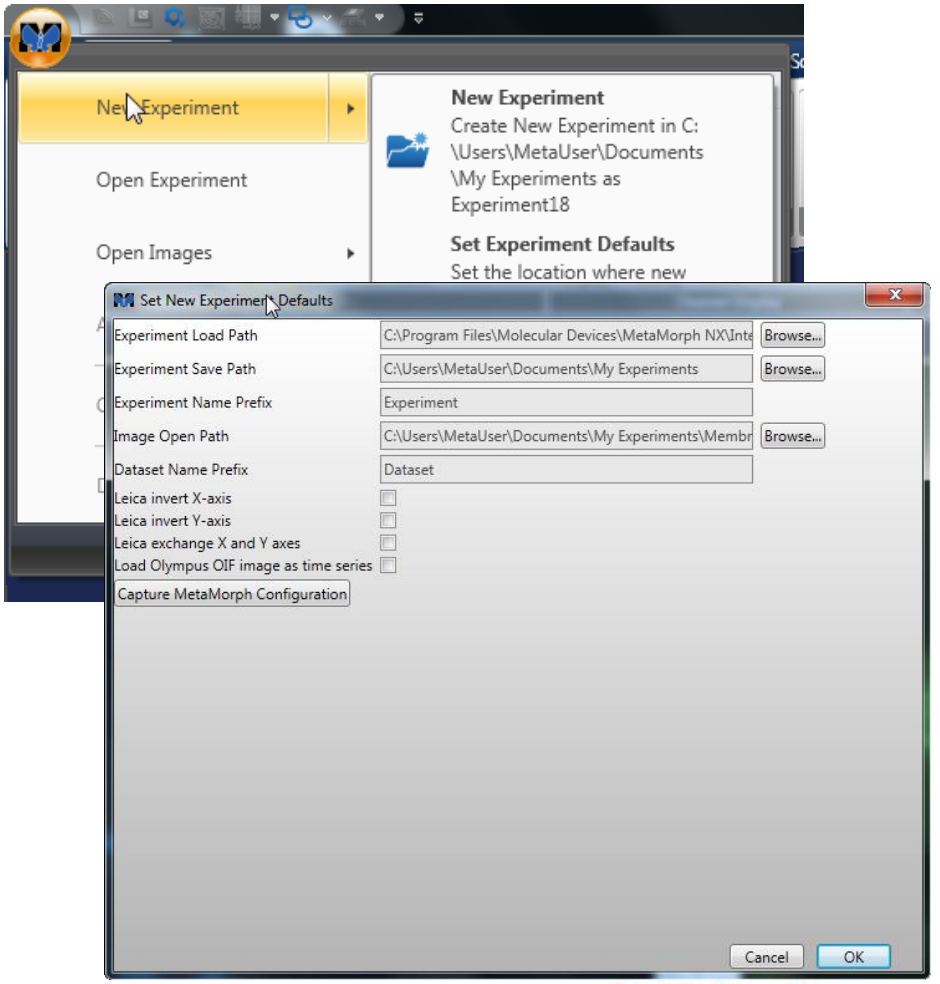

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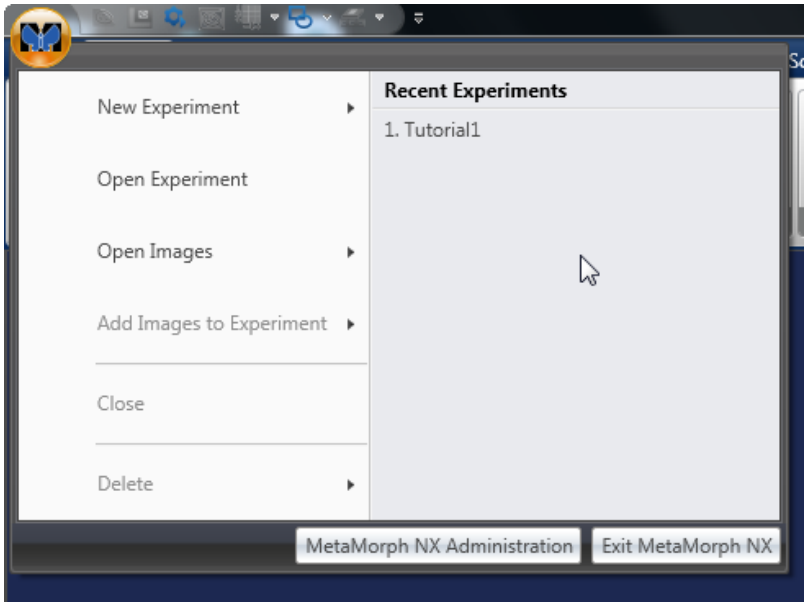
Working with experiments

- Application Menu
  - Holds tools for working with the current experiment files
- Also tools for MetaMorph NX Administration.

- Open Experiment
  - Loads a previously saved experiment into MetaMorph NX
  - Experiments are saved into a folder with their name on it
  - Always open the ‘Experiment.mexp’ file.



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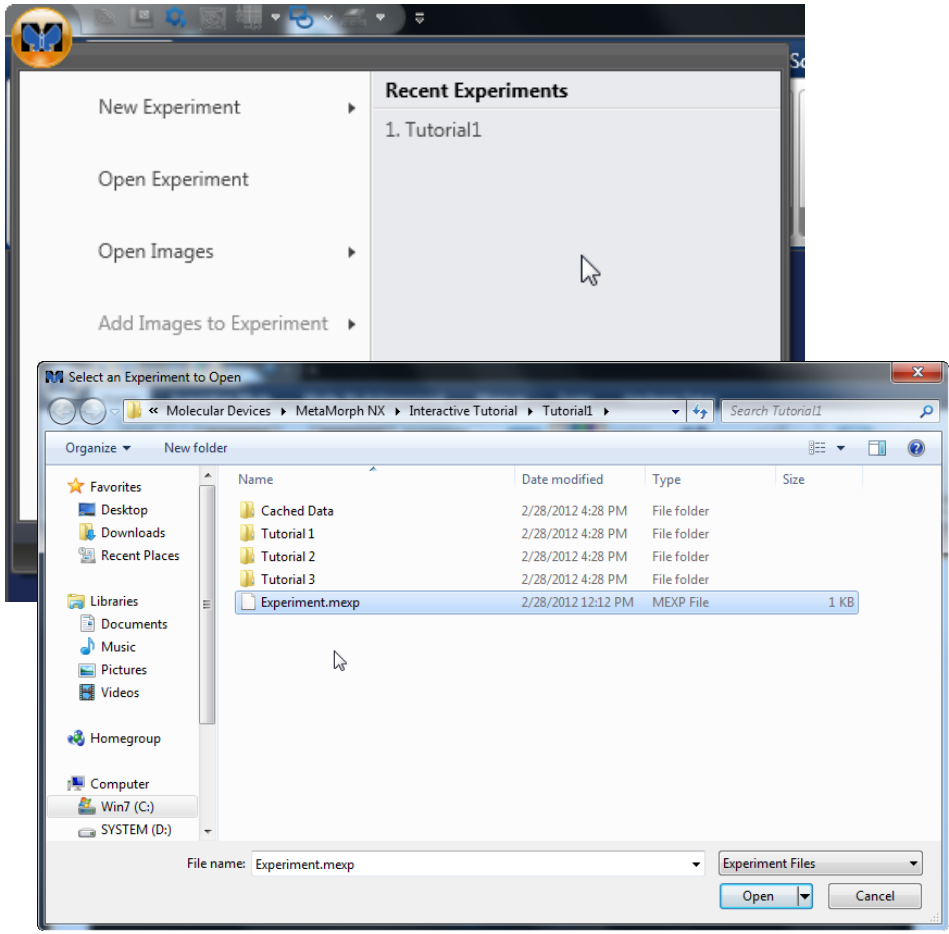

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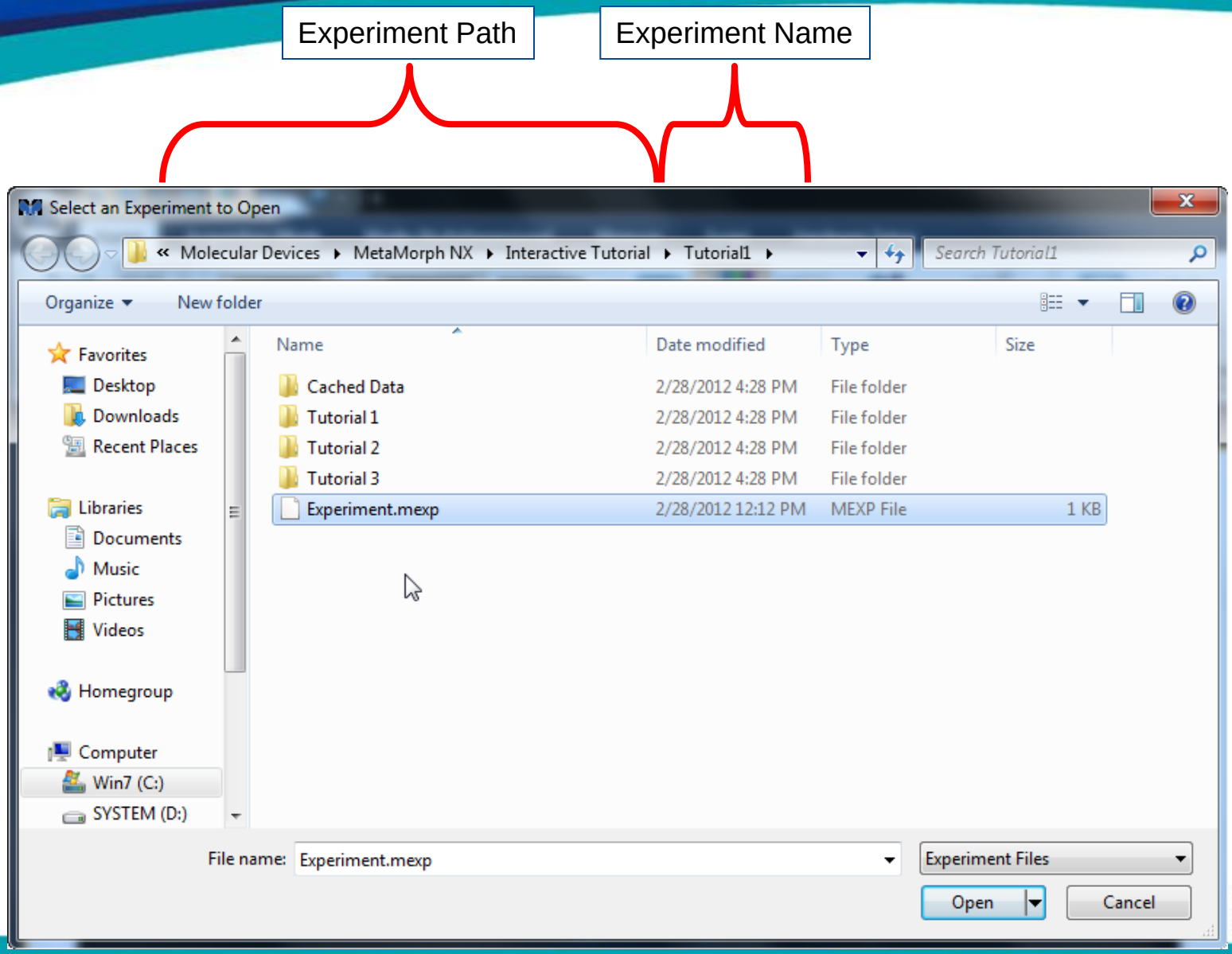
Experiment File Structure



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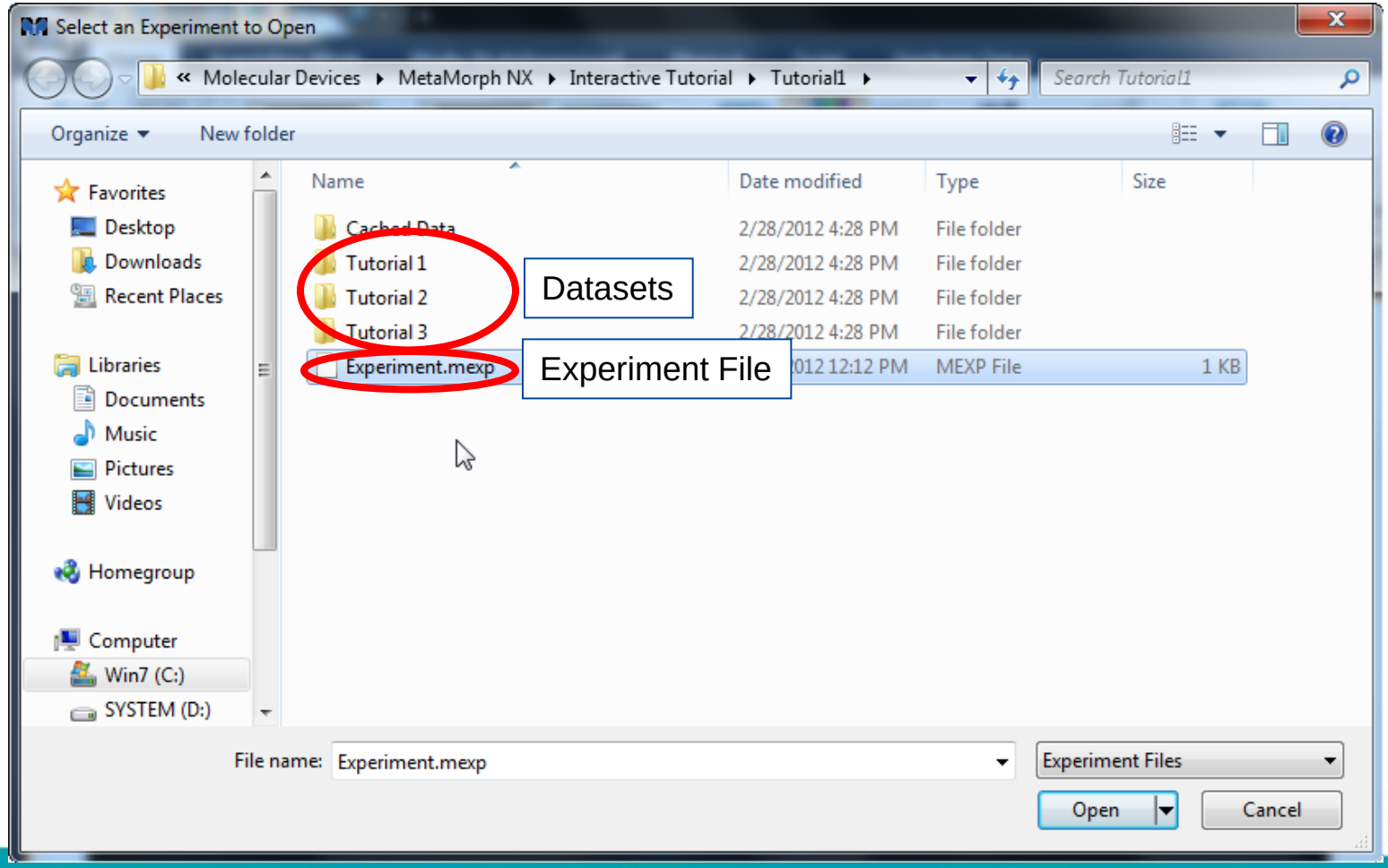
Experiment File Structure



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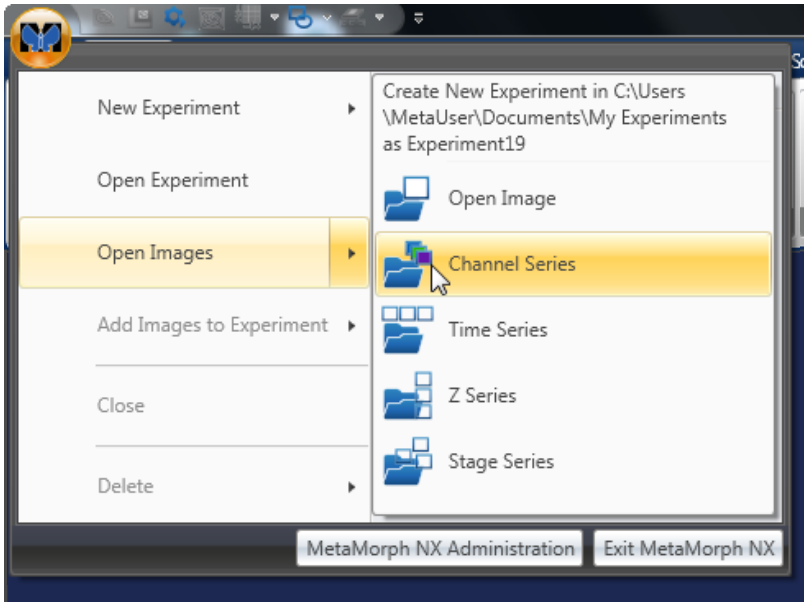
Working with experiments

- Application Menu
  - Holds tools for working with the current experiment files
- Also tools for MetaMorph NX Administration.

- Open Images
  - Opens images acquired outside of MetaMorph NX into a **New Experiment**
  - Open Image
    - Select a single image, or import a .ND file from MetaMorph
  - Channel / Time / Z Series
    - Import multiple images or stage is a series of the given dimension
  - Stage Series
    - Opens multiple images – each image is considered a new stage location.



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  - Stage Series
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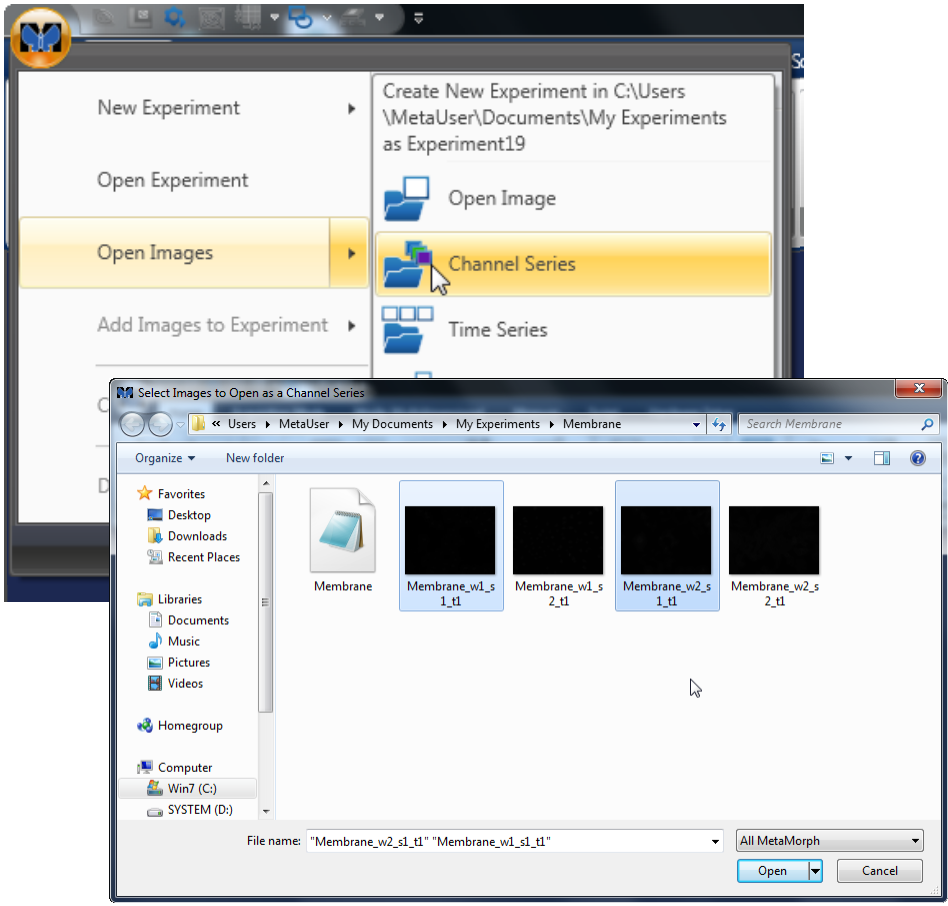

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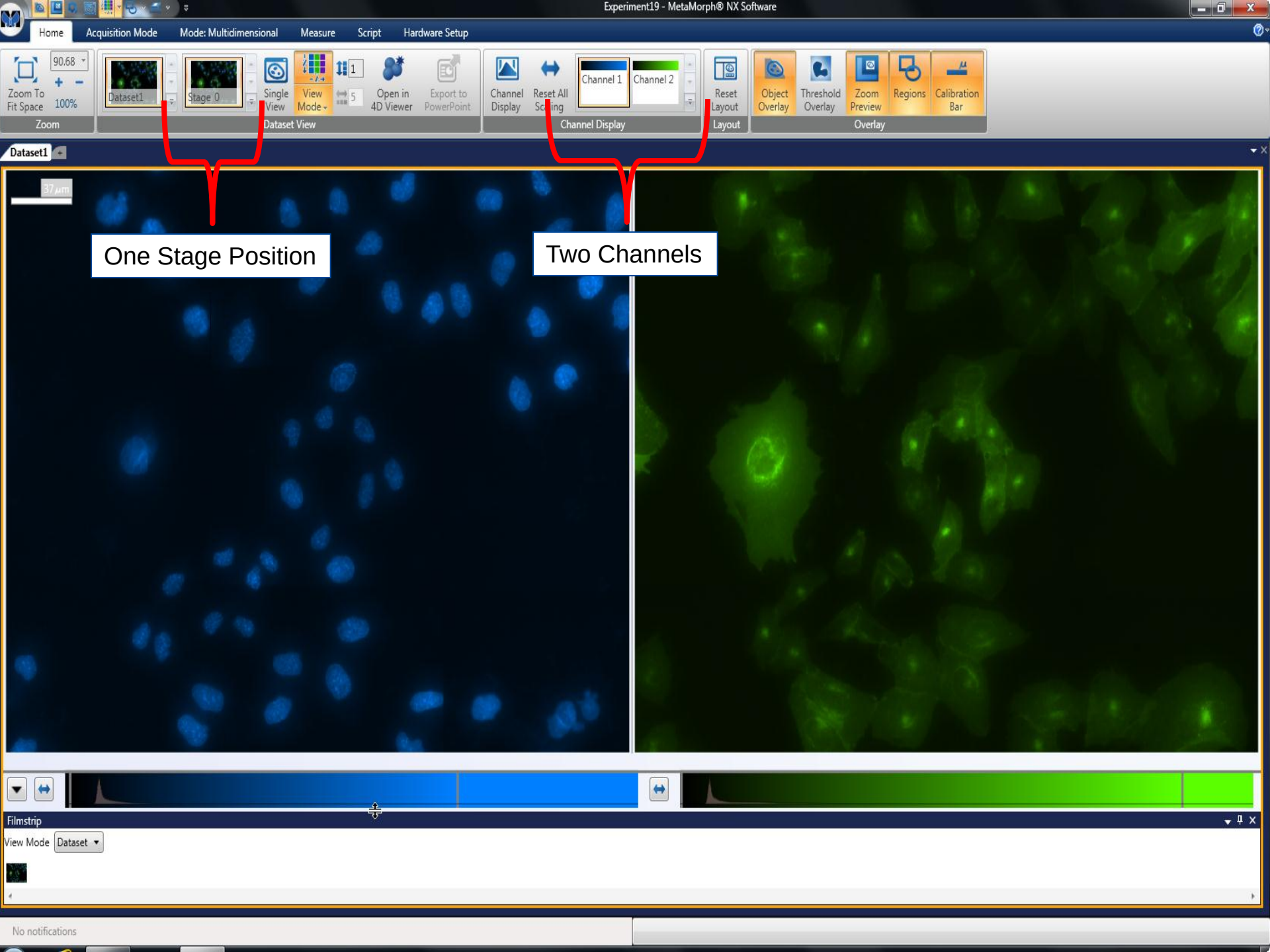
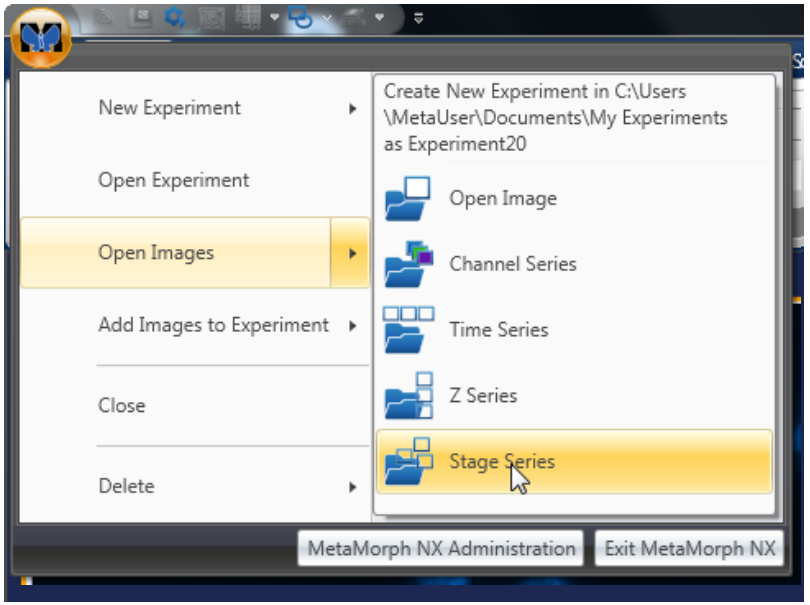

Experiment19 - MetaMorph® NX Software
Home
Acquisition Mode
Mode: Multidimensional
Measure
Script
Hardware Setup
Zoom To Fit Space
90.68
100%
Zoom
Dataset1
Stage 0
Single View
View Mode
Open in 4D Viewer
Export to PowerPoint
Dataset View
Channel Display
Reset All Scaling
Channel 1
Channel 2
Channel Display
Reset Layout
Layout
Object Overlay
Threshold Overlay
Zoom Preview
Regions
Calibration Bar
Overlay
Dataset1
One Stage Position
Two Channels
Filmstrip
View Mode
Dataset
No notifications

Working with experiments

- Application Menu
  - Holds tools for working with the current experiment files
- Also tools for MetaMorph NX Administration.

- Open Images
  - Opens images acquired outside of MetaMorph NX into a **New Experiment**
  - Open Image
    - Select a single image, or import a .ND file from MetaMorph
  - Channel / Time / Z Series
    - Import multiple images or stage is a series of the given dimension
  - Stage Series
    - Opens multiple images – each image is considered a new stage location.



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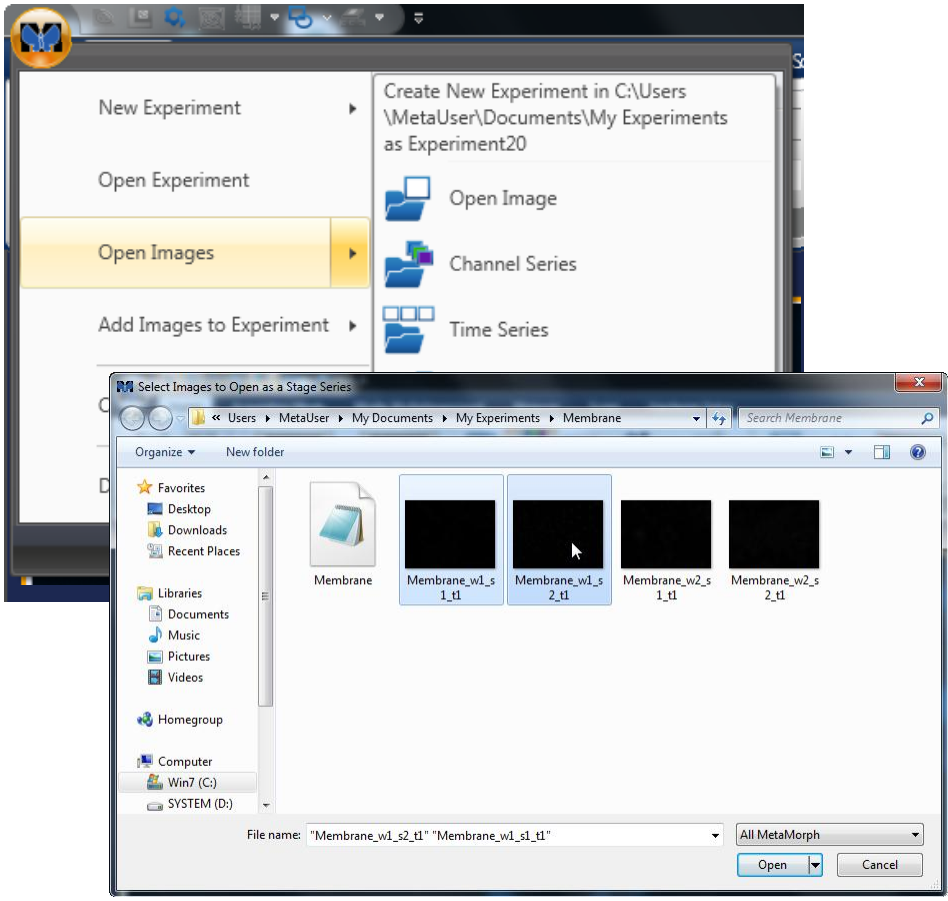
Working with experiments

- Application Menu
  - Holds tools for working with the current experiment files
- Also tools for MetaMorph NX Administration.

- Open Images
  - Opens images acquired outside of MetaMorph NX into a **New Experiment**
  - Open Image
    - Select a single image, or import a .ND file from MetaMorph
  - Channel / Time / Z Series
    - Import multiple images or stage is a series of the given dimension
  - Stage Series
    - Opens multiple images – each image is considered a new stage location.



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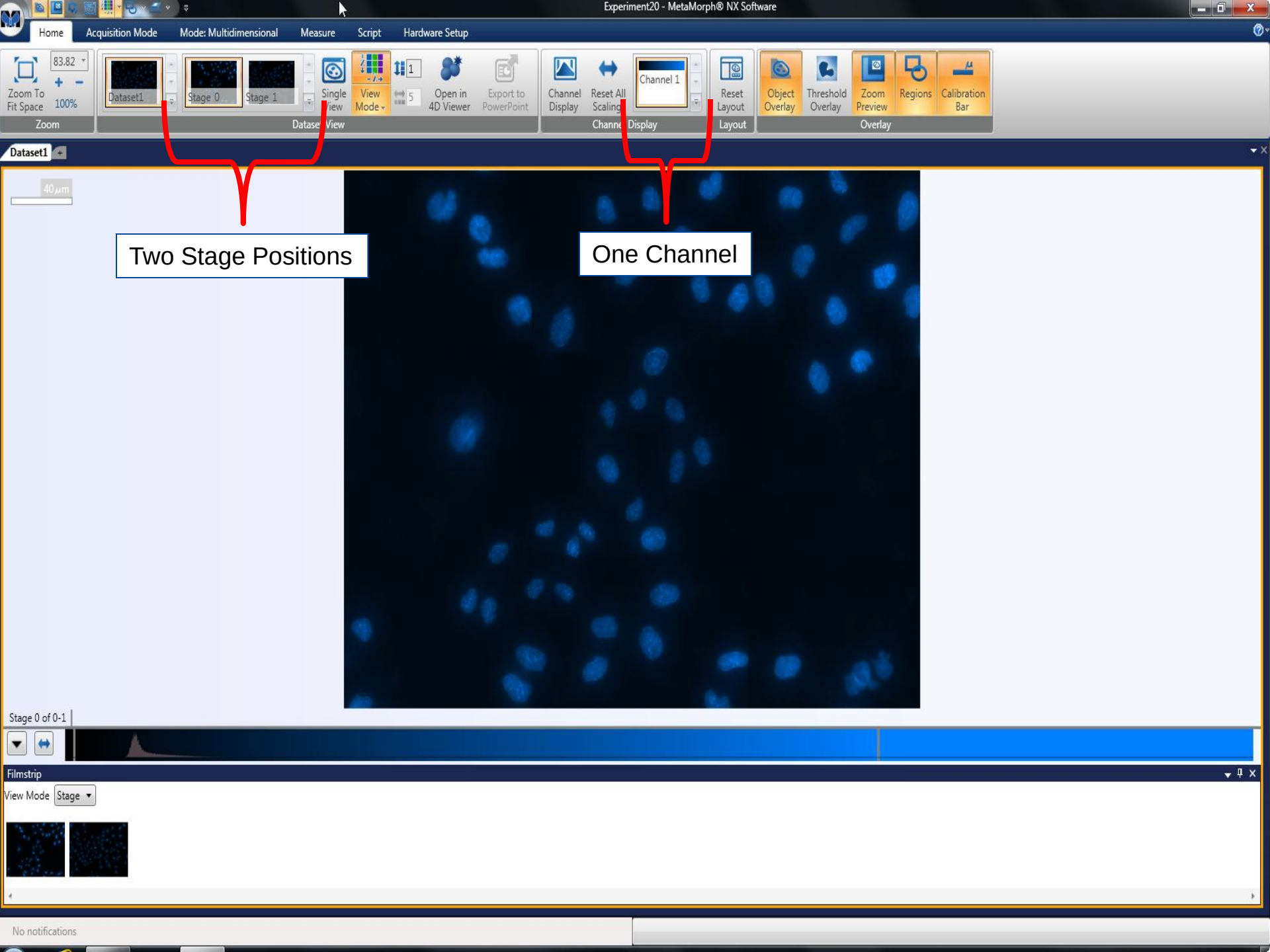
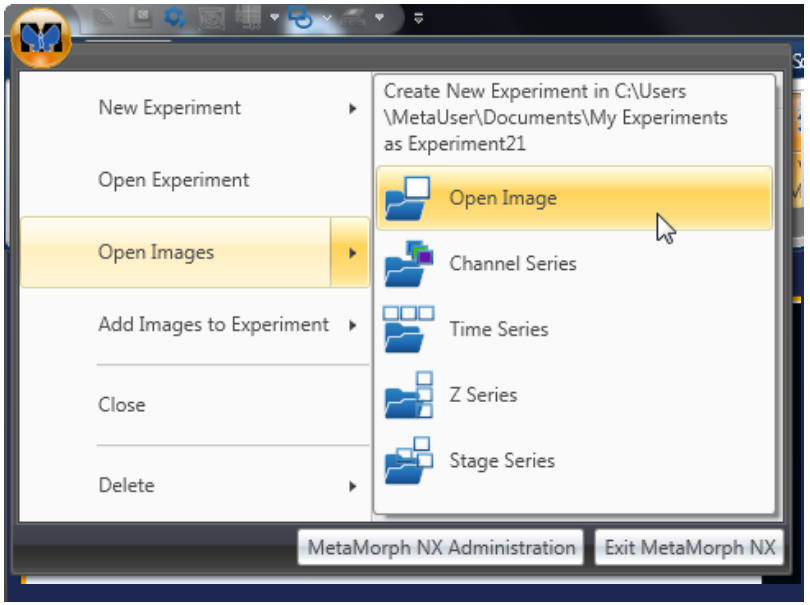

Experiment20 - MetaMorph® NX Software
Home
Acquisition Mode
Mode: Multidimensional
Measure
Script
Hardware Setup
Zoom To Fit Space
83.82
100%
Zoom
Dataset1
Stage 0
Stage 1
Single View
View Mode
Open in 4D Viewer
Export to PowerPoint
Dataset View
Channel Display
Reset All Scaling
Channel 1
Channel Display
Reset Layout
Layout
Object Overlay
Threshold Overlay
Zoom Preview
Regions
Calibration Bar
Overlay
Dataset1
40 µm
Two Stage Positions
One Channel
Stage 0 of 0-1
Filmstrip
View Mode
Stage
No notifications

Working with experiments

- Application Menu
  - Holds tools for working with the current experiment files
- Also tools for MetaMorph NX Administration.

- Open Images
  - Opens images acquired outside of MetaMorph NX into a **New Experiment**
  - Open Image
    - Select a single image, or import a .ND file from MetaMorph
  - Channel / Time / Z Series
    - Import multiple images or stage is a series of the given dimension
  - Stage Series
    - Opens multiple images – each image is considered a new stage location.



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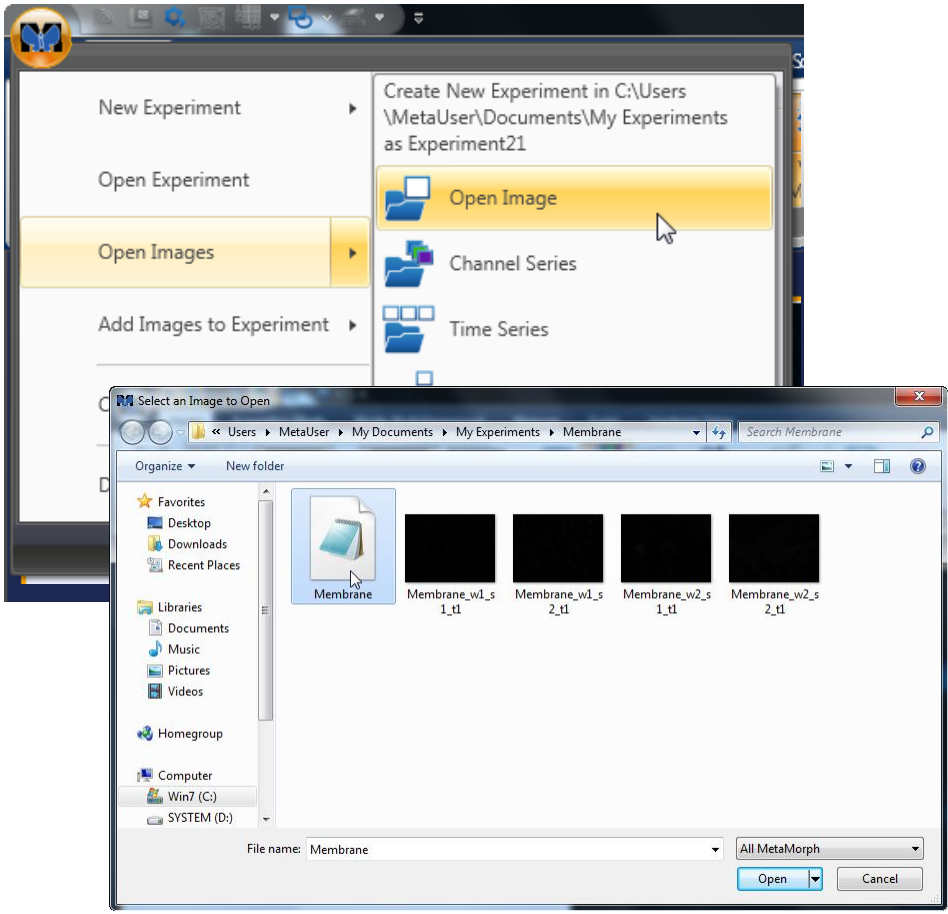
Working with experiments

- Application Menu
  - Holds tools for working with the current experiment files
- Also tools for MetaMorph NX Administration.

- Open Images
  - Opens images acquired outside of MetaMorph NX into a **New Experiment**
  - Open Image
    - Select a single image, or import a .ND file from MetaMorph
  - Channel / Time / Z Series
    - Import multiple images or stage is a series of the given dimension
  - Stage Series
    - Opens multiple images – each image is considered a new stage location.



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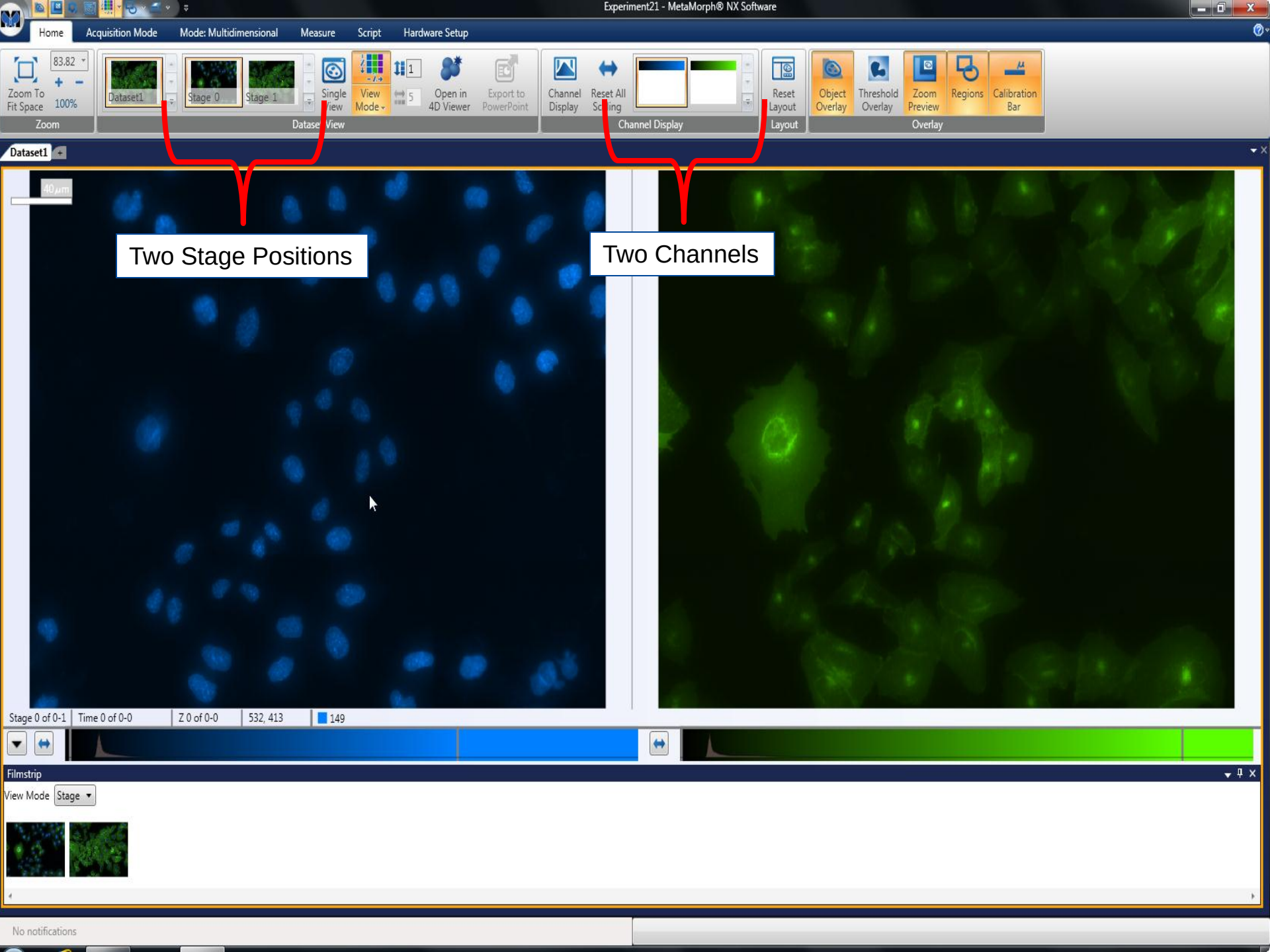
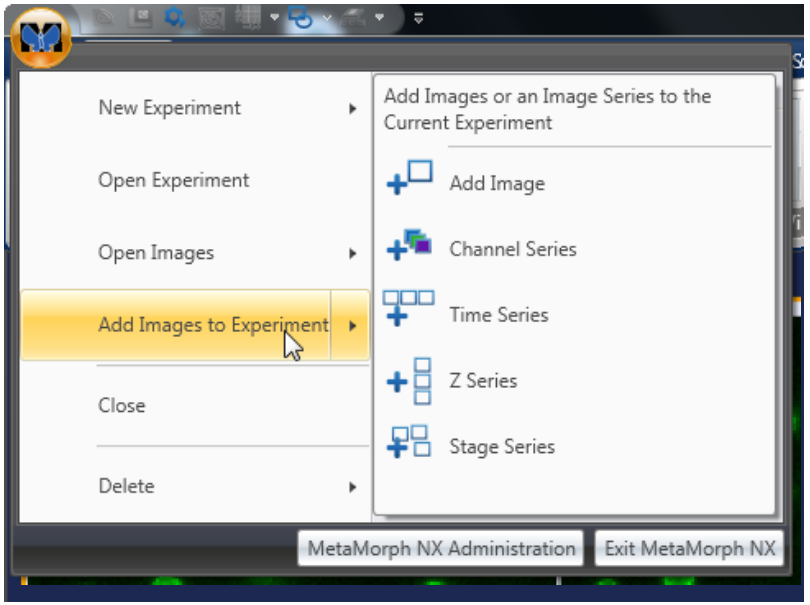

Experiment21 - MetaMorph® NX Software
Home
Acquisition Mode
Mode: Multidimensional
Measure
Script
Hardware Setup
Zoom To Fit Space
83.82
100%
Zoom
Dataset1
Stage 0
Stage 1
Single View
View Mode
Open in 4D Viewer
Export to PowerPoint
Dataset View
Channel Display
Reset All Scaling
Channel Display
Reset Layout
Layout
Object Overlay
Threshold Overlay
Zoom Preview
Regions
Calibration Bar
Overlay
Dataset1
40 µm
Two Stage Positions
Two Channels
Stage 0 of 0-1
Time 0 of 0-0
Z 0 of 0-0
532, 413
149
Filmstrip
View Mode
Stage
No notifications

Working with experiments

- Application Menu
  - Holds tools for working with the current experiment files
- Also tools for MetaMorph NX Administration.

- Add Images to Experiment
  - Opens images acquired outside of MetaMorph NX adding them to the **Current Experiment** as a new Dataset
  - Open Image
    - Select a single image, or import a .ND file from MetaMorph
  - Channel / Time / Z Series
    - Import multiple images or stage is a series of the given dimension
  - Stage Series
    - Opens multiple images – each image is considered a new stage location.



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MetaMorph NX

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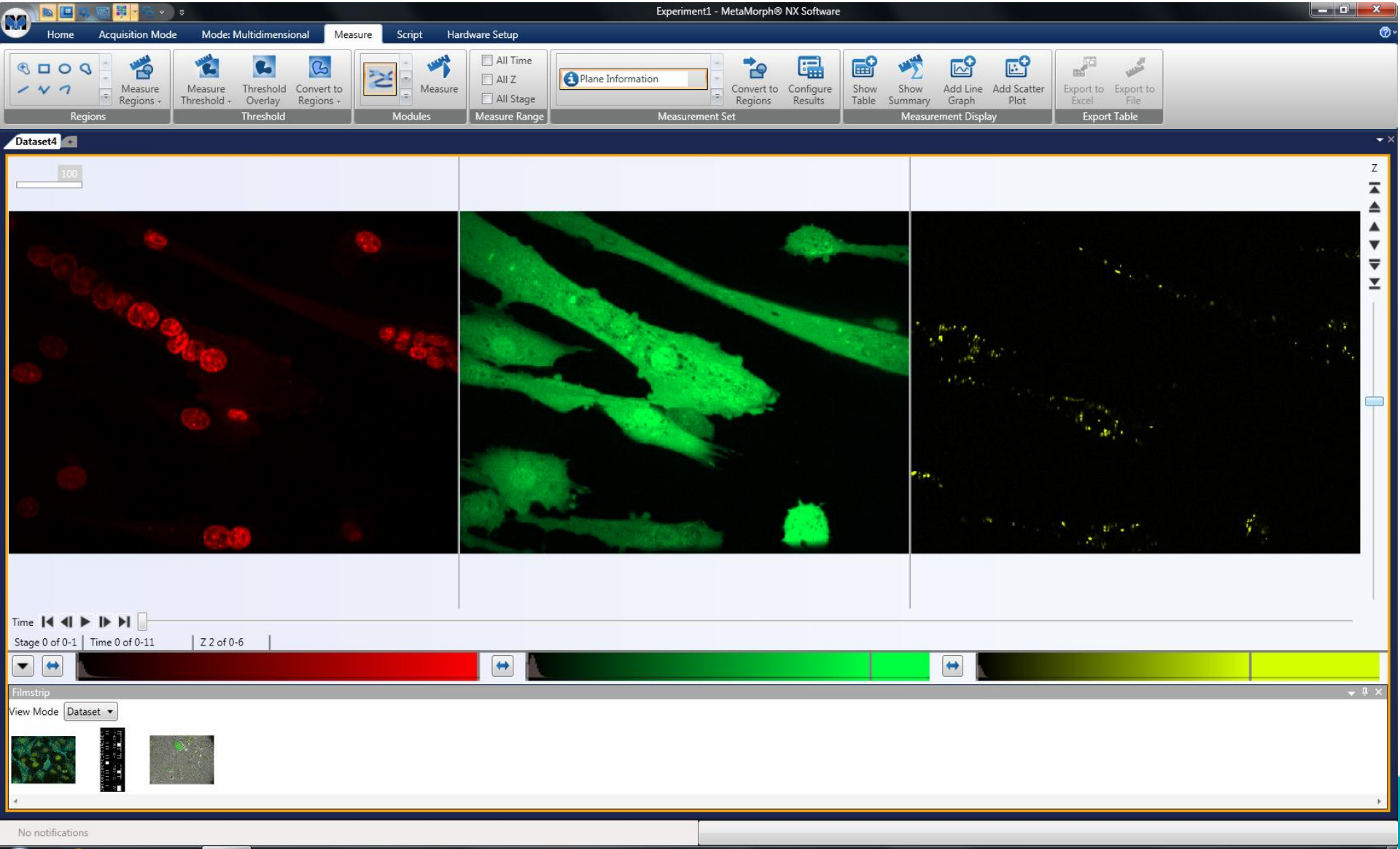
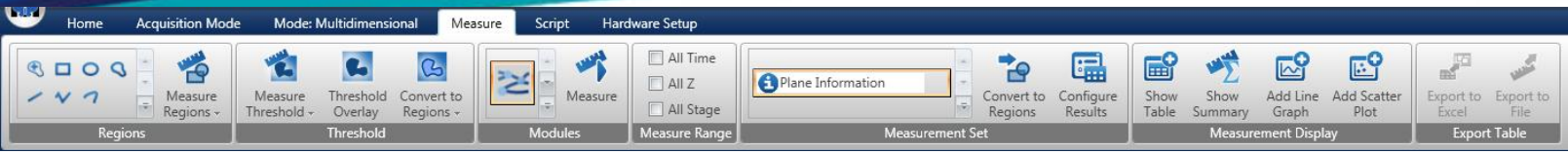
Measurements

Basic Measurement Tools in MM NX

The New Measure Ribbon



The New Measure Ribbon



- MetaMorph 2.0.1 has re-designed the measure ribbon
  - Reorganized tools like Regions, Thresholding, and Modules
  - Added space for the Application Modules
  - Added tools for exporting data
  - Added tools for turning thresholds and Module masks to Regions of Interest.

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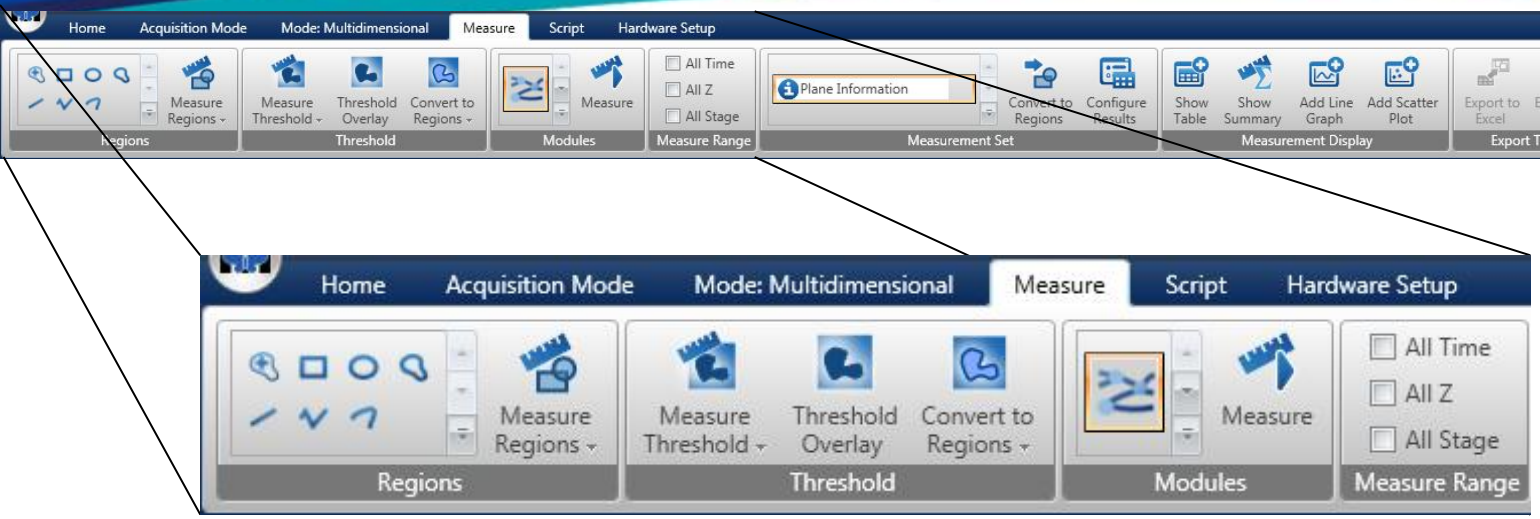
Measurement Tools



- MetaMorph 2.0.1 has re-designed the measure ribbon
  - The Left side of the Ribbon contains tools for making measurements.

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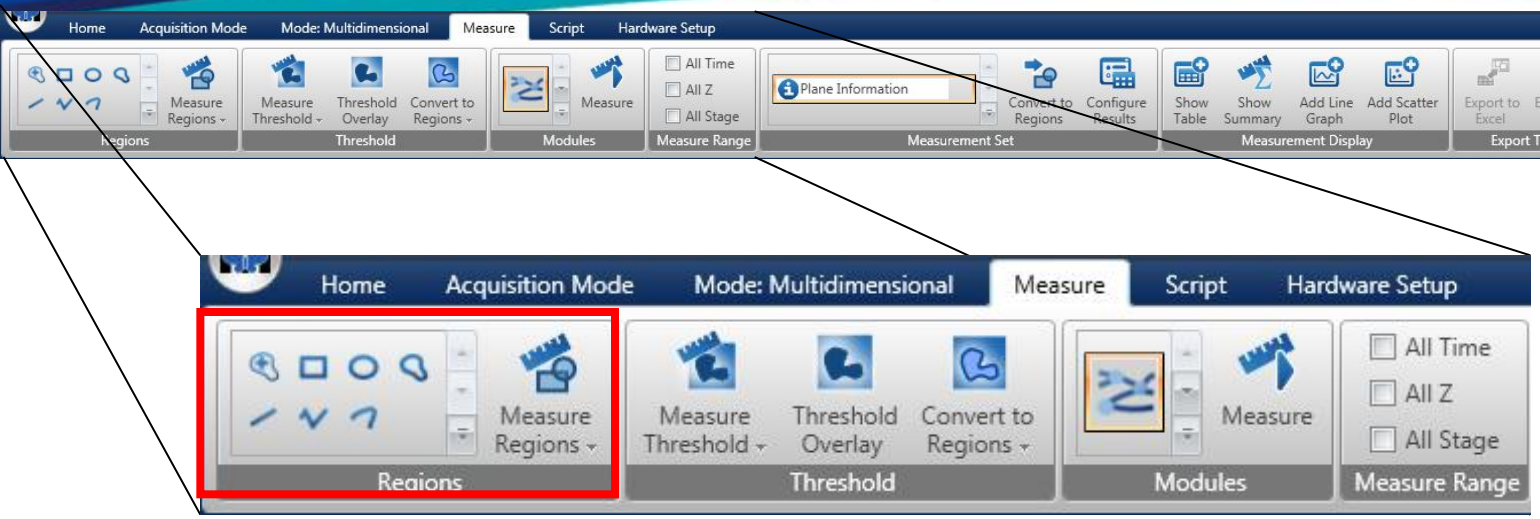
Region Tools



- Regions
  - The first section is for Regions of Interest.
  - There is a gallery for choosing the type of Region to draw.
  - There is a drop down menu for configuring Region Measurements
  - There is a button to Measure Regions

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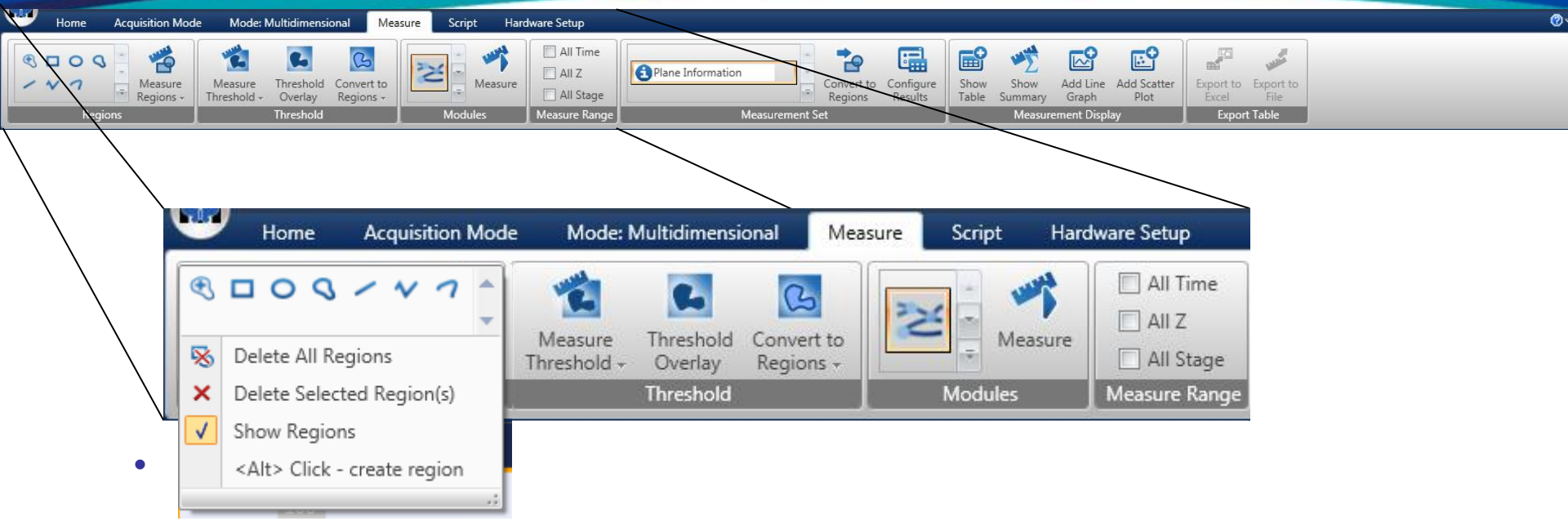
Region Tools



- The first section is for Regions of Interest.
- There is a gallery for choosing the type of Region to draw.
- There is a drop down menu for configuring Region Measurements
- There is a button to Measure Regions

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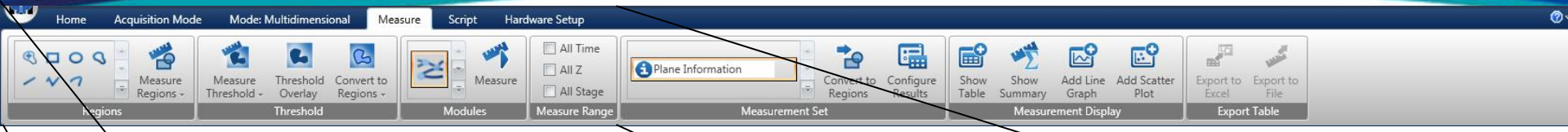
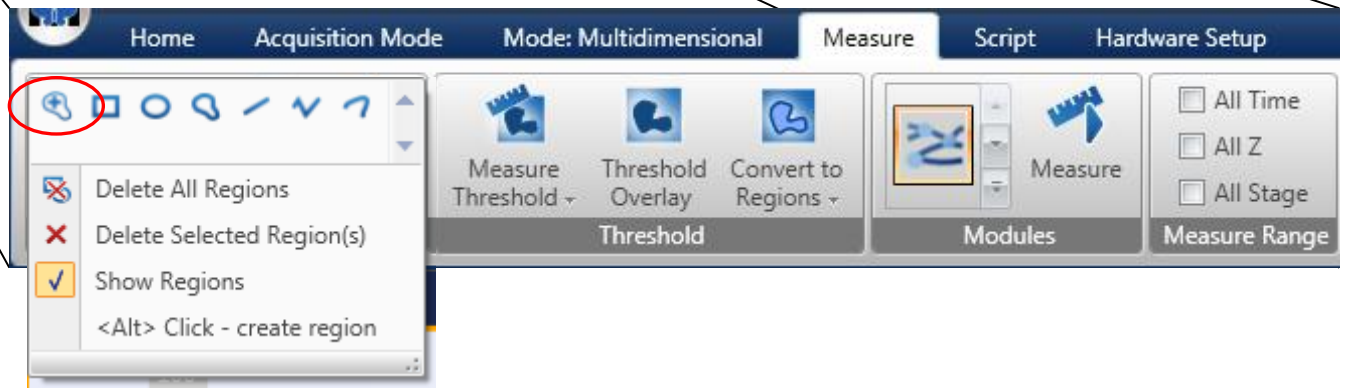
Region Tools





- The first section is for Regions of Interest.
- There is a gallery for choosing the type of Region to draw.
- New Auto Find Tool helps place Regions by clicking on an object of Interest.
- There is a drop down menu for configuring Region Measurements
- The Region then is drawn automatically around the object
- There is a button to Measure Regions

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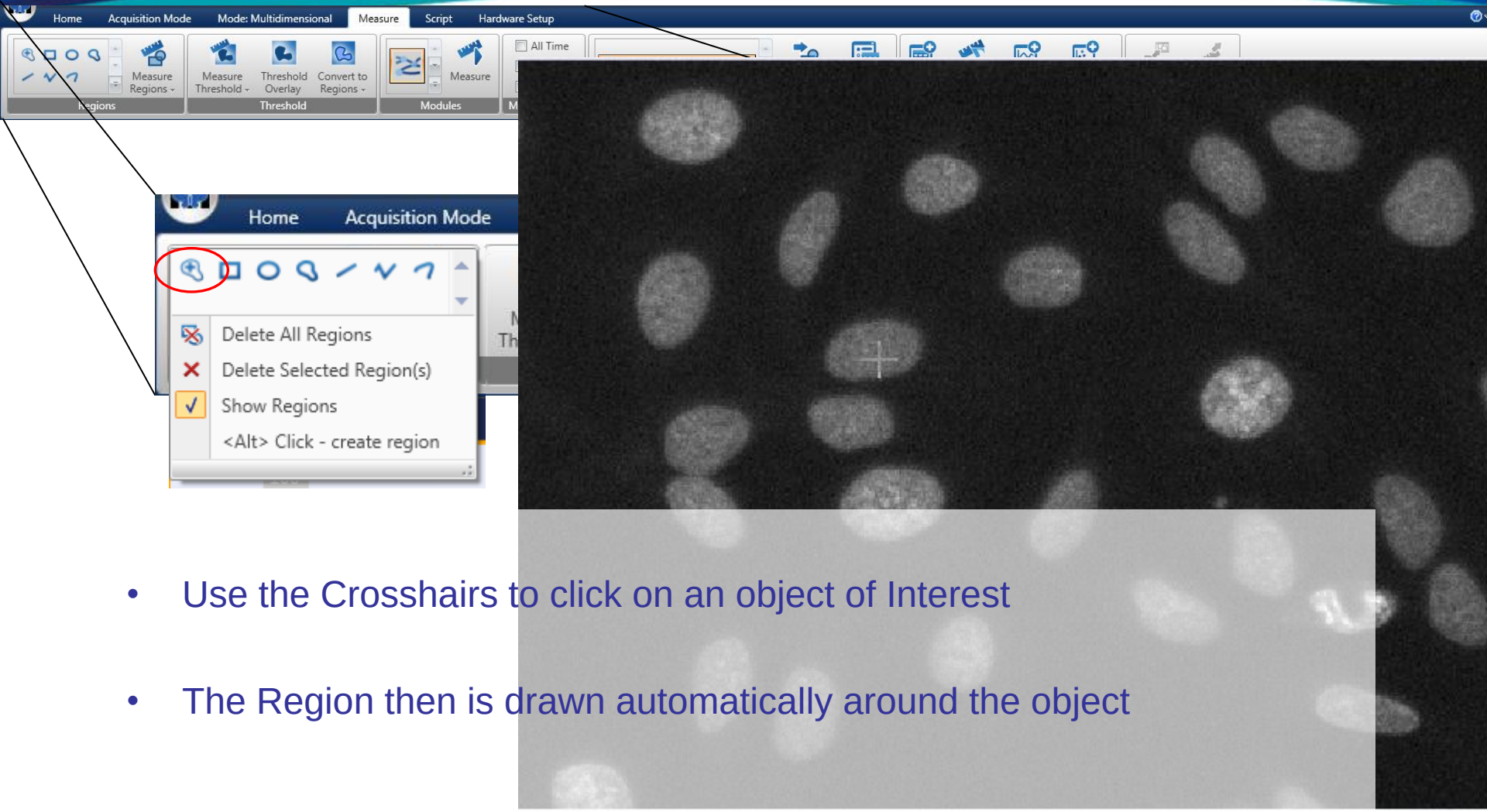
Region Tools



- Use the Crosshairs to click on an object of Interest
- The Region then is drawn automatically around the object

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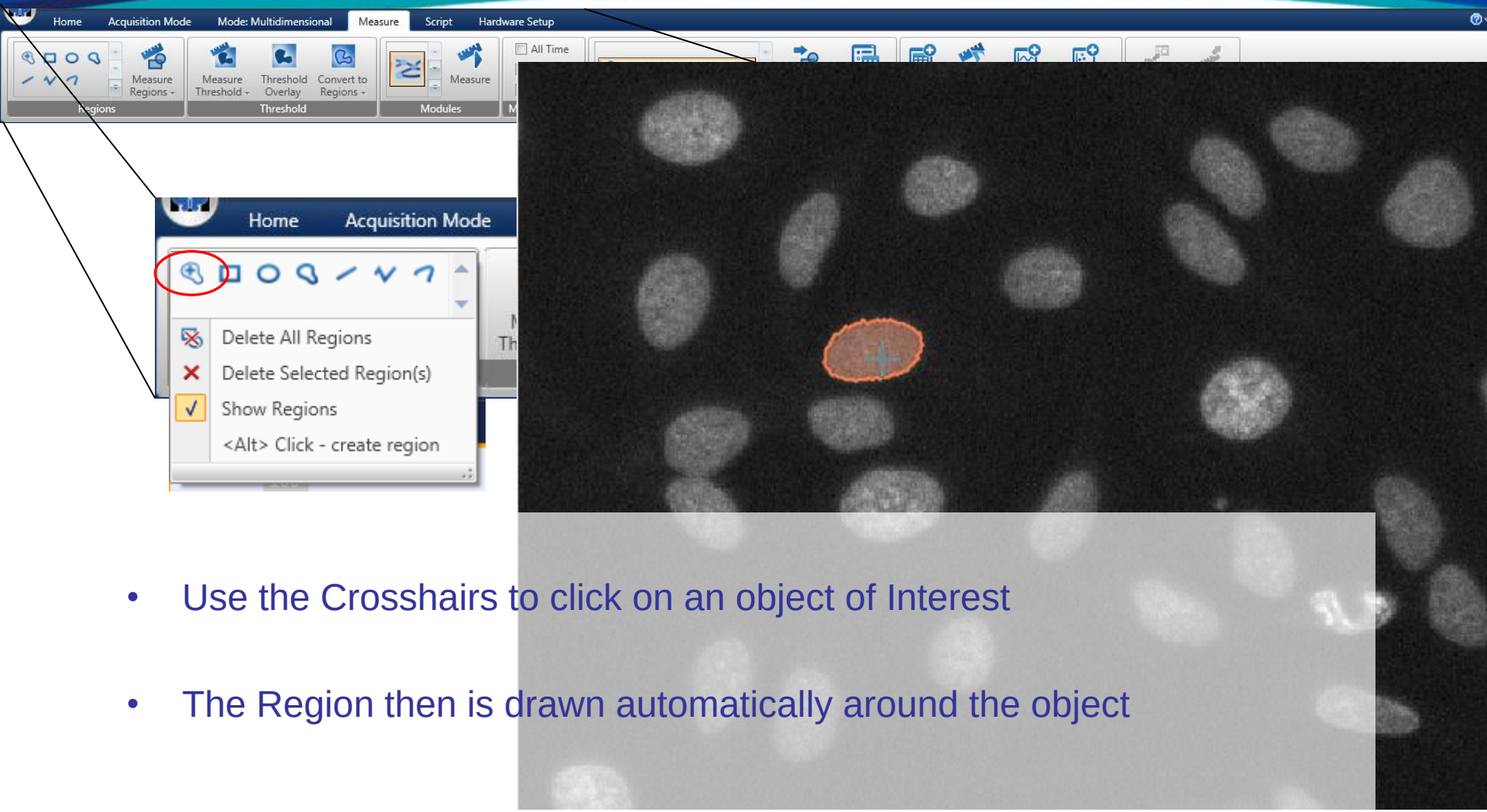
Region Tools



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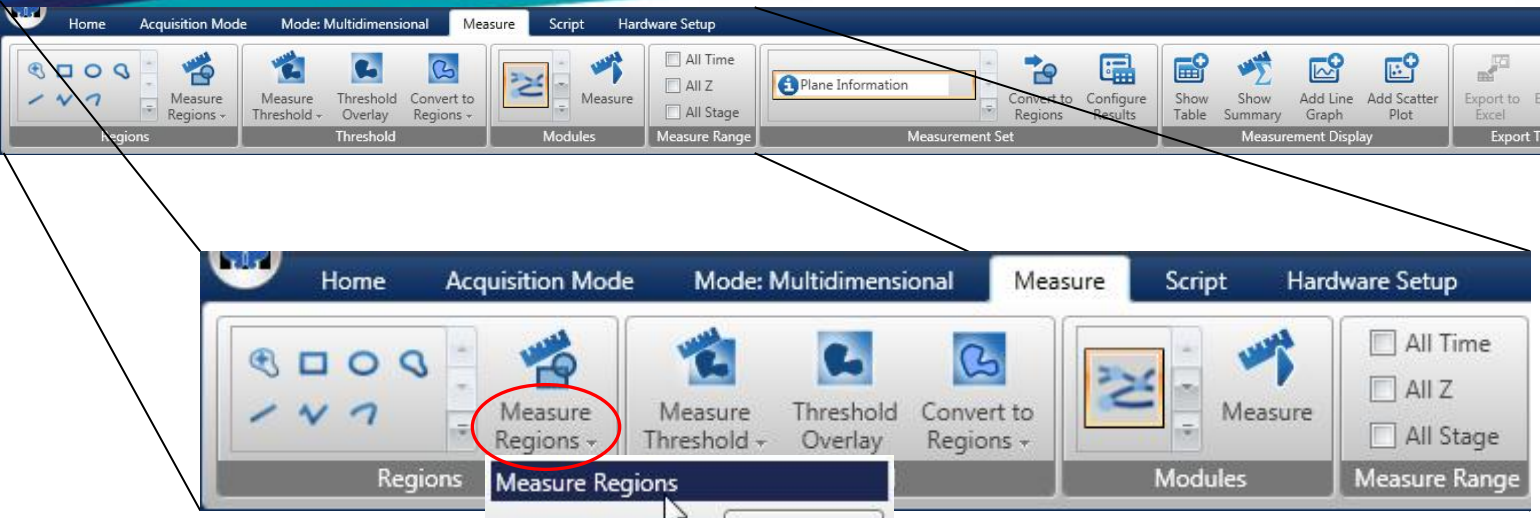
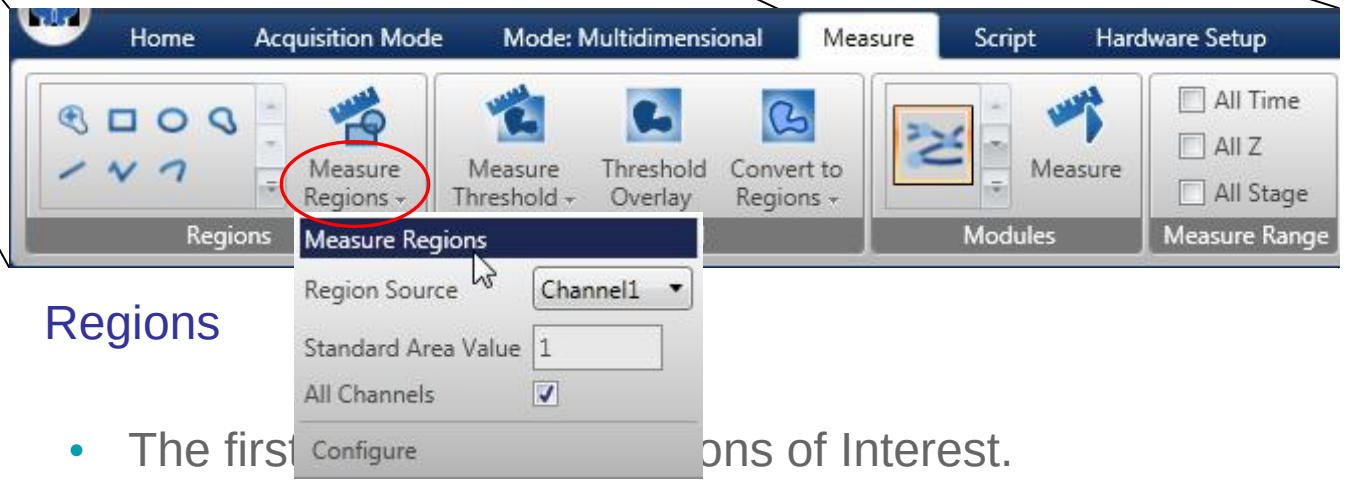
Region Tools





- Regions
  - The first ons of Interest.
  - There is a gallery for choosing the type of Region to draw.
  - There is a drop down menu for configuring Region Measurements
  - There is a button to Measure Regions

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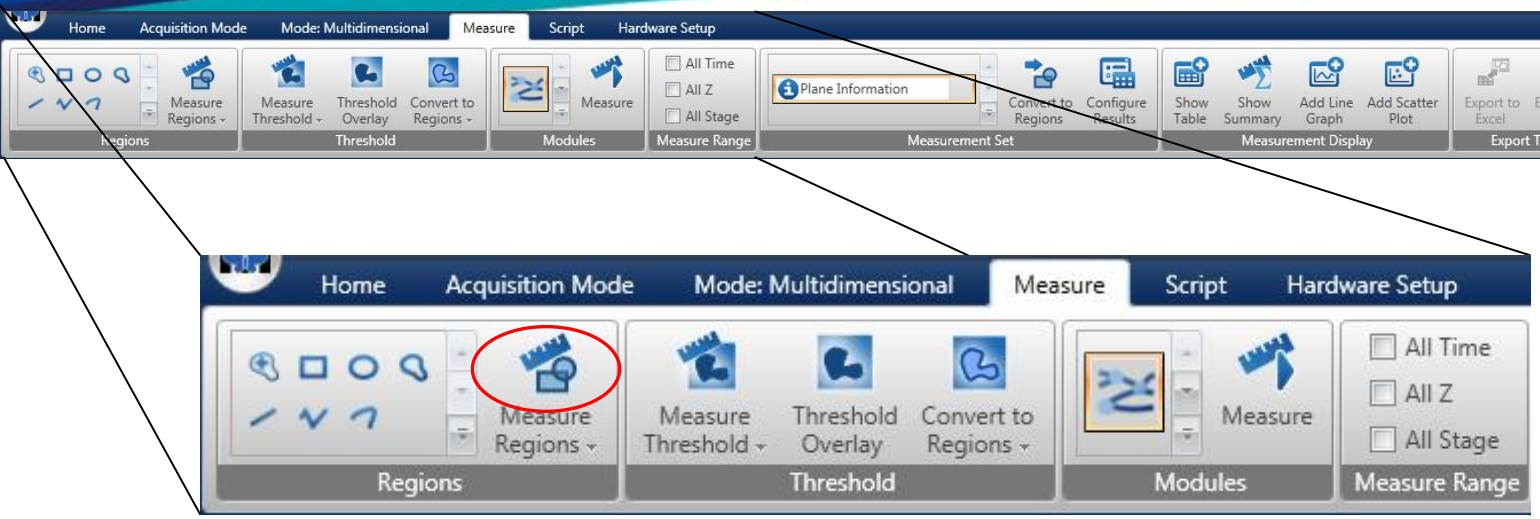
Region Tools



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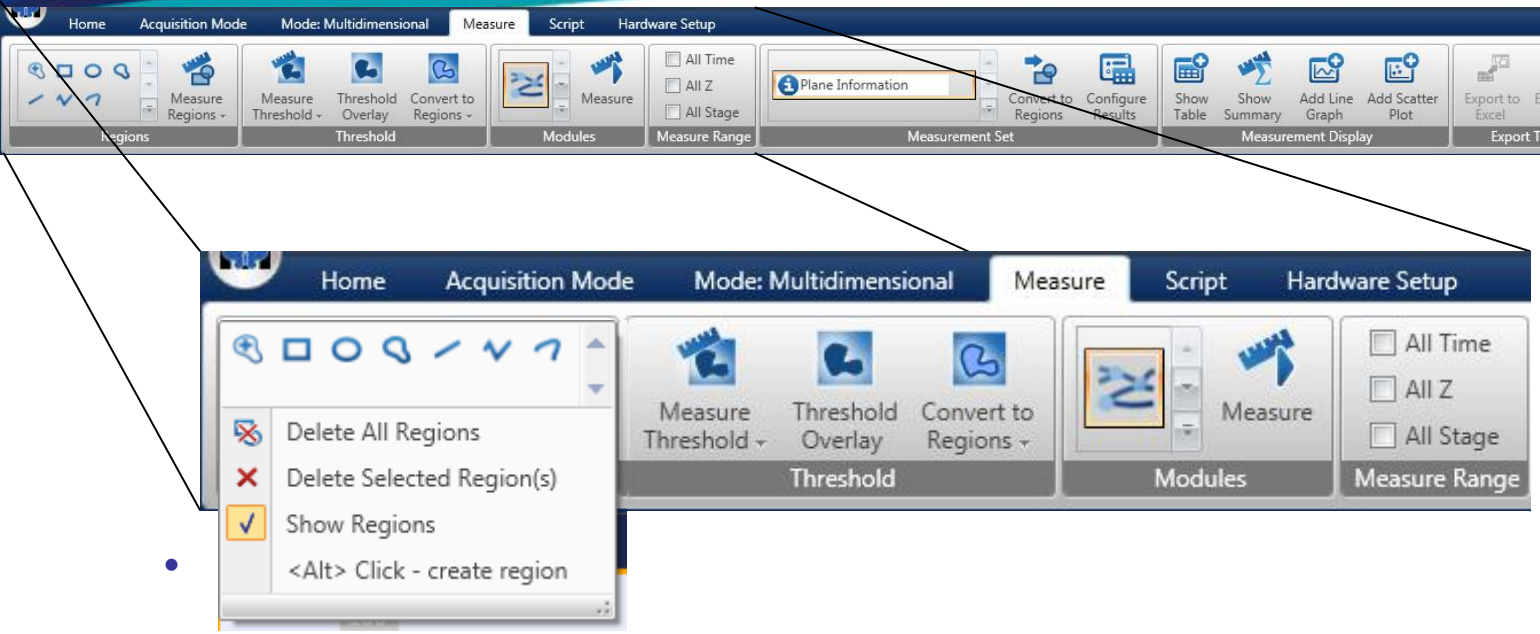
Region Tools



- TIP
  - Press the ALT key and click on the image to continue to place Regions of the same type

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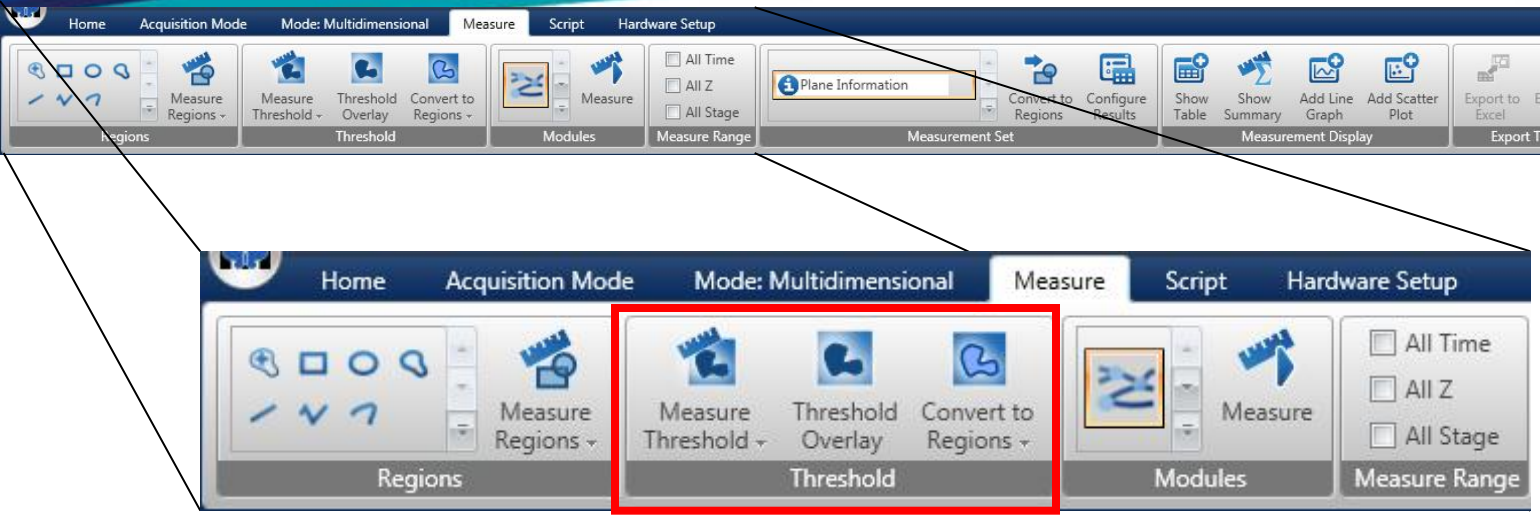
Threshold Tools



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  - There is a drop down menu for setting the Threshold
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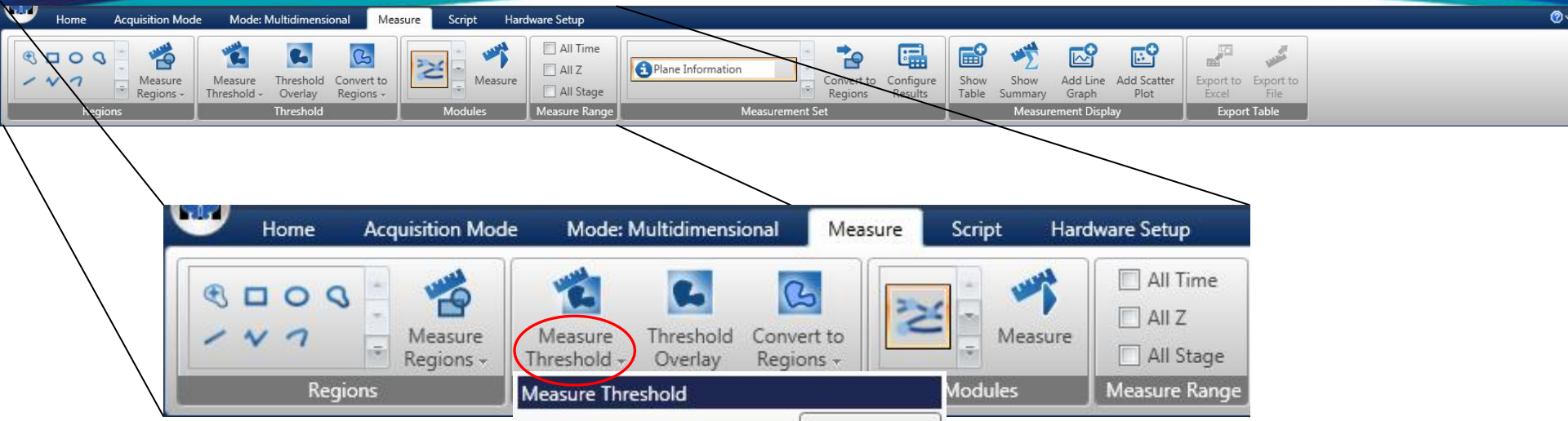
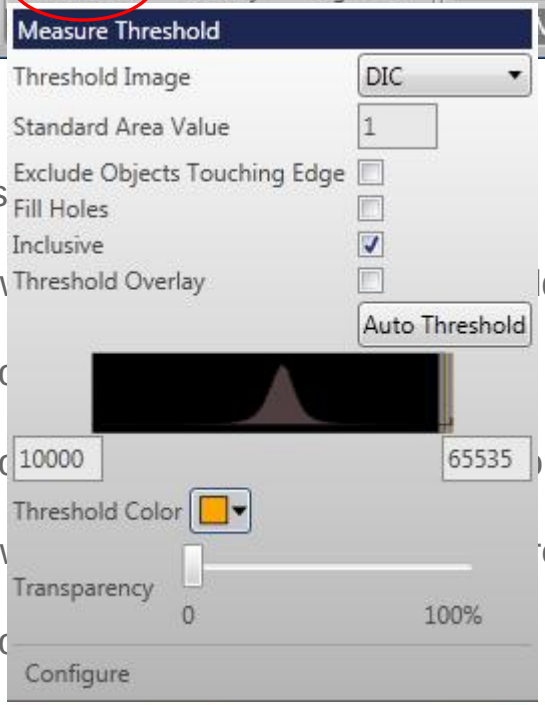
Threshold Tools





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  - There is a drop do ld
  - There is a button t
  - There is a button t r off
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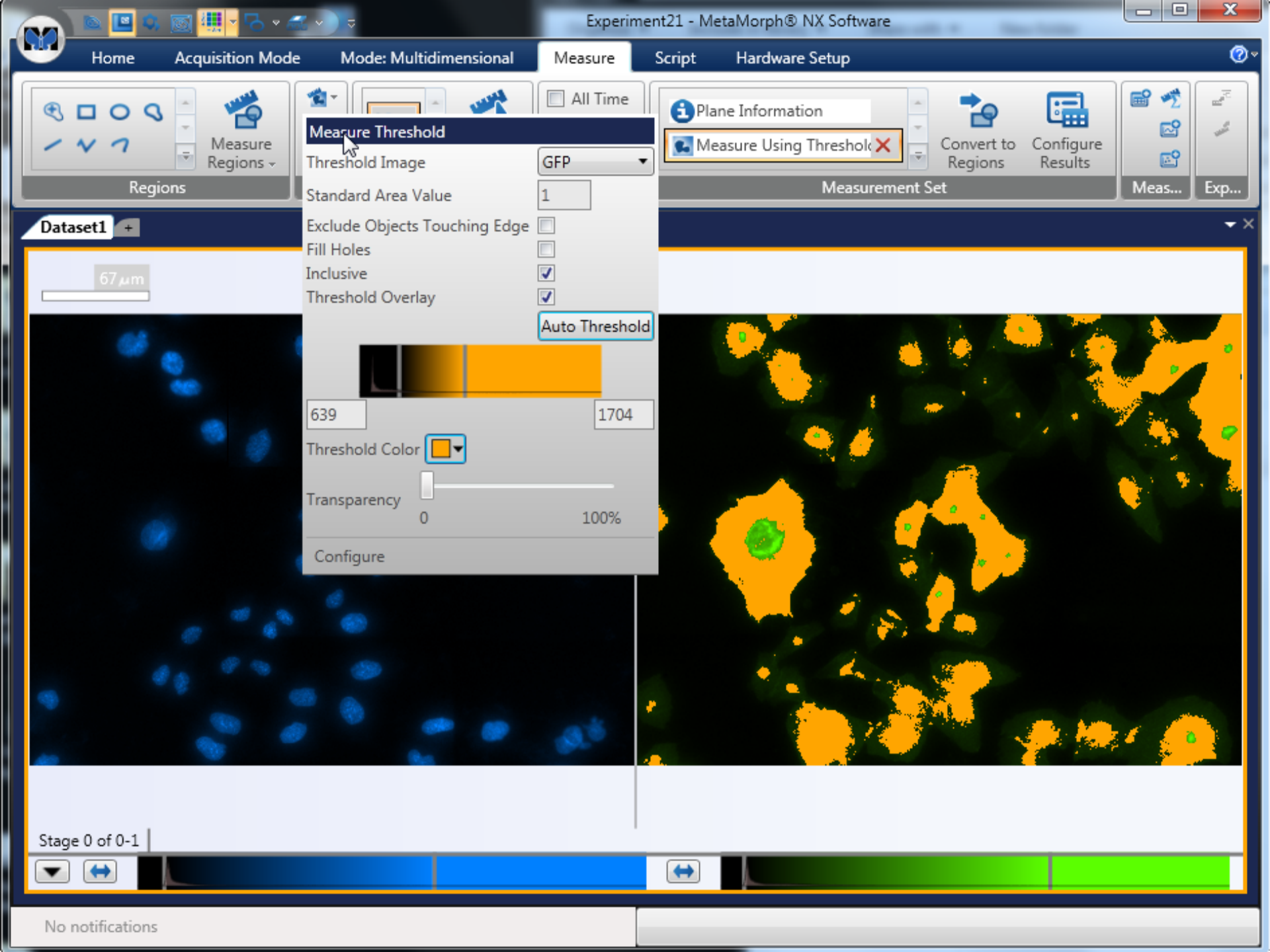
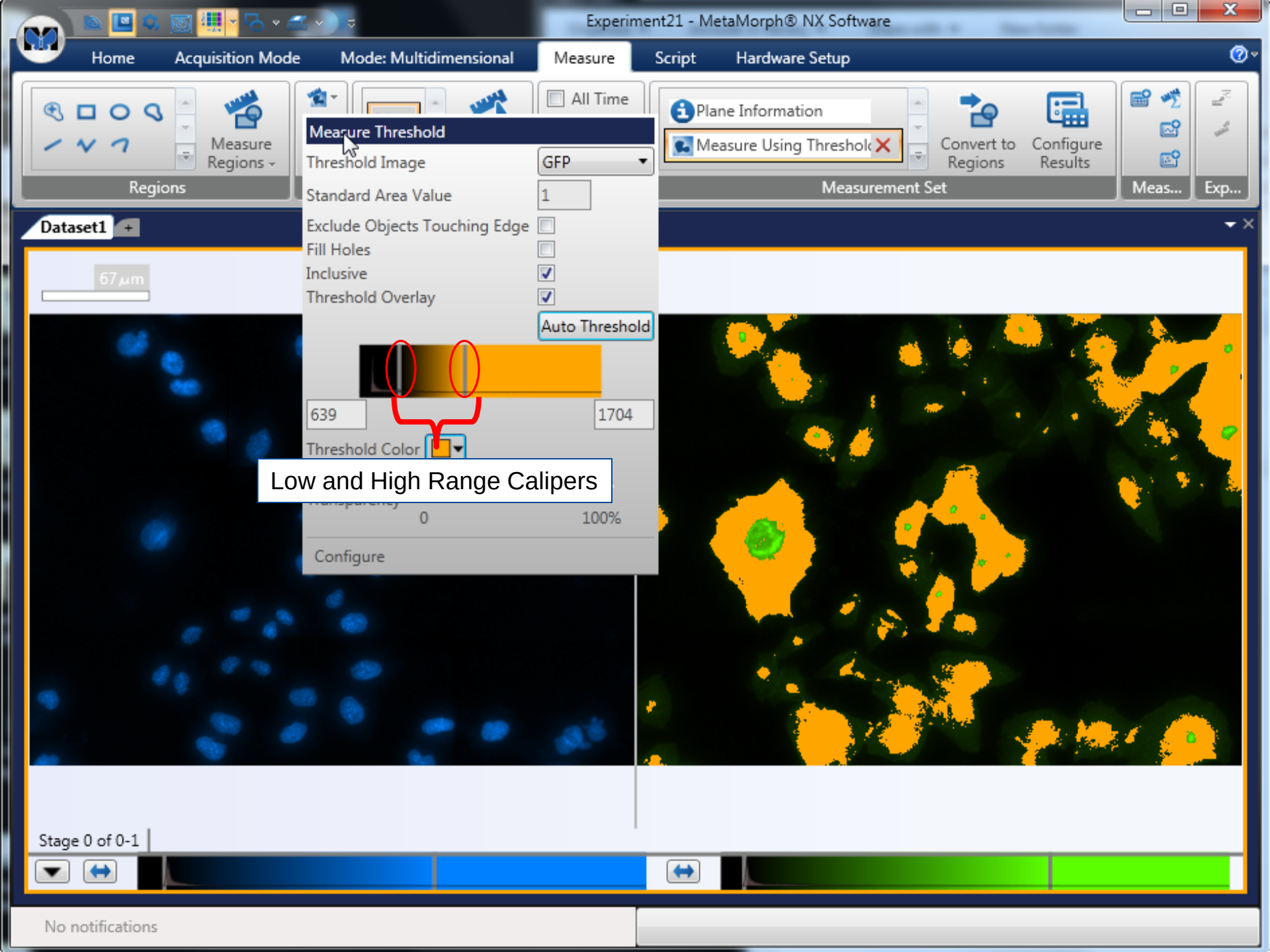

Experiment21 - MetaMorph® NX Software
Home
Acquisition Mode
Mode: Multidimensional
Measure
Script
Hardware Setup
Measure Regions
Regions
All Time
Plane Information
Measure Using Threshol
Convert to Regions
Configure Results
Measurement Set
Meas...
Exp...
Measure Threshold
Threshold Image
GFP
Standard Area Value
1
Exclude Objects Touching Edge
Fill Holes
Inclusive
Threshold Overlay
Auto Threshold
639
1704
Threshold Color
Transparency
0
100%
Configure
Dataset1
67 µm
Stage 0 of 0-1
No notifications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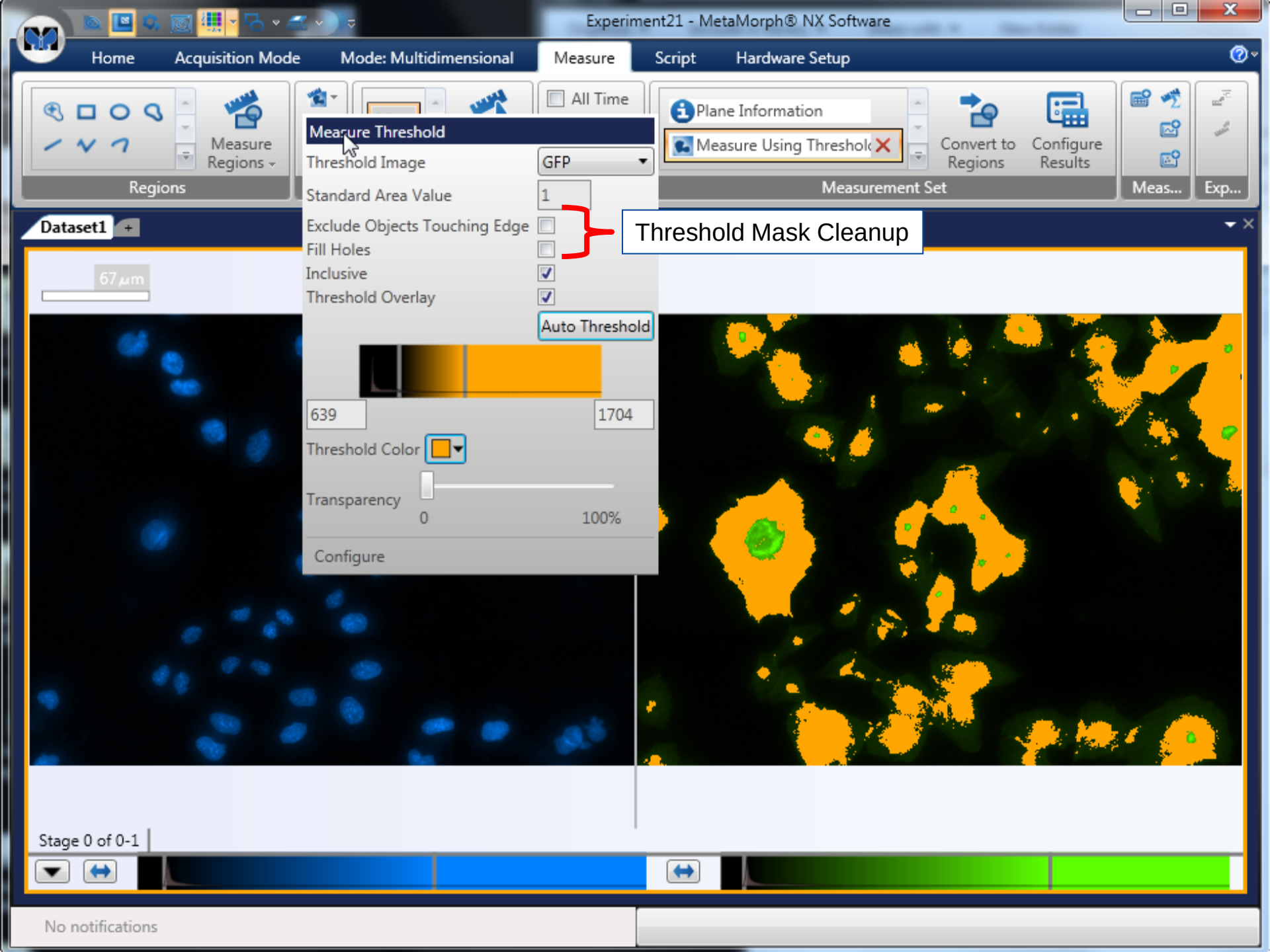
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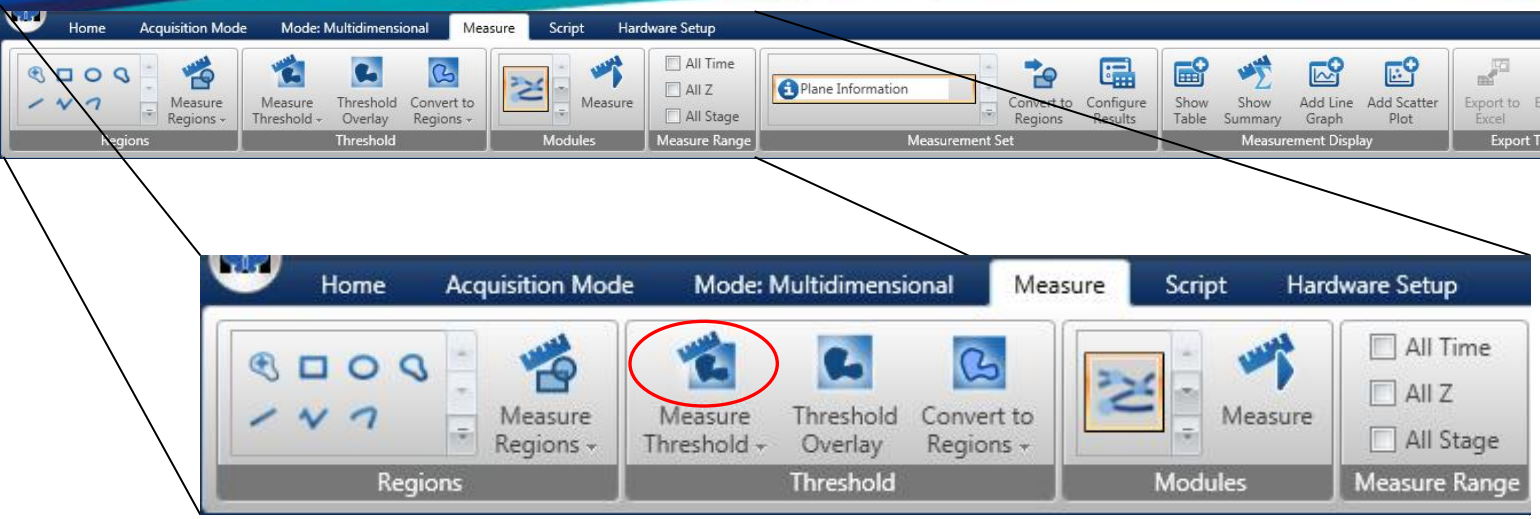
Threshold Tools



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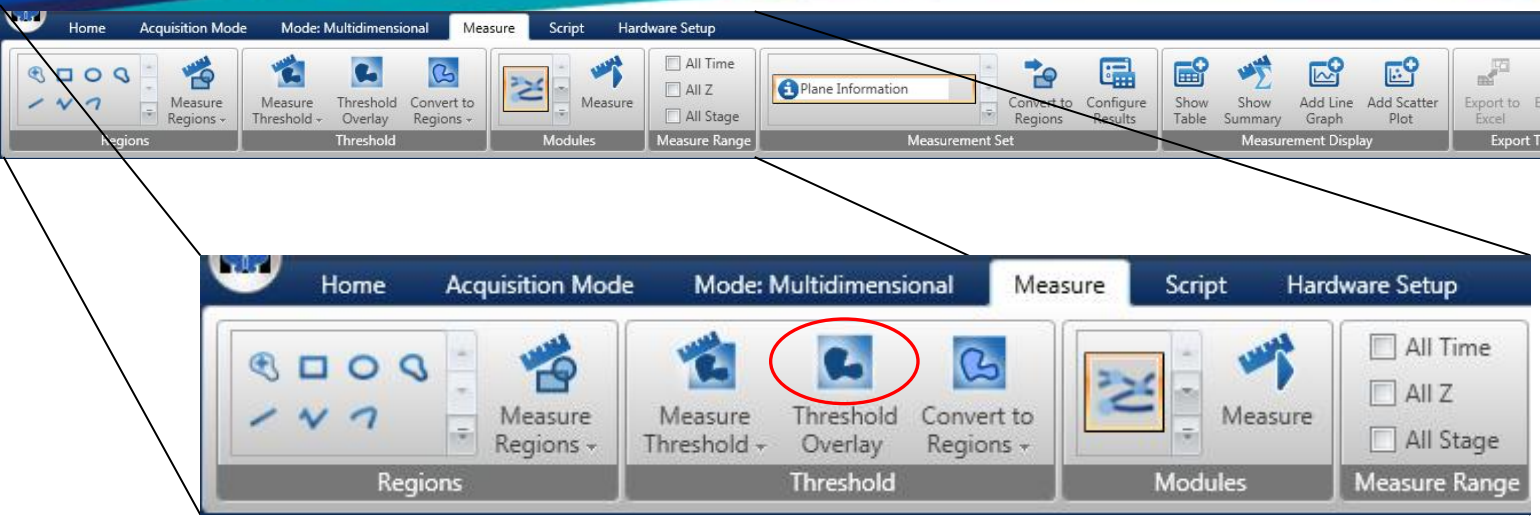
Threshold Tools



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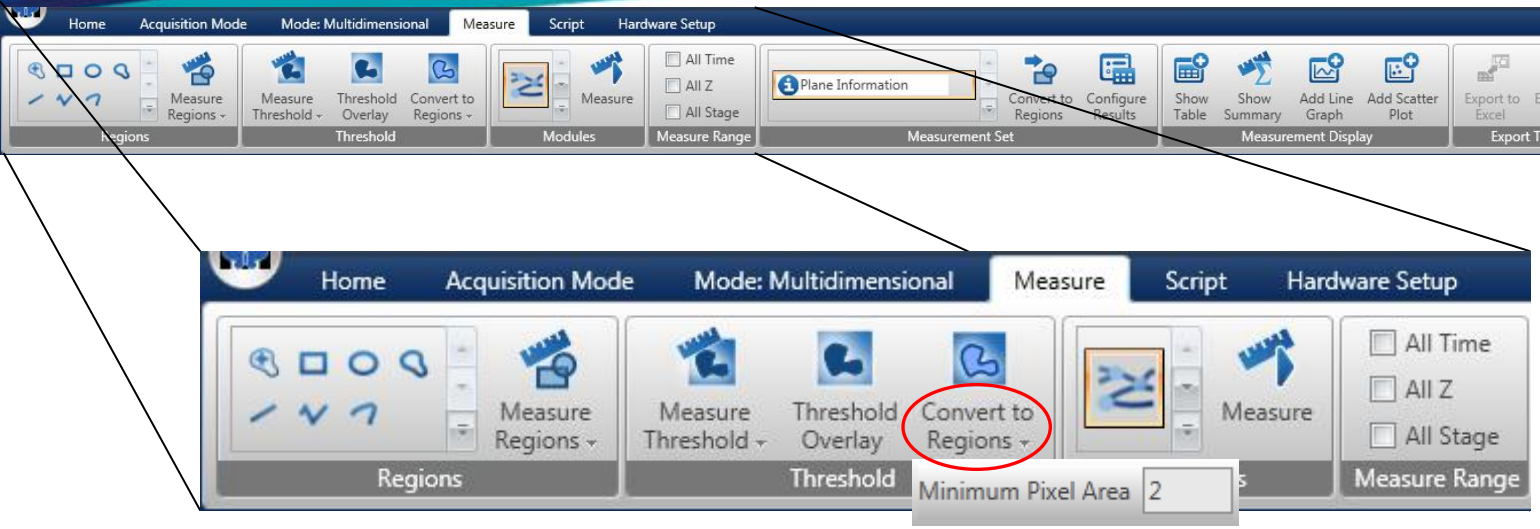
Threshold Tools



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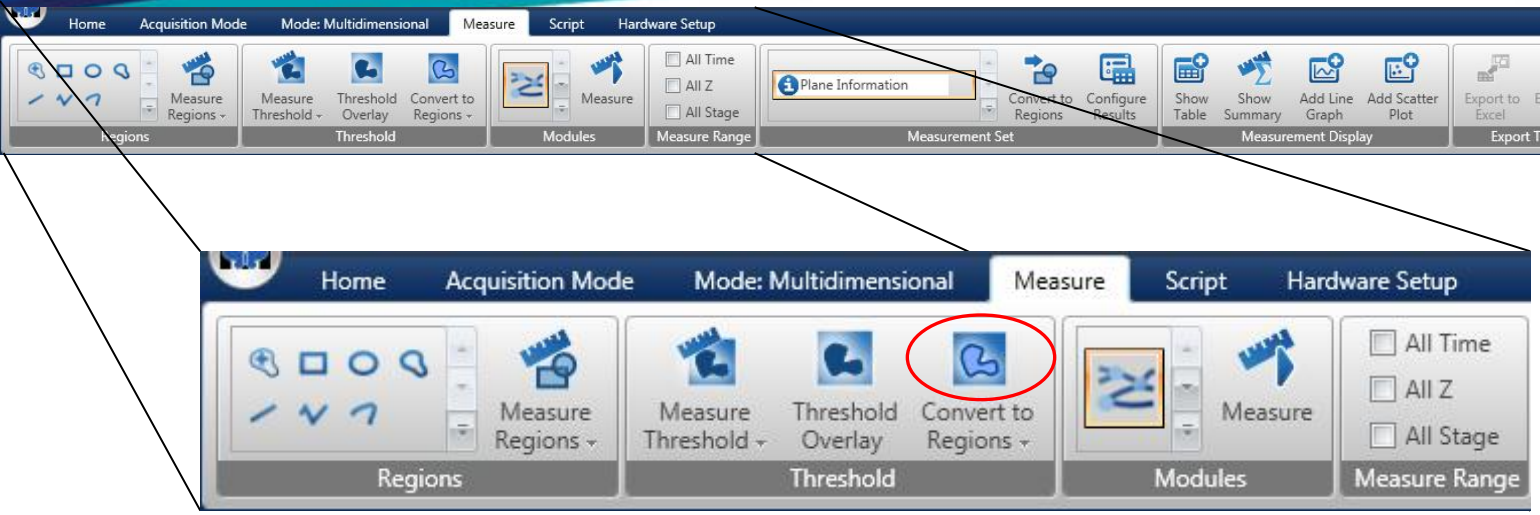
Threshold Tools



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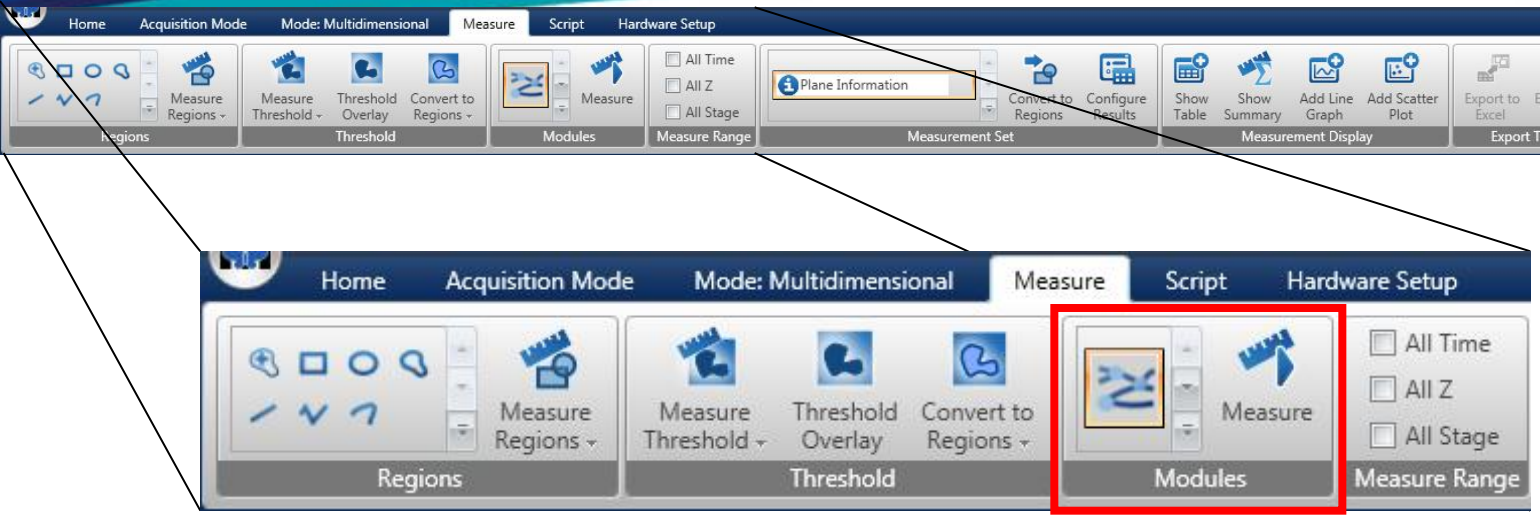
Modules



- Module
  - The next section is for Modules.
  - There is a gallery for selecting which Application or Custom Module to run
  - You can click on the Module to configure it
  - Custom Modules can be edited or deleted
  - Use Create Module to make a new Custom Module
  - Press Measure to run the selected Module

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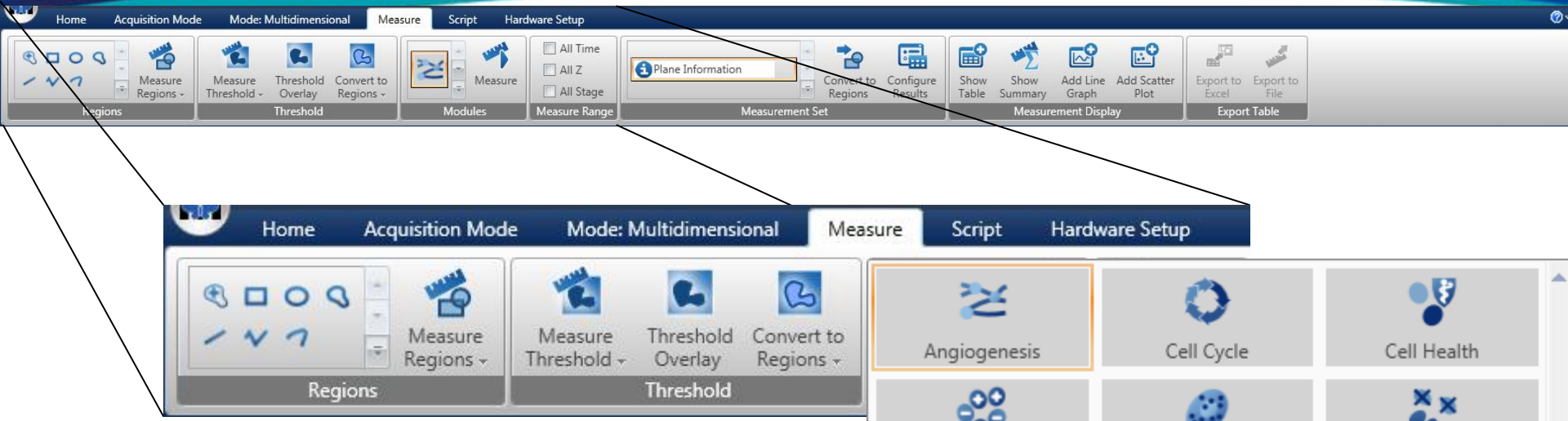
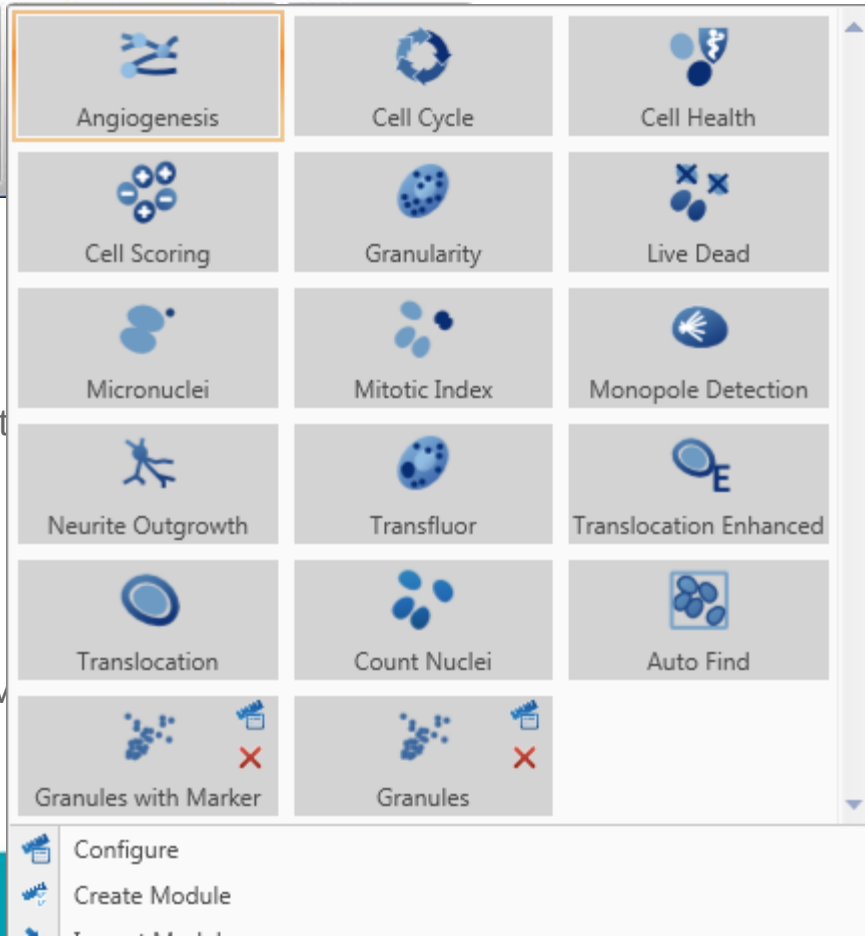
Modules





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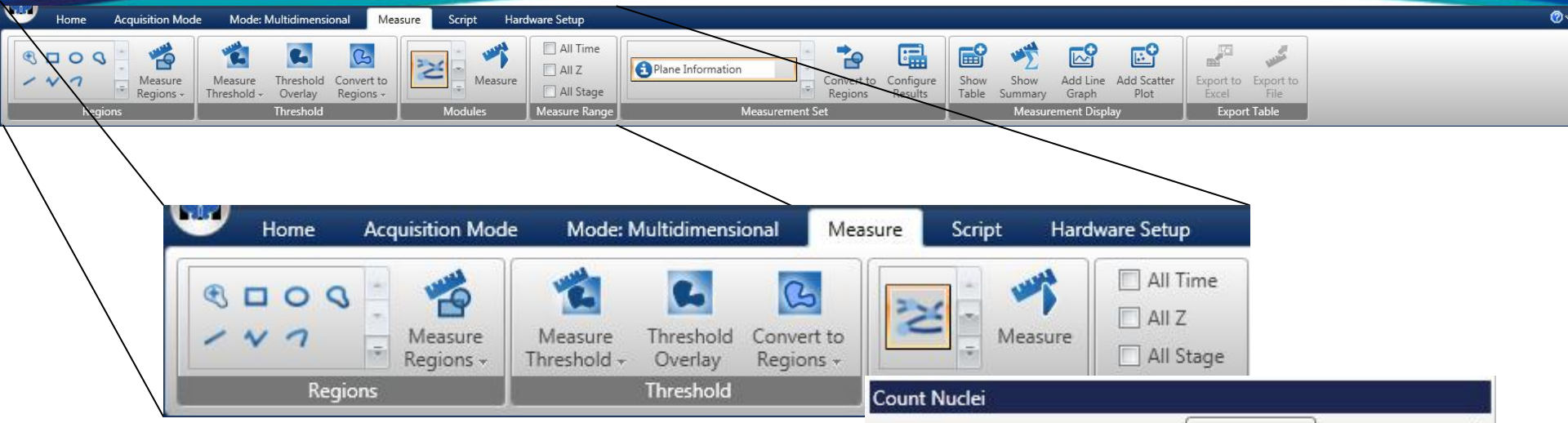
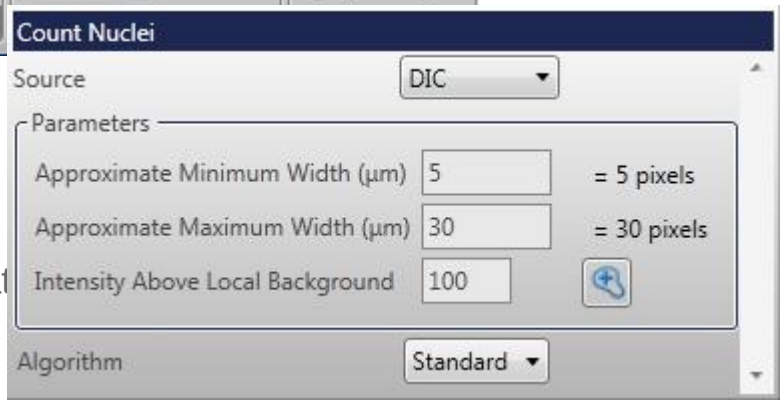
Modules





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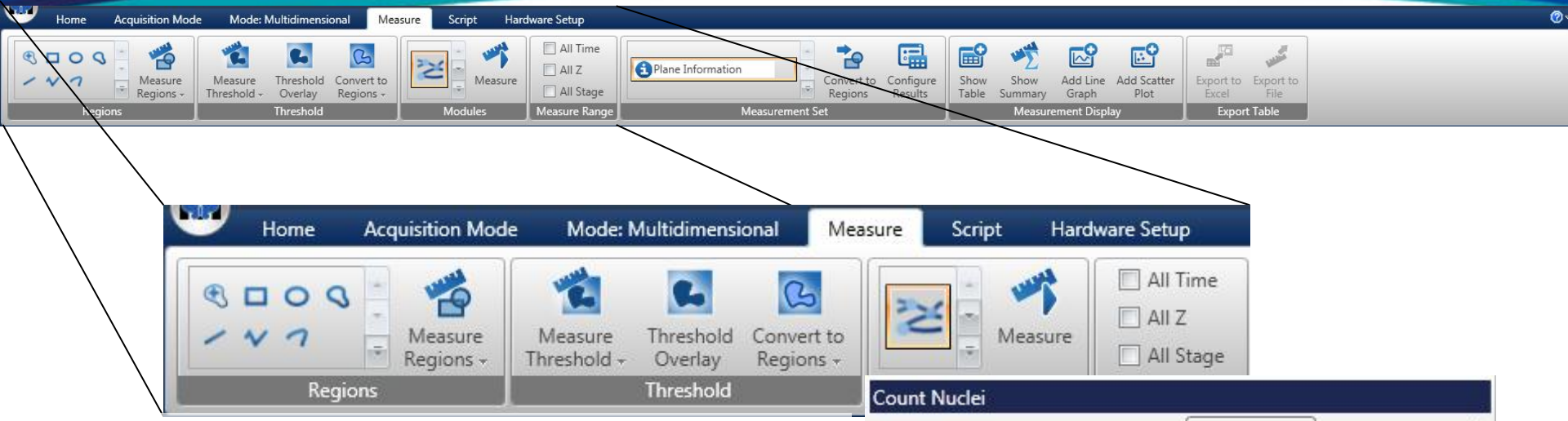

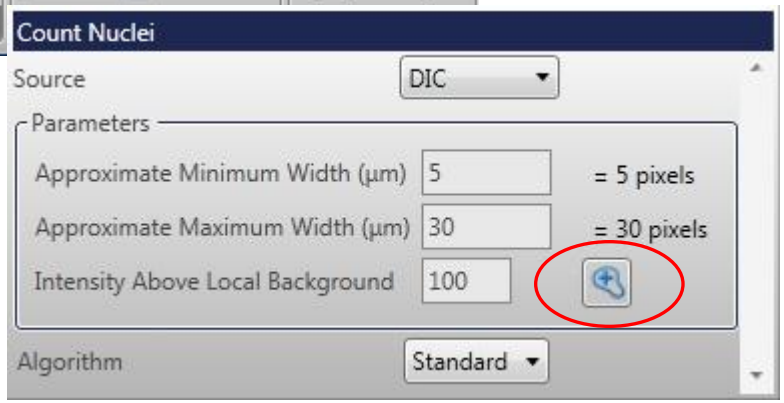

- Many of the Application Modules also have the Click To Find feature
  - Modules are easier to setup – no measuring intensities or sizes needed
- Modules also have Fast Algorithm options
  - Perform similar to Standard algorithm, but run 2x faster (or more)

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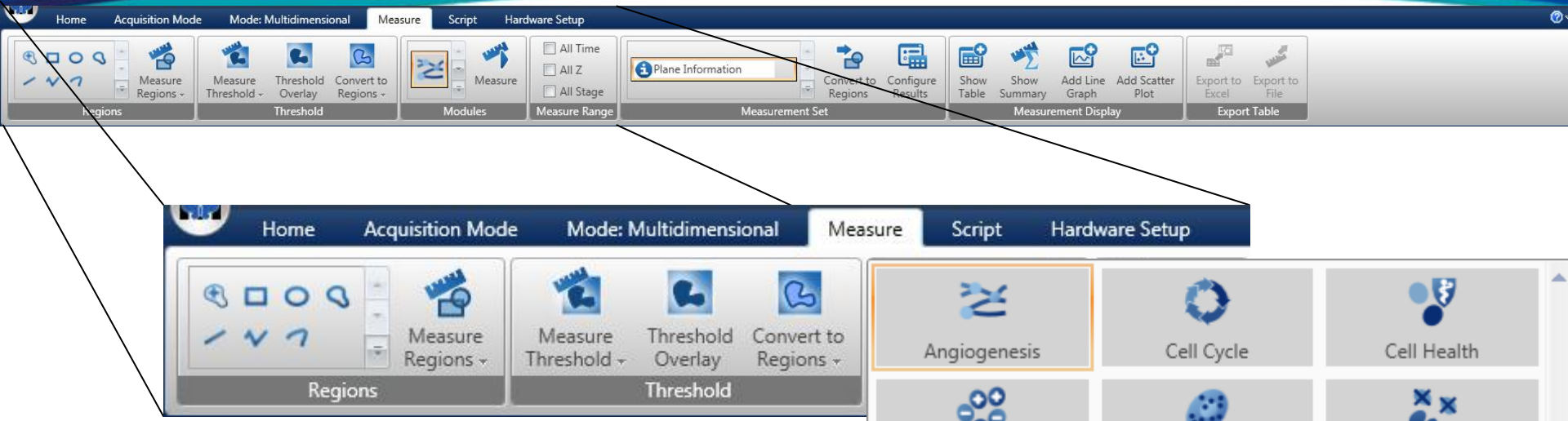
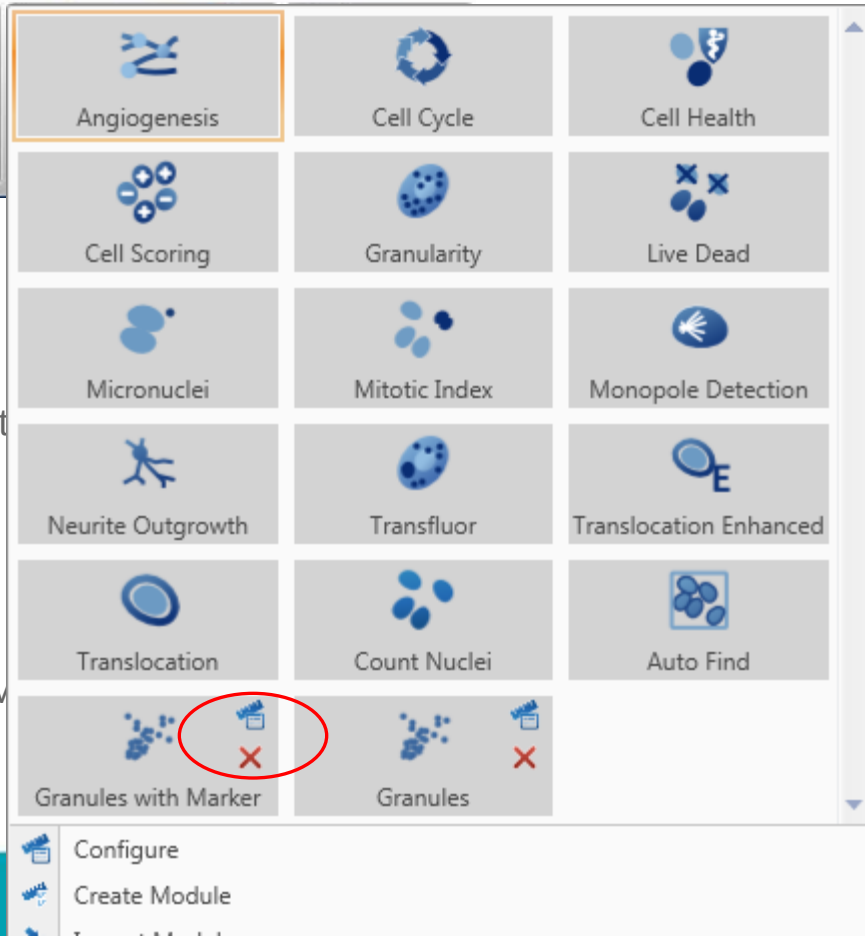
Modules





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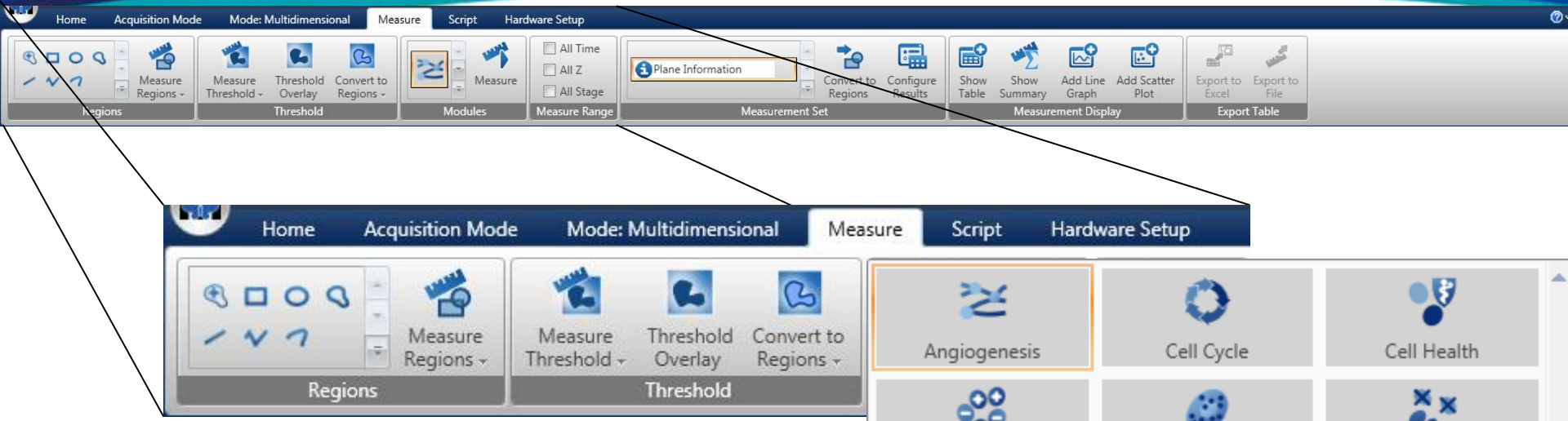
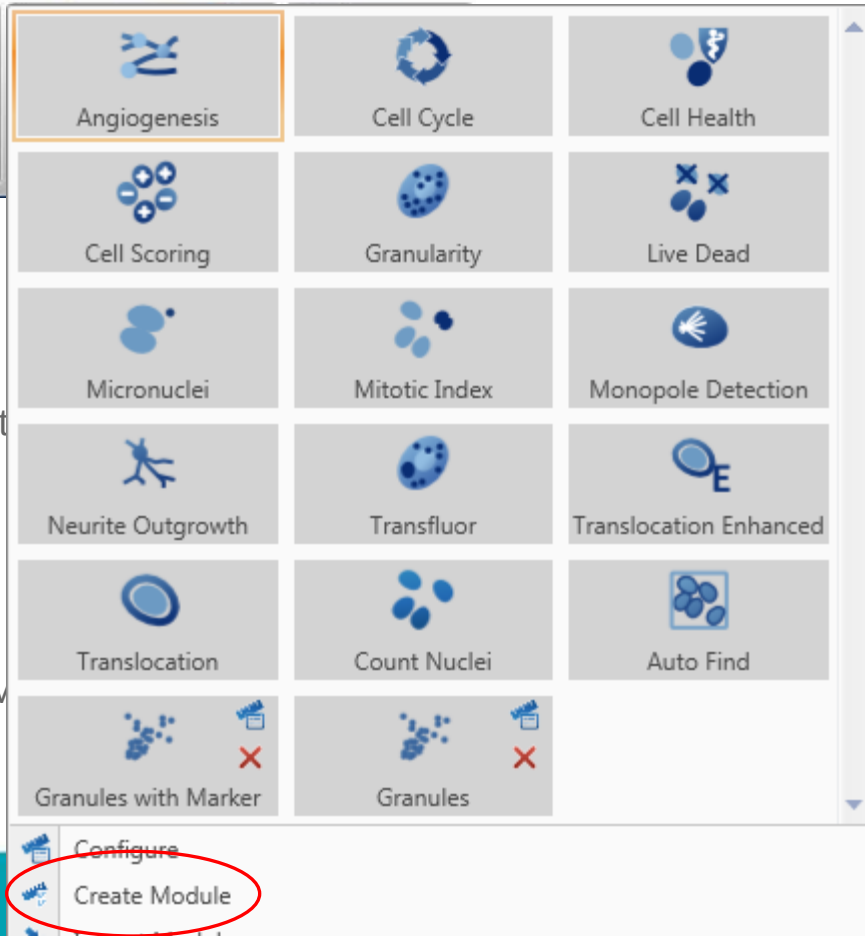
Modules





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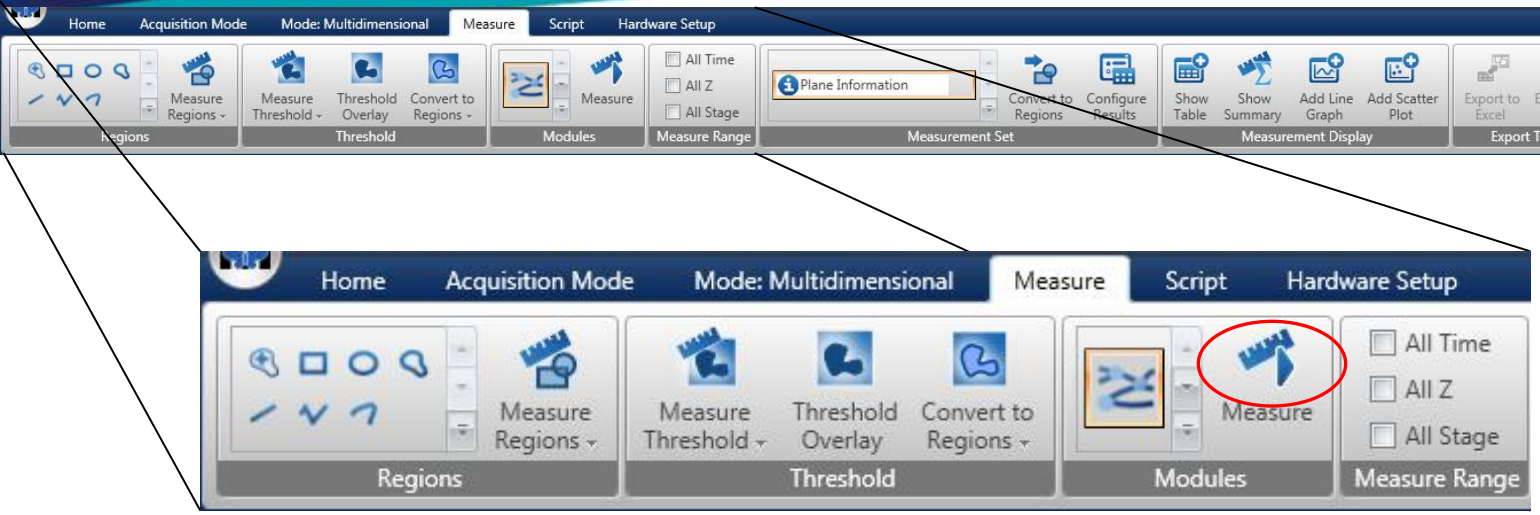

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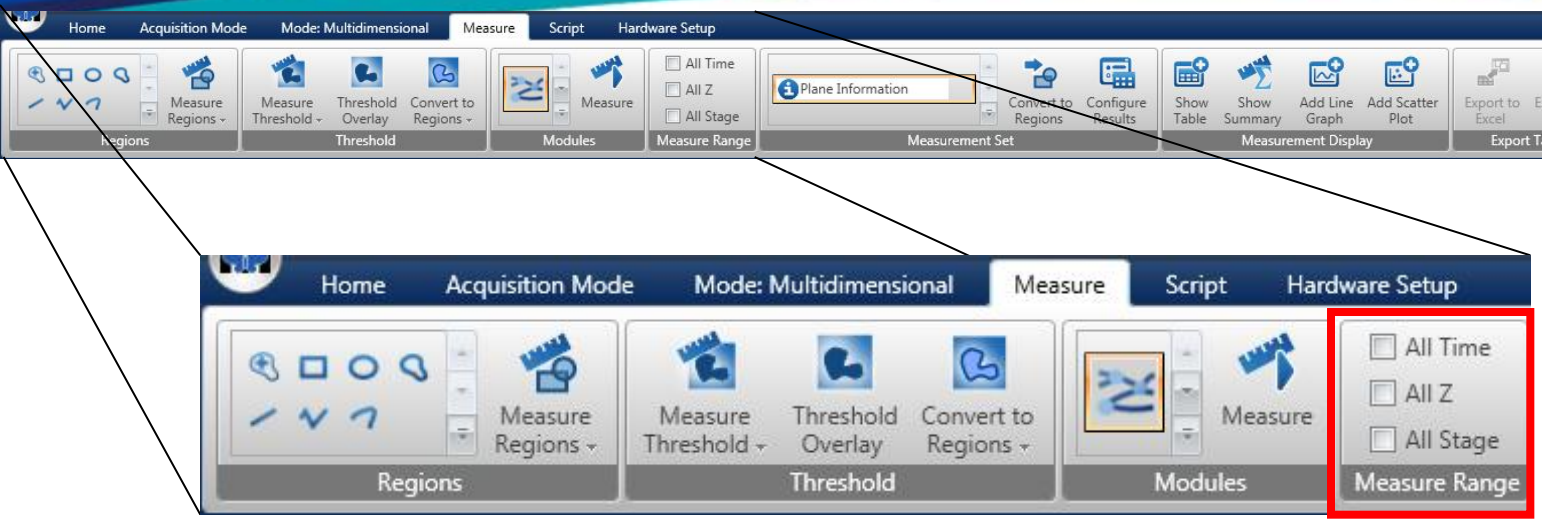

- Measured Images
  - Measure Range defines what Images to measure using any of the 3 Measure buttons.
  - If no options are turned on, only the Visible images are measured
  - Turn on All Time, All Z, and All Stage to measure your entire dataset.

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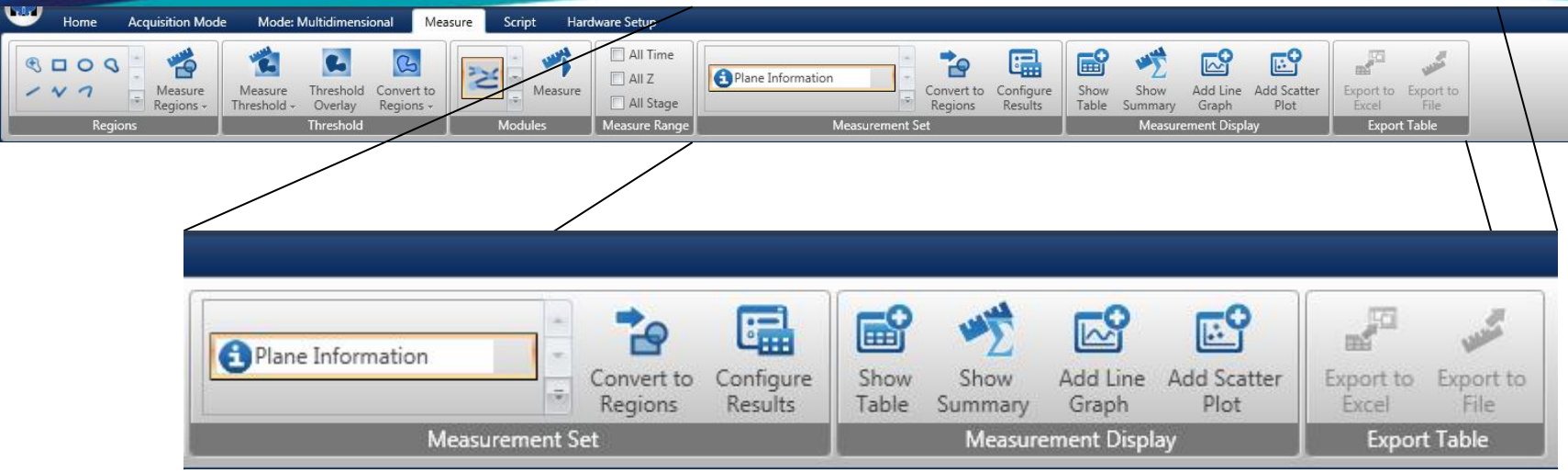
Measurement Tools



- Measurements
  - The Right side of the Ribbon contains tools for after you make measurements.
  - Such as selecting or displaying data, and converting Masks to Regions.

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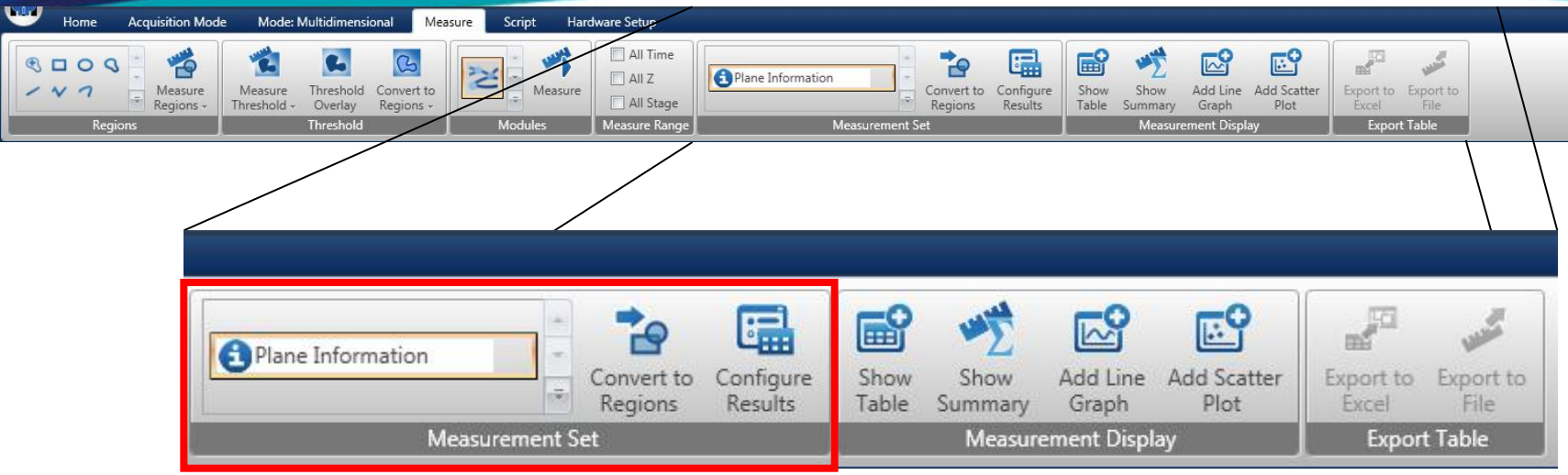
Measurement Tools



- Measurement Set
  - A Measurement Set contains all the result, the numbers and the masks, from any one measurement.
  - There is a gallery to choose which Measurement Set to work with.
  - There is a button to turn the masks associated with the active Measurement Set into Regions
  - There is a button to configure what Objects to keep in for Display.

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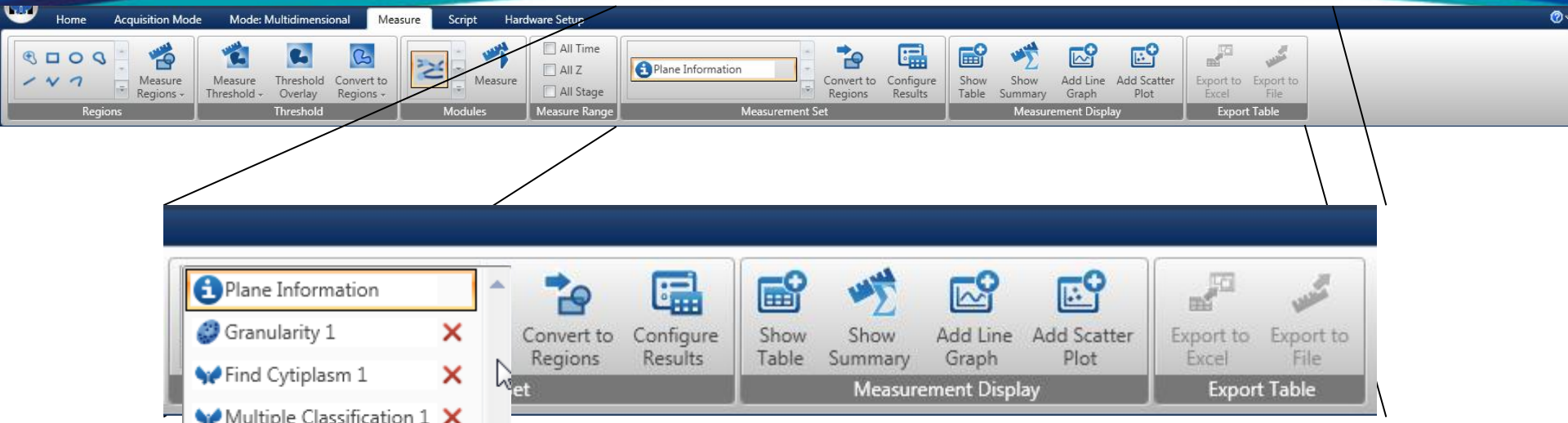
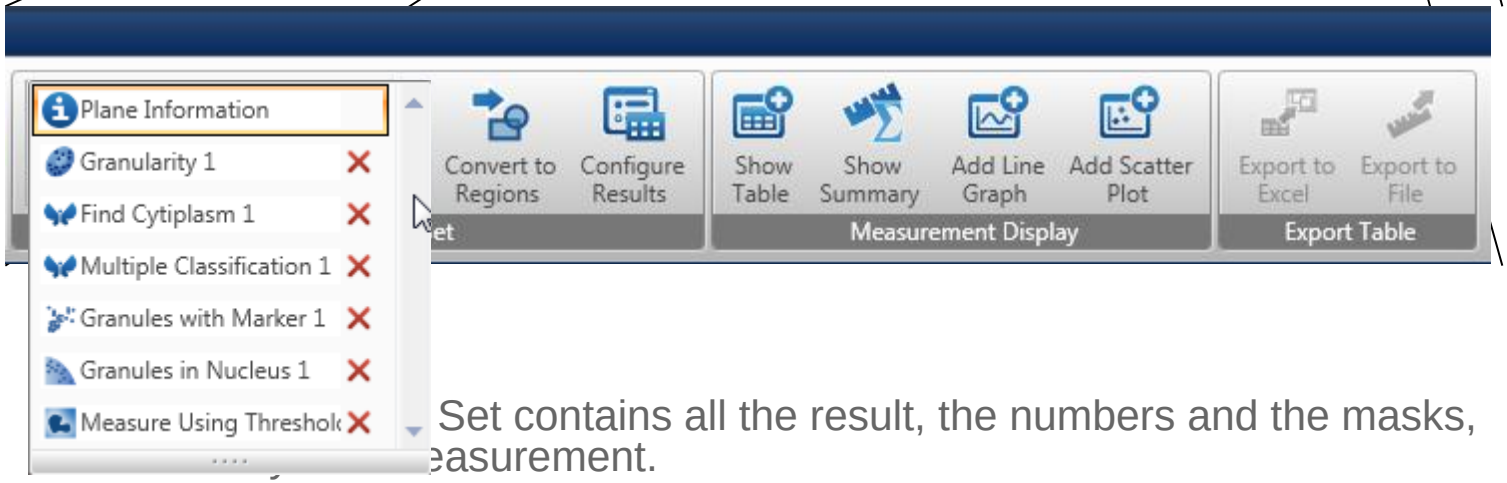
Measurement Tools





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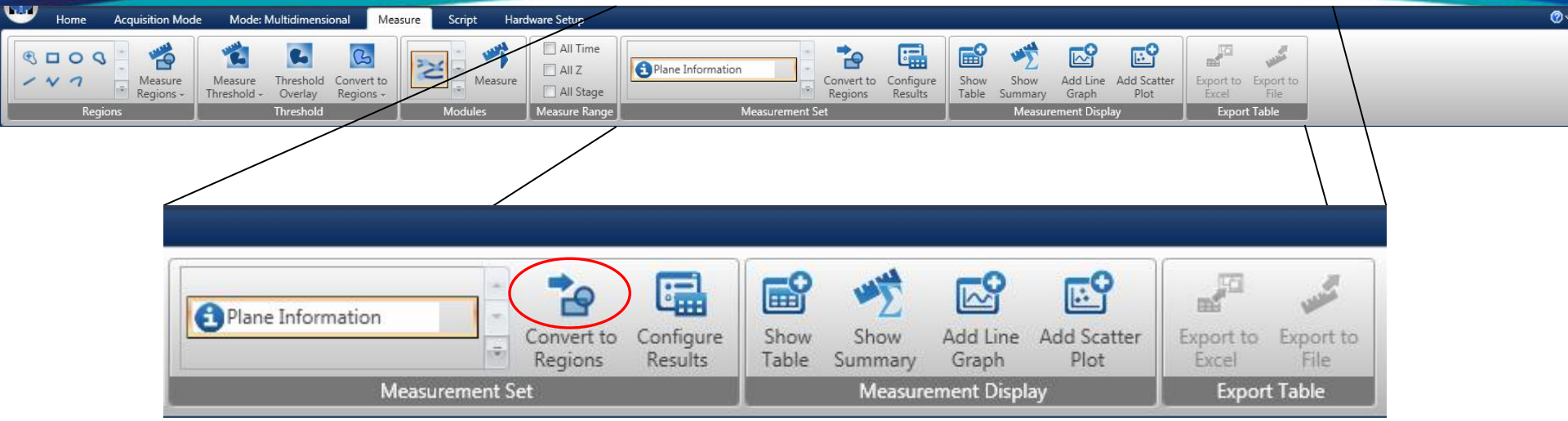
Measurement Tools



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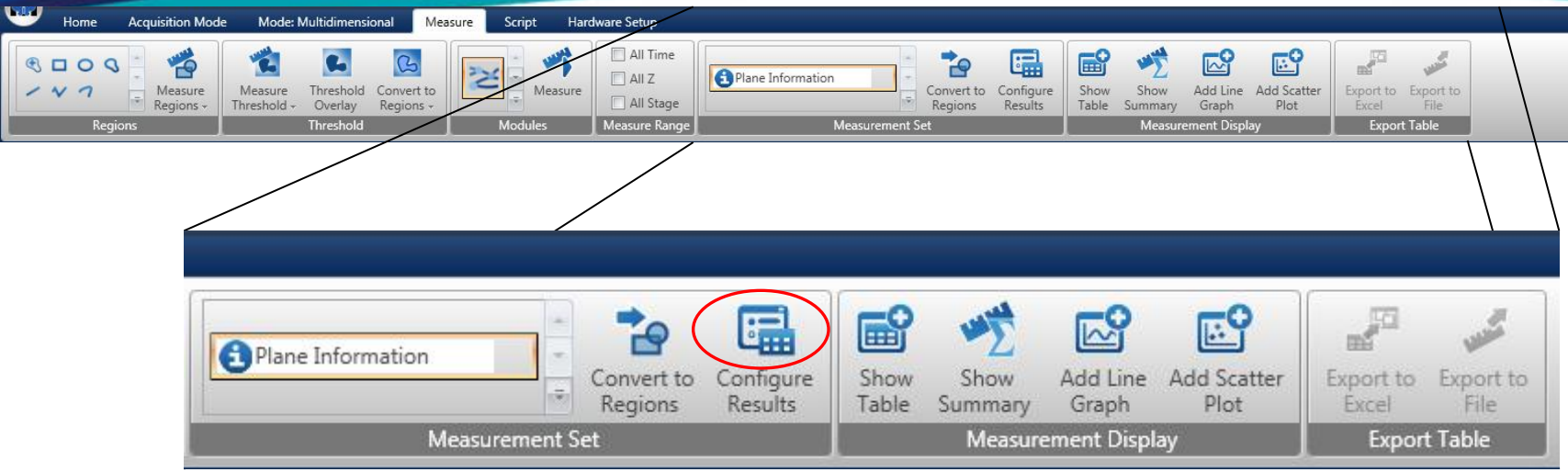

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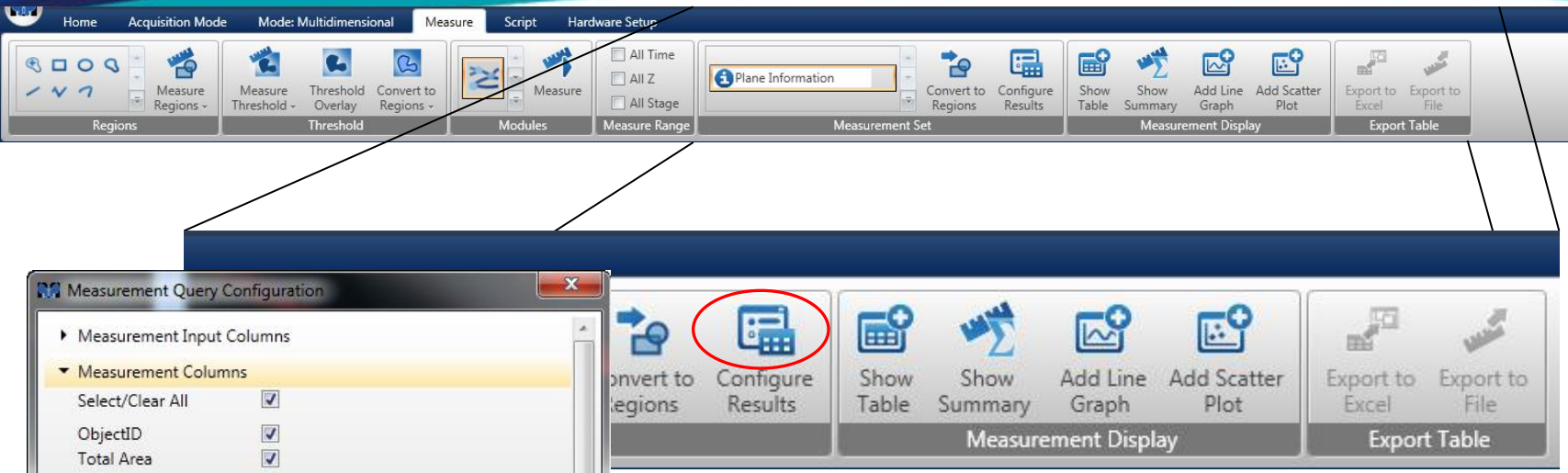

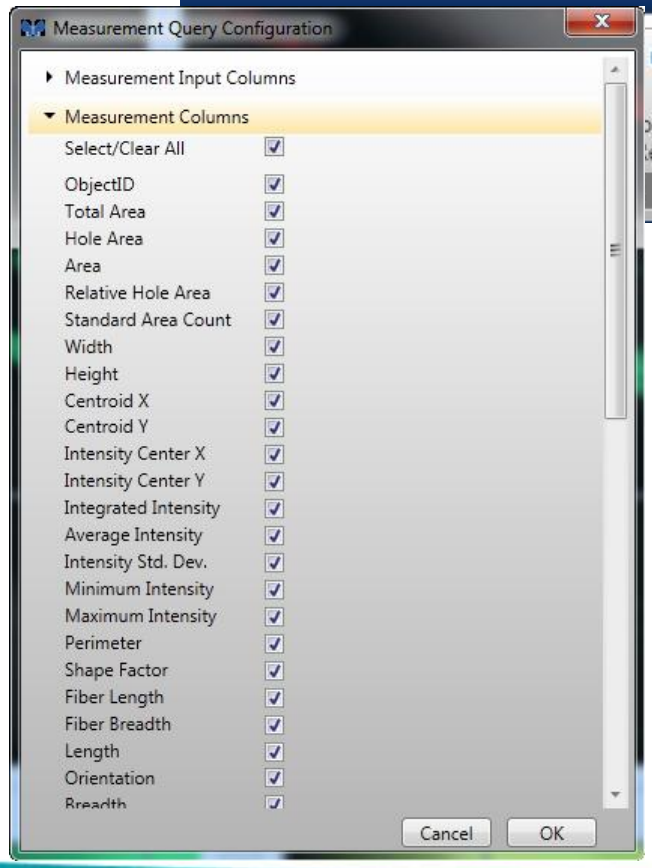

- Measurement Set Configuration
  - Choose which Measurement Columns will be displayed.
  - Filter un-desired Objects out.

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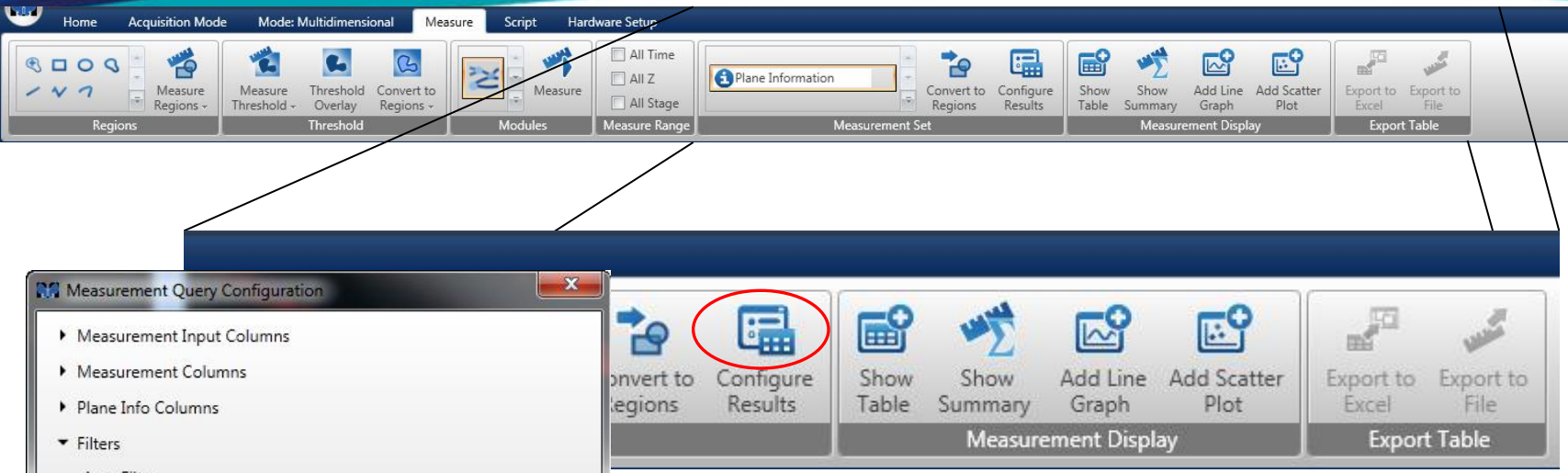
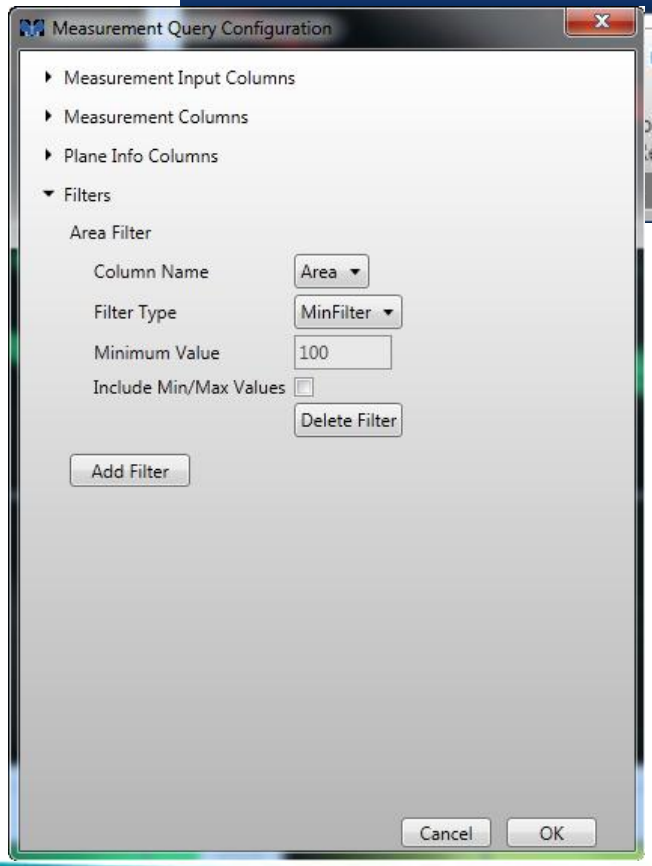
Measurement Tools





- Measurement Set Configuration
  - Choose which Measurement Columns will be displayed.
  - Filter un-desired Objects out.

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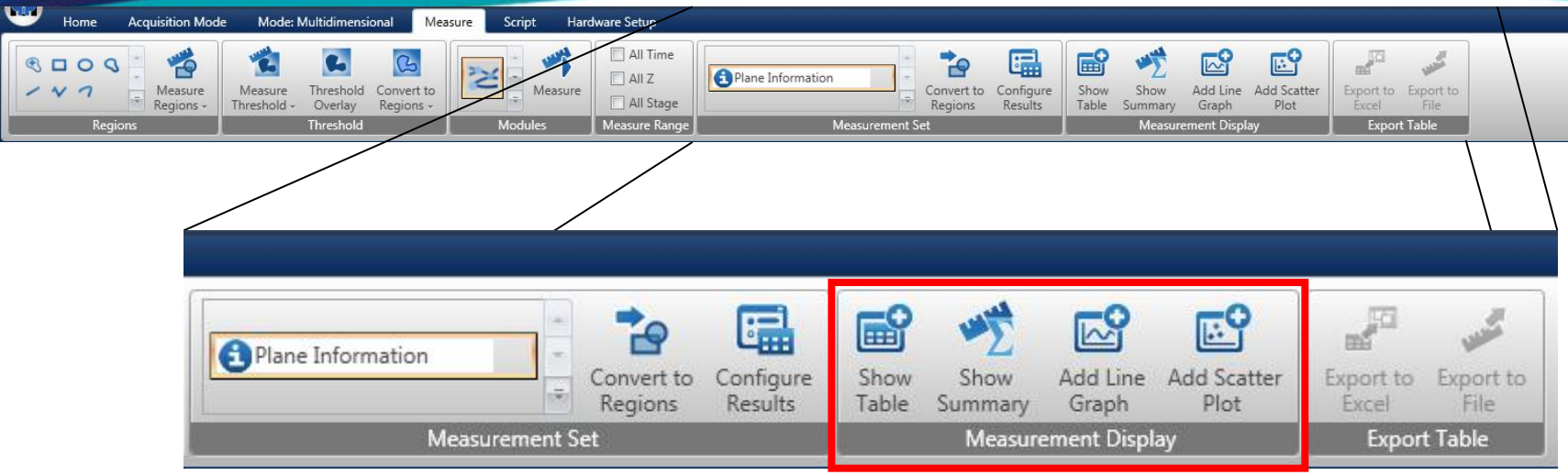
Measurement Tools



- Measurement Display
  - The next section controls different ways of displaying the Data
  - Show Table will display a table with all the Object data on it.
  - Show Summary will show a table with statistical summary information
  - Add Line Graph and Add Scatter Plot will plot the data

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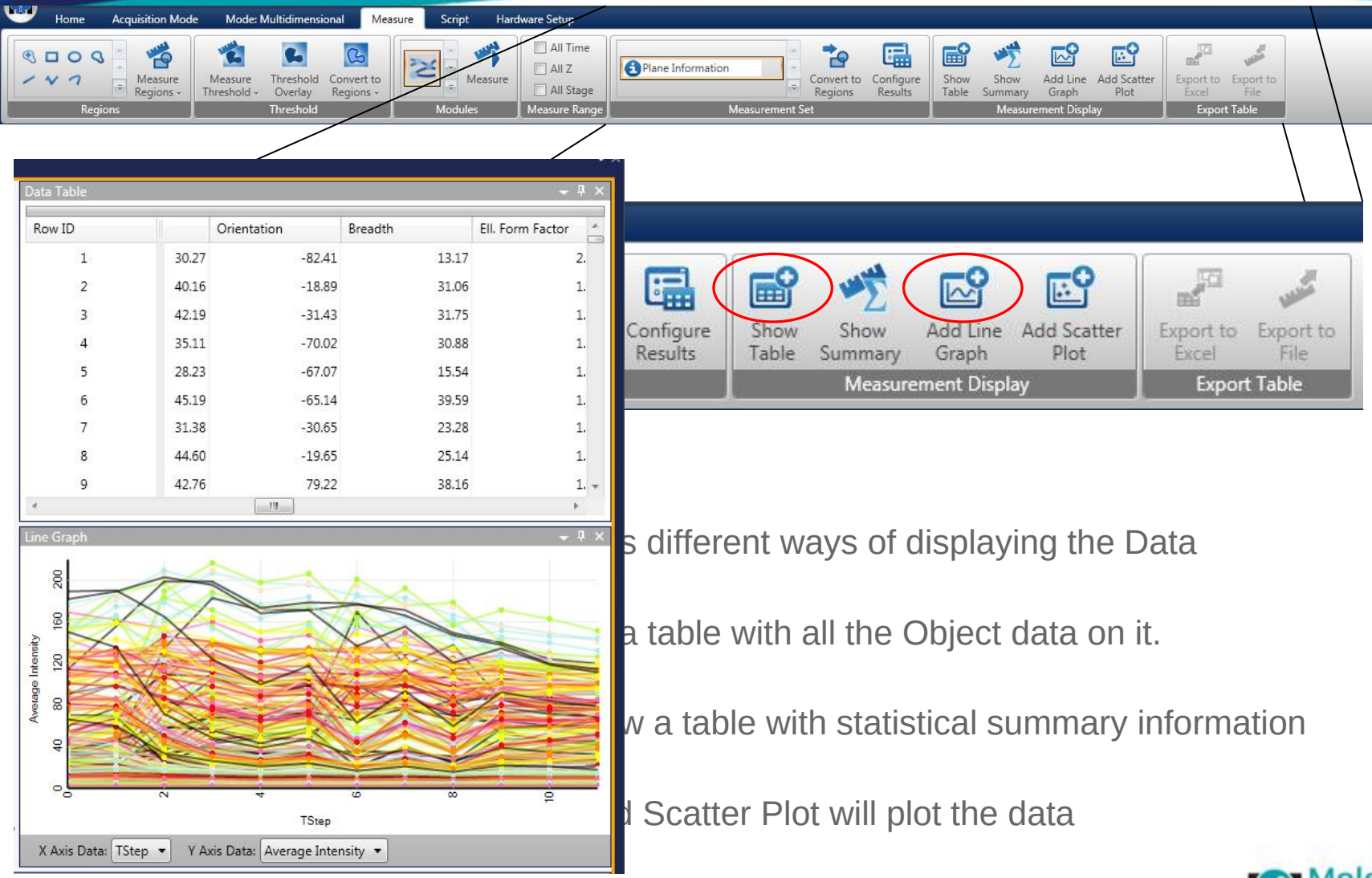
Measurement Tools



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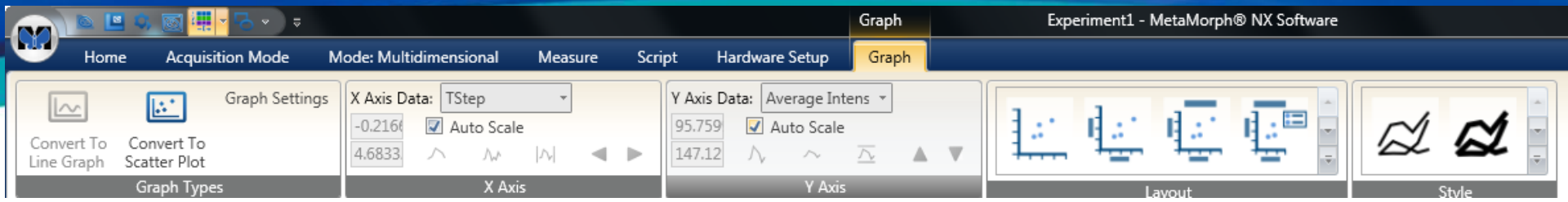
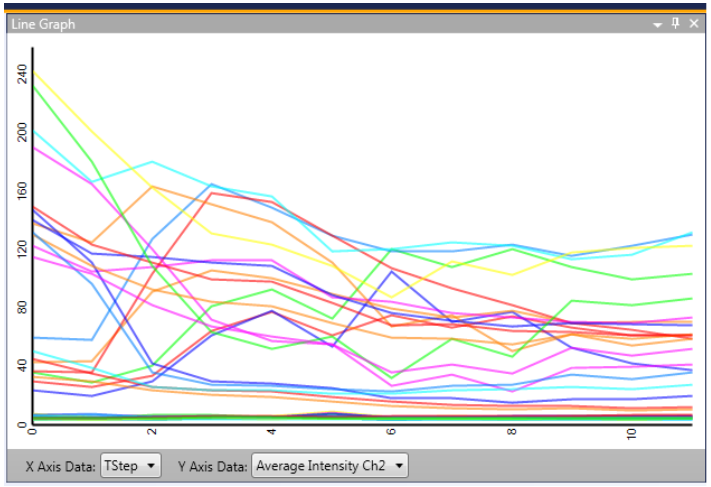
The Graph Ribbon



- When a Line Graph or Scatter Plot is shown, the Graph Ribbon becomes available
  - The Graph Ribbon allows you to resize an move the displayed area of the graph
  - The Graph can have different Layouts, controlling what labels and text get displayed



- Graphs can have different styles, controlling colors, line thicknesses and data points
- Graph Settings can be used to further modify the style.

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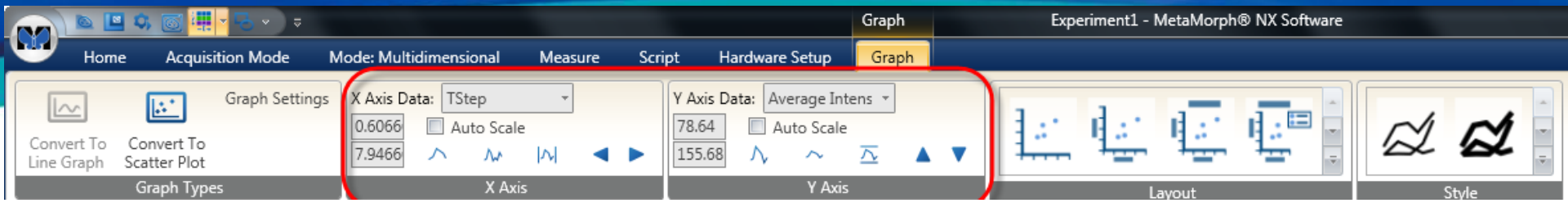
The Graph Ribbon



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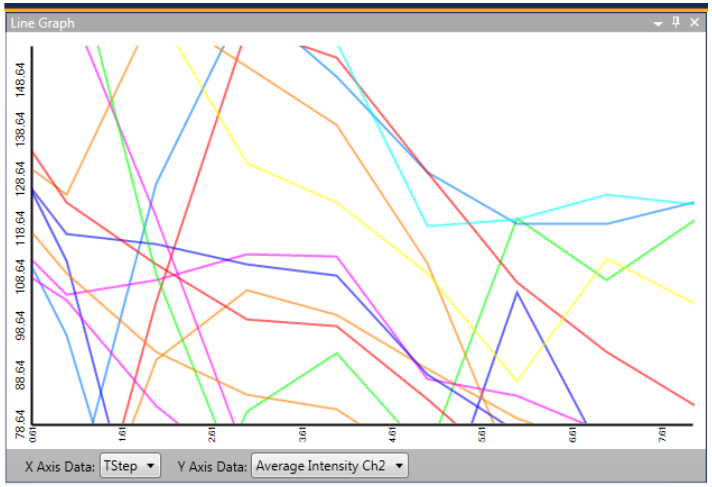

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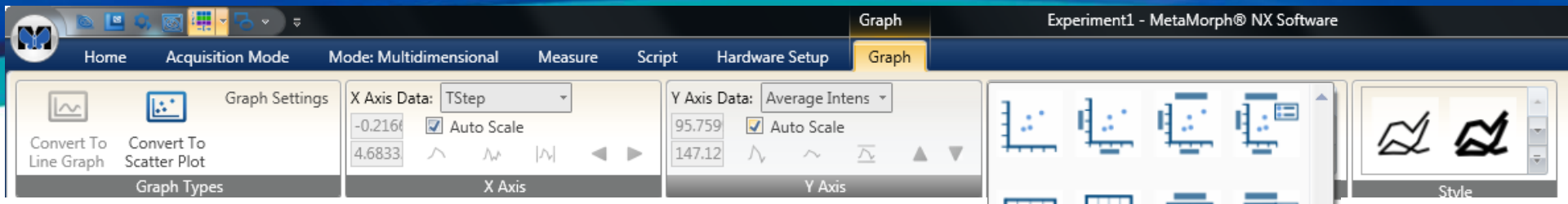

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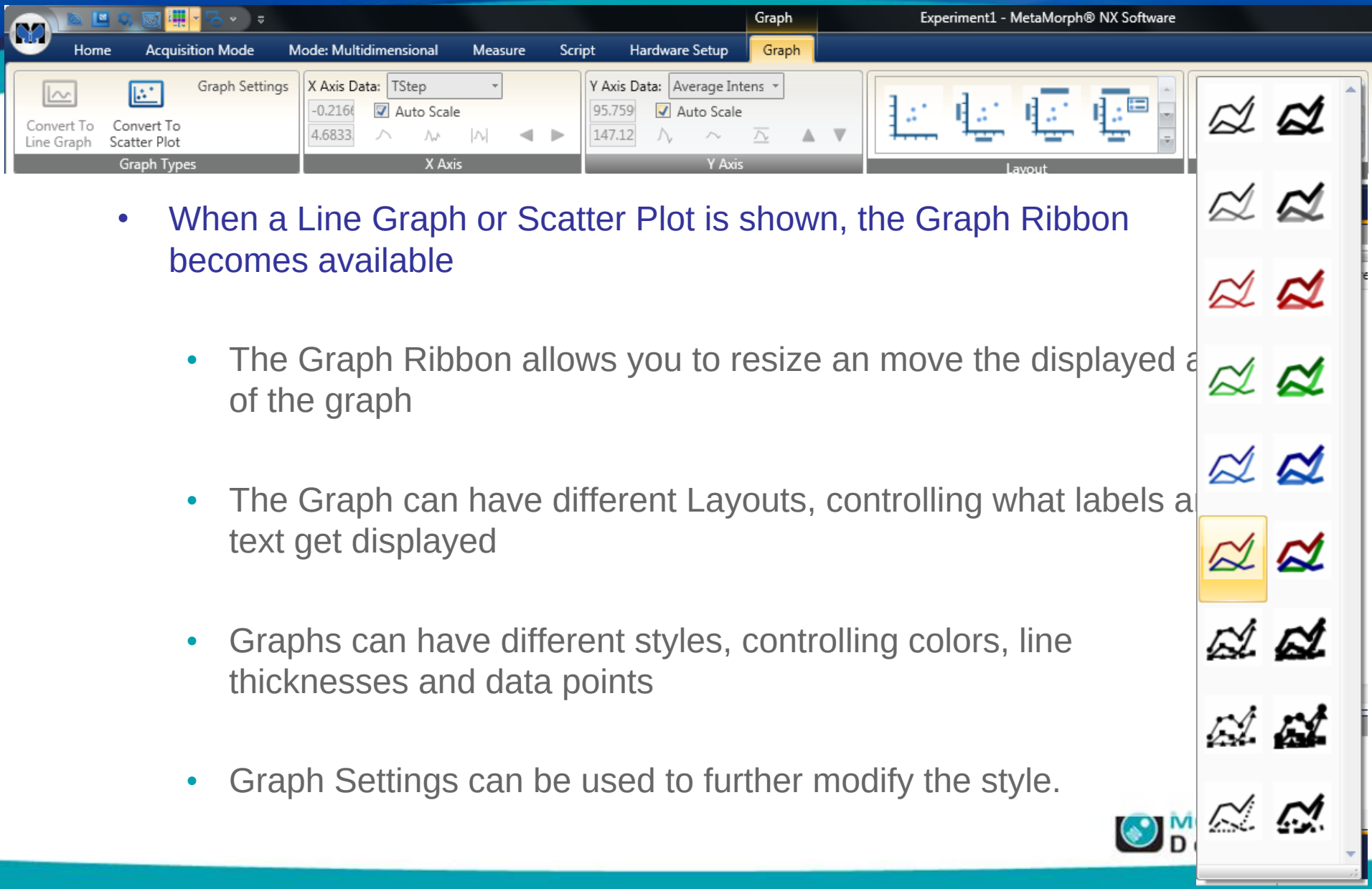

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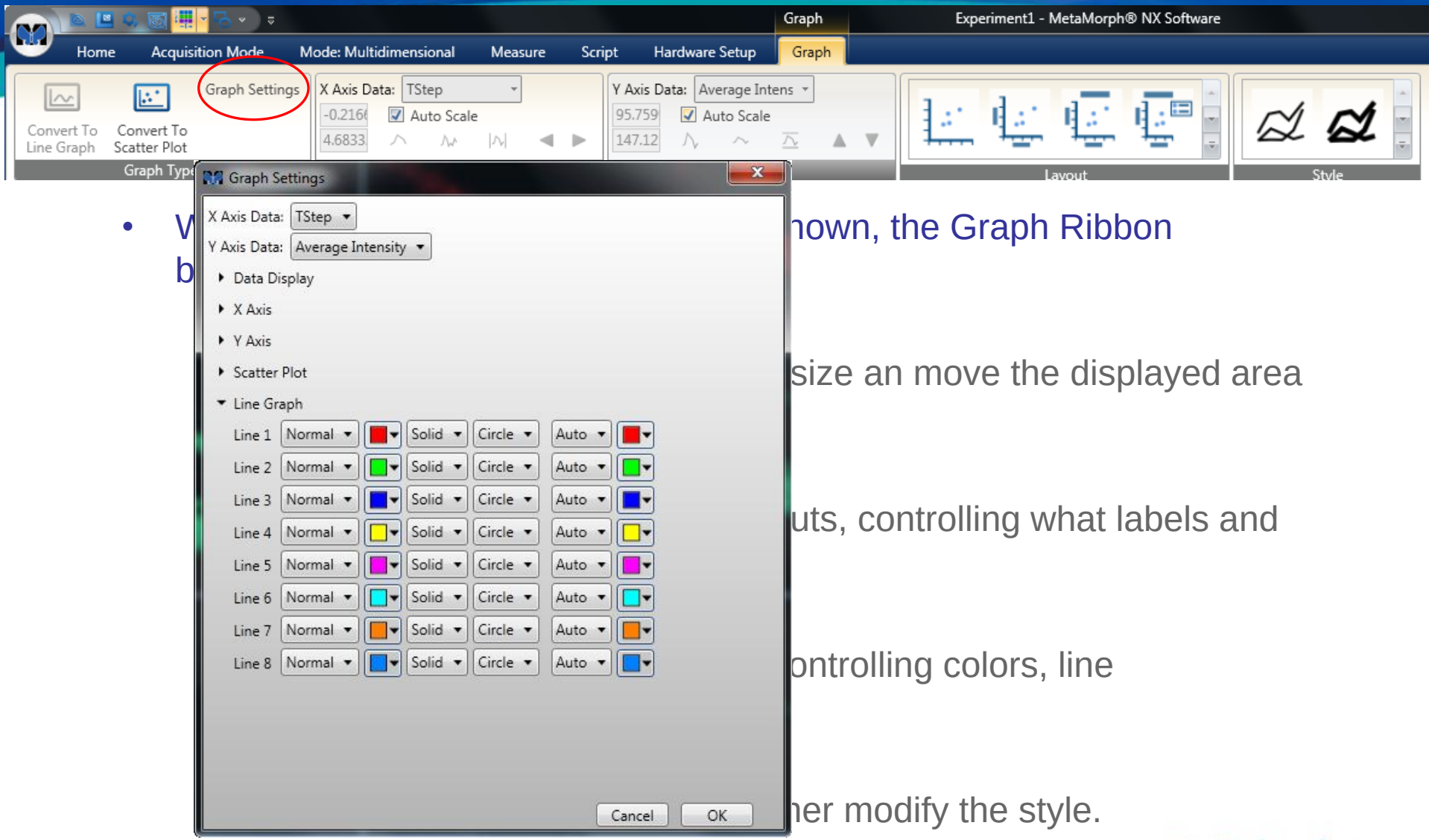

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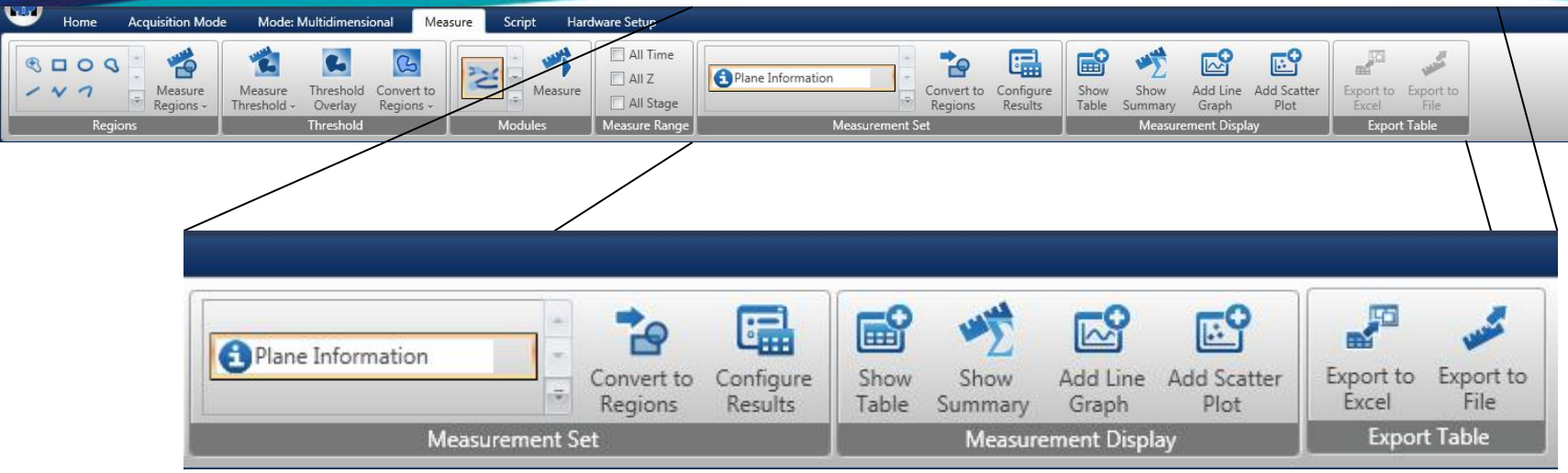

- Working with data logs
  - Measurements made in MetaMorph NX are always maintained in a ‘database’ – you do not need to open a log file to record measurement values.
  - Measurements are stored with the Dataset and maintained between MetaMorph NX sessions (i.e. if you close NX and re-open it the measurements are still there).
  - You can export a **displayed data table** to Excel or to a file
    - Displayed Data Table: You export the table as displayed – including the column and object filtering performed in the ‘Configure Results’ panel.

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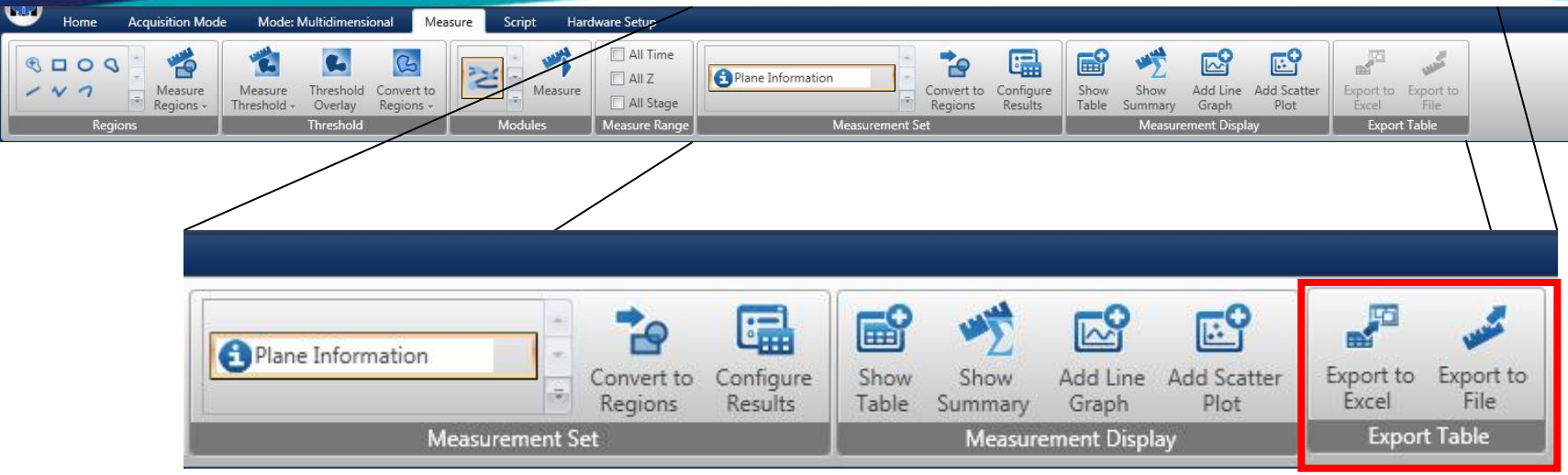
Measurement Tools



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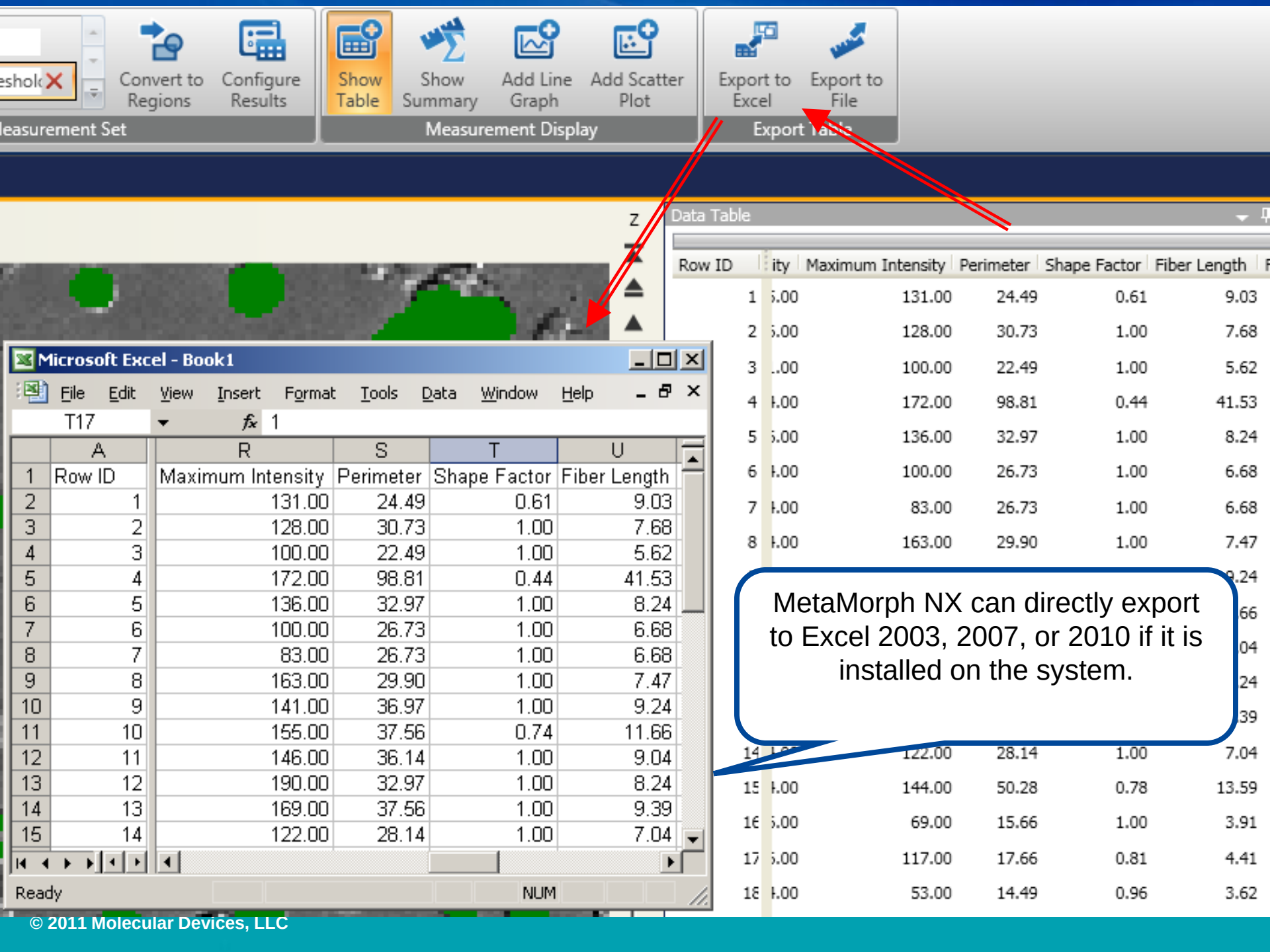

Row ID	Maximum Intensity	Perimeter	Shape Factor	Fiber Length
1	131.00	24.49	0.61	9.03
2	128.00	30.73	1.00	7.68
3	100.00	22.49	1.00	5.62
4	172.00	98.81	0.44	41.53
5	136.00	32.97	1.00	8.24
6	100.00	26.73	1.00	6.68
7	83.00	26.73	1.00	6.68
8	163.00	29.90	1.00	7.47
9	141.00	36.97	1.00	9.24
10	155.00	37.56	0.74	11.66
11	146.00	36.14	1.00	9.04
12	190.00	32.97	1.00	8.24
13	169.00	37.56	1.00	9.39
14	122.00	28.14	1.00	7.04

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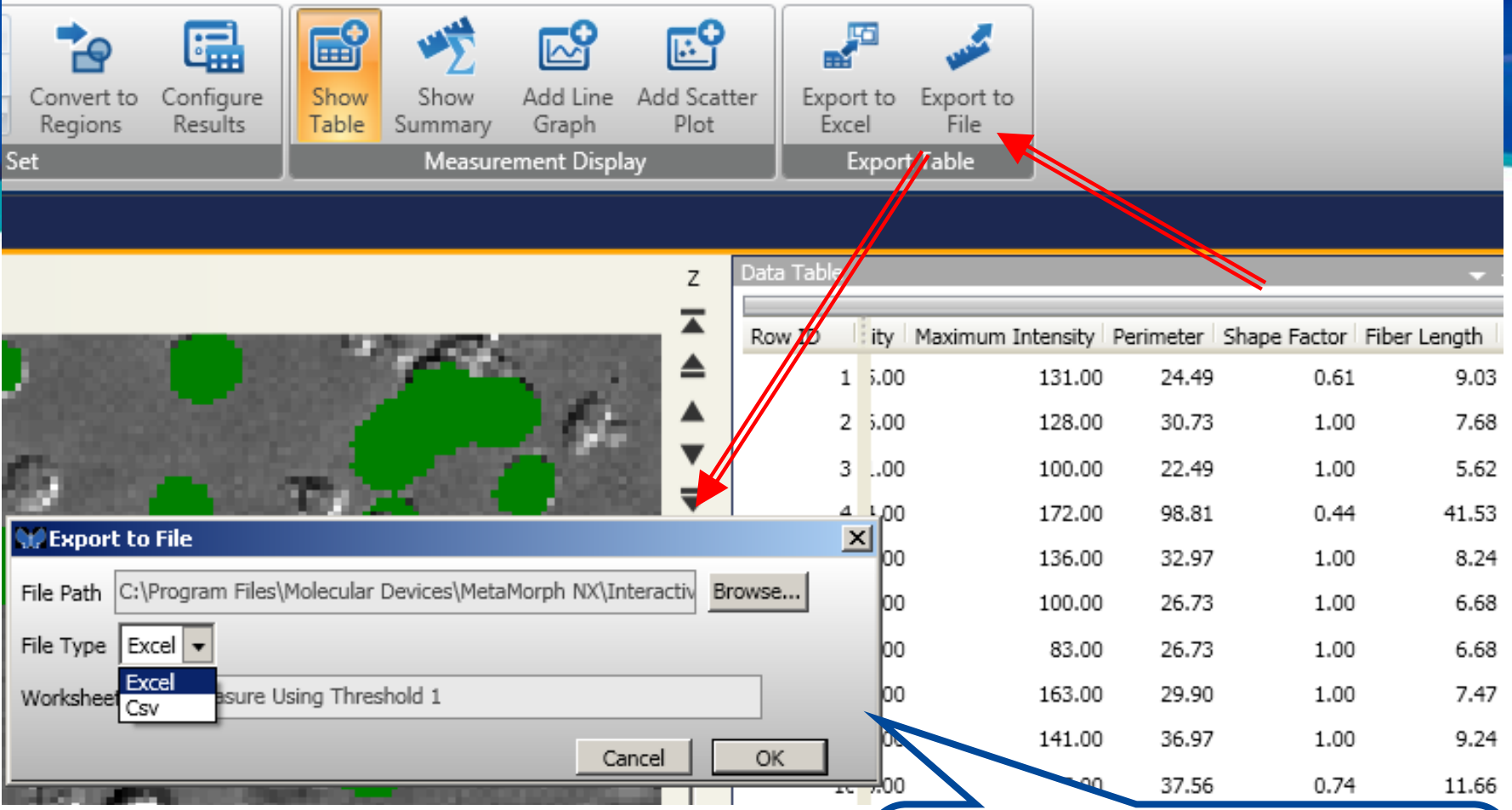

Or MetaMorph NX can write data to an XLS file or CSV file if Excel is not present on the computer.

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Using the Analysis Builder

Custom Modules

Why Custom Modules? (aka the analysis builder)

- Application Modules are great but…
  - Many times customers need to ‘add to’ what App Modules provide
  - So many things to measure – not all application modules

- Not Journals!
  - Easier to use than journals
  - Most segmentation tools available to journals are present
  - UI makes it easier to find the tool, test options, without getting lost in menus or minutia

- Custom Modules are Modules
  - Can be run exactly like application modules
  - Measurements are logged the same as application modules

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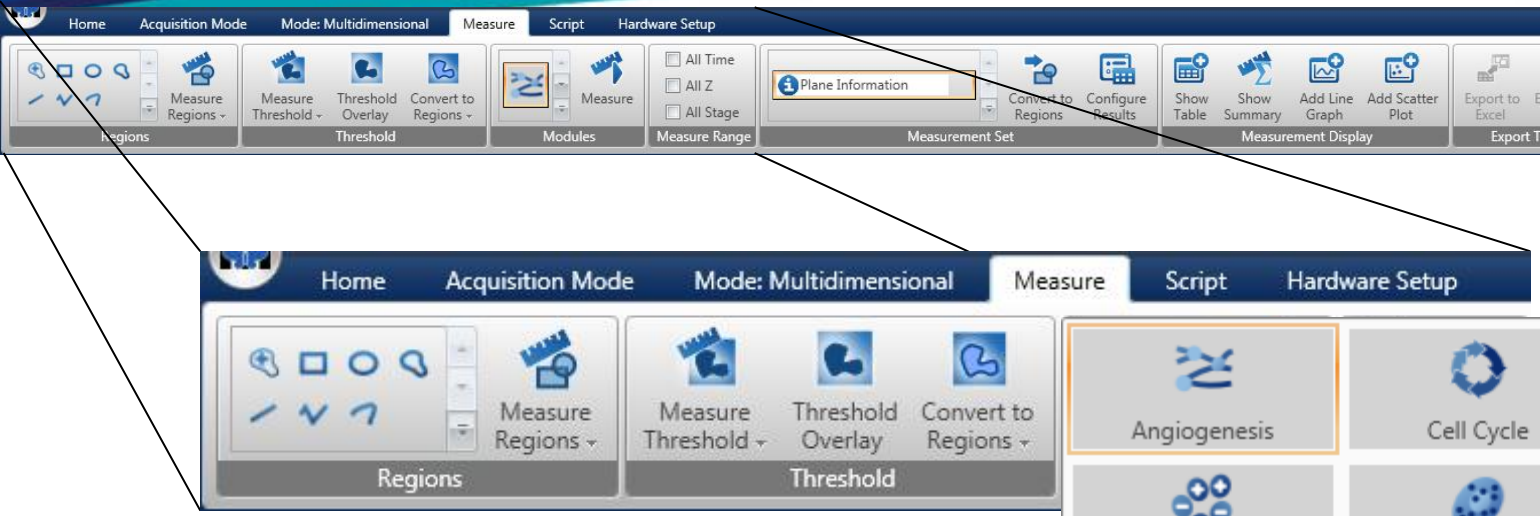
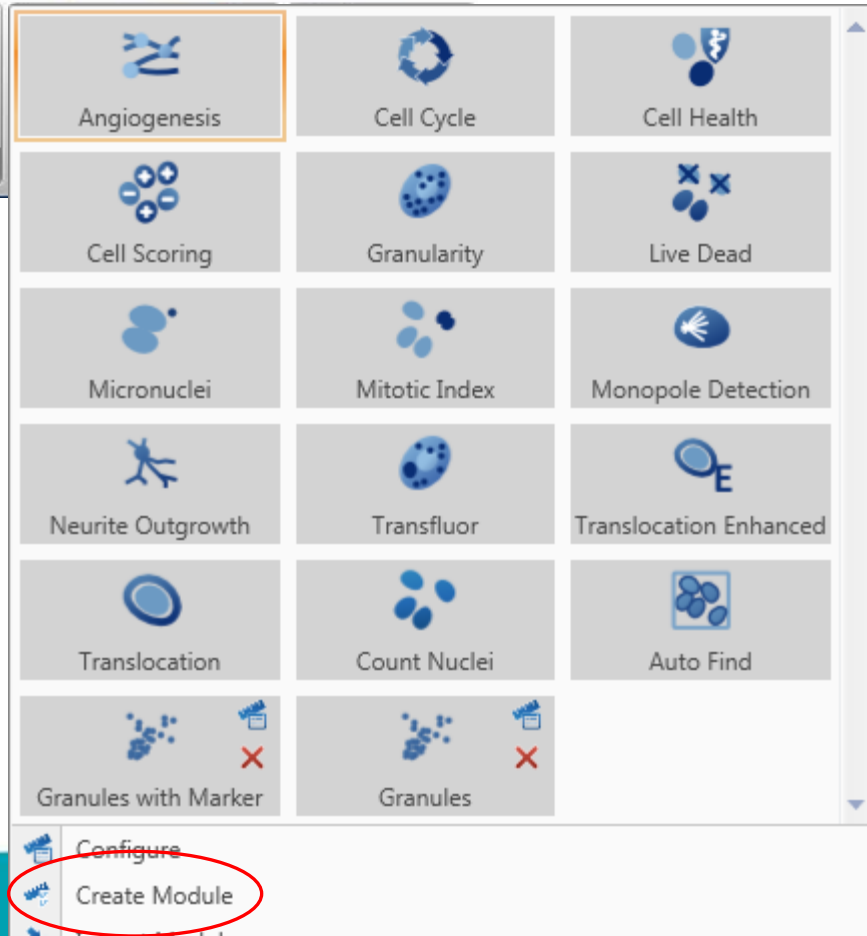
Modules





- Custom Modules
  - Use the Analysis Builder to make custom modules
  - Open the Analysis Builder using the Create Module on the Modules palette

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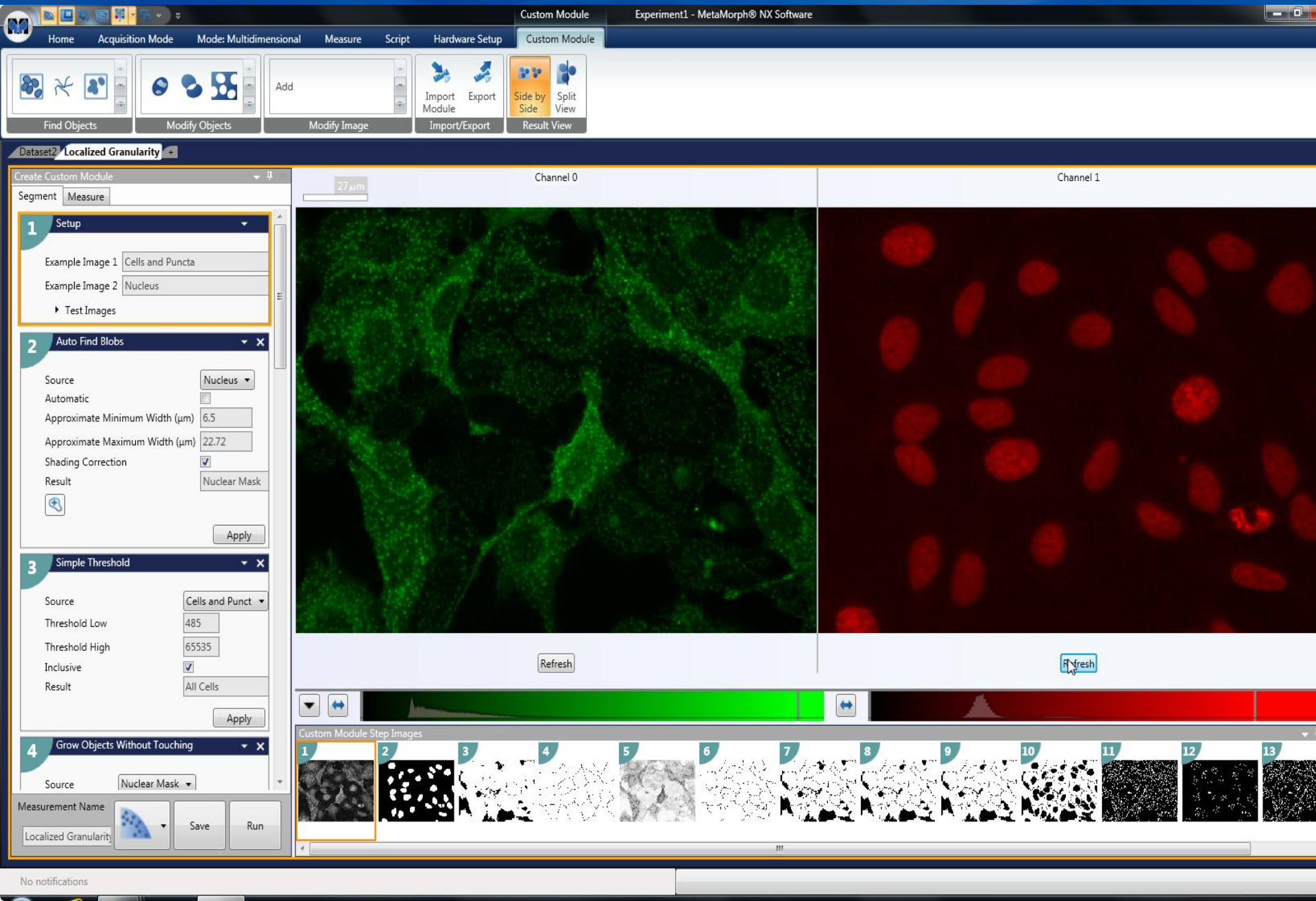
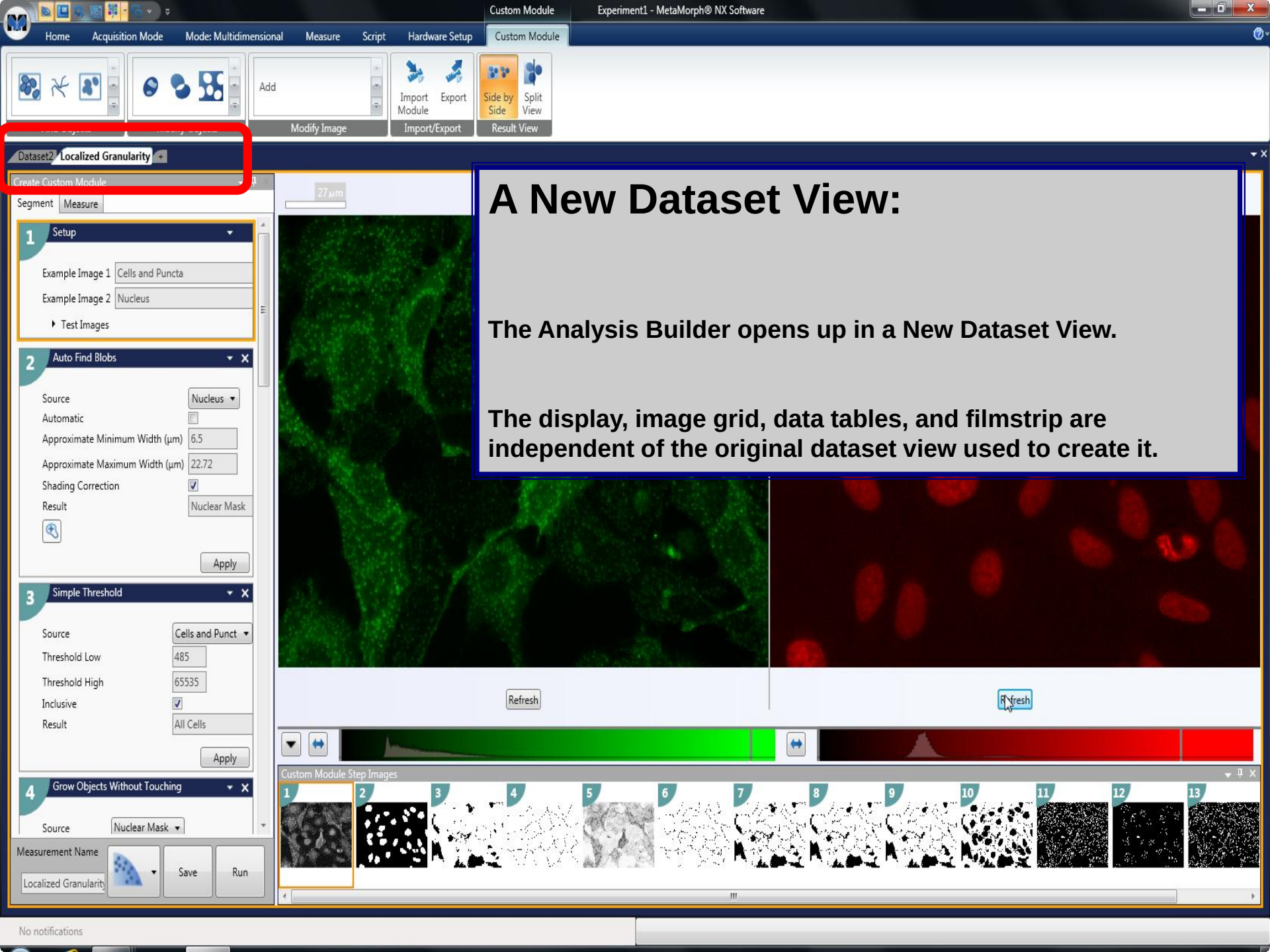
The Analysis Builder

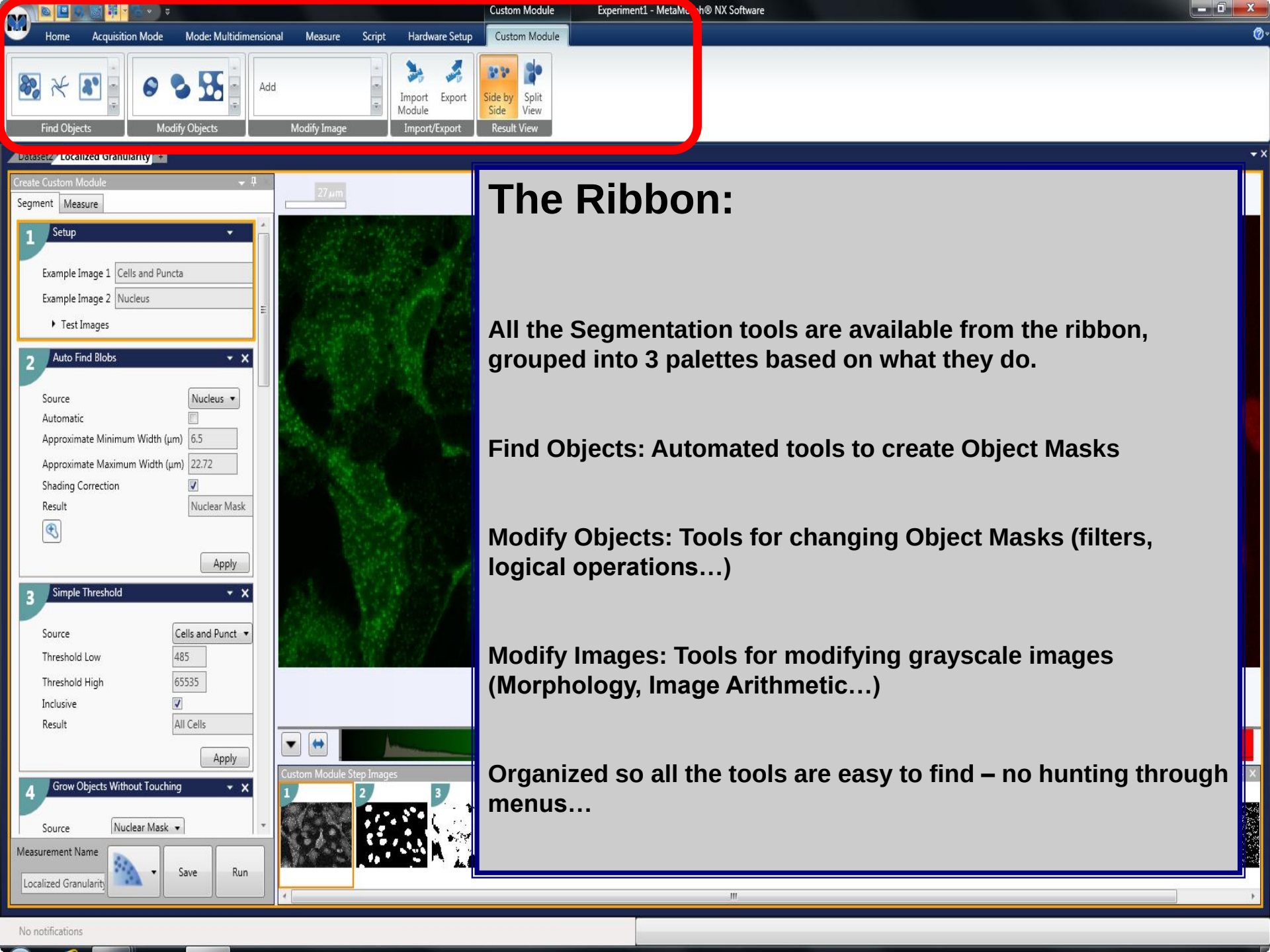




A New Dataset View:

The Analysis Builder opens up in a New Dataset View.

The display, image grid, data tables, and filmstrip are independent of the original dataset view used to create it.



The Ribbon:

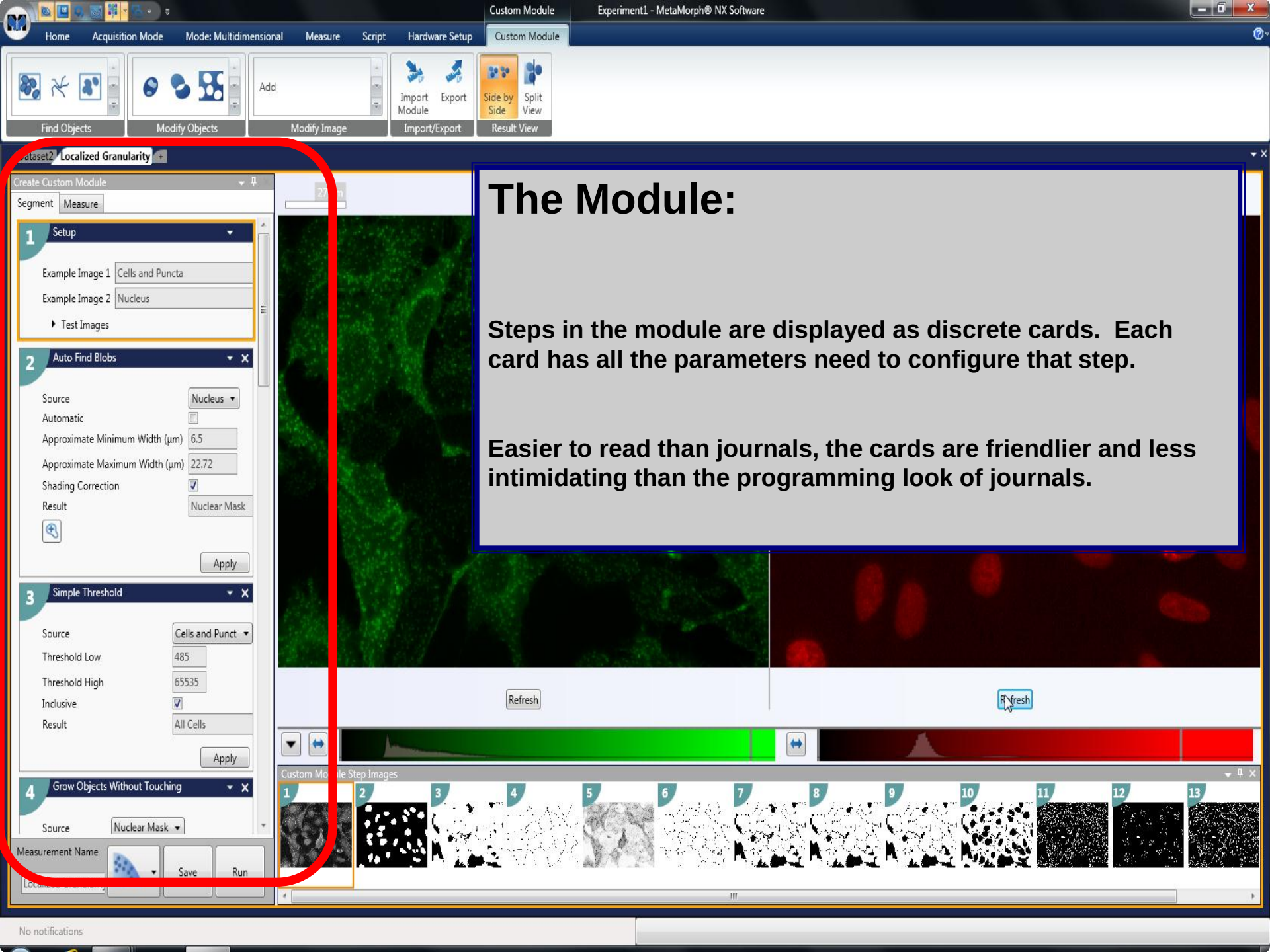
All the Segmentation tools are available from the ribbon, grouped into 3 palettes based on what they do.

Find Objects: Automated tools to create Object Masks

Modify Objects: Tools for changing Object Masks (filters, logical operations…)

Modify Images: Tools for modifying grayscale images (Morphology, Image Arithmetic…)

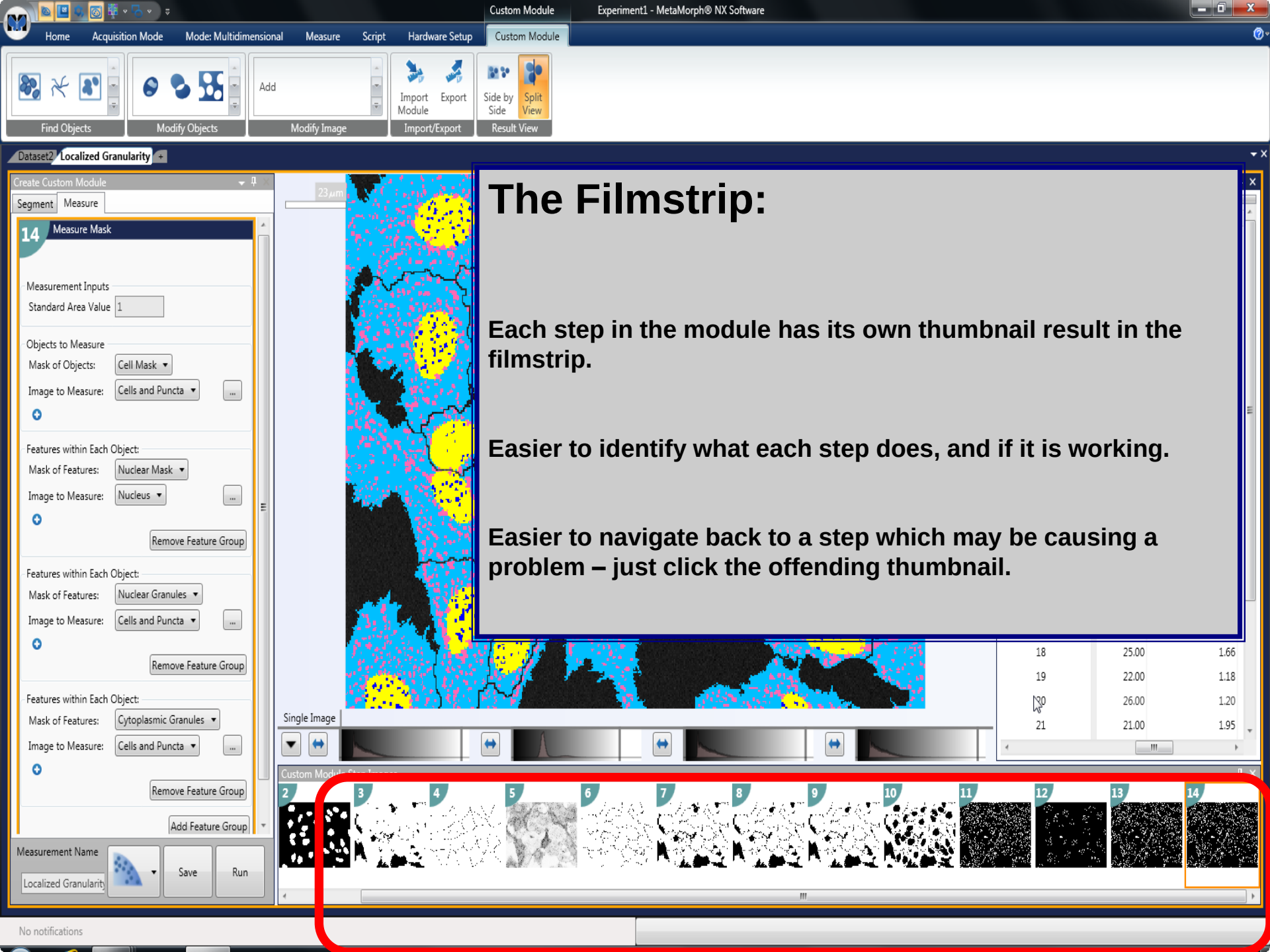
Organized so all the tools are easy to find – no hunting through menus…



The Module:

Steps in the module are displayed as discrete cards. Each card has all the parameters need to configure that step.

Easier to read than journals, the cards are friendlier and less intimidating than the programming look of journals.



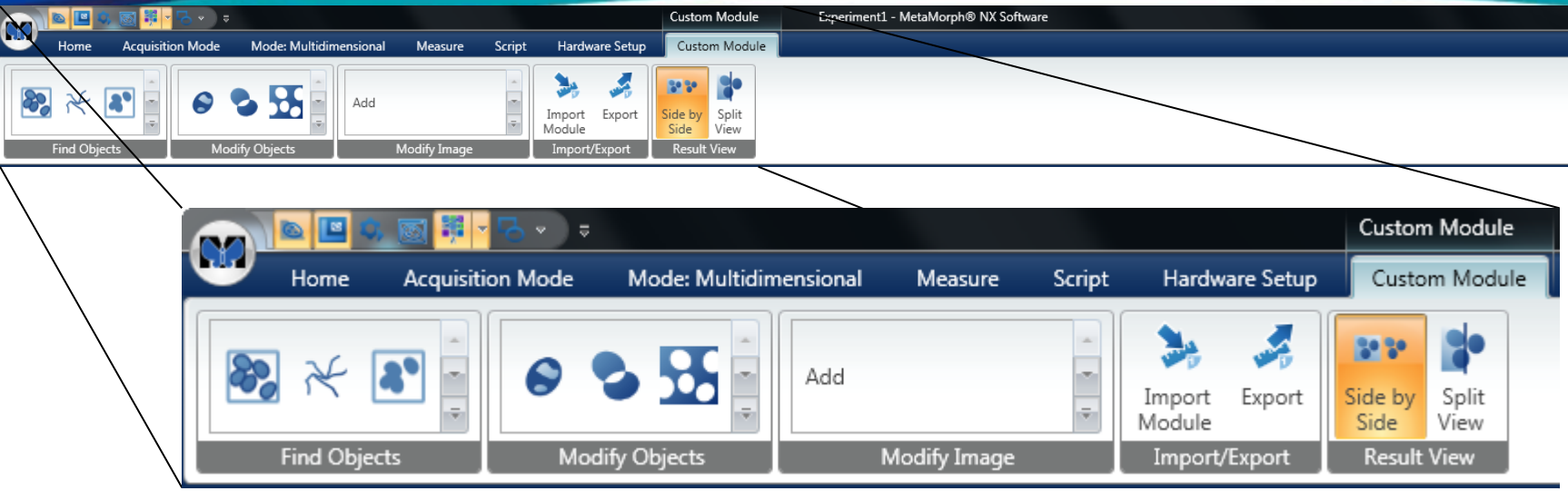
The Filmstrip:

Each step in the module has its own thumbnail result in the filmstrip.

Easier to identify what each step does, and if it is working.

Easier to navigate back to a step which may be causing a problem – just click the offending thumbnail.

Custom Modules



- The Custom Module Ribbon
  - Modify Image: Tools for processing grayscale images
  - Find Objects: Tools for creating masks and detecting objects from grayscale images
  - Modify Objects: Tools for changing or selecting masks.

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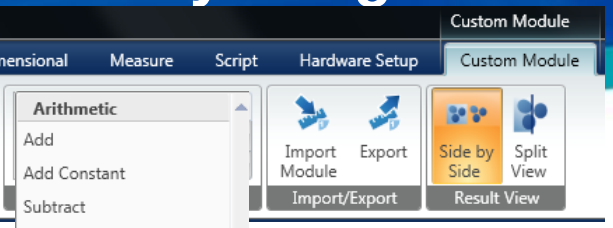
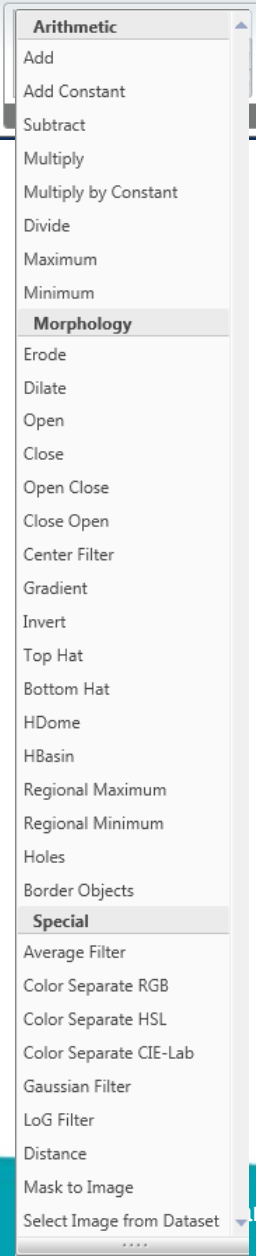
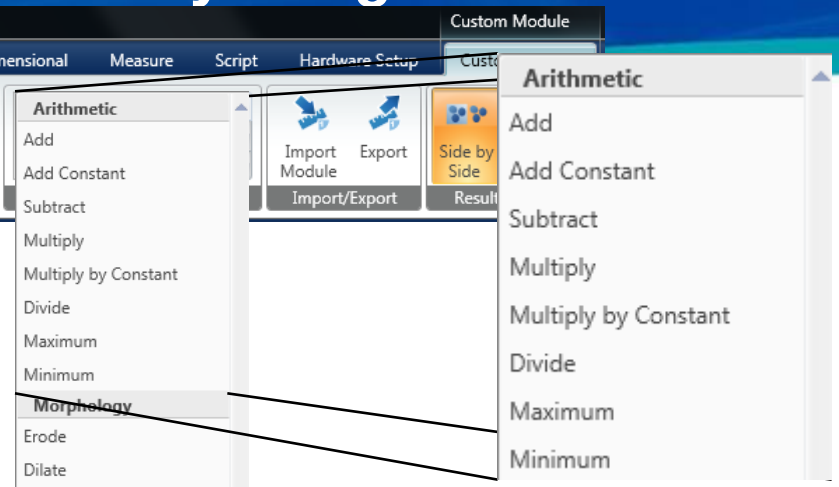
Modify Images





- Modify Image
  - Tools for modifying real image data, grouped into functional sections
  - Arithmetic: Adding, Subtracting, etc… two images or an image and a constant value
  - Morphology: Filters based on shape, size and relative intensities
  - Special: Color separation techniques, basic filters…

Modify Images



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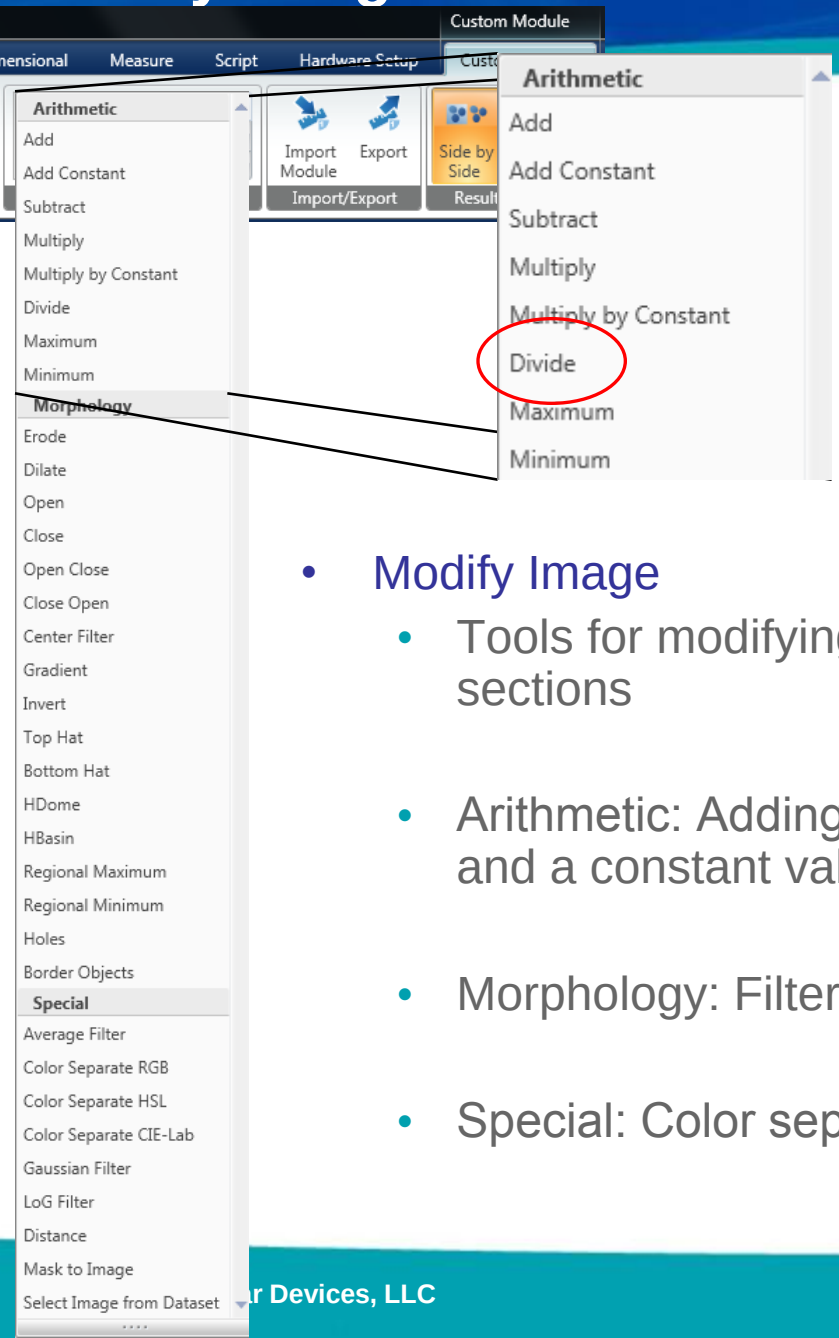

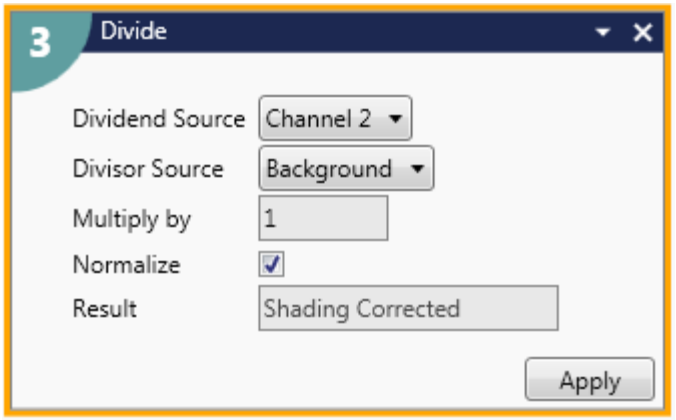

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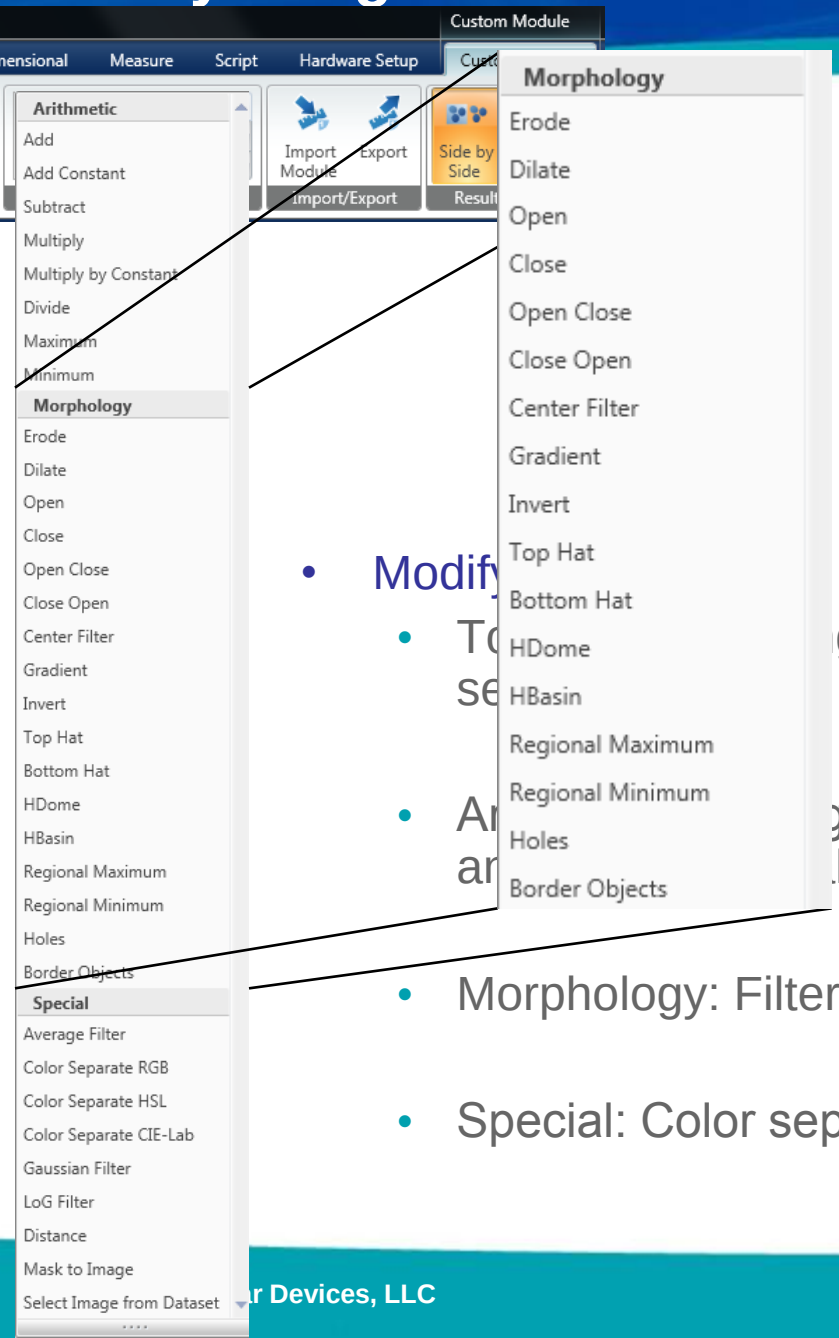

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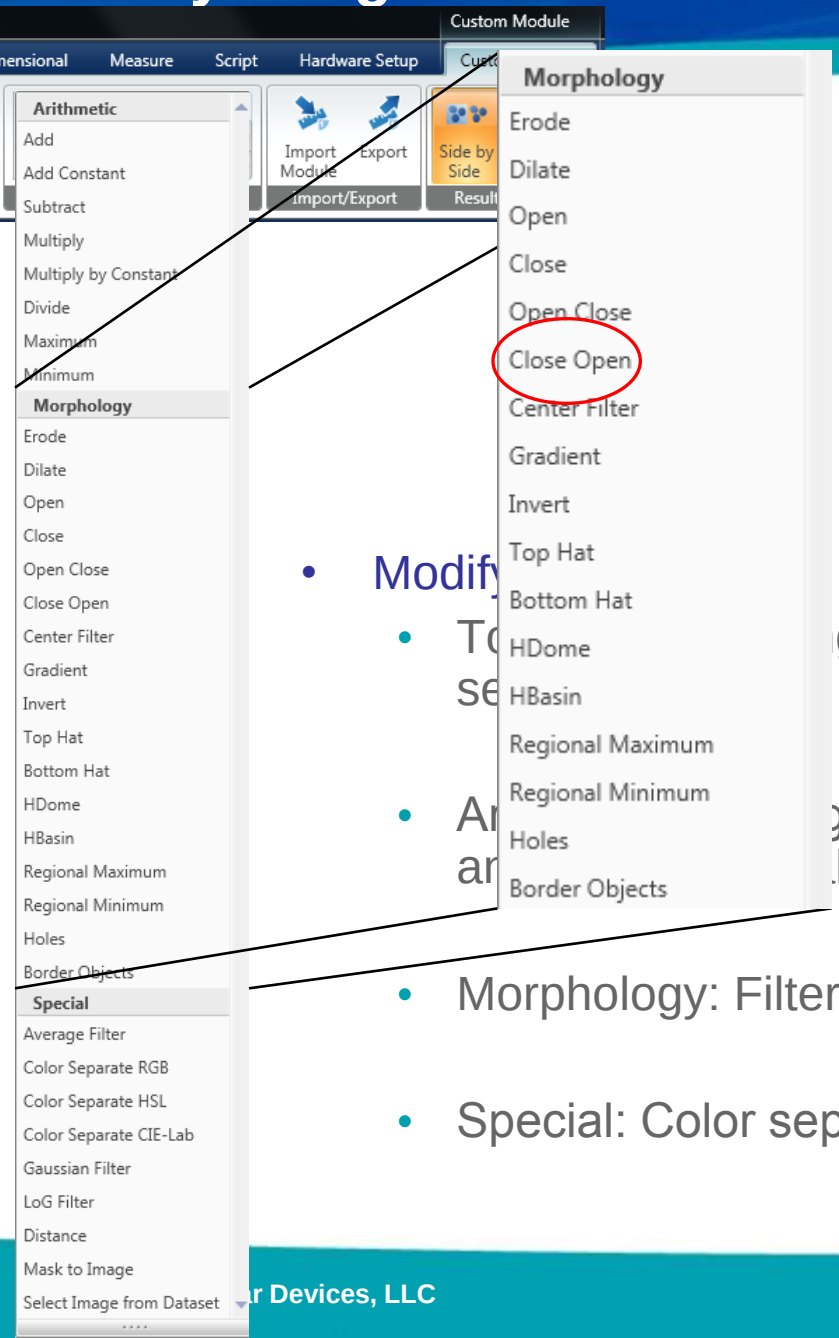

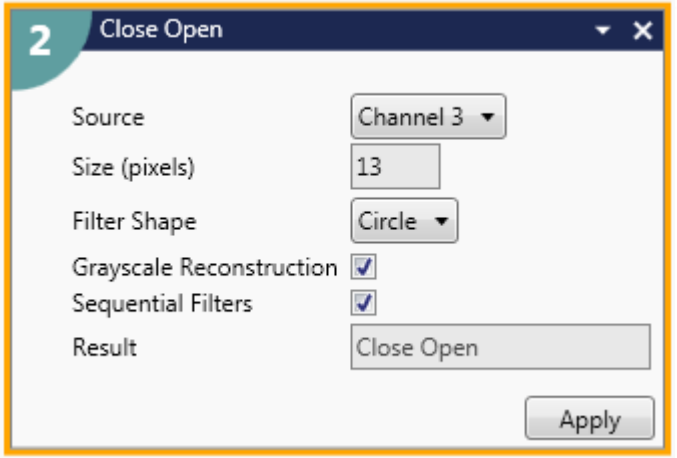

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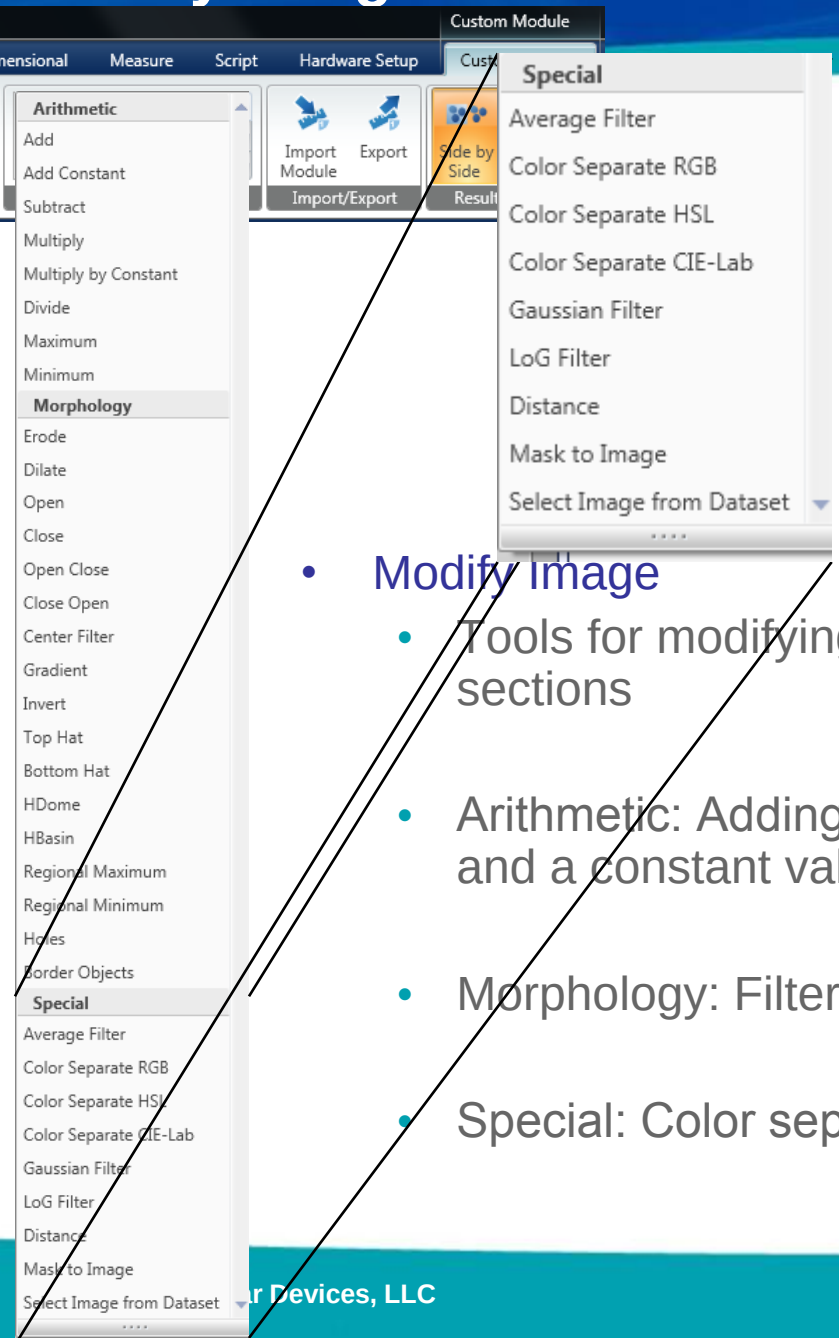

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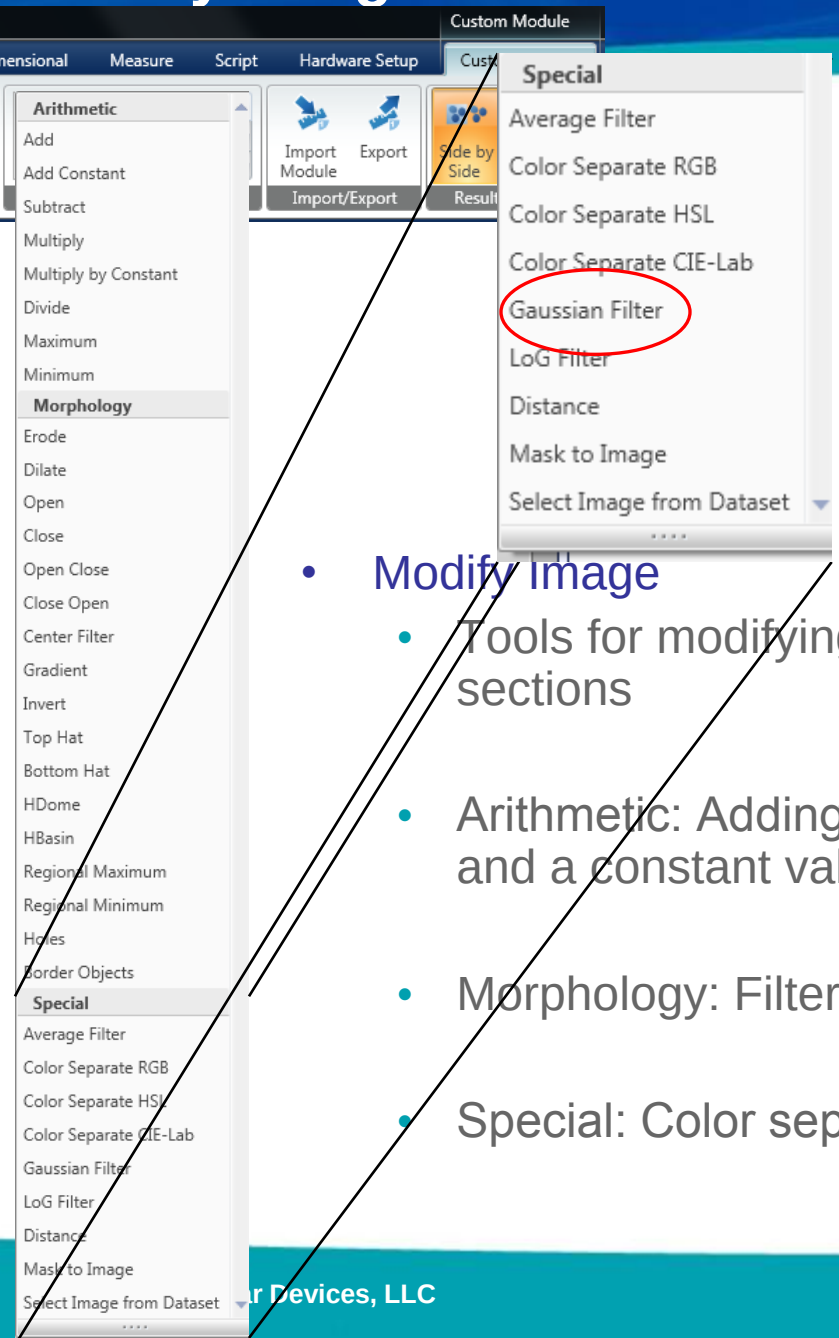

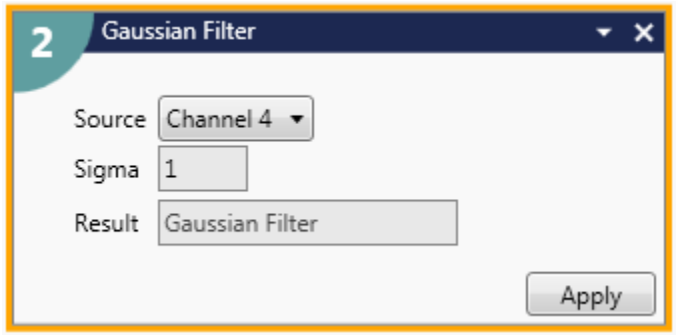

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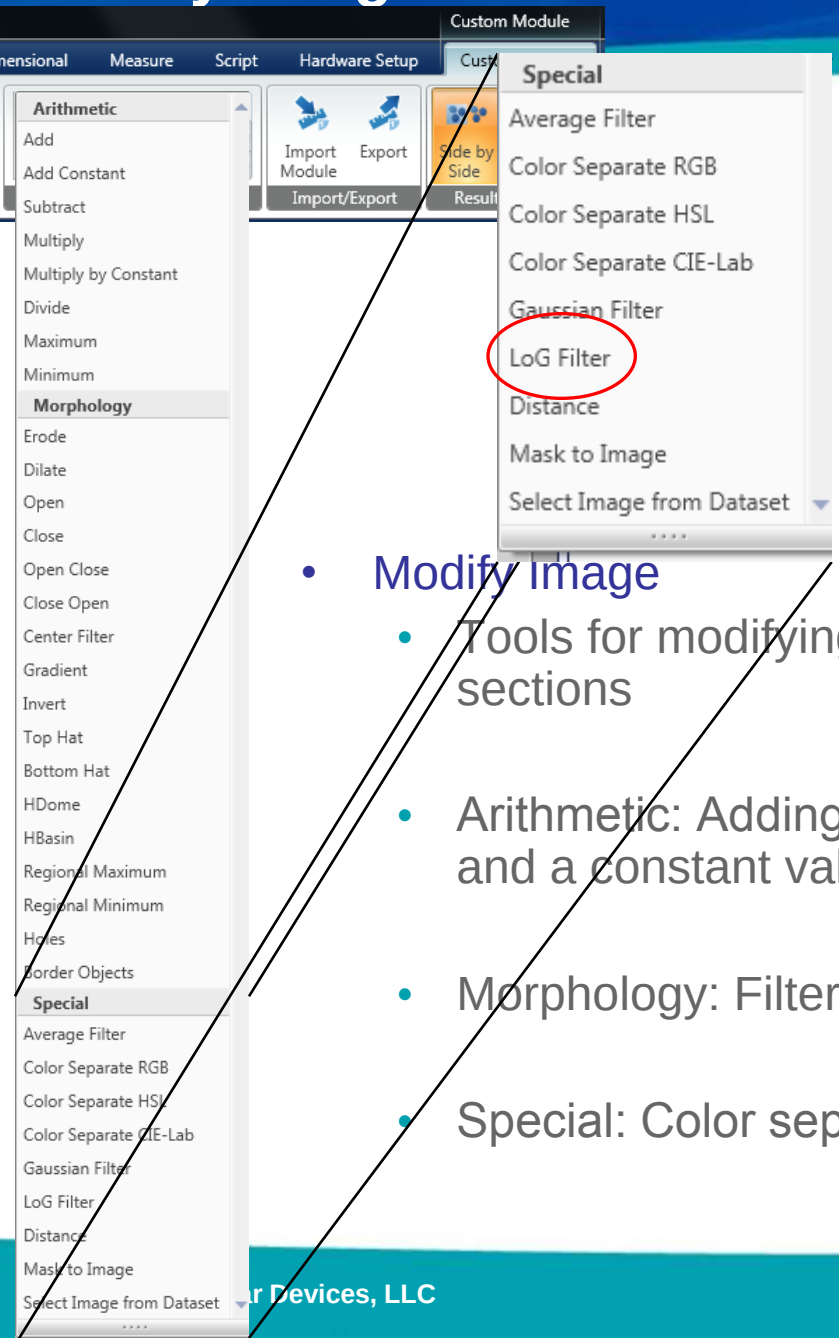

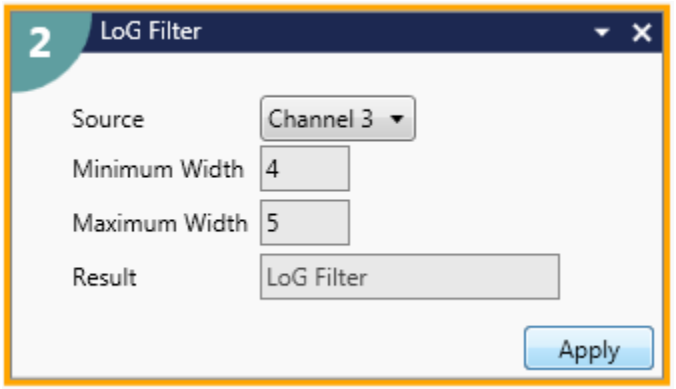

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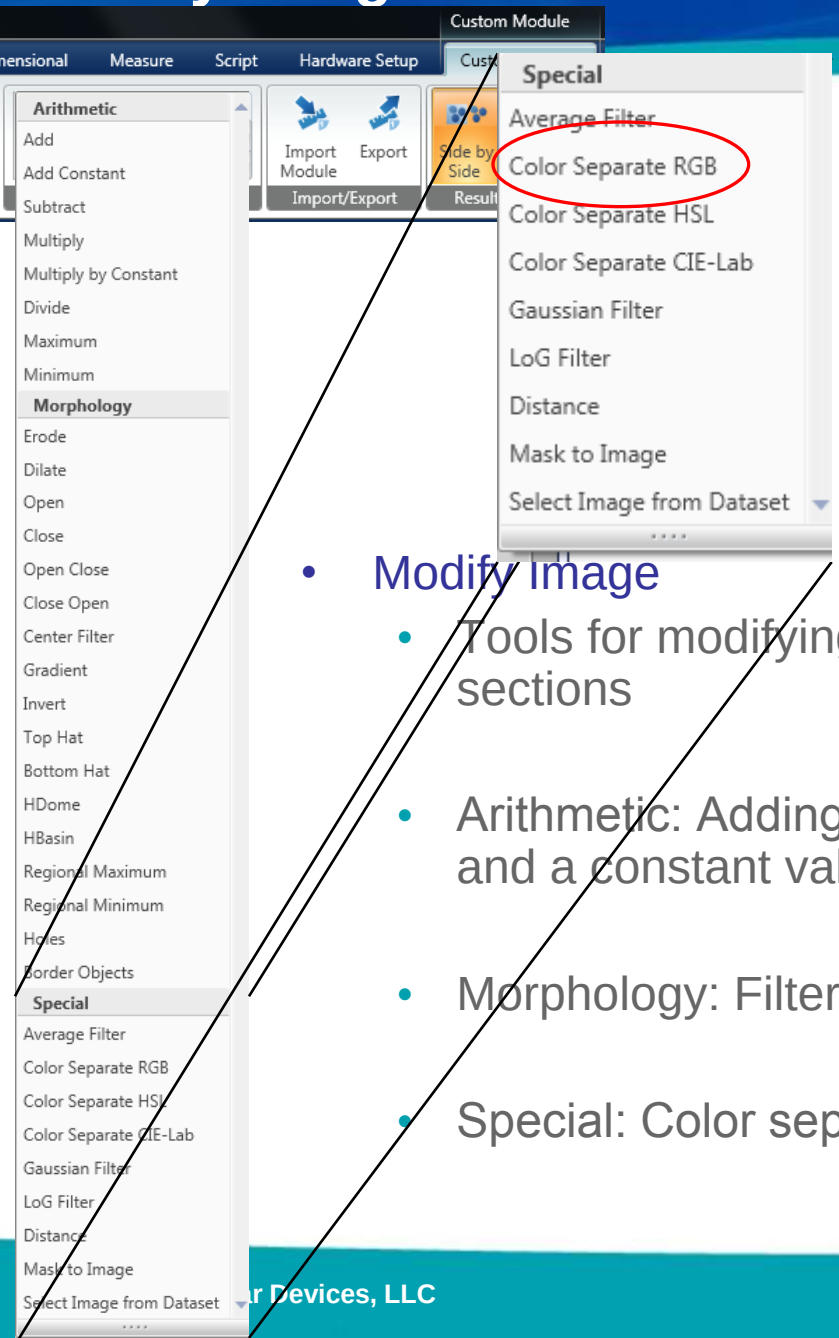

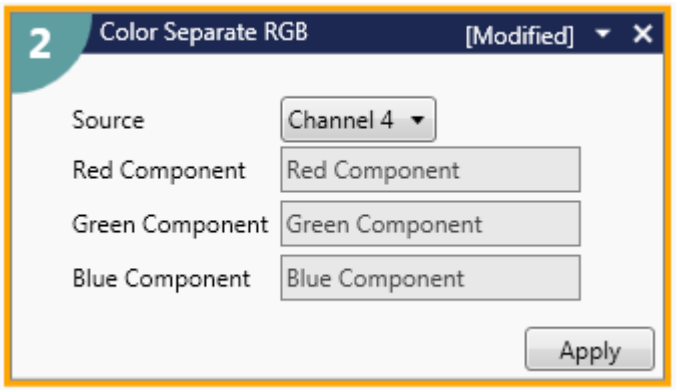

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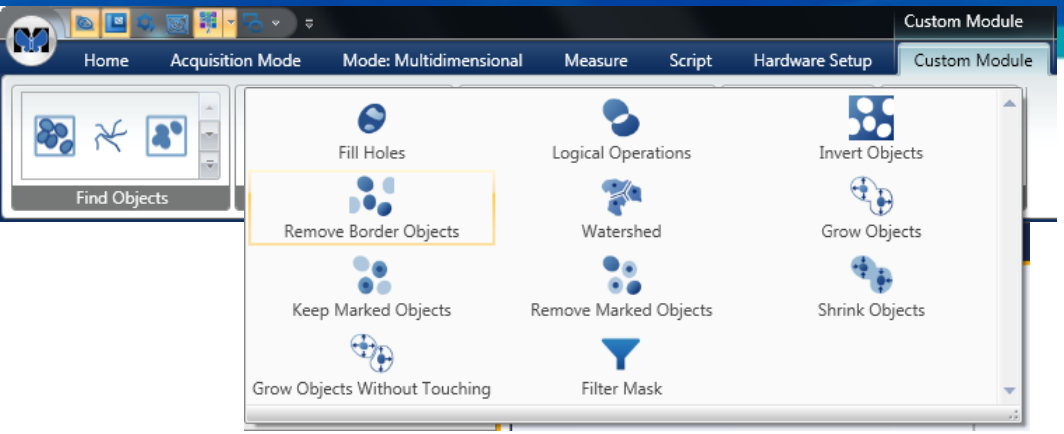
Modify Objects



- Modify Objects
  - Tools for resizing, selecting, or reshaping objects on a mask
  - Example object selecting tools:
    - Logical Operations
    - Keep/Remove Marked Objects
    - Filter Mask
  - Example object resizing tools:
    - Grow Objects
    - Grow Objects Without Touching
    - Shrink Objects
  - Example reshaping tools:
    - Invert Object
    - Watershed
    - Fill Holes

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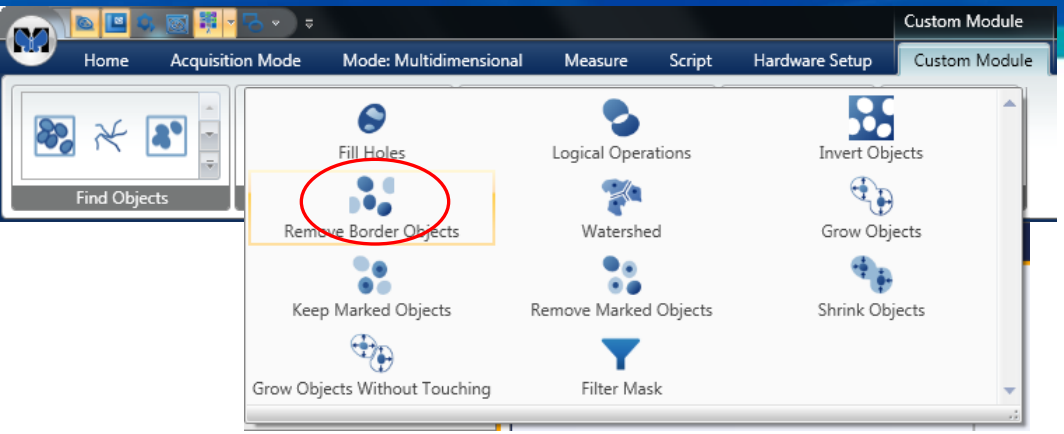
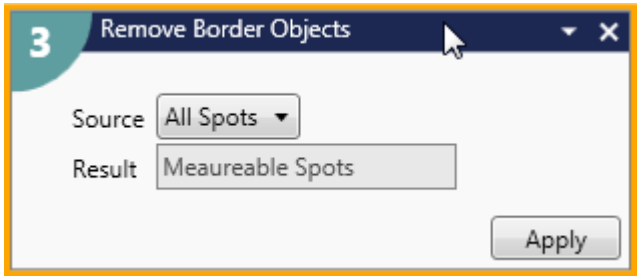
Modify Objects





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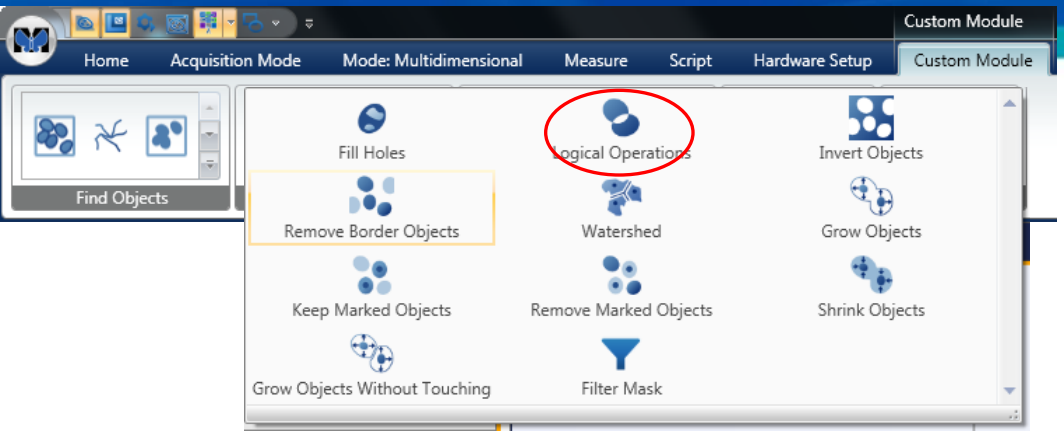

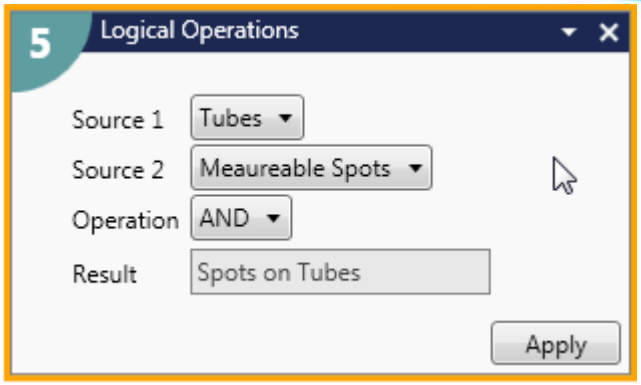

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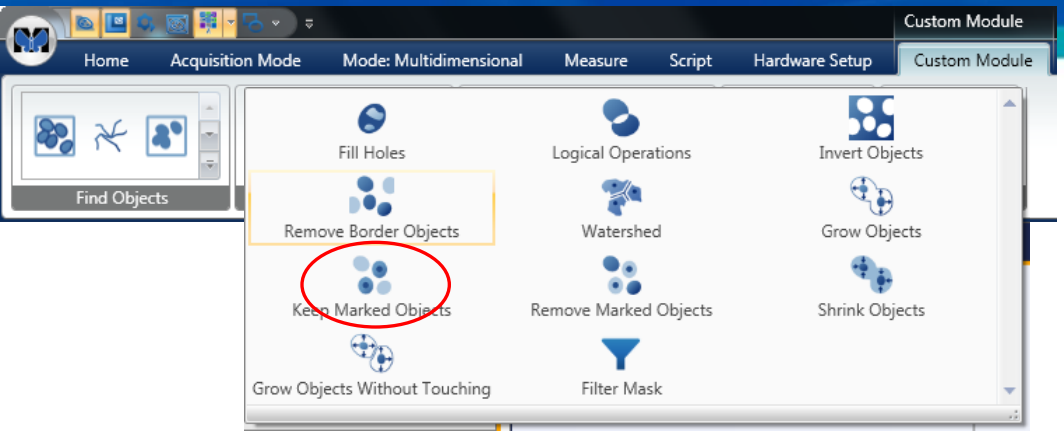

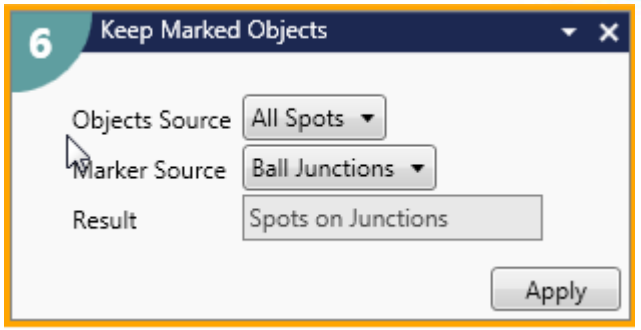

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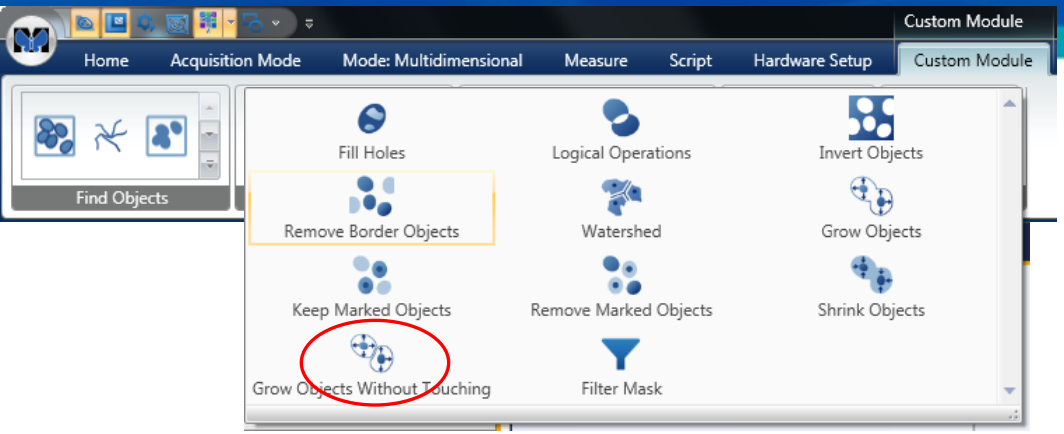

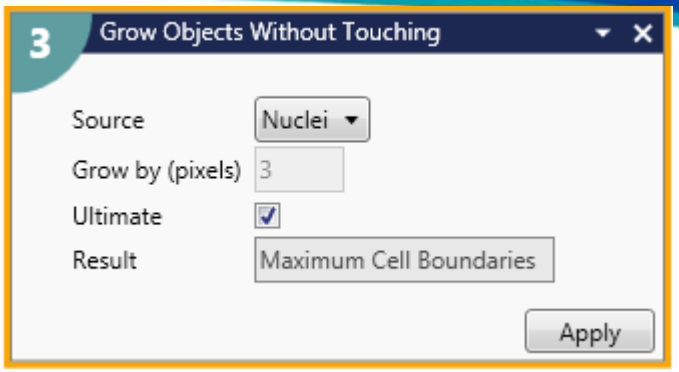

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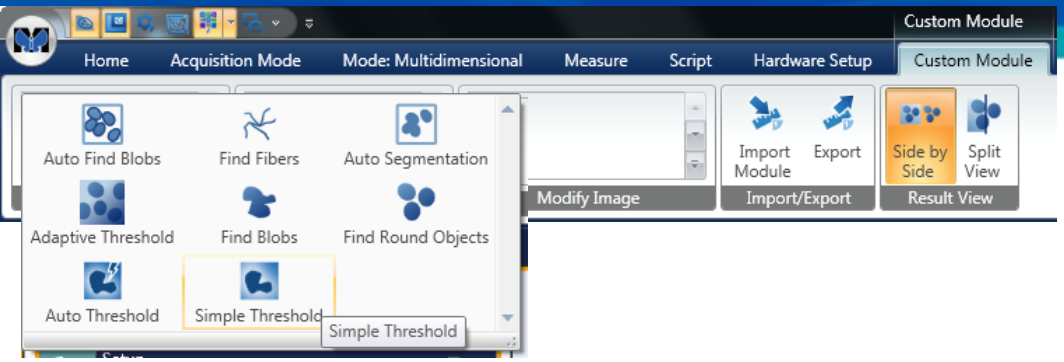
Find Objects



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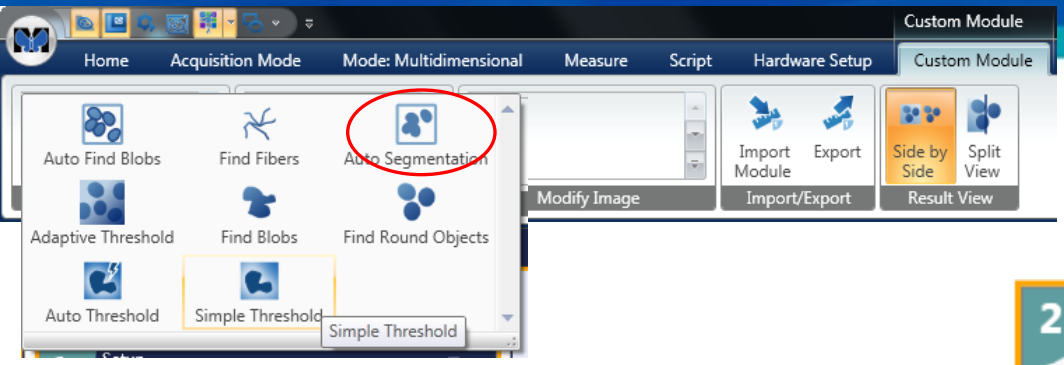
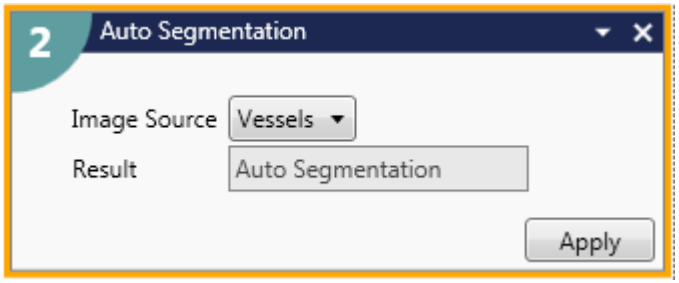
Find Objects





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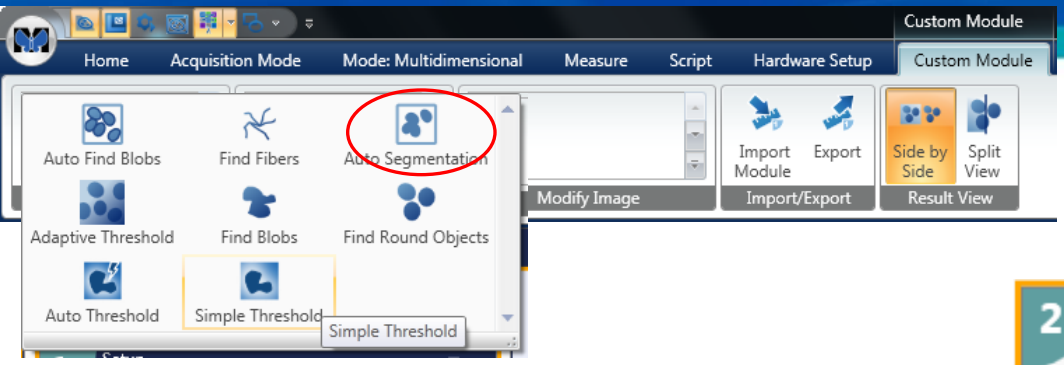

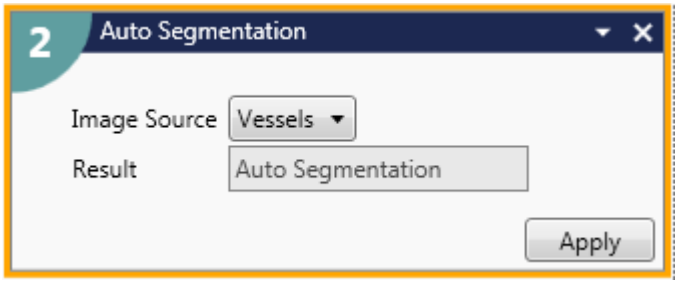

- Auto Segmentation
  - Find all kinds of Objects with NO values to configure.
  - Great for objects of all sizes and shapes
  - Does not split touching objects
  - May need to filter small objects out

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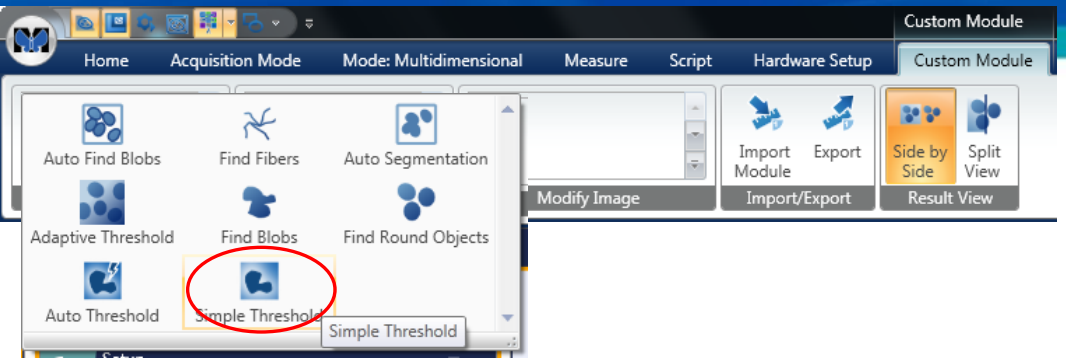
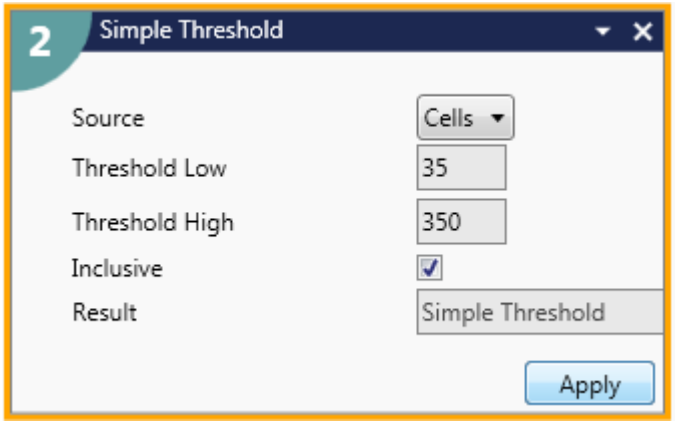
Find Objects





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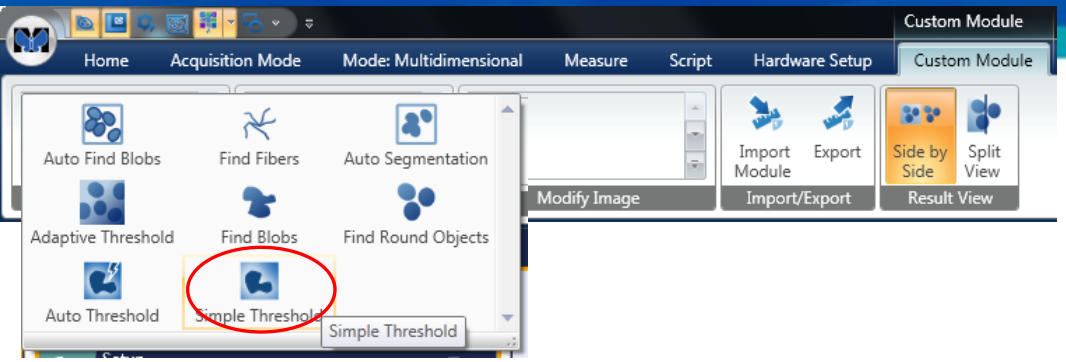

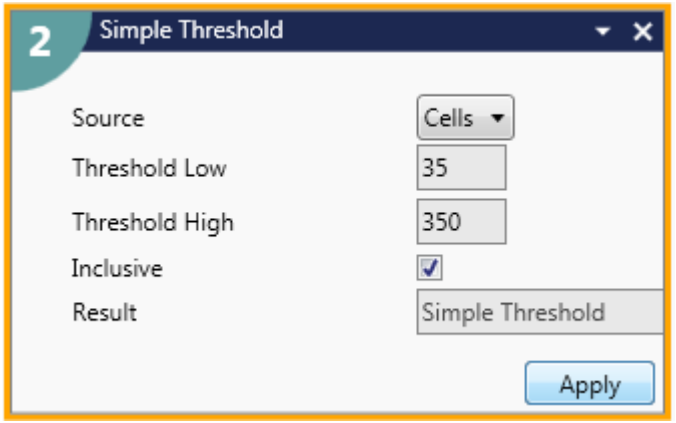

- Simple Threshold
  - Identify objects based on their absolute intensity
  - Set a Low and High Threshold Value
  - Inclusive On = Target intensities are between the Low and High values
  - Inclusive Off = Target intensities are those values NOT between the Low and High

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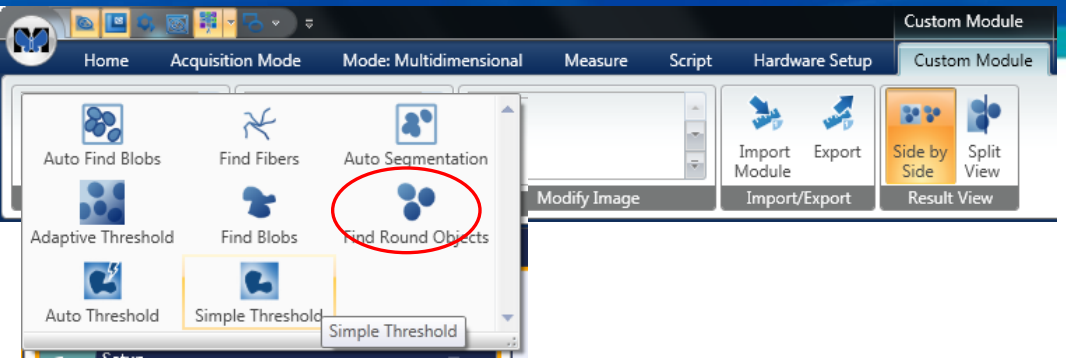
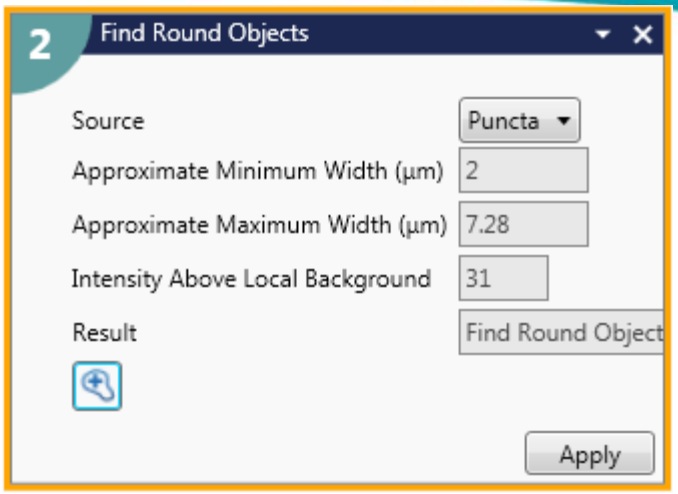
Find Objects





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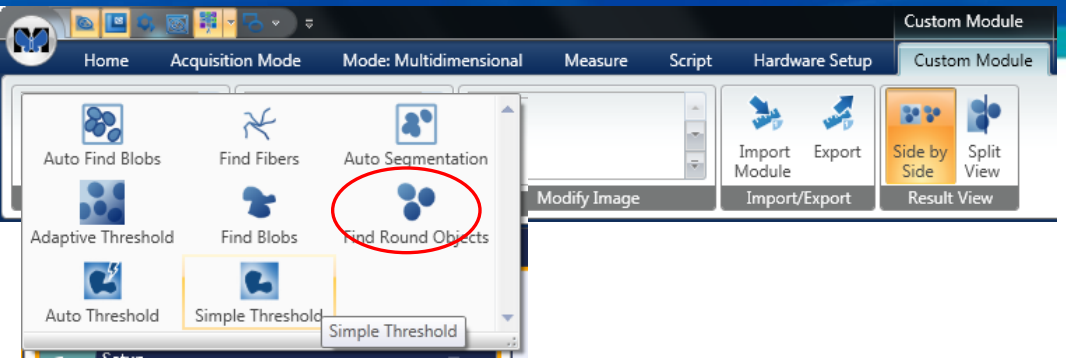
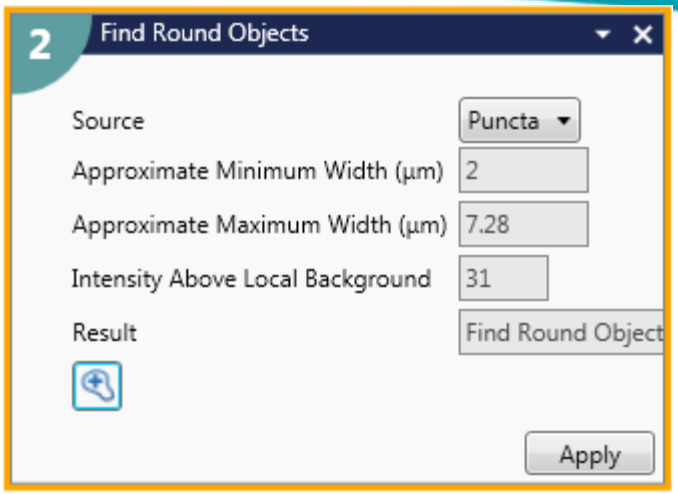
Find Objects





- Find Round Objects
  - Great at finding round things
  - Splits touching objects
  - Best for small objects
  - Not best option for nuclei – nuclei can be more cigar shaped …

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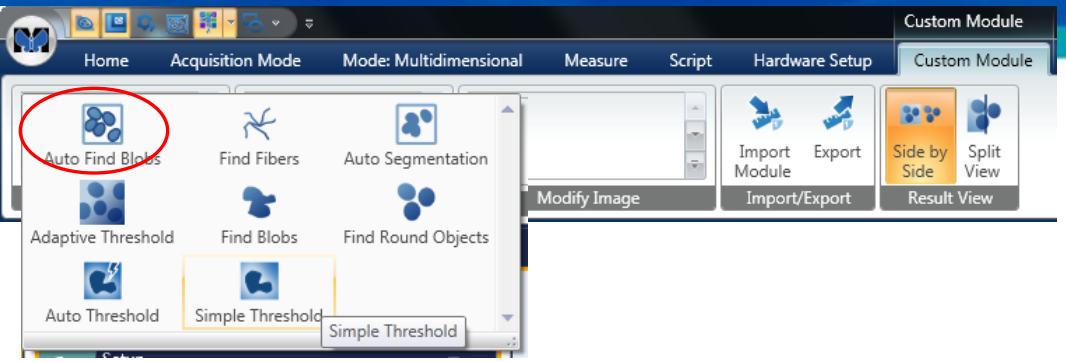
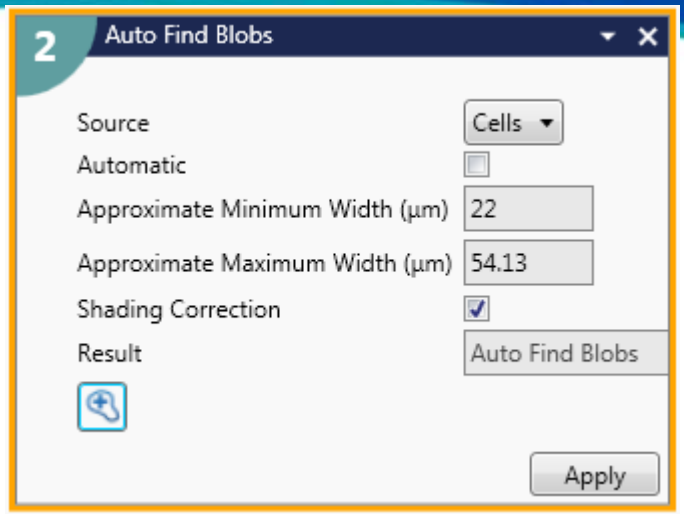
Find Objects





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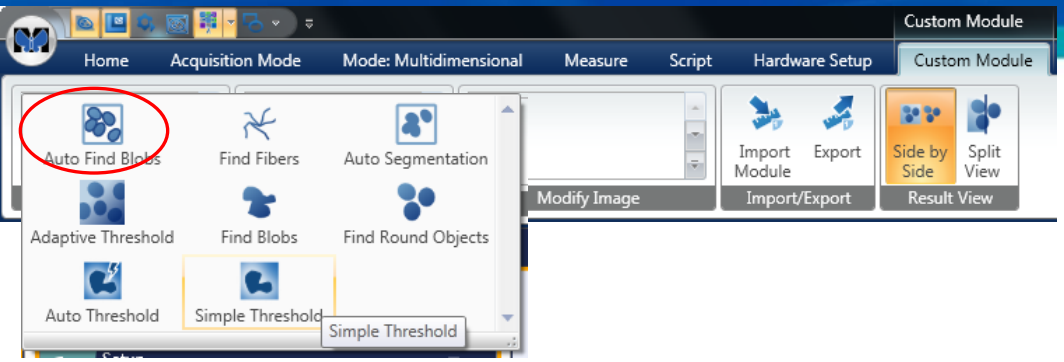

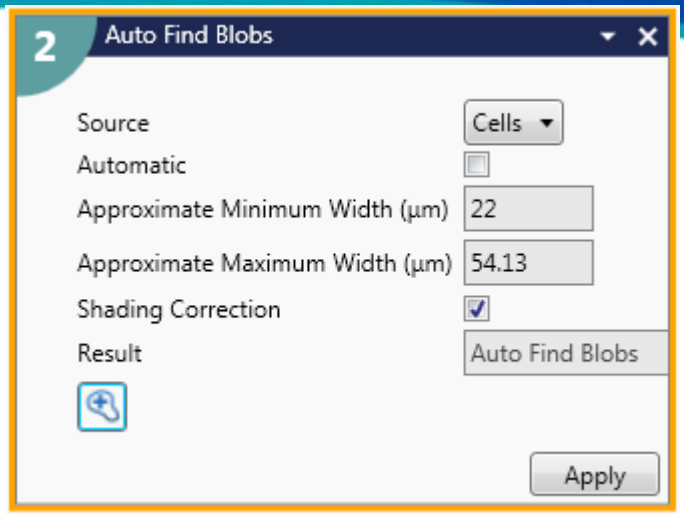

- Auto Find Blobs
  - Great at finding objects with little or no configuration
  - With ‘Automatic’ option on – Zero configuration setup, just apply and go
    - Splits objects
    - may find smaller objects than you want
    - Can add Filter Mask to get rid of the small stuff
  - Splits touching objects
  - **Best tool for Nuclei**, or other relatively uniform objects

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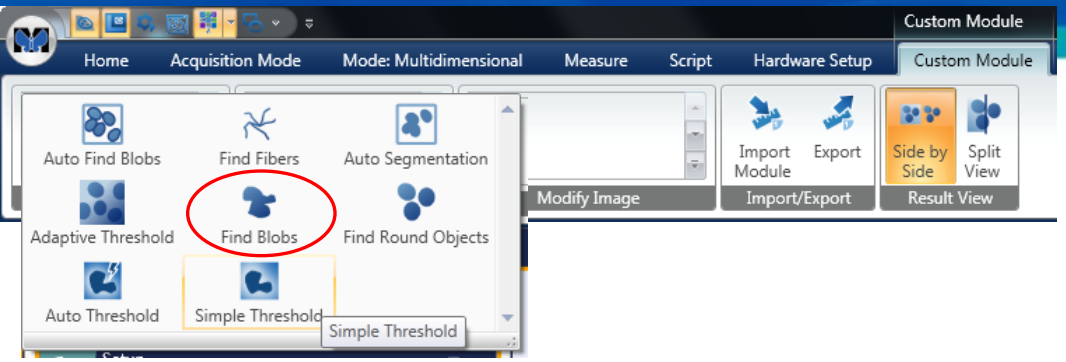
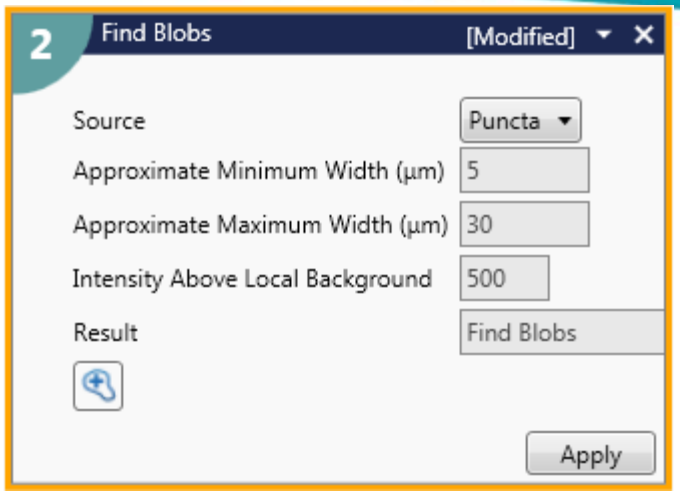
Find Objects





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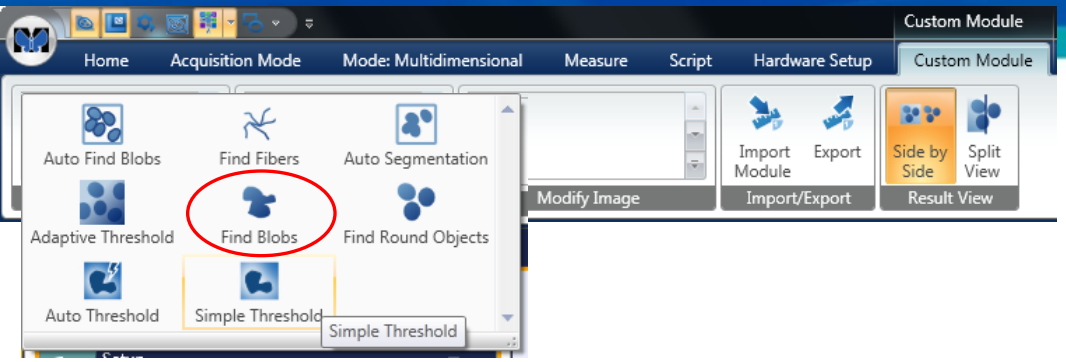

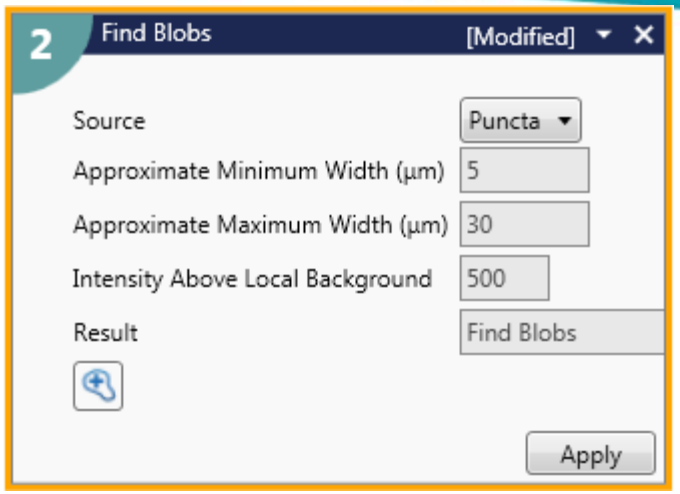

- Find Blobs
  - Finds arbitrary shaped objects, like Cytoplasm
  - Finds borders of objects based on Local Intensity differences
  - Min / Max Width define the details of the object borders, not necessarily how big the objects are
    - Small Minimum Width shows all the blebs and formations on the edge of a cytoplasm
    - Large Minimum Width shows mostly the same area, but the smaller details will be clipped.
  - Will not split touching objects

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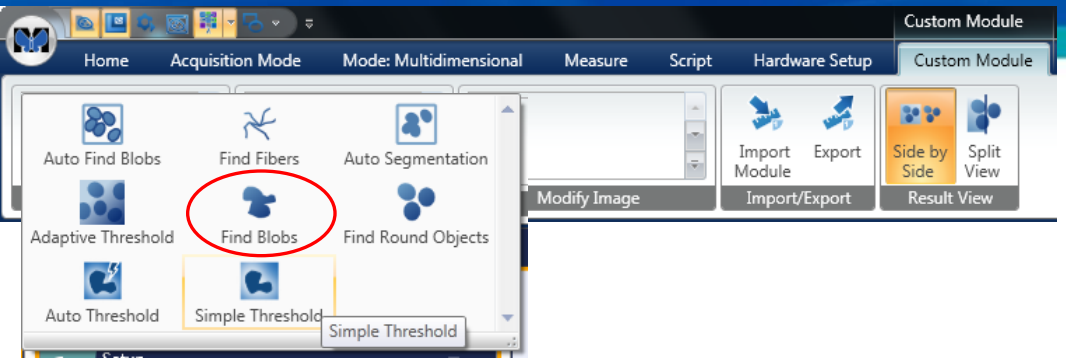
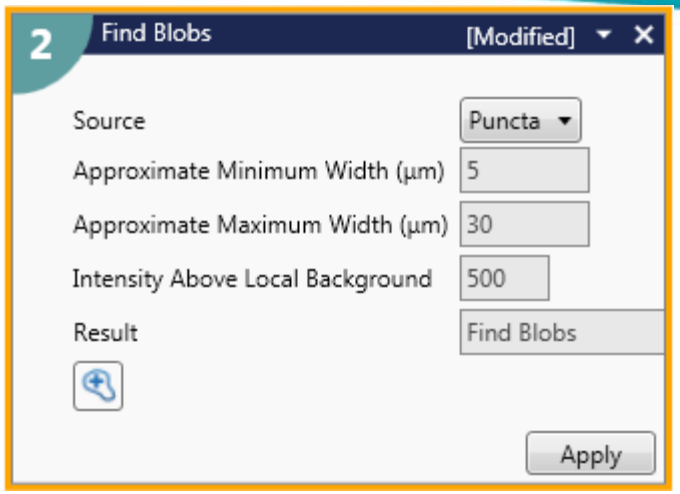
Find Objects





d objects, like Cytoplasm

cts based on Local Intensity differences

Approximate Minimum Width: 5

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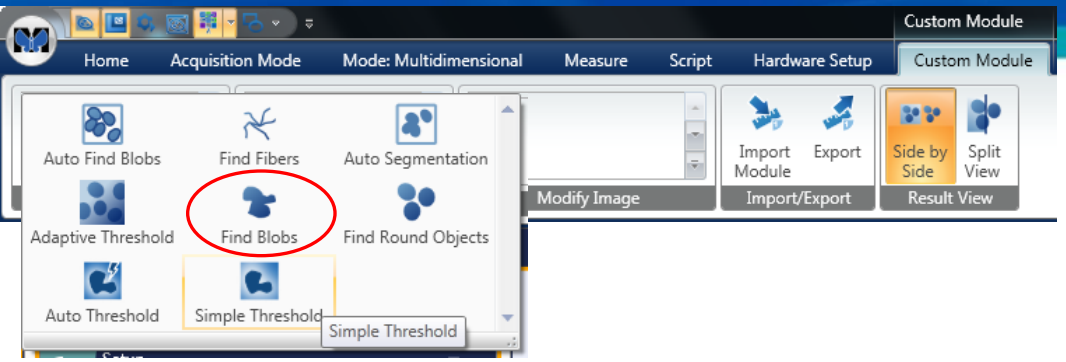
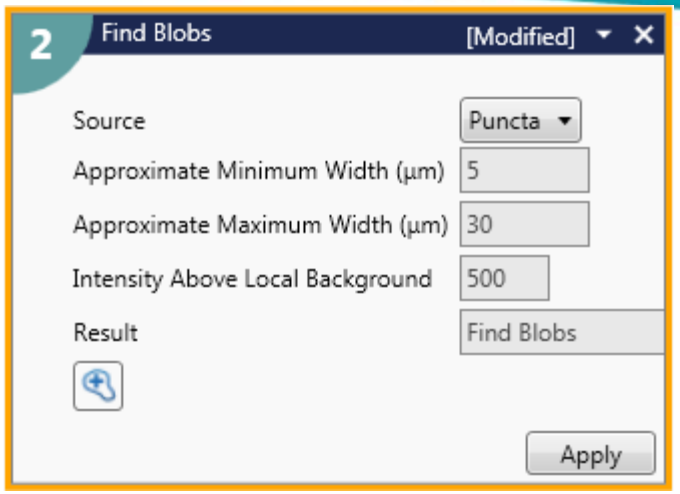
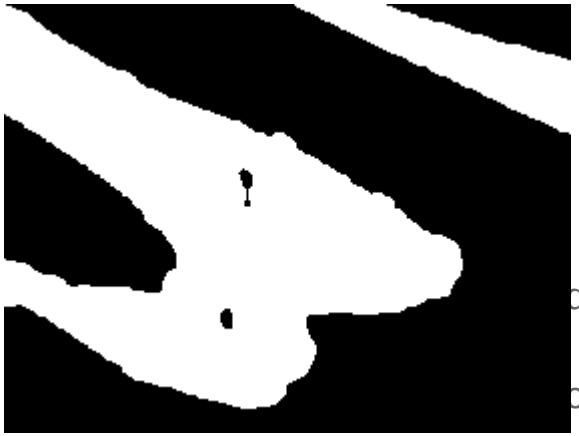
Find Objects







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cts based on Local Intensity differences

Approximate Minimum Width: 20

Min / Max Width define the details of the object borders, not necessarily how big the objects are

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- Will not split touching objects

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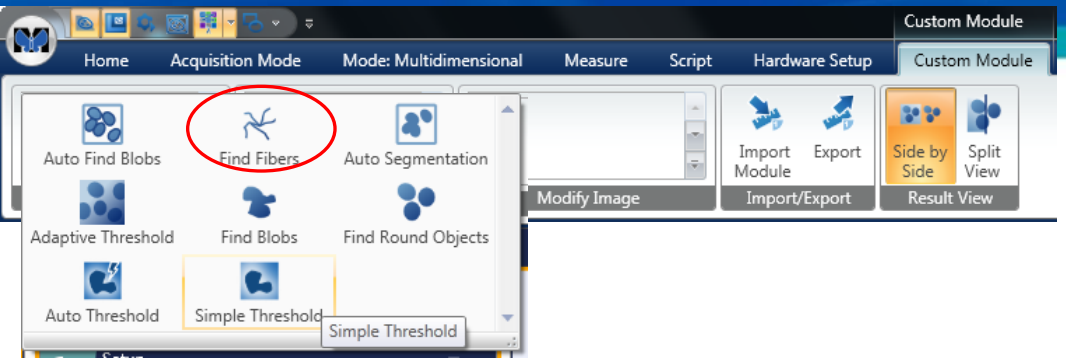

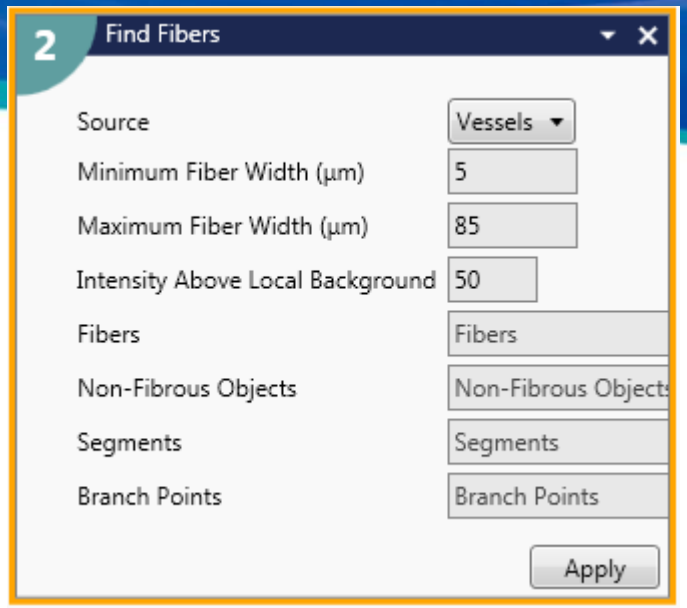

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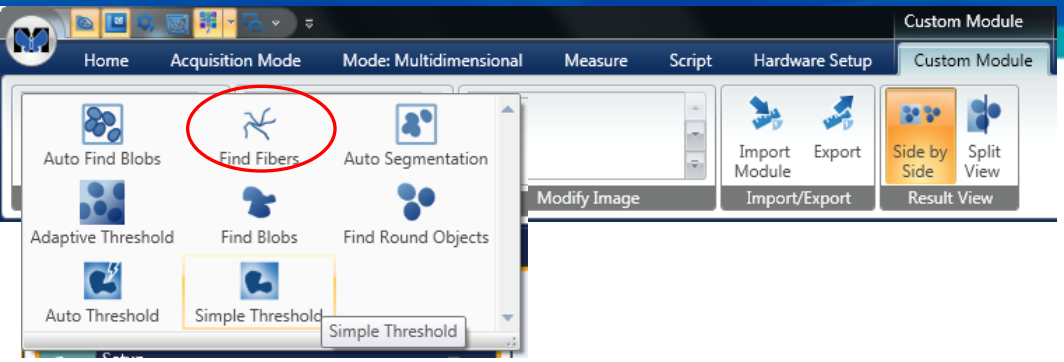

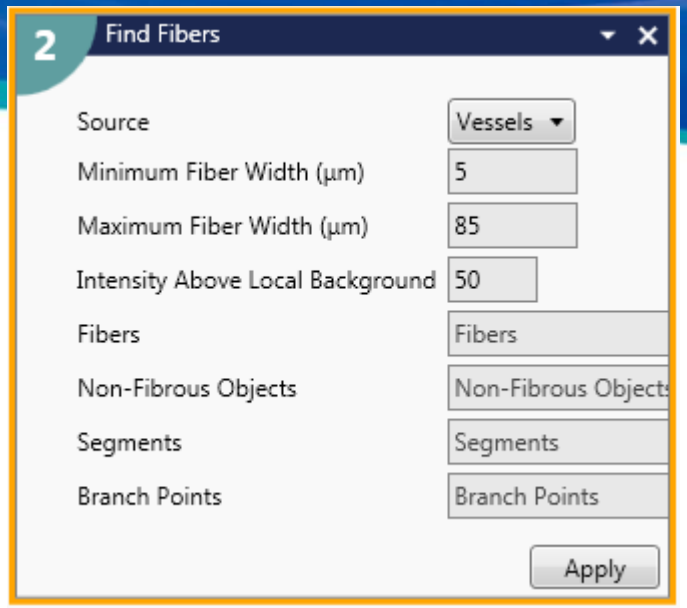

- Find Fibers
  - Find long tubes or fibers, their branches, and objects too large to be fibers.
  - Four masks produced
    - Fibers: Objects with Widths between the Min Fiber Width and Max Fiber Width
    - Non-Fibrouse Objects: Objects with Widths > Max Fiber Width
    - Segments: Skeleton of Fibers – good for measuring length of Fibers
    - Branch Points: Single points where segments meet each other.
    - Segments + Branch Points = total Fiber system

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Finding Granules In the Nucleus

An Example Custom Module

Granules in Nucleus

- Goals:
  - Count the number of Granules in a GFP stain that are localized to the Nucleus
- Measurements to make:
  - Nuclear Area and Intensity
  - Granule Count
  - Total Granule Area and Intensity
  - Average Granule Area
- Inputs:
  - DRAQ5 Nuclear Stain
  - GFP Stain localize to granules (in and out of nucleus)

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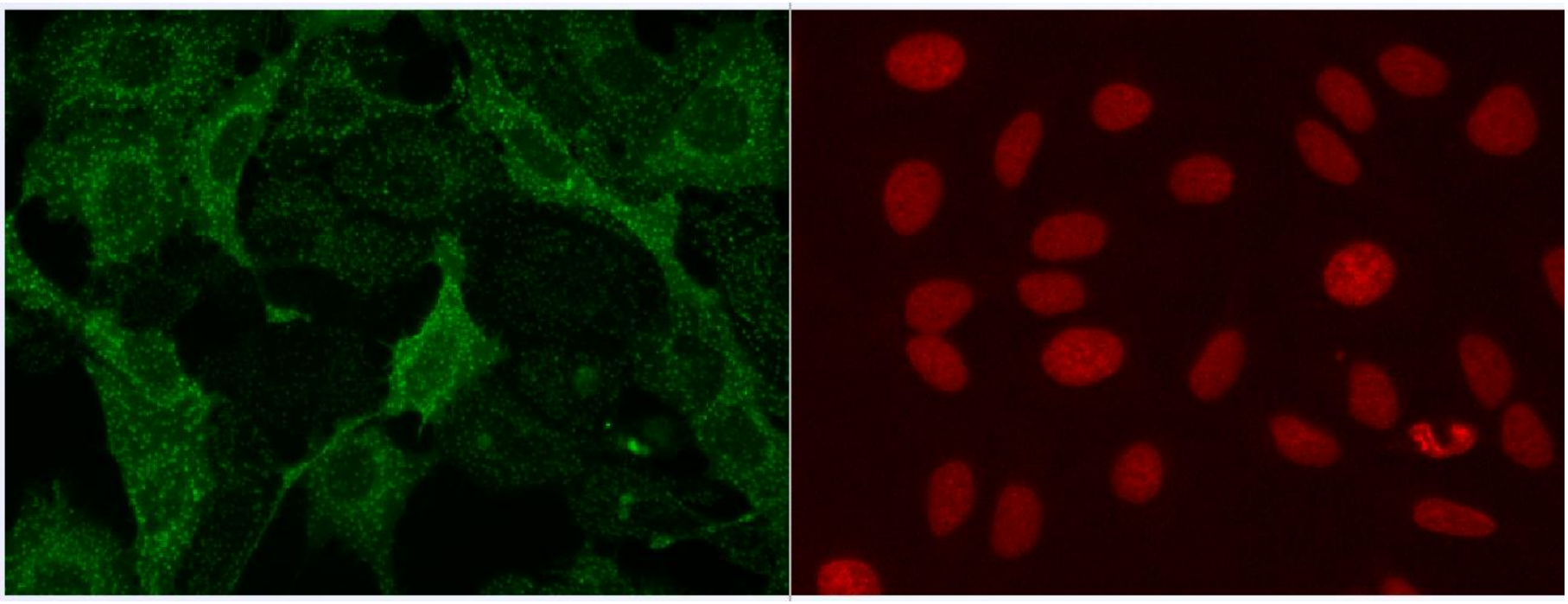
Granules in Nucleus

- Example Images



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Granules In Nucleus

- Setup:
  - Assign real names to be used for the input images
  - These names will be used throughout the Custom Module when referring to the ‘Input’ images
  - These names will be used when running the Custom Module from the Measurement Ribbon to assign the ‘Input’ images

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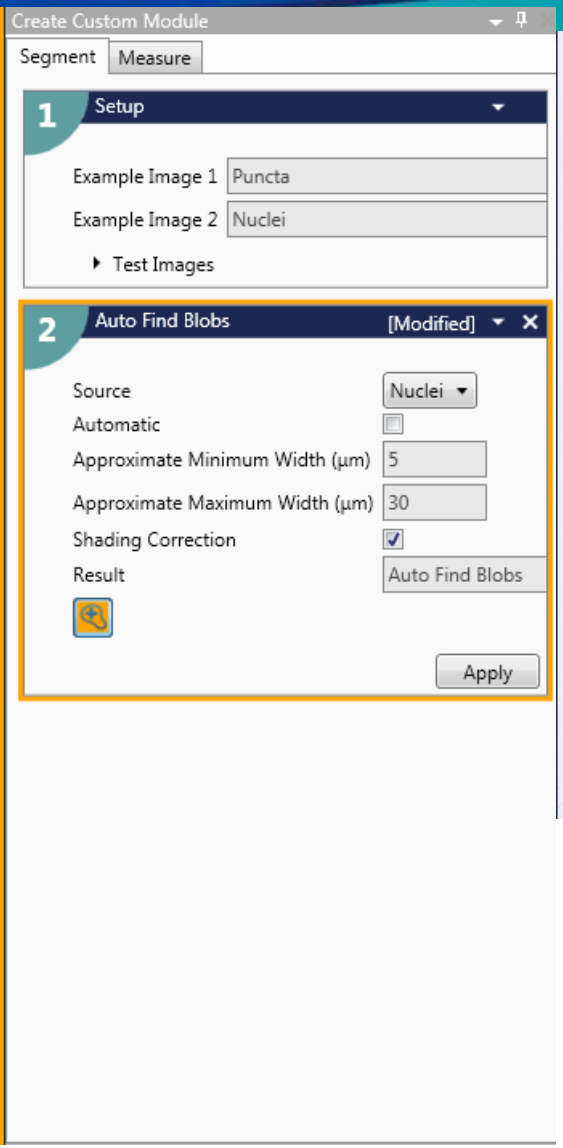
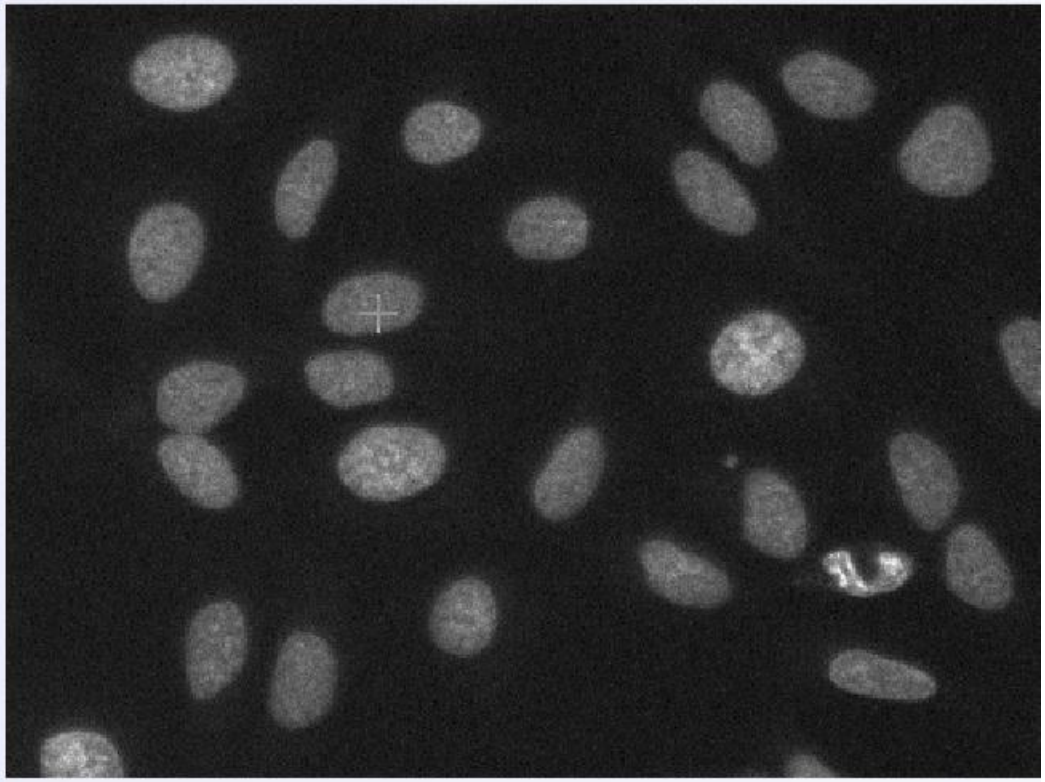
Granules In Nucleus





- Finding the Nuclei
  - Auto Find Blobs using Click to Find
    - Turn Automatic Off
  - Click on a few Nuclei
  - Hit Apply to find all nuclei

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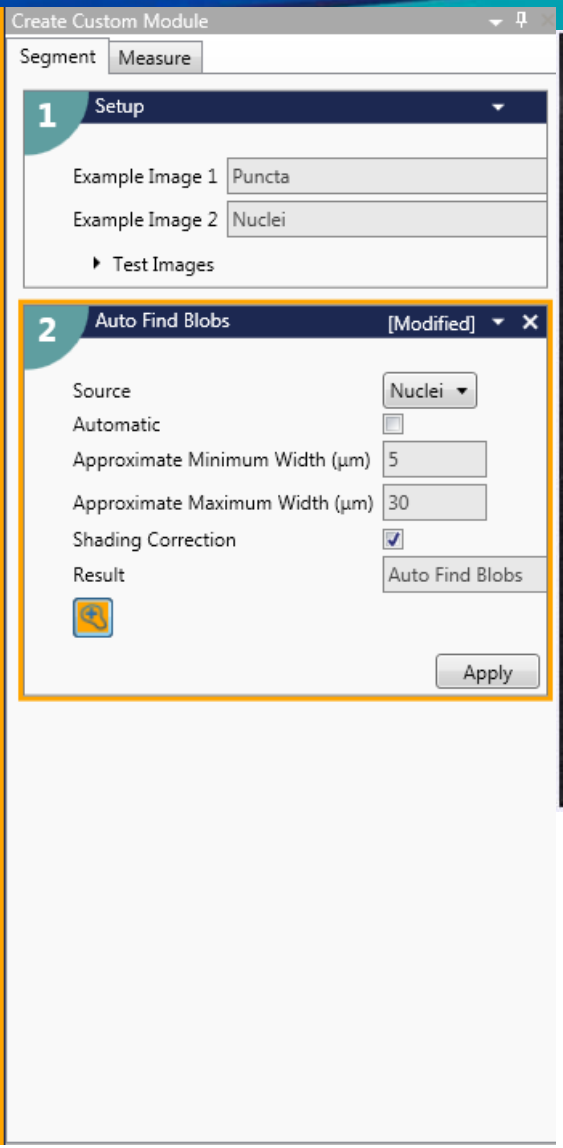
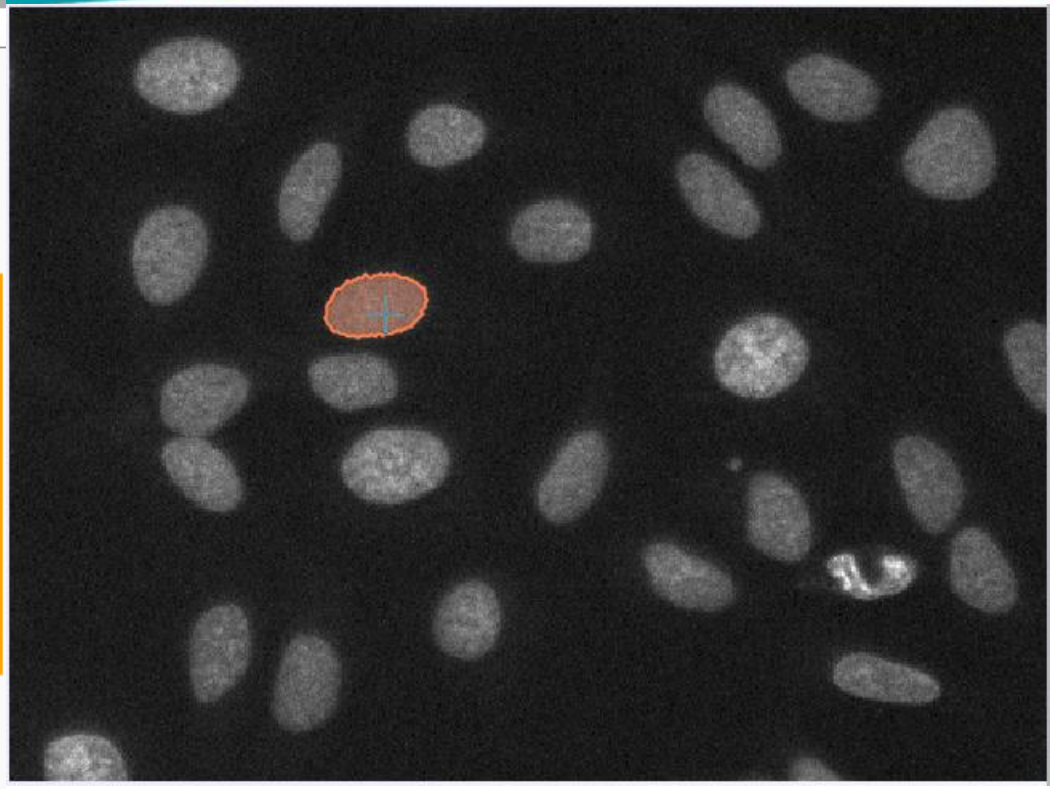
Granules In Nucleus





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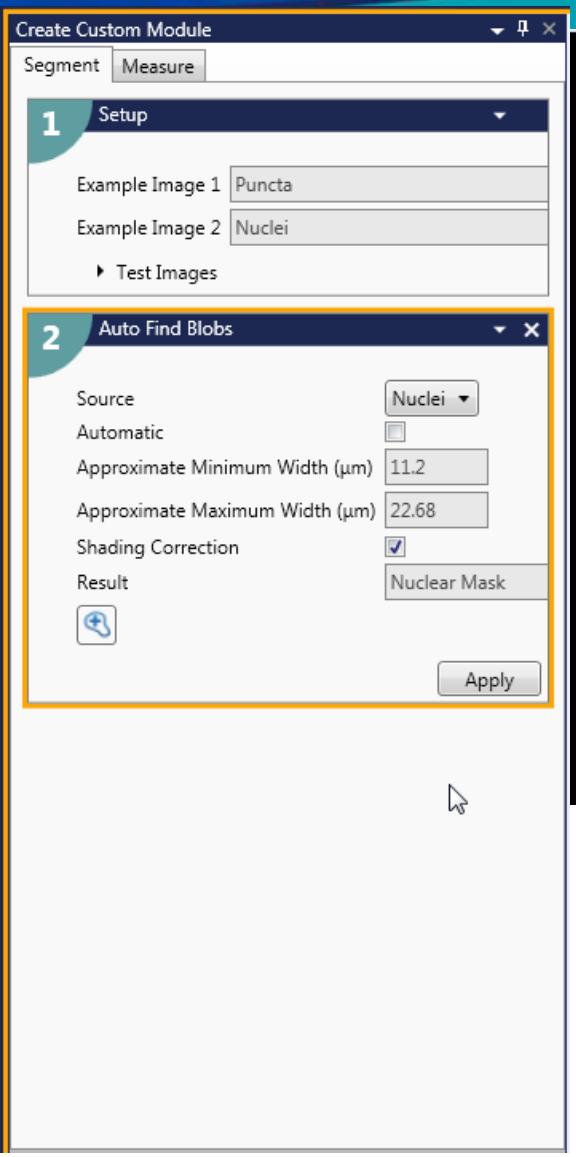
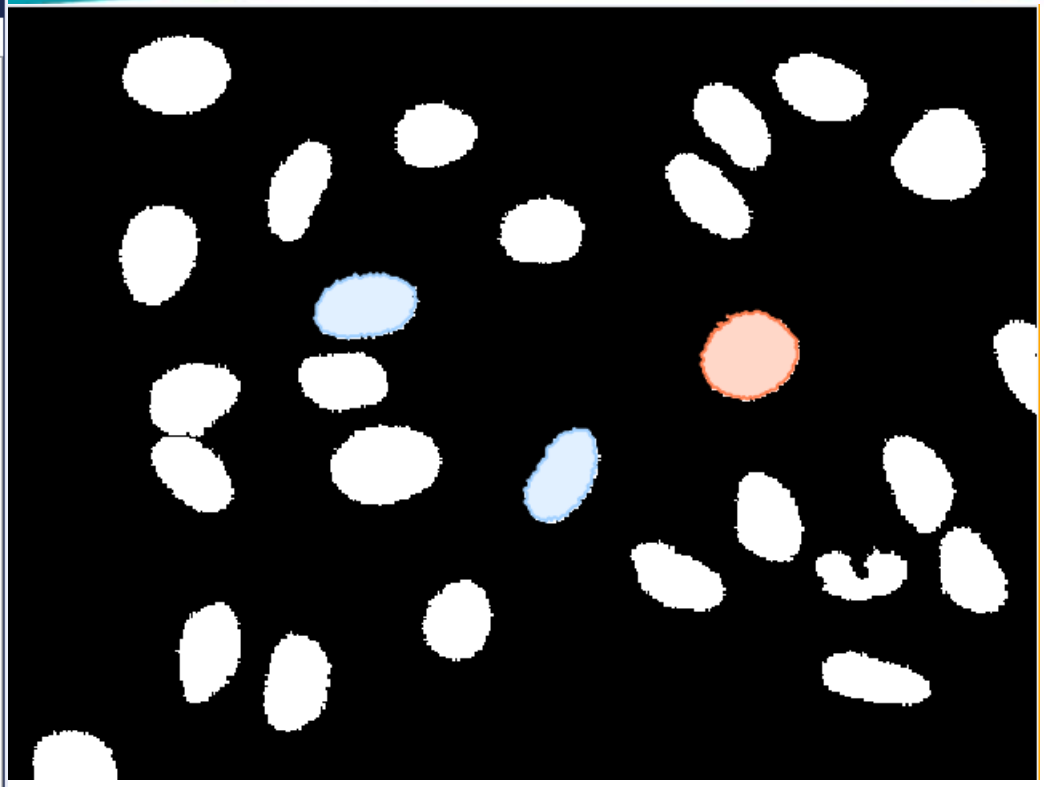
Granules In Nucleus





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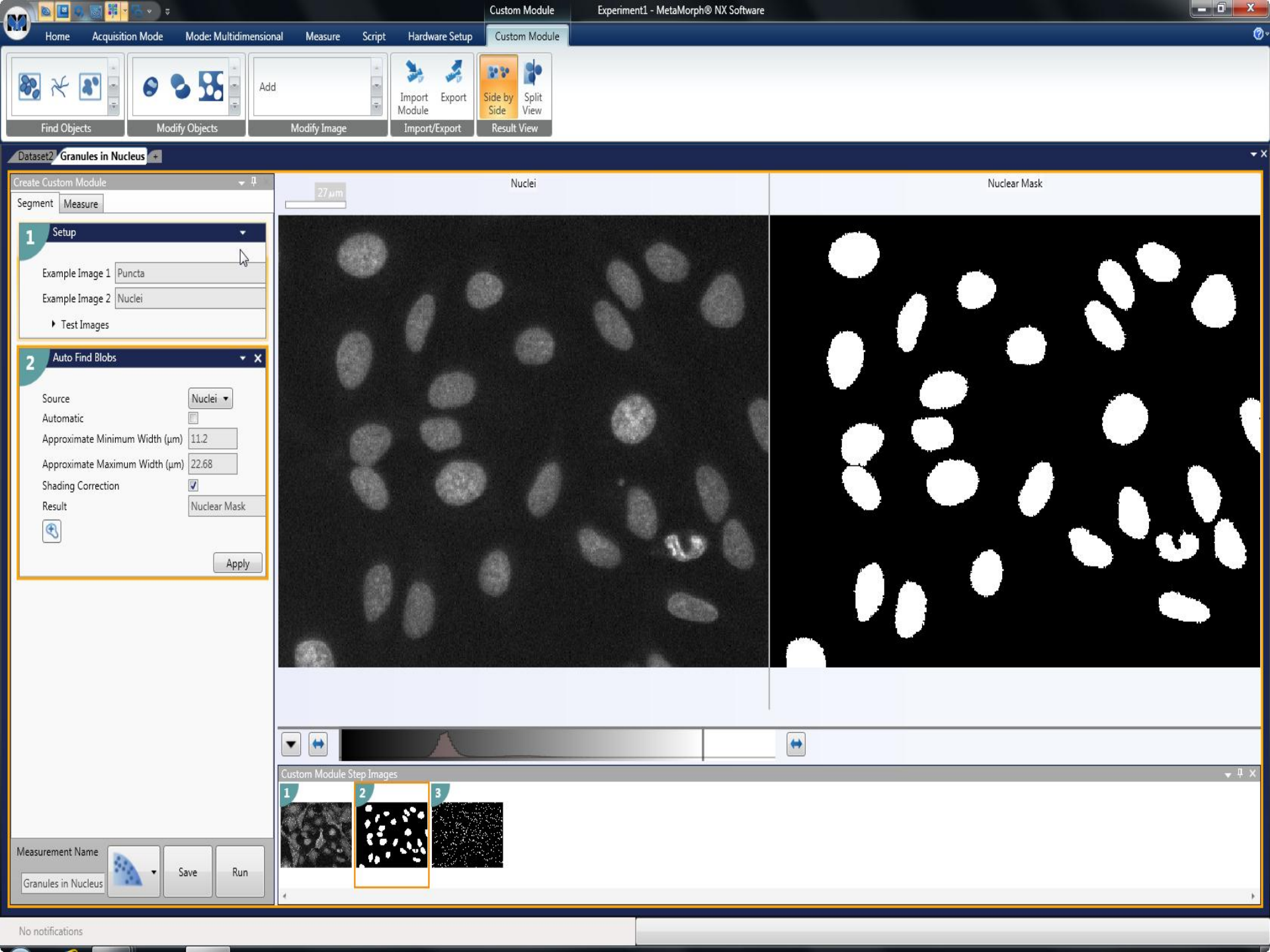
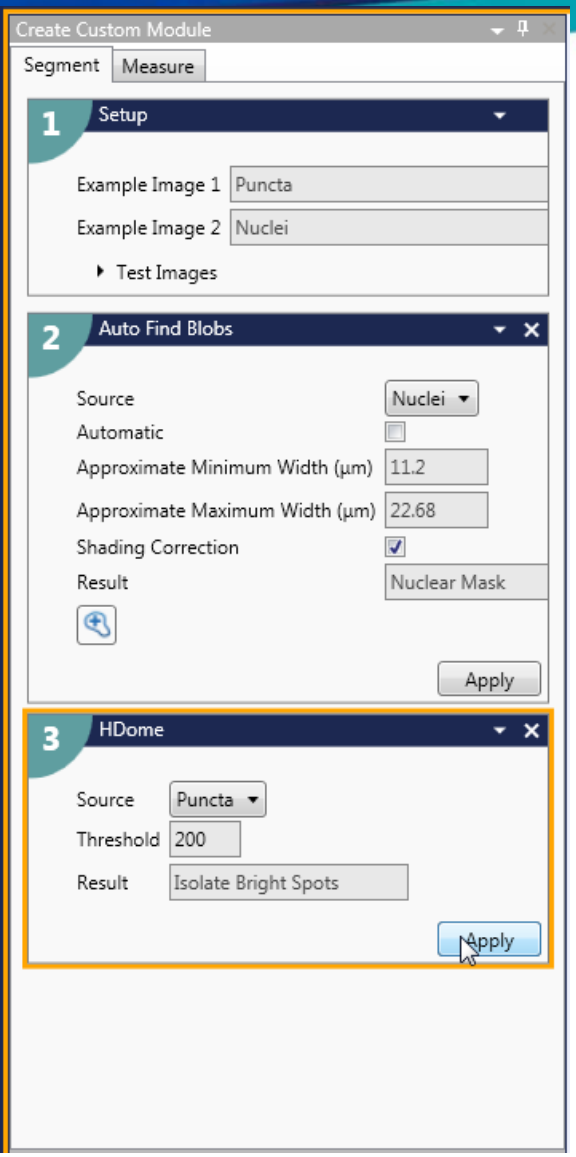

Custom Module
Experiment1 - MetaMorph® NX Software
Home
Acquisition Mode
Mode: Multidimensional
Measure
Script
Hardware Setup
Custom Module
Find Objects
Modify Objects
Add
Modify Image
Import Module
Export
Import/Export
Side by Side
Split View
Result View
Dataset2
Granules in Nucleus
Create Custom Module
Segment
Measure
1 Setup
Example Image 1 Puncta
Example Image 2 Nuclei
Test Images
2 Auto Find Blobs
Source Nuclei
Automatic
Approximate Minimum Width (µm) 11.2
Approximate Maximum Width (µm) 22.68
Shading Correction
Result Nuclear Mask
Apply
Measurement Name
Granules in Nucleus
Save
Run
27 µm
Nuclei
Nuclear Mask
Custom Module Step Images
1
2
3
No notifications

Granules In Nucleus



- Finding Granules
  - Separate Granules from background using Modify Images > Morphology > HDome
  - HDome uses a Relative Intensity Threshold
  - Don't forget to provide meaningful names to the Result Images
  - After HDome, use Find Objects > Auto Segmentation to create a Mask of All Puncta

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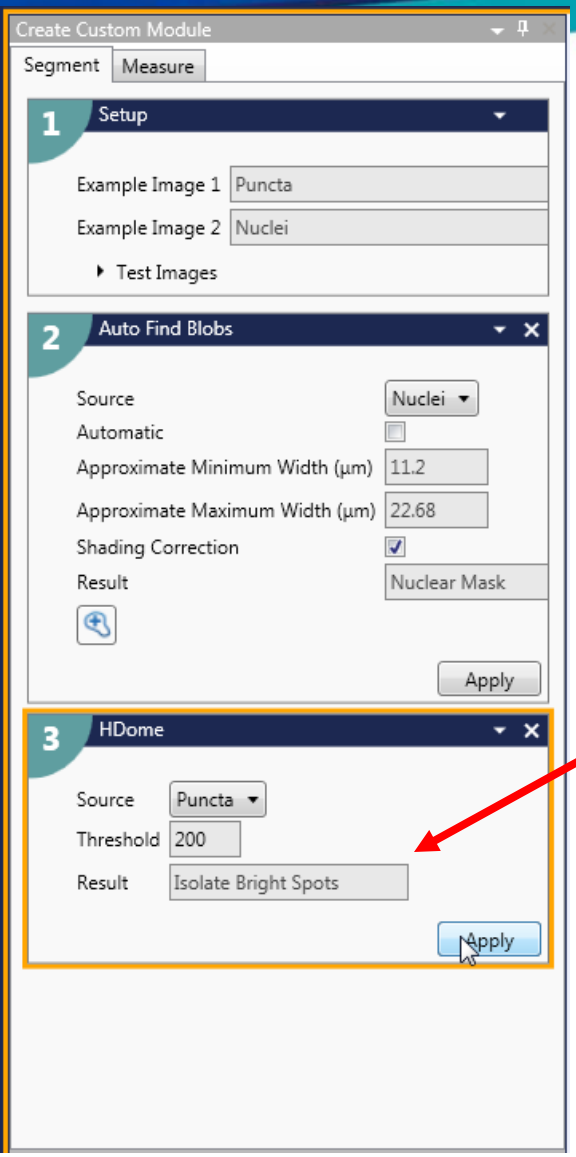
Granules In Nucleus



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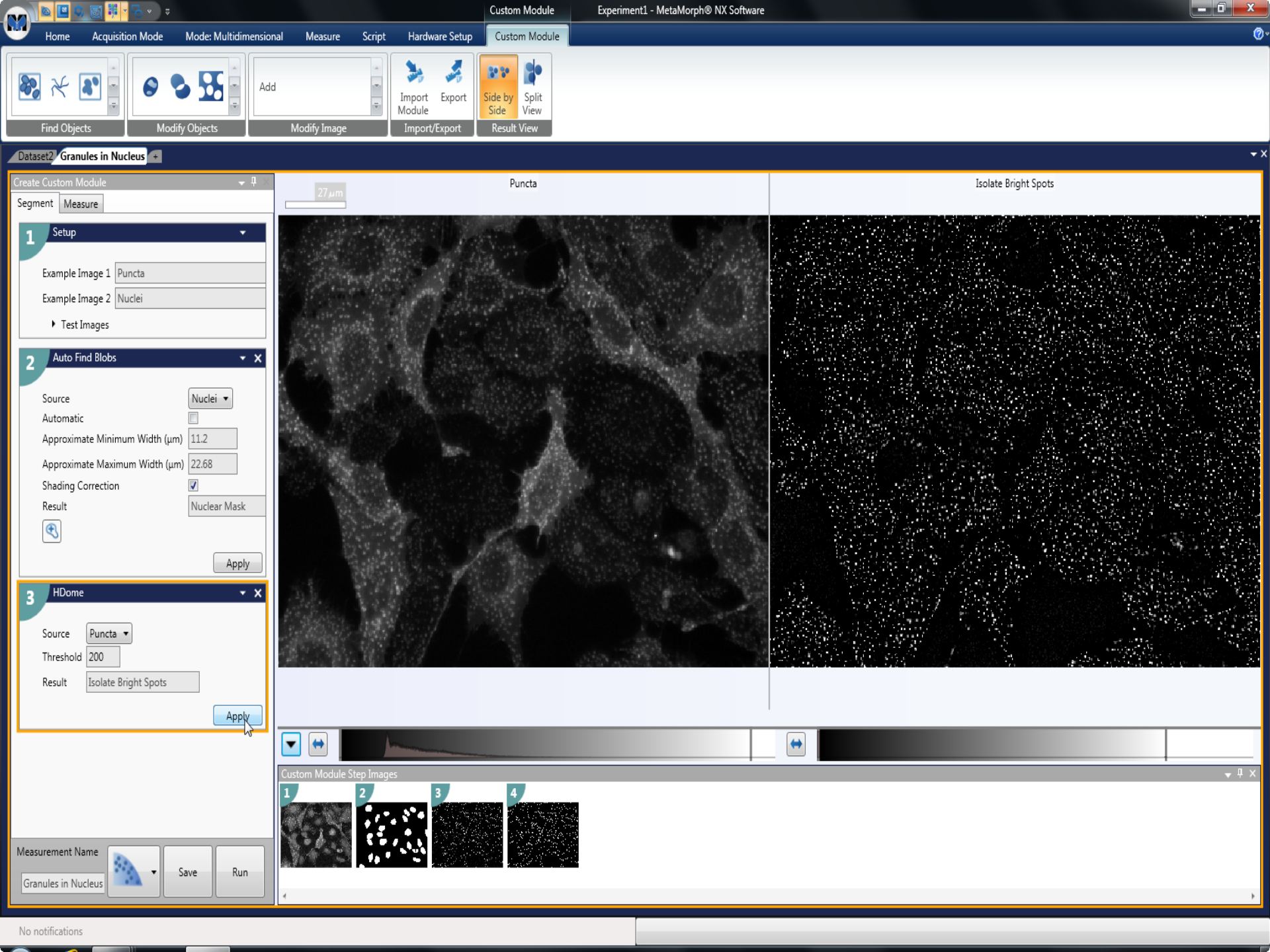
Custom Module
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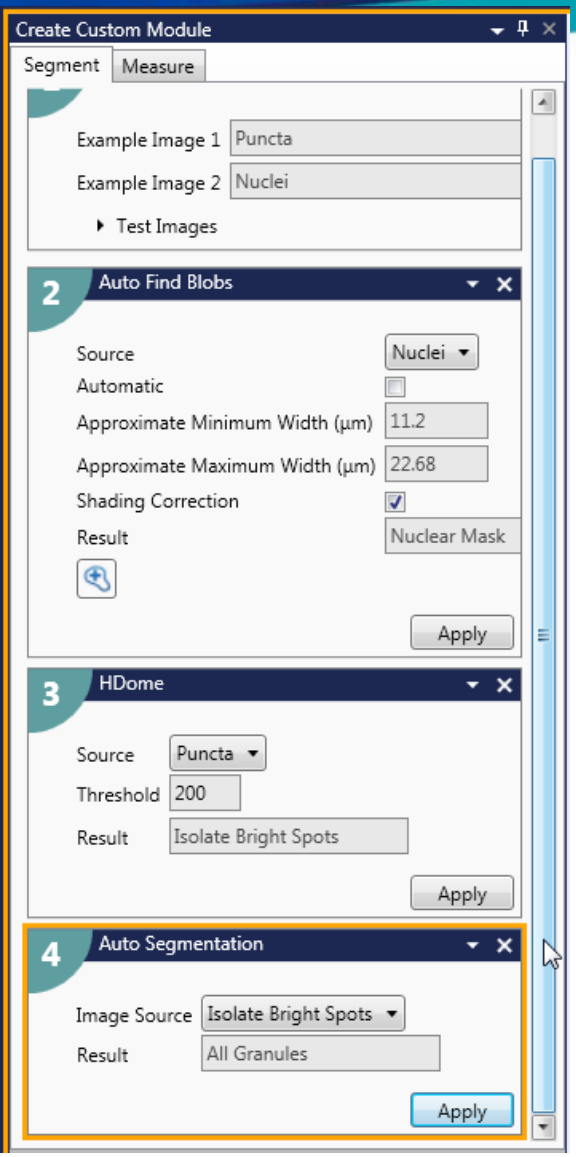
Shading Correction
Result Nuclear Mask
Apply
3 HDome
Source Puncta
Threshold 200
Result Isolate Bright Spots
Apply
Measurement Name
Granules in Nucleus
Save
Run
27 µm
Puncta
Isolate Bright Spots
Custom Module Step Images
1
2
3
4
No notifications

Granules In Nucleus



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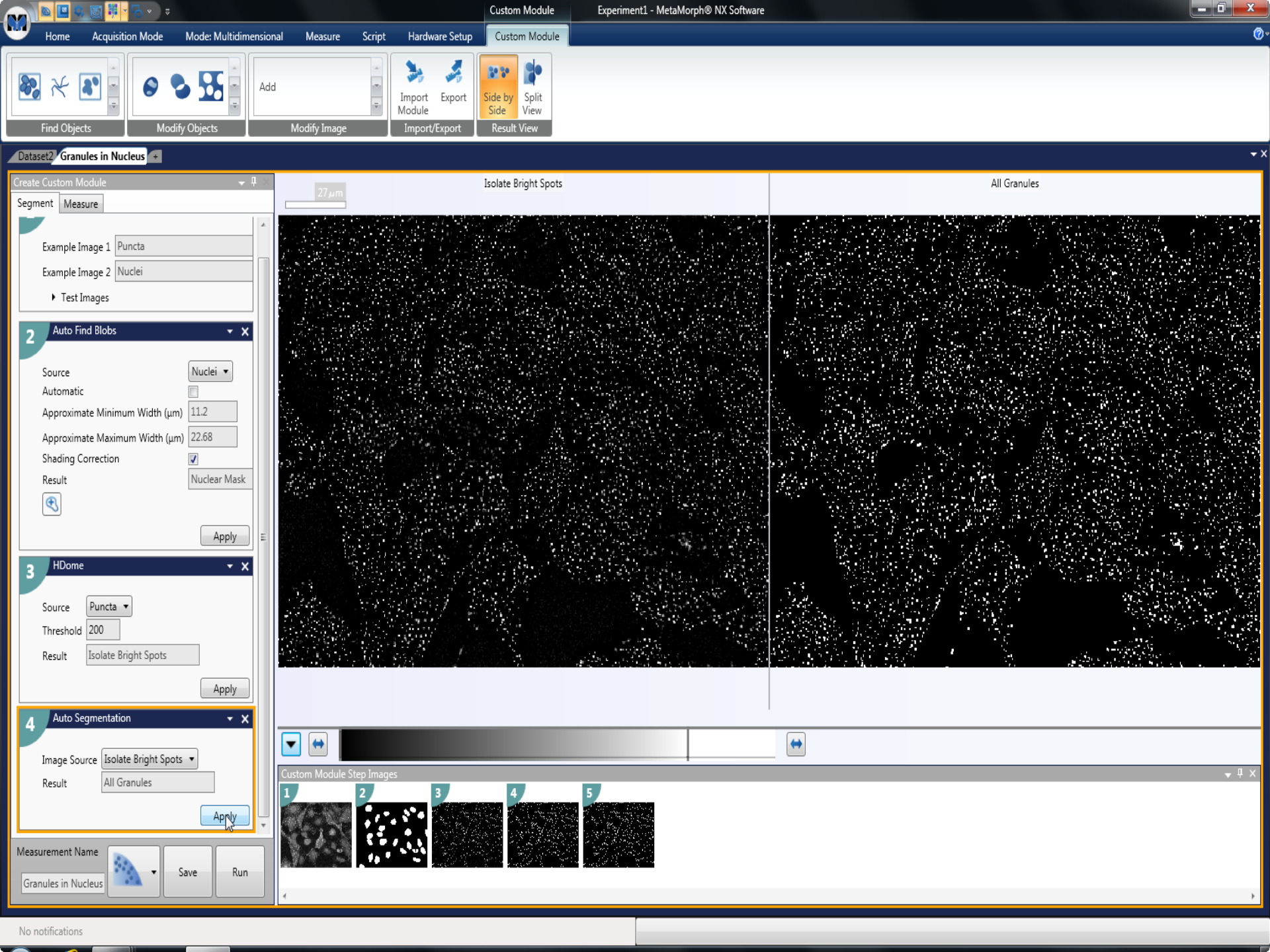
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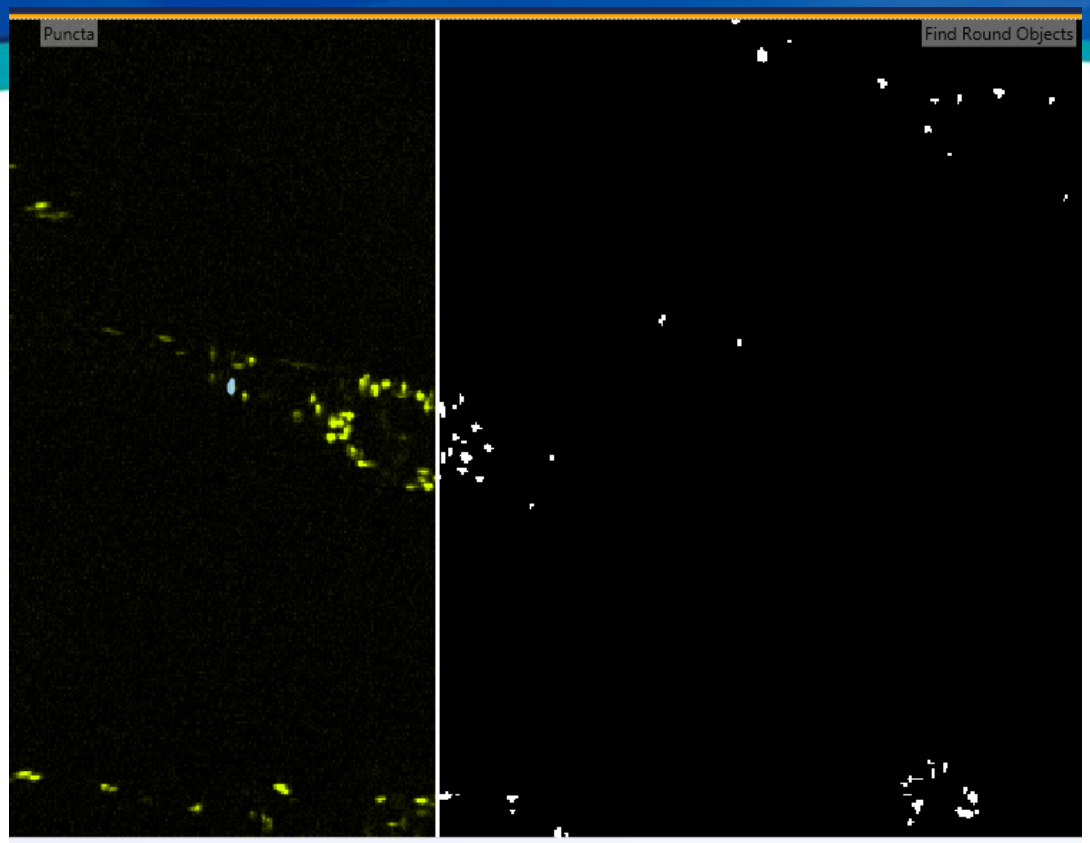
Source
Puncta
Threshold
200
Result
Isolate Bright Spots
Apply
4
Auto Segmentation
Image Source
Isolate Bright Spots
Result
All Granules
Apply
Measurement Name
Granules in Nucleus
Save
Run
27 µm
Isolate Bright Spots
All Granules
Custom Module Step Images
1
2
3
4
5
No notifications

Granules In Nucleus



- How Good Did Segmentation Do
  - Use Side By Side view to see!
  - Slide the Bar left and right to see which spots (on the Left) were turned into objects (on the Right)

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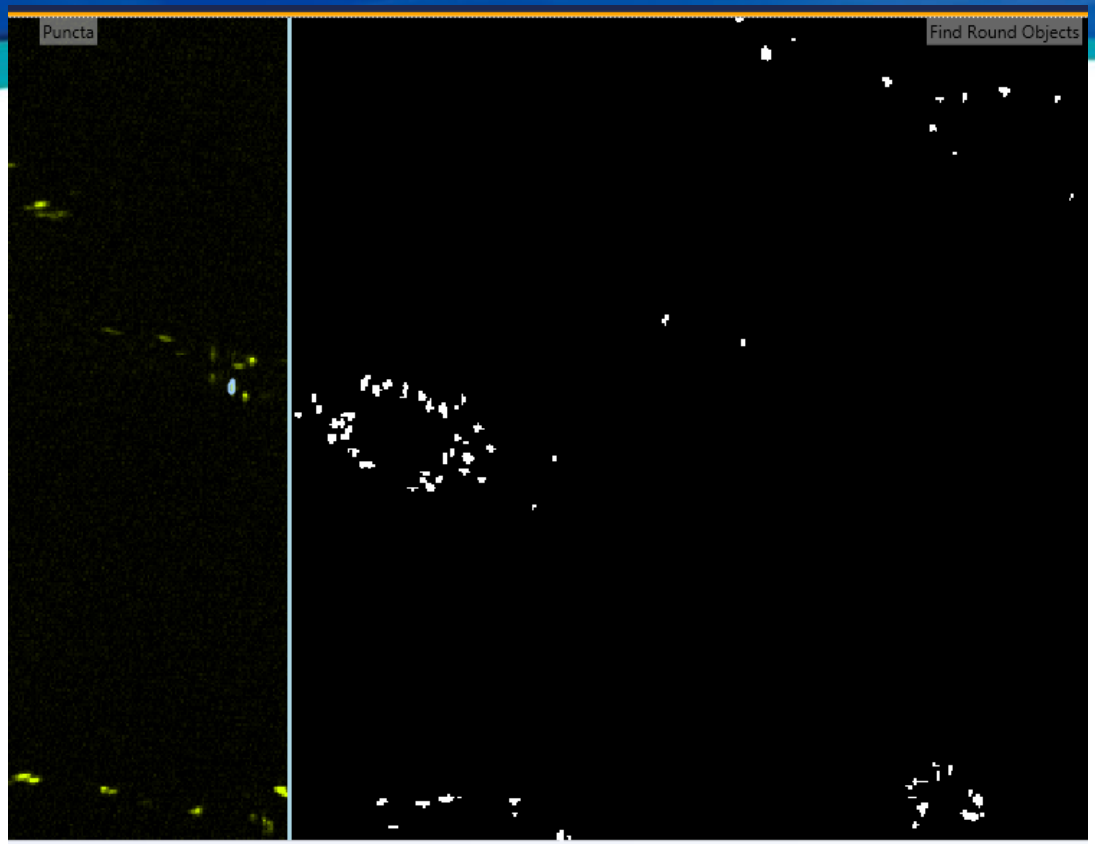
Granules In Nucleus



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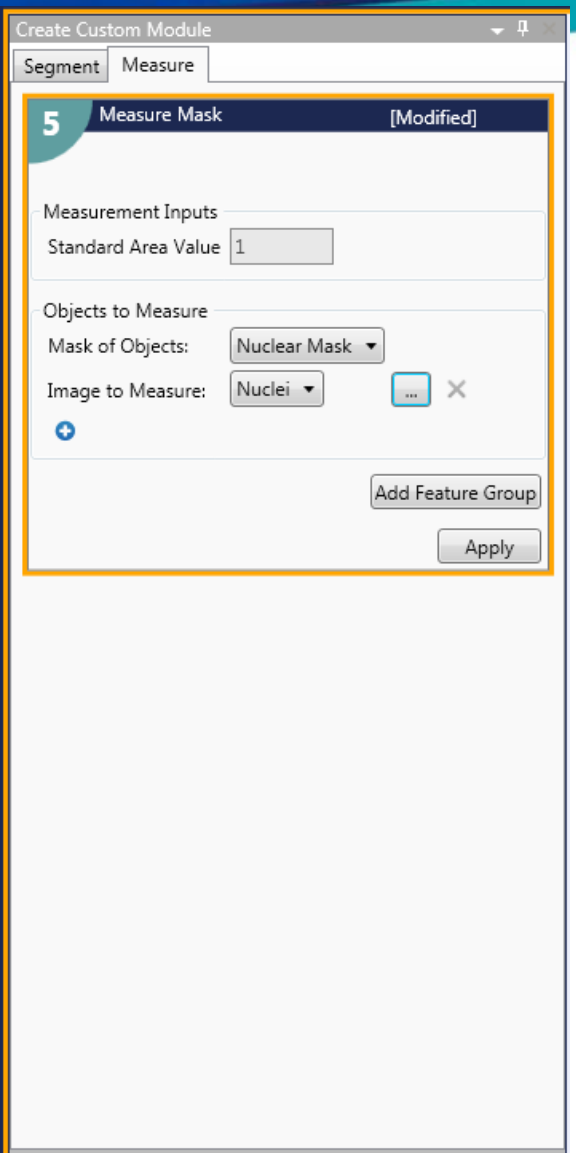
Granules In Nucleus



- Making Measurements: Measure Tab
  - Custom Modules are designed to measure 'Features within Objects'
    - For Example 'Granules within Nuclei'
  - The first step is to measure the outer-borders: the Objects of Interest
    - In this case, the Nuclei
  - In the Object to Measure section:
    - Mask of Objects = Nuclear Mask
      - Define the widest area to measure in
    - Image to Measure = Nuclei
      - Grayscale image to get Intensities from
    - You can measure more than One image using the icon.

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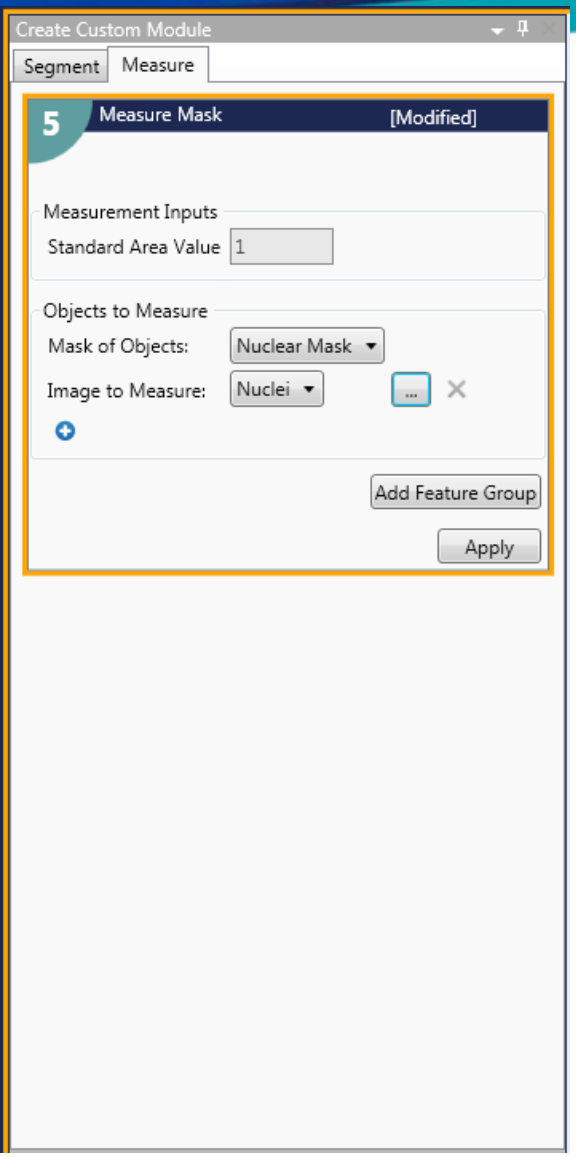
Granules In Nucleus



- Making Nuclear Measurements
  - Press the … button to configure what values gets measured
  - Turn off the Right column of values. They are not needed for the 'Object' measurement.
  - Select which rows to measure from the Left column of values
    - Area, Integrated Intensity, Average Intensity
    - Can re-name the values to be more meaningful

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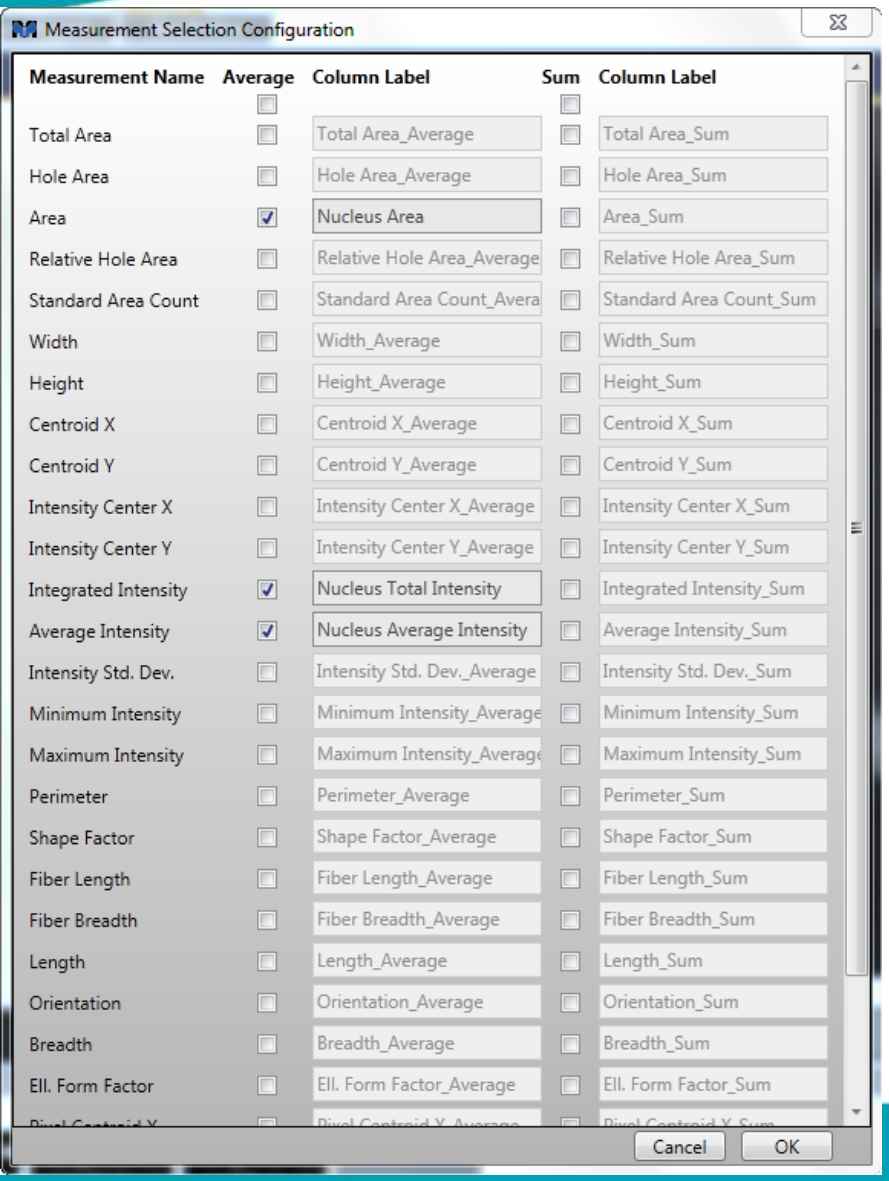
Granules In Nucleus

- Making Nuclear Measurements



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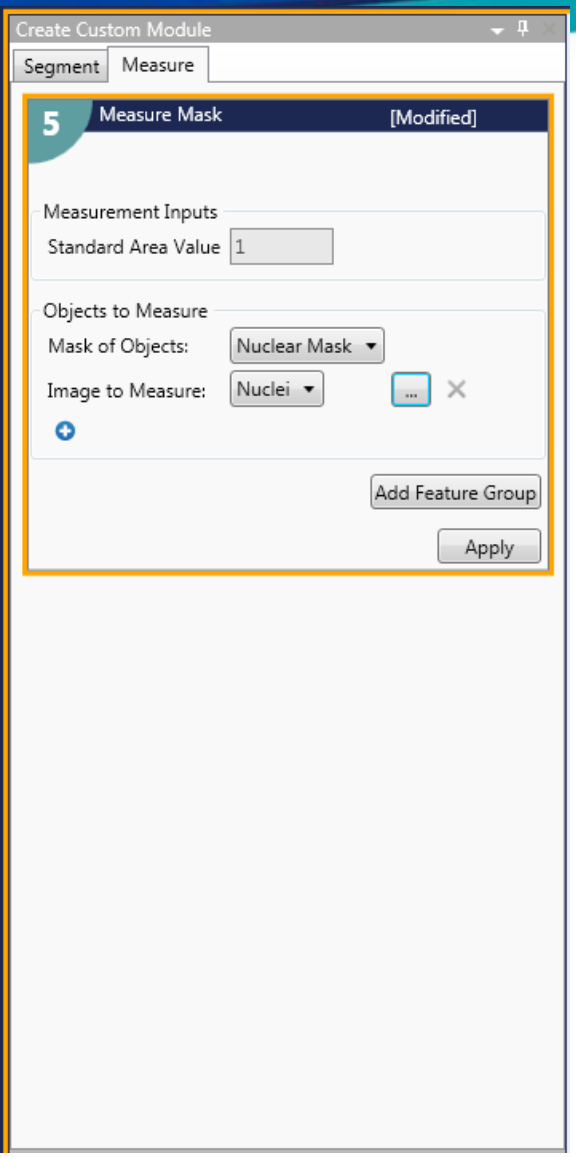
Granules In Nucleus



- Making Granule Measurements
  - The Granules are ‘Features’ found inside the Nucleus.
  - Click on the ‘Add Feature Group button to add an new section for measuring the Granules.
  - Mask of Features = All Granules
  - Image to Measure = Puncta
  - Press … to select which measurements to make on Granules

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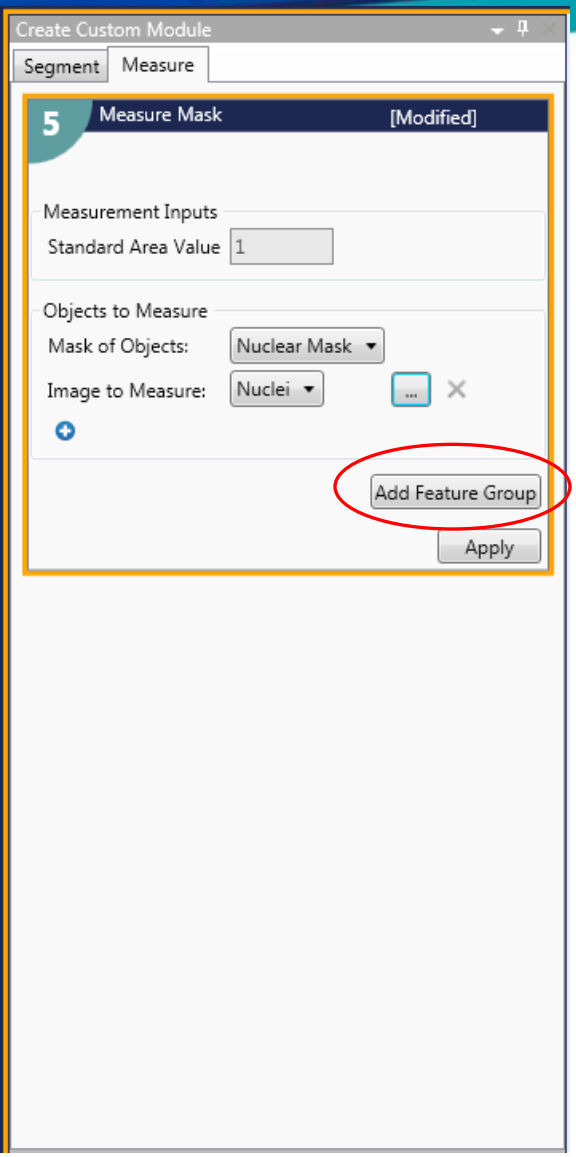
Granules In Nucleus



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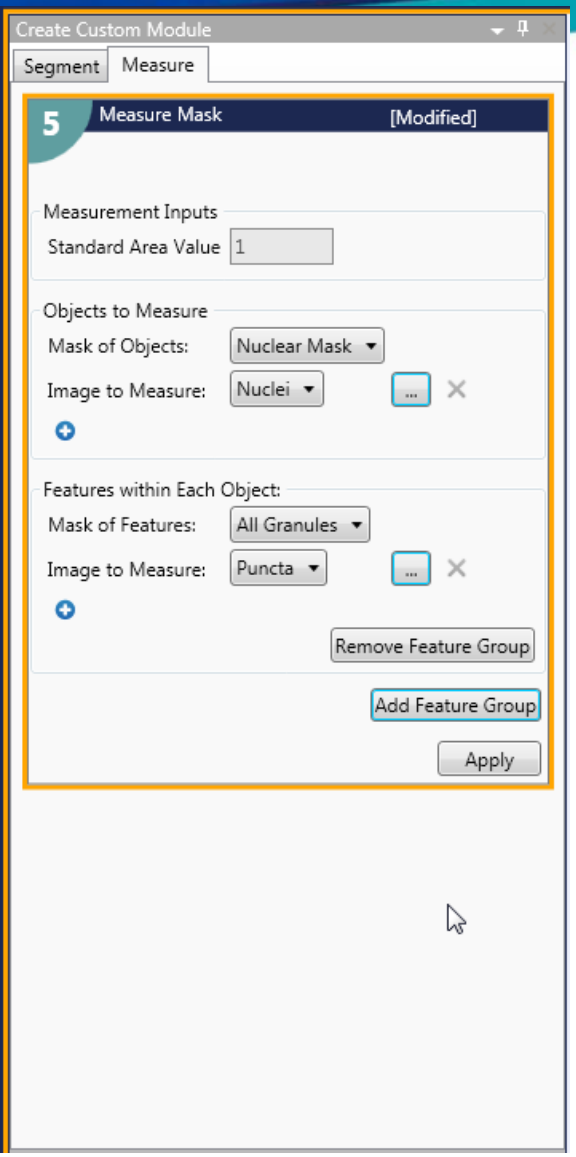
Granules In Nucleus



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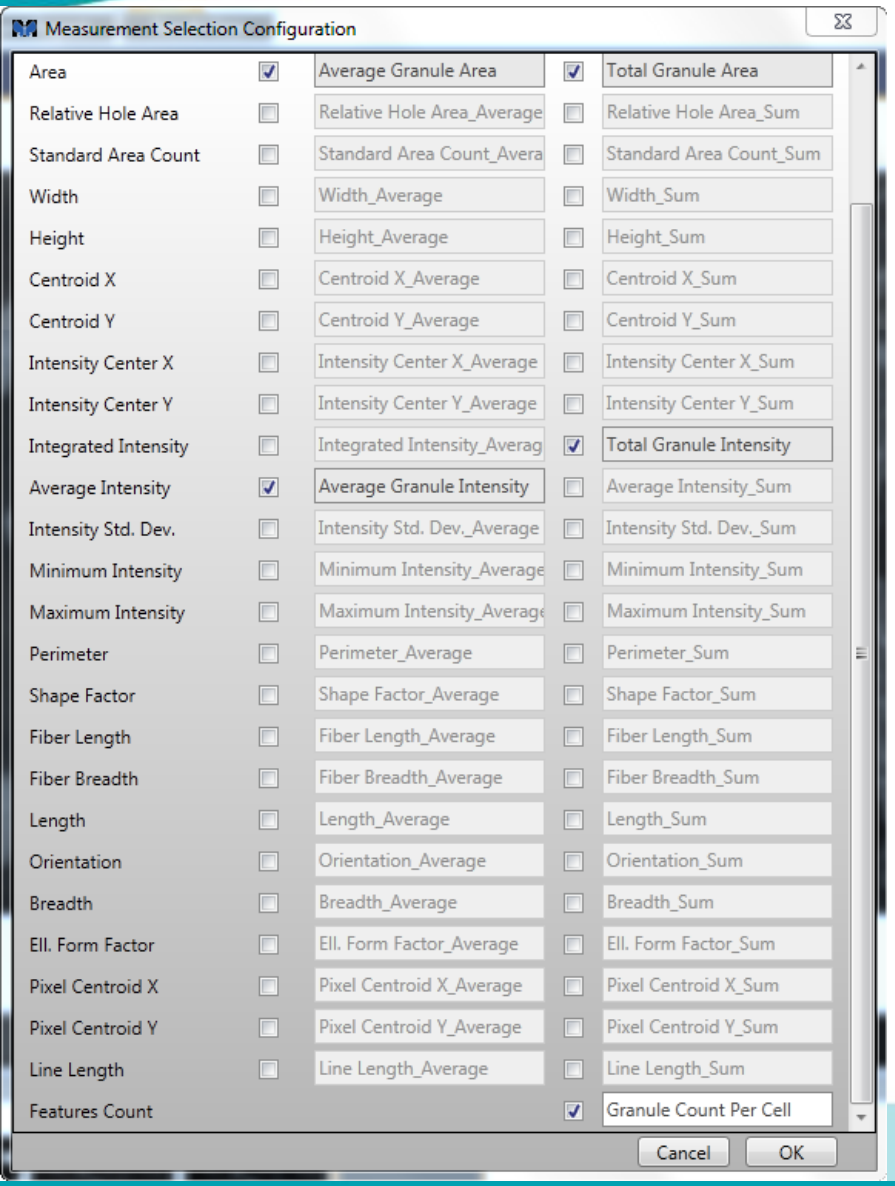
Granules In Nucleus

- Making Granule Measurements



Press … to select which measurements to make on Granules

- The Left Column is the Average of all Features per Object
- The Right Column is the Sum of all Features per Object
  - Area on Left Column = Average Granule Area
  - Area on Right Column = Total Granule Area
- The last measurement on the Right Column is the Count of Features
- Measure:
  - Average / Total Granule Area
  - Average / Total Granule Intensity
  - Total Granule Count

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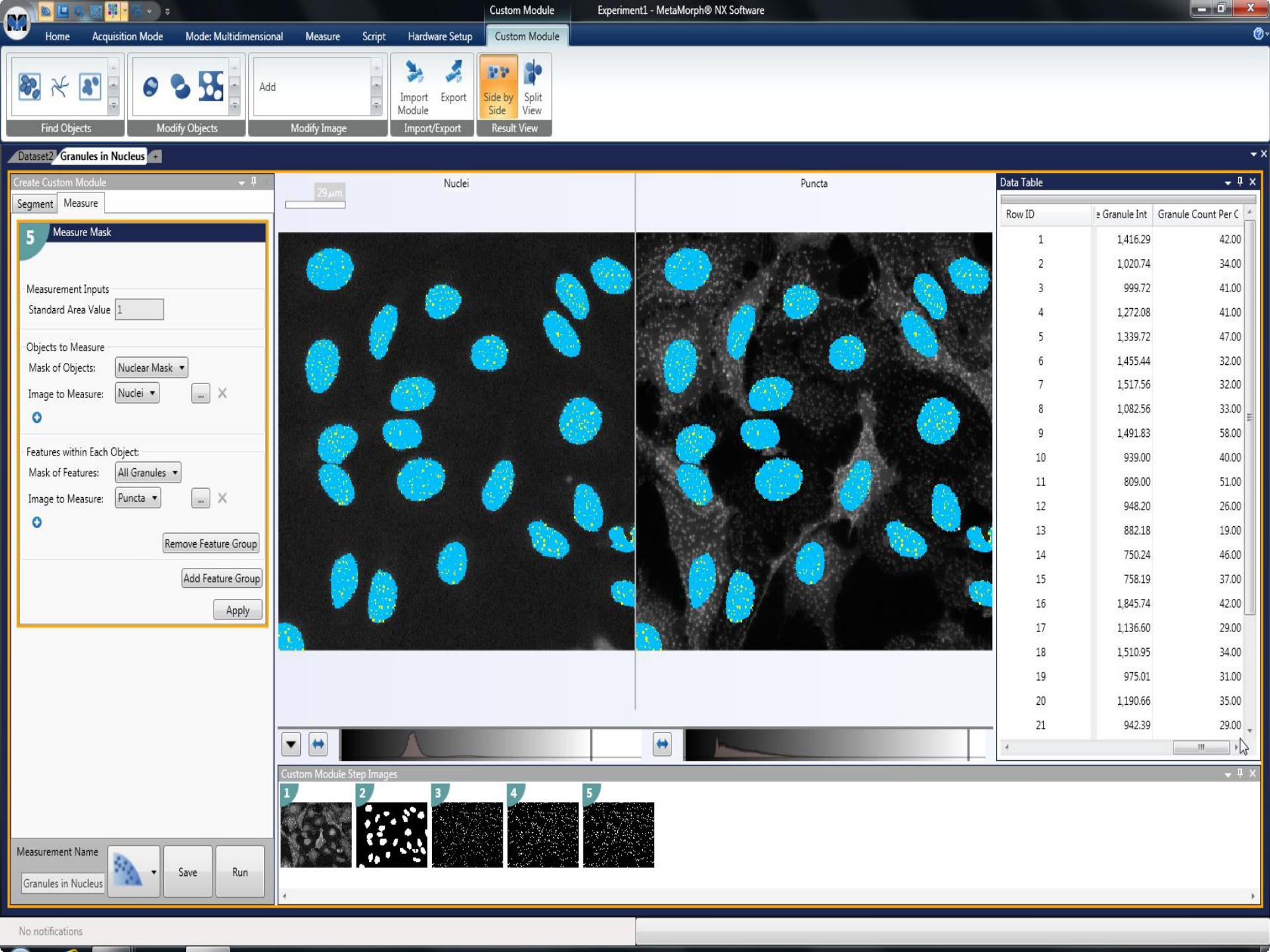
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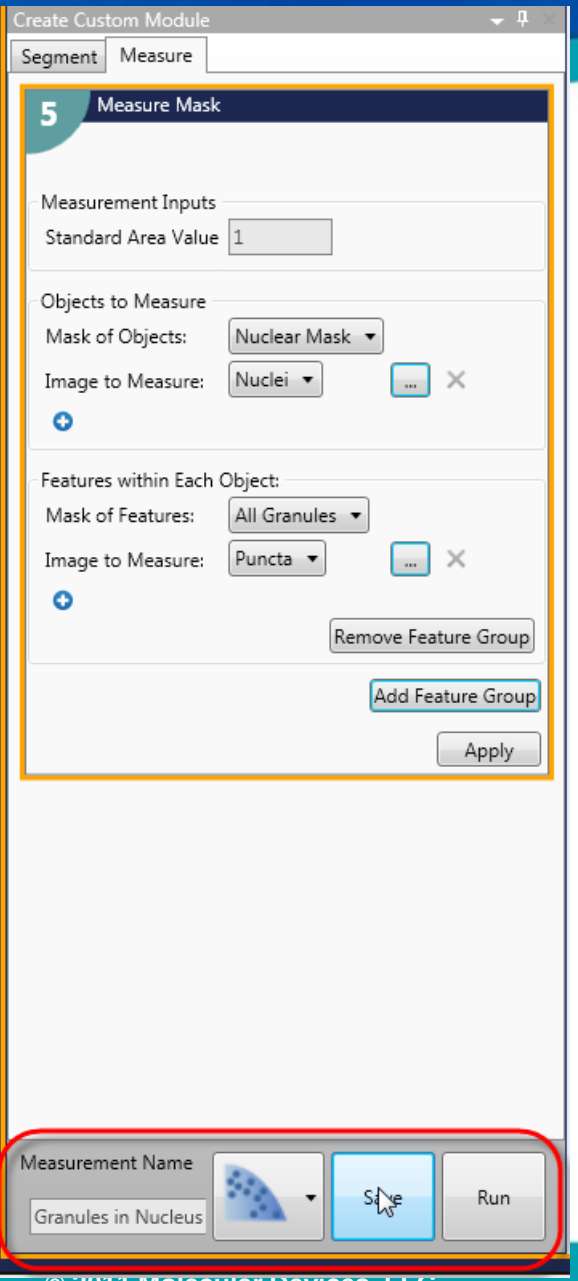
Import/Export
Side by Side
Split View
Result View
Dataset2
Granules in Nucleus
Create Custom Module
Segment
Measure
5
Measure Mask
Measurement Inputs
Standard Area Value
1
Objects to Measure
Mask of Objects:
Nuclear Mask
Image to Measure:
Nuclei
Features within Each Object:
Mask of Features:
All Granules
Image to Measure:
Puncta
Remove Feature Group
Add Feature Group
Apply
Measurement Name
Granules in Nucleus
Save
Run
29 µm
Nuclei
Puncta
Data Table
Row ID
Granule Int
Granule Count Per C
1 1,416.29 42.00
2 1,020.74 34.00
3 999.72 41.00
4 1,272.08 41.00
5 1,339.72 47.00
6 1,455.44 32.00
7 1,517.56 32.00
8 1,082.56 33.00
9 1,491.83 58.00
10 939.00 40.00
11 809.00 51.00
12 948.20 26.00
13 882.18 19.00
14 750.24 46.00
15 758.19 37.00
16 1,845.74 42.00
17 1,136.60 29.00
18 1,510.95 34.00
19 975.01 31.00
20 1,190.66 35.00
21 942.39 29.00
Custom Module Step Images
1
2
3
4
5
No notifications

Granules In Nucleus



- Saving the Custom Module
  - At the bottom of the Module, provide a Measurement Name
  - Select from a list of icons to display for the measurement
  - Save the measurement to add it to the list of Modules
  - Then close the Custom Module dataset view

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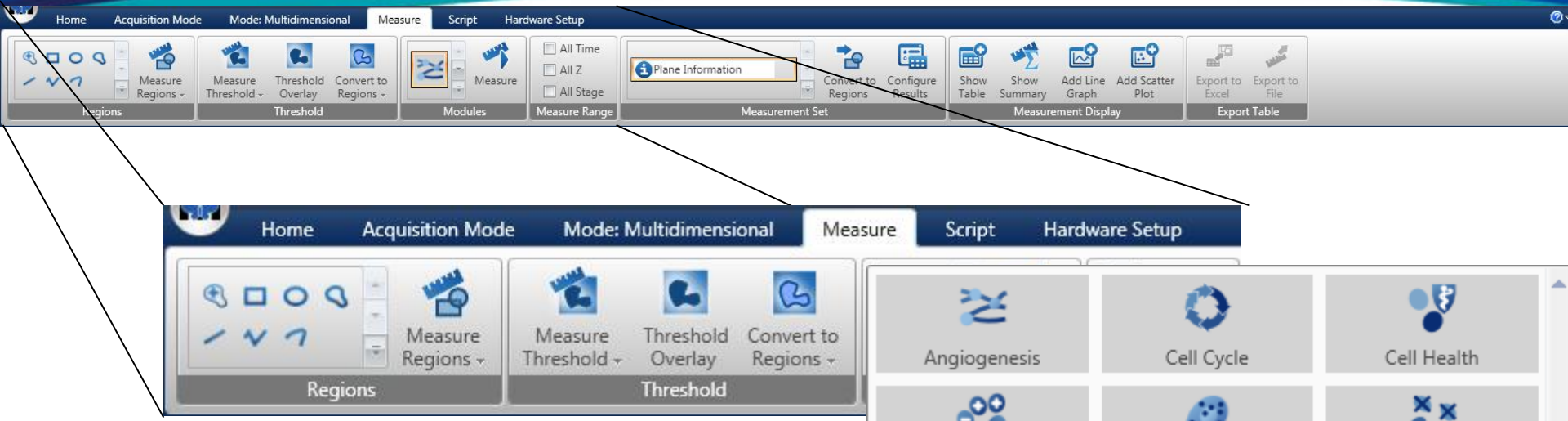
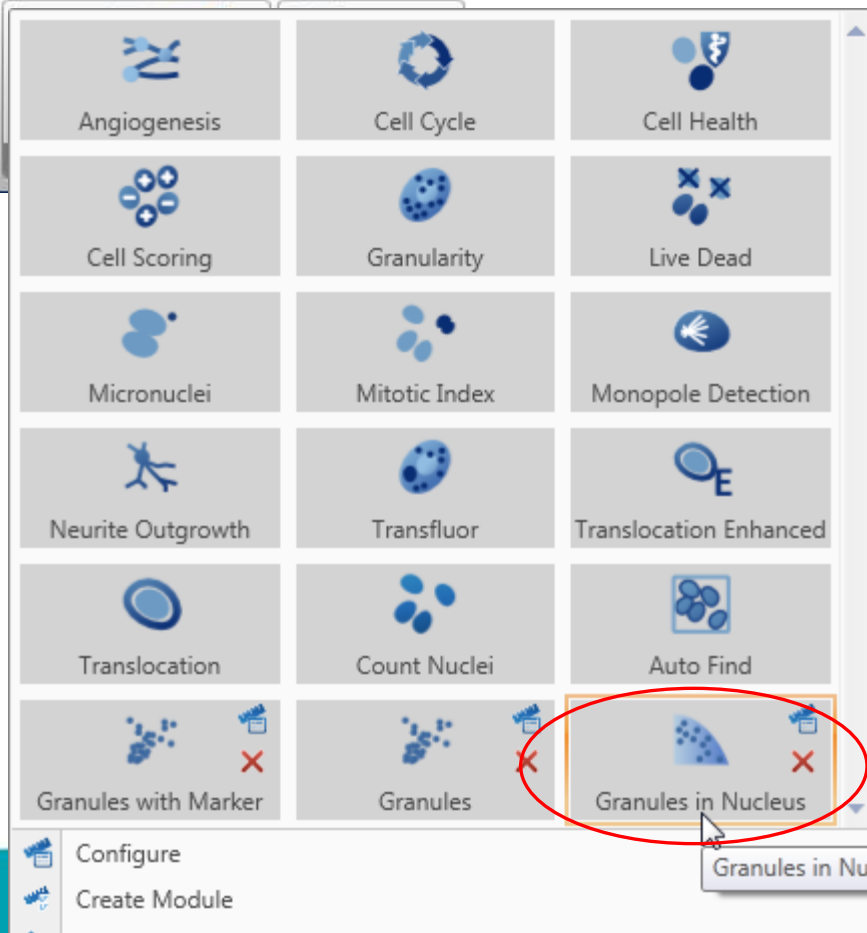
Modules





- Running a Custom Module
  - Select the Module you made from the same list as the Application Modules
  - Click on it in the Ribbon
  - Assign Images
  - Run Measurement

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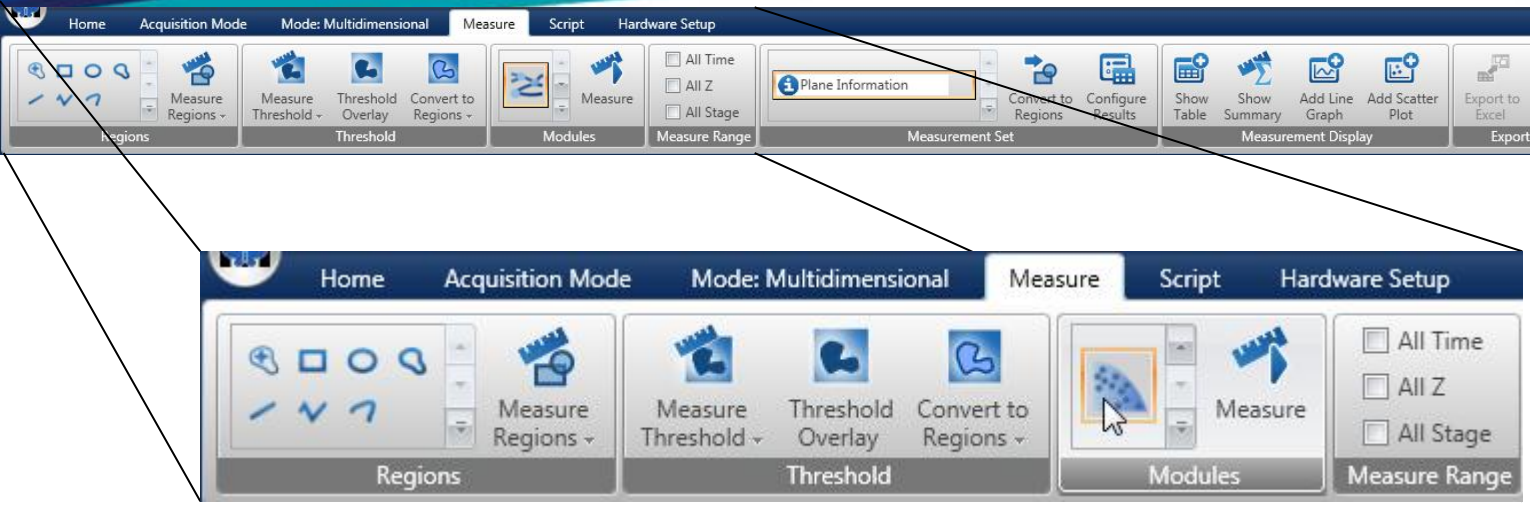
Modules



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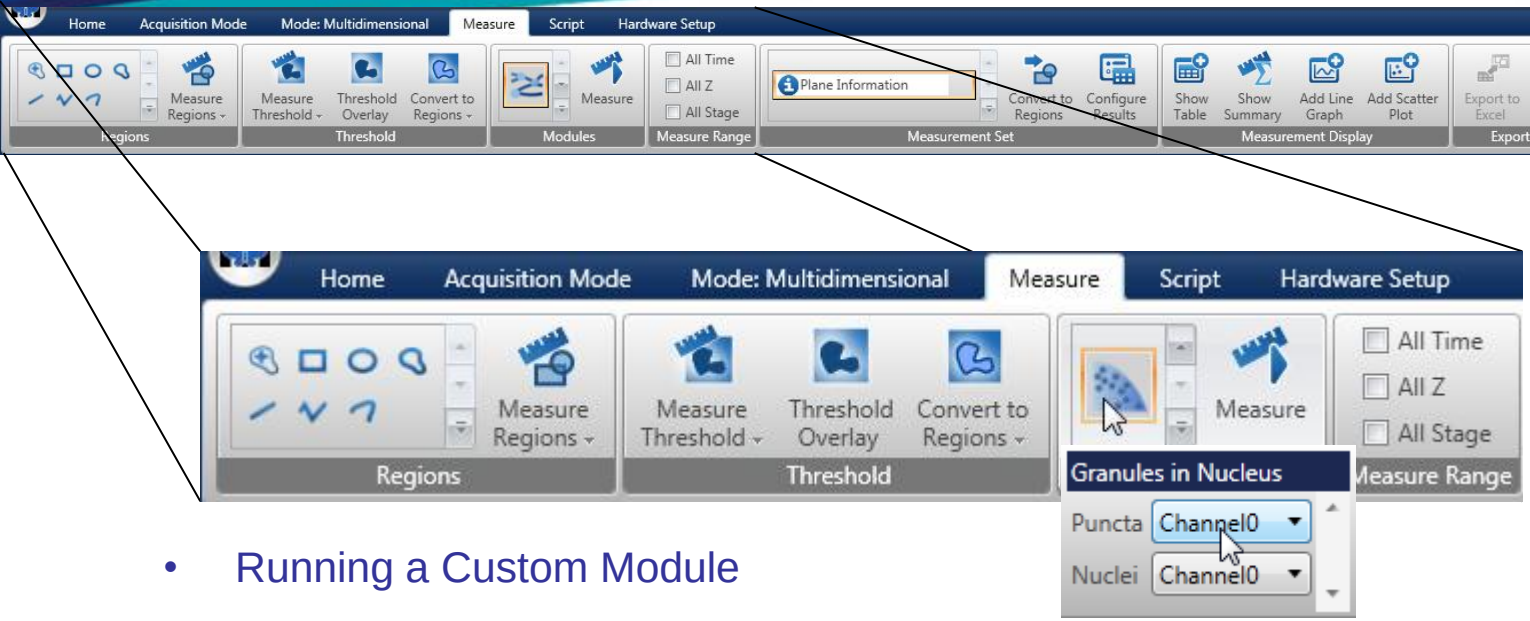

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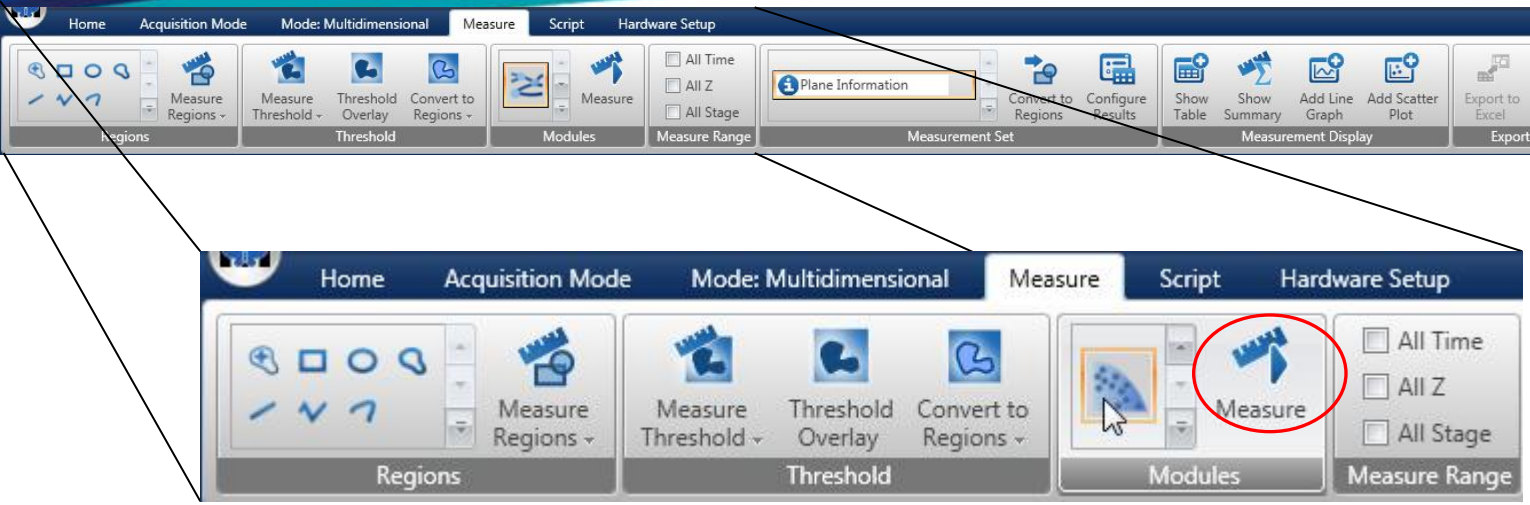

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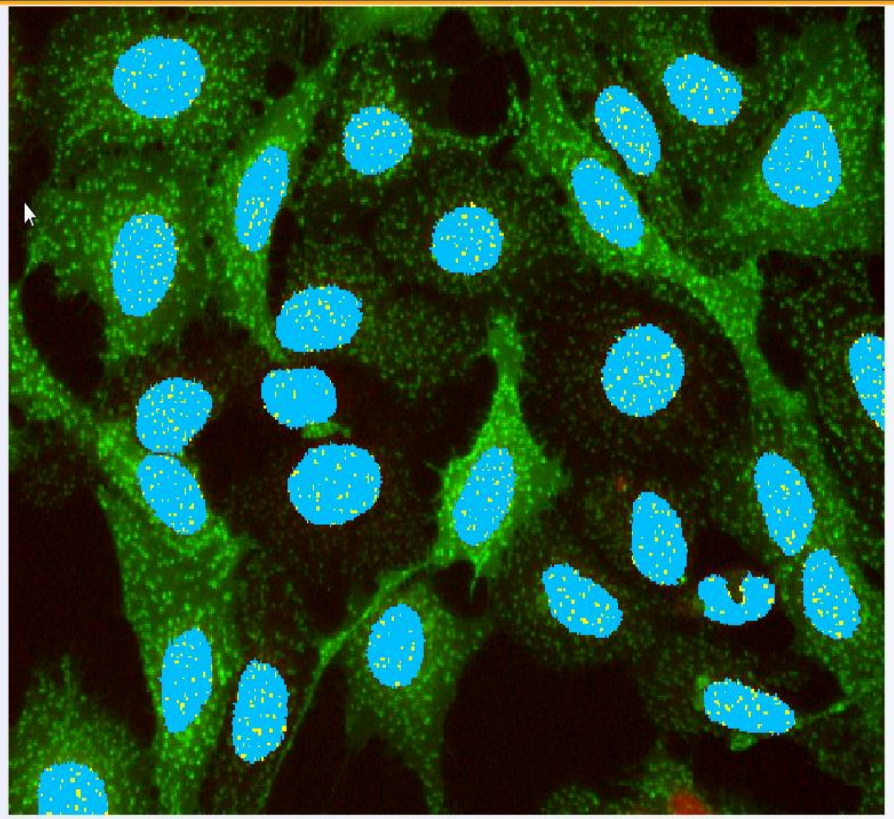
Experiment1 - MetaMorph® NX Software

Home | Acquisition Mode | Mode: Multidimensional | Measure | Script | Hardware Setup

Regions: Measure Regions
Threshold: Measure Threshold | Threshold Overlay | Convert to Regions
Modules: Measure
Measure Range: All Time | All Z | All Stage
Measurement Set: Granules in Nucleus 2 | Granules in Nucleus 3 | Convert to Regions | Configure Results
Measurement Display: Show Table | Show Summary | Add Line Graph | Add Scatter Plot
Export Table: Export to Excel | Export to File

Dataset2



Single Image | Time 0 of 0-0 | Z 0 of 0-0 | 7, 83 | 453 | 129

Filmstrip

View Mode: Dataset

No notifications

This part of the presentation will be handled in software

Process images based on shapes and sizes

Morphology Filters