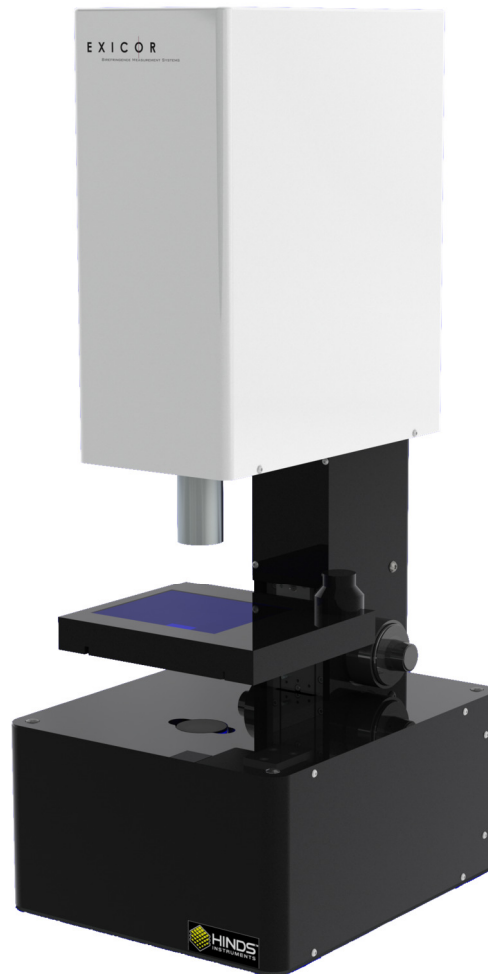


# EXICOR<sup>®</sup> MICROIMAGER<sup>™</sup>

BIREFRINGENCE MEASUREMENT SYSTEM

## USER MANUAL



Hinds Instruments, Inc.  
P/N: 010-0000-077 UM Rev D

Software 025-0000-075 Beta Version

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The Exicor<sup>®</sup> MicroImager has Patents Pending.

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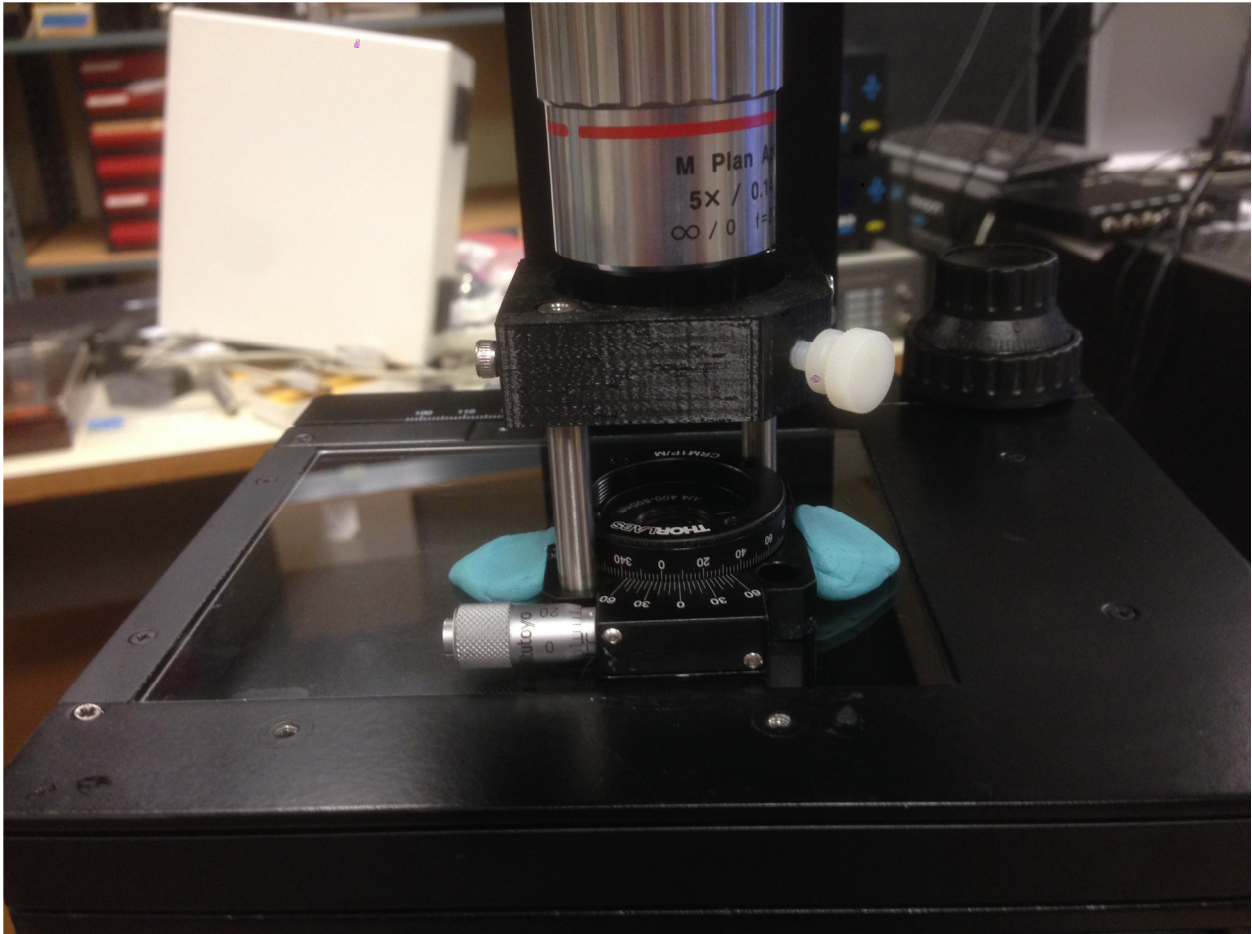
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# Operator Safety Summary

The general safety information in this summary is for operators of the Exicor® Micro Imager. Specific warnings and cautions may be found throughout the manual where they apply but may not appear in this summary.

---

## Terms

**DANGER** statements identify conditions or practices that will result in personal injury or loss of life.

**WARNING** statements identify conditions or practices that could result in personal injury or loss of life.

**CAUTION** statements identify conditions or practices that could result in damage to the equipment or other property.

**NOTICE** statements identify conditions or practices that are important in proper use of the equipment to get the expected results.

---

## Labels

The system identification label below is placed on the rear of the MicroImager frame.

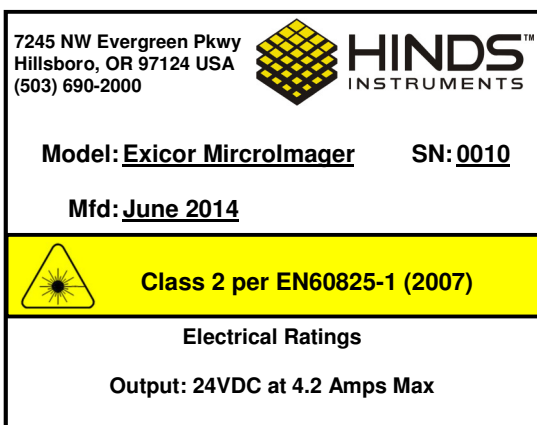


Figure 1 System identification label

The wording on this label is:

Model No. \_\_\_\_\_, Serial No. \_\_\_\_\_, Manufactured: \_\_\_\_\_.

---

## Power Source

This product is intended to operate from a power source that will not apply more than 250 volts rms between the supply conductors or between either the supply

conductor and ground. A protective ground connection by way of the grounding connector in the power cord is essential for safe operation. The user should supply power to the system that will provide at least the following amount of current at the corresponding supply voltage:

**100-240VAC, 50/60Hz, 1.5A MAX**

The Microlmager system uses a single AC power cord to power a DC power brick. If the power cord needs to be replaced for any reason, make sure that the replacement cord is rated for the voltage and current noted above

---

## Do Not Operate without Covers

To avoid personal injury, only operate this product with all covers and panels installed.

---

## Light Safety

The light source is located in the bottom module of the system. It is a 3 wavelength LED that outputs <1mW. Removing any covers (all of them require tools) can expose a user to the LED light. The light beam path is shown in Figure 2.

### CAUTION

Avoid direct eye exposure to the beam and to reflections from shiny objects.

This or any other low power LED can cause a temporary inability to see clearly, much as is experienced by exposure to the flash of a camera.

Use of controls or adjustments or performance of procedures other than those specified herein, may result in hazardous LED light exposure.

Persons other than qualified maintenance personnel should not unnecessarily remove covers.

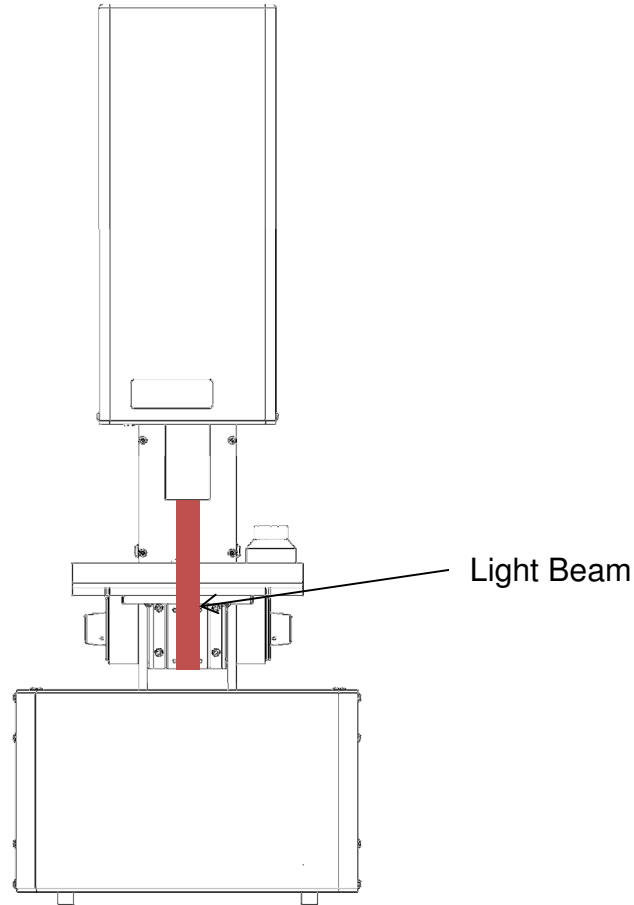


Figure 2 Light beam path

---

## Mechanical Safety

Be careful to have hands clear of any pinch points while operating the focus block and sample stage.

---

## Electrical Safety

Rear panel outlets, other than the DC input are only USB 3.0 connectors which do not exceed 5 Volts.

The Exicor<sup>®</sup> Microlmager contains no user-serviceable components. Refer any maintenance or adjustment needs to Hinds Instruments, Inc.

Do not allow any liquids to get inside the equipment.

Maintenance of the other elements of the system should be referred to Hinds Instruments, Inc. or other trained personnel.





# System Overview

The Exicor<sup>®</sup> Microlmager is a highly sensitive polarization imaging system that utilizes different microscope objectives to image very small features of samples. It measures Retardation and fast axis angle. Samples need to be flat and transparent to the wavelength that is being used.

---

## System Description

Listed below are the main components of the system. See Figure 3 for the component layout.

**Top Module:** The Top Module houses the top half of the optical components of the imaging system.

**Focus Block:** The Focus Block has both fine and coarse adjustment knobs. Use the larger outer knob to adjust the coarse focus and the smaller inner knob to adjust the fine focus.

**Bottom Module:** The Bottom Module houses the electronics of the system as well as the bottom half of the optical train of the system. The bottom half also houses the light source.

**Sample Stage:** The Sample Stage can be moved in the vertical direction by the focus block while having an X travel of 76mm and a Y travel of 50mm.

**Microscope Objective:** The Microlmager comes with a variety of different options in objectives. Most commonly in 2X, 5X, and 10X. To use a different objective, simply unscrew the current objective and replace it with the desired objective. The focus block may need to be readjusted to bring the sample back into focus.

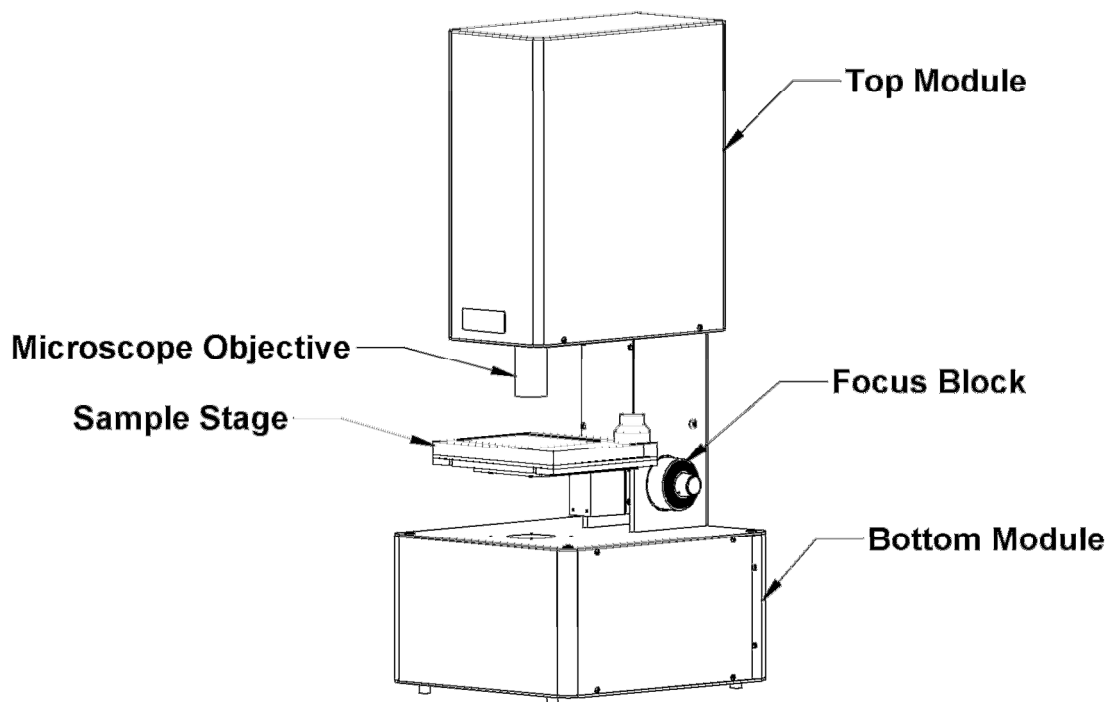


Figure 3 System main components

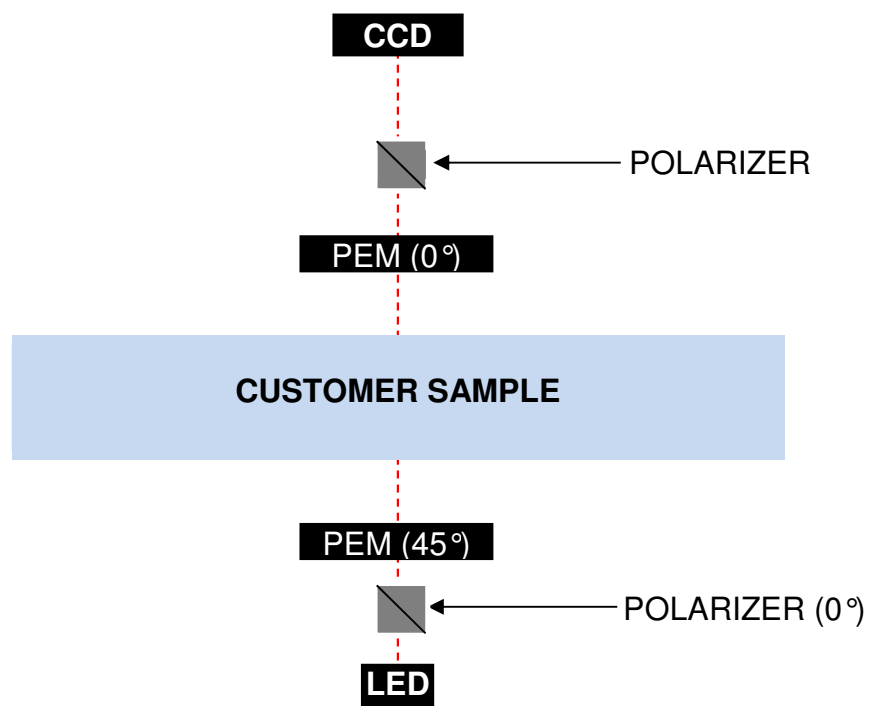
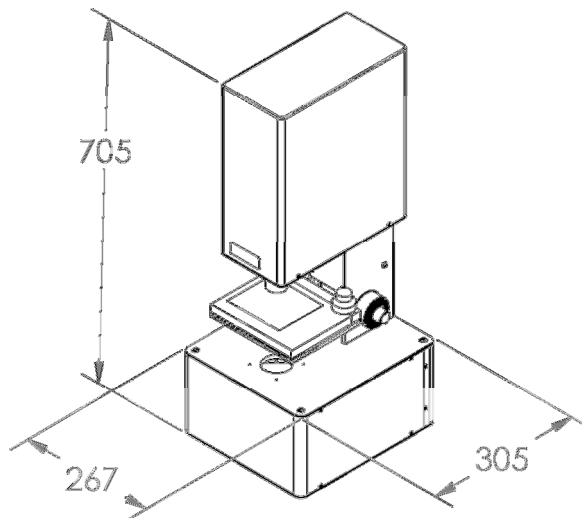


Figure 4 Main optical components of the system

---

## General Dimensions

Units: mm



*Figure 5 Dimensions*



# ***System Operating Requirements/Setup***

---

## **Component Placement**

The computer and monitor need to be placed within 0.5 meter of the system to facilitate connection of all hardware control cables.

The system uses a fan to keep internal electrical components located in the base of the system cool. The system must be placed such that airflow from the rear panel is not restricted.

---

## **Power Connections**

The Exicor<sup>®</sup> MicroImager system is designed to use an external DC power supply that outputs 24VDC while accepting 100-240VAC, 50/60 Hz. User adjustment should not be necessary for any internal components due to changes in power.

The Exicor<sup>®</sup> MicroImager system requires a single power outlet. The computer and monitor need to be powered separately from a user-supplied wall outlet or outlet strip.

---

## **Calibration**

The Exicor<sup>®</sup> MicroImager has been calibrated by Hinds Instruments, Inc. prior to shipment. The instrument should require no further adjustment for most applications. Regularly zeroing the system will ensure the best low level sensitivity for all measurement parameters.

**Note:** All systems sold by Hinds Instruments are currently installed and supported only through Hinds Instruments, Inc. and authorized distributors.



# 3

## *Operating The System*

### **WARNING**

The Exicor® MicroImager contains hazards such as: bright visible light and pinch points.

All operators should be aware of the location of the main power switch

To ensure continued safety, all operators should familiarize themselves with the Operators' Safety Summary section, beginning on page vii.

---

### **System Initialization**

To initialize the Exicor® MicroImager system, starting with the power off:

1. Turn the power switch to the ON position. The power switch is found on the rear panel of the machine.
2. Launch the software by double clicking on the Exicor® desktop icon.

During hardware initialization, the user might notice the LED and camera will initialize using the settings from the previous use.

If there are no errors during the initialization phase, the main window will come up as shown in Figure 6.

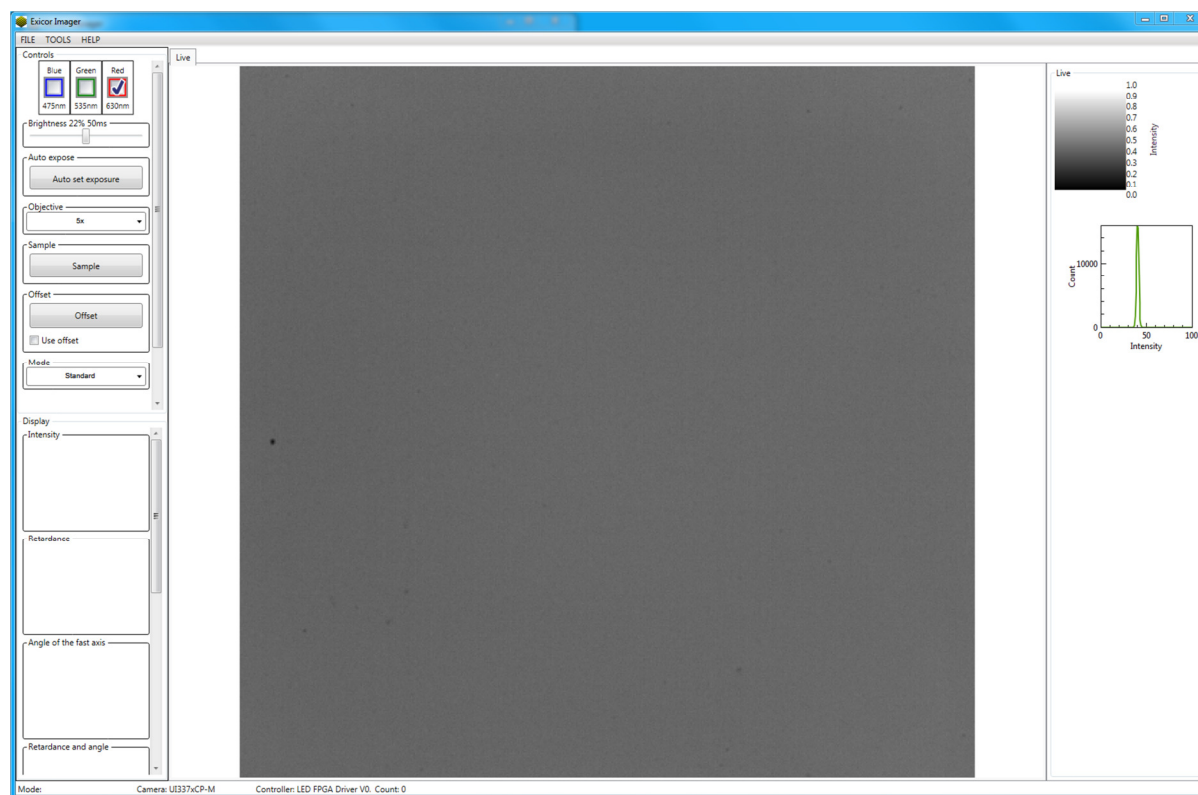


Figure 6 Main Window

If an error is witnessed during the initialization phase, see section 7 “Troubleshooting & Help” on page 50 for system initialization errors.

To start the system if the hardware has already been powered up, such as from a computer restart, simply start the software.

## Loading a Sample

This system includes a basic manually operated sample stage. The best way to get reproducible measurements is to make a custom sample holder that holds the sample and fastens to the stage in a repeatable way. Hinds Instruments can also supply custom sample holders as an option.

Use the following steps to load a sample:

1. Place the sample on the stage. Do not hold the sample to the stage in a way that might put stress on the sample.
2. Using the manual adjusters, move the sample to the desired location on the screen. The adjustment knob controls both the X and Y-axis adjustments. The X-axis is controlled by the bottom part of the knob. The Y-axis is controlled by the top part of the knob. See Figure 7.



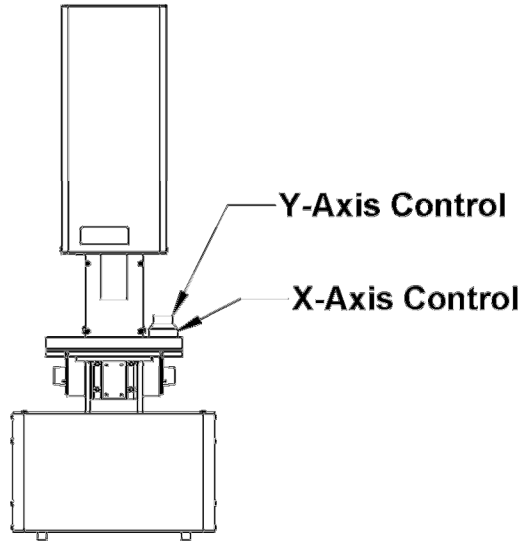


Figure 7 Stage axis controls

**Note:** It is preferable to wait at least 10 minutes before measuring samples after handling in order for the sample to reach thermal equilibrium. Handling the sample can change its temperature temporarily, which may also affect the retardation measurement. The wait time may be different for samples of different sizes or different material.

---

## Measuring a Sample

1. Choose the color of light desired by clicking the corresponding checkbox.
2. Choose the Objective setting corresponding to the objective in the instrument in the objective menu.
  - **Note: The use of an objective on the system that doesn't match the setting will result in inaccurate measurements.**
3. Set the Light Level/Exposure by clicking the Auto Set Exposure Button
4. Click sample on the left side of the screen.

Once the scan starts, there is a status bar at the bottom showing the amount of progress of the scan.

When the scan is complete, the software will switch to the Data tab and display the results as shown in Figure 8.

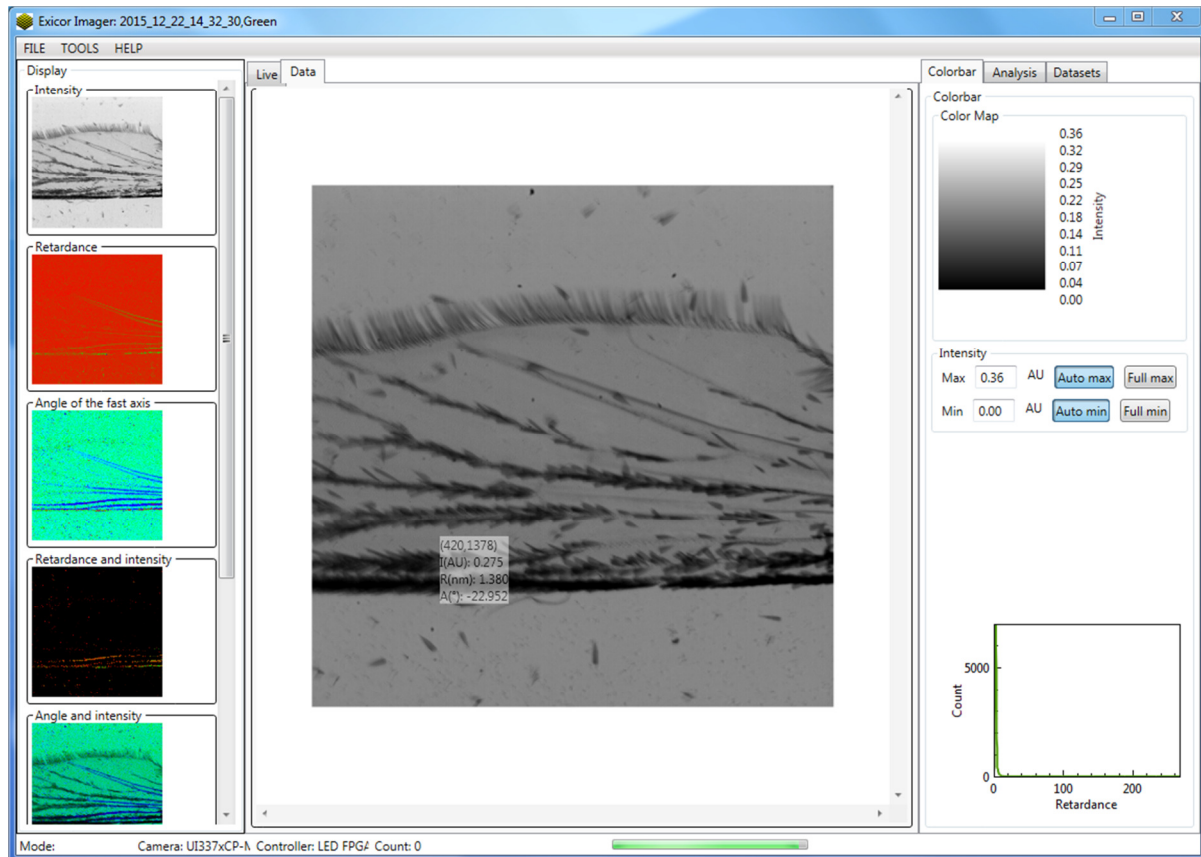


Figure 8 Completed scan

If the data needs to be saved, simply select **File→Save** and select which information to save.

## System Shutdown

1. Close the Exicor<sup>®</sup> software.

Move the start/stop switch to the OFF position. All hardware devices inside the system will shut down. The PC and monitor can be shut down independently if necessary.



# 4

## *Software Interface*

Depending on the options purchased with the Microlmager, different software options may be available. This chapter explains the rest of the software interface in detail, including:

- Calibration
- Opening Files
- Setting Exposure
- Changing Objectives
- Fast Mode
- Offsets
- Display of Data
- Evaluation of Data
- Analysis
- Multi-Order Samples
- Auto-Collect

---

### **Calibration**

The system does not need to be recalibrated on a regular basis but it is up to the user to decide if they want to recalibrate the system. Reasons Hinds Instruments would recommend recalibration include the following:

1. Moving the system from to a different room.
2. Adding additional objectives obtained from Hinds Instruments.
3. There has been a substantial effect of some kind upon the instrument to doubt the calibration.

For more information on how to calibrate the instrument see Section 5 Calibration.

---

### **Opening Files**

To open a file, go to File:Open, and select the corresponding .mic file.

When opening a file when using Auto-Collect, open the batch folder, open the folder of the sample you wish to open, and open the .xml file.

## Setting Exposure

During the calibration, the software determines the optimal setting for the exposure and brightness for a blank sample. Pressing the Auto set Exposure button sets the machine to that value.

If the sample has low transmission, it is possible to use the slider bar to increase the amount of light entering the camera. Left is minimum light and right is maximum light. As you move the slider to the right, first the brightness of the LED increases. When the LED is at maximum brightness, the camera begins to lengthen the exposure to let even more light in. You can move the slider to the right until the optimal brightness is achieved.

However, letting too much light into the camera will cause over exposure. In the LIVE screen this will manifest itself in the pixel becoming red as shown in Figure 9.

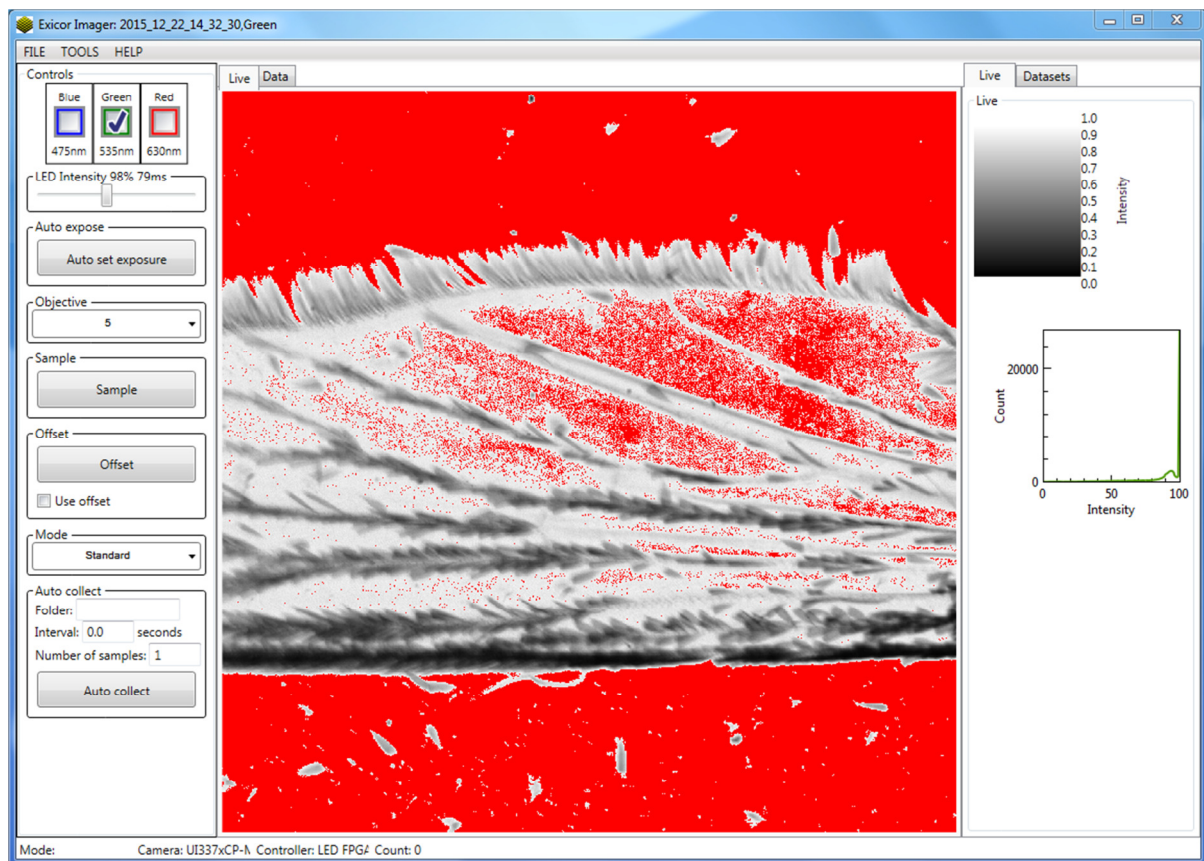


Figure 9 Over exposure Live Screen.

If the sample is taken when over exposed, it will tell you in the Data screen in the upper left corner what percentage of the image was overexposed. An example is shown in Figure 10.

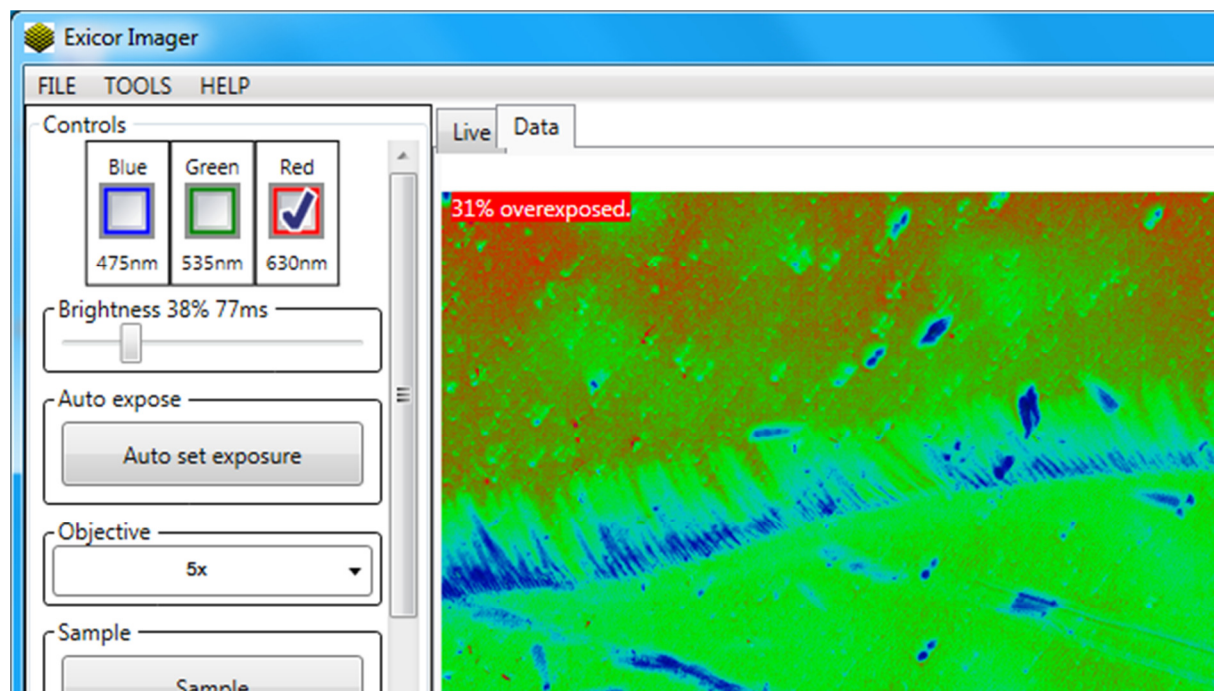


Figure 10 Overexposure Data Screen.

---

## Changing Objectives

It is possible to use any number of objectives with the MicroImager provided that there is a calibration file associated with that objective. To see how to add additional objectives, see Section 5 Calibration.

To change objectives, remove the objective physically from the machine and replace it with the desired objective. Then select the correct objective from the drop down menu. Finally, click the Auto Set Exposure button to readjust the light intensity for that objective.

---

## Fast Mode

If needed, it is possible to collect data faster than in standard mode. However, the noise of the image will increase slightly.

To change from Standard to Fast Mode, click on the drop down menu under Mode to select the desired speed.

---

## Offsets

The offset button is found just below the sample button. Clicking this button will take map the current retardation and angle of the image and then store it in memory to be subtracted later.

After you take an offset, you can choose to use the offset or not by checking the box next to the offset button.

Each color/objective combination will have its own unique offset. For example, if you create an offset for a 2x objective using the red LED, you will only be able to use that offset when the software is set to the red LED and the 2x objective.

---

## Display of data

Data is displayed in 7 Different formats. Intensity, Retardance, Angle, Retardance and Angle, Retardance and Intensity, Angle and Intensity, and all three together.

When displaying single sets of data the color map in the upper right corner provides the legend to change the color scheme of the image. Clicking on the color map brings up the screen shown in Figure 11.

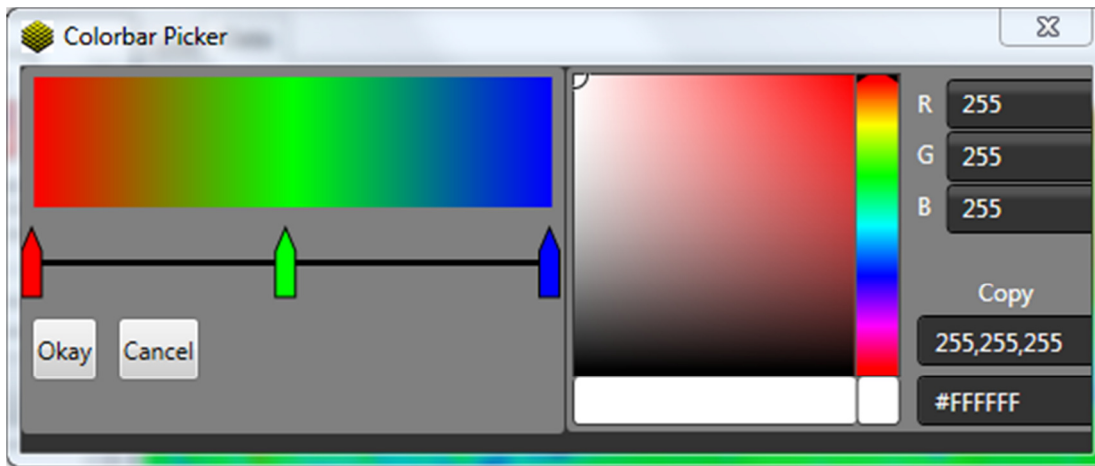


Figure 11 Colorbar Picker.

To change between preset color configurations, such as grayscale, right click on the left colored part and choose the color scheme desired.

To create a custom color scheme, you can add colors by clicking on the slider bar. To choose what color you want a particular marker to be, click on it and then move the selector in the hue generator to pick the color you would like.

To choose the maximum and minimum values of the color map, it is possible to either use an auto setting by clicking the Auto max/min or Full max/min buttons on the right side of the screen or setting custom values. Auto max/min will use the pixels with the lowest and highest values to determine the maximum and minimum.

Using Full max/min will use 0 for the minimum and the systems highest allowed value for the maximum.

## Analysis

To access the data analysis tools, click on the tab in the upper right hand corner. This will bring up a screen similar to what is shown in Figure 12.

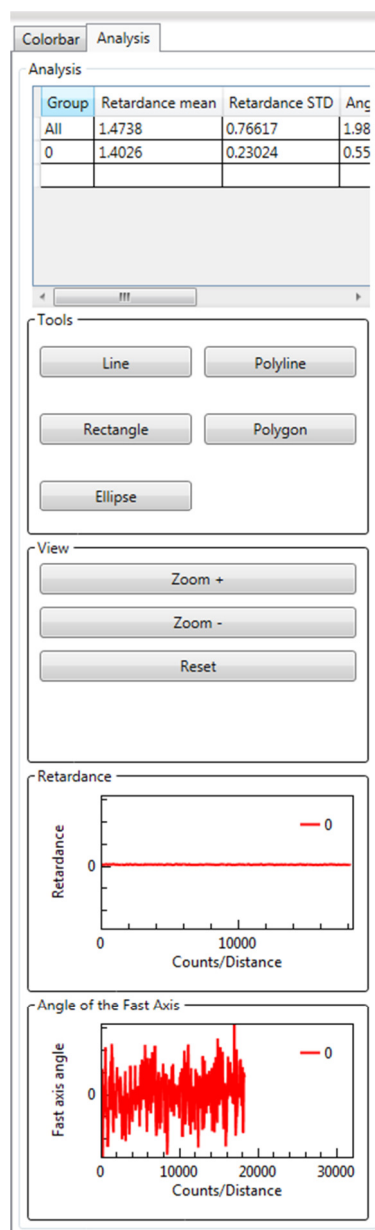


Figure 12 Analysis Toolbar



**Statistics:** Statistics of the current image are found in the upper part of the toolbar. The first row will always have the mean and standard of deviation of the Retardance, angle, and intensity of the entire image. If other shapes are created on the screen then the statistics for each individual group will show up here as well.

**Shape Tools:** Several shape tools for drawing out data from specific parts of the image are available. Examples are shown in Figure 13.

- **Line-** simple two point line. Finished with one click.
- **Polyline-** functions similarly as line, but with multiple vertices. Finished with two clicks.
- **Rectangle-** simple rectangle. Finished with one click.
- **Ellipse-** all manner of round shapes. Finished with one click.
- **Polygon-** multiple lines but will enclose an area. Finished with two clicks.

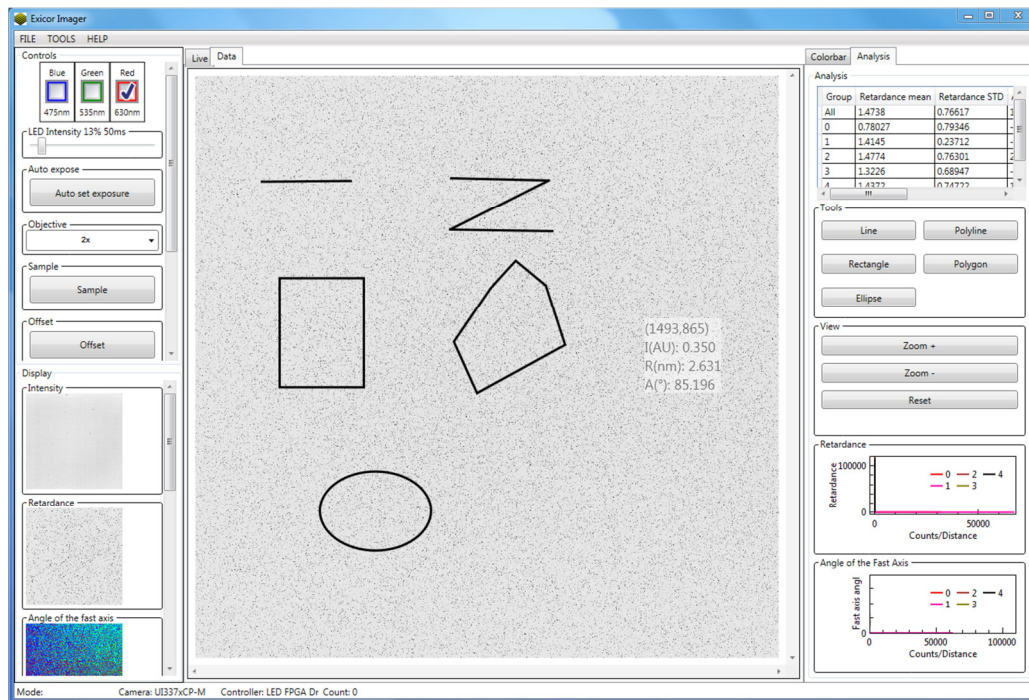


Figure 13 Shape Tool Examples.

**Shape Tool Options:** A variety of functions are available for each shape as well. These are shown in Figure 14 and are accessed by right clicking on the shape.

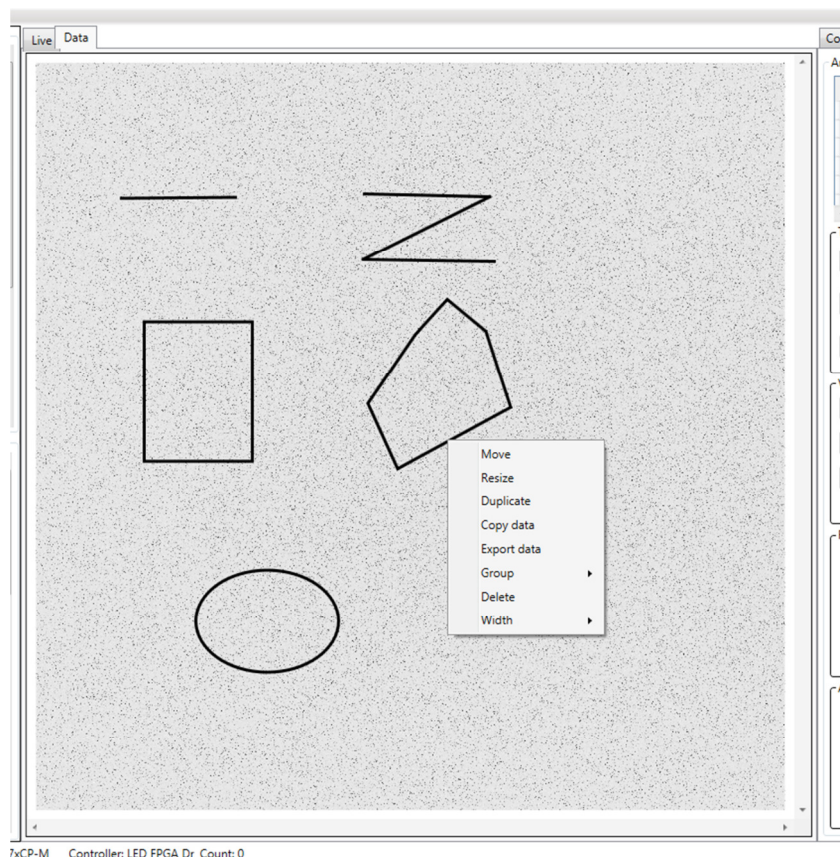


Figure 14 Shape Tool Options

- **Move-** moves a shape from one location to another.
- **Resize-** allows the user to change the size of the shape.
- **Duplicate-** allows the user to create an exact copy of the shape.
- **Copy data-** this copies the histogram output of the shape to the clipboard.
- **Export data-** this creates a text file with the histogram output in it.
- **Group-** allows you to reassign the group number of a shape to include it with another to view the statistics of both (or more) in the statistics box.
- **Delete-** deletes the shape.
- **Width-** changes the width of the line of the shape.

**Histograms:** Histograms for the Retardance and the Angle of the Fast Axis are found at the bottom of the Analysis Toolbar.

The histograms can be manipulated using the mouse.

- Left click brings back the value at that part of the histogram.

- Right click and dragging moves the histogram.
- The scroll wheel allows the user to move in and out.
- Hovering the mouse over either the x or y axis and using the scroll wheel zooms only that axis.
- Clicking and dragging the scroll wheel allows a box to be drawn over a selection and the histogram will zoom to fit.

The histogram for a line plot and a normal shape function slightly differently for now. The line and polyline will have the retardation of each point as the line's length. The normal shapes will show the number of pixels (i.e. counts) at each retardation.

## Multi-Order Samples

Occasionally, there is a need to measure retardation beyond the limit of a single wavelength. To do this multiple wavelengths need to be measured and unwrapped to find the correct order and value of a sample.

To complete this:

1. Measure the exact same area on two, three, or four wavelengths depending on what hardware you have installed on your MicroImager.
2. The datasets (and all previous datasets) will appear in the data sets tab as found in Figure 15.

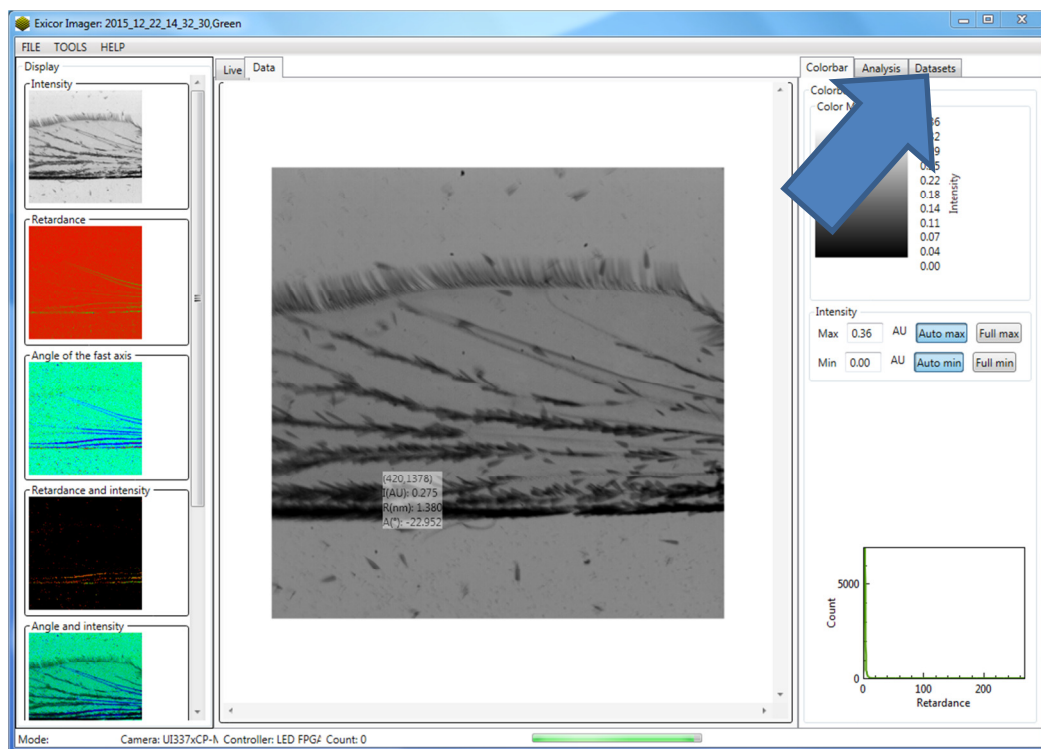


Figure 15 Dataset Tab.

3. After clicking on the tab you will set a screen similar to Figure 16.

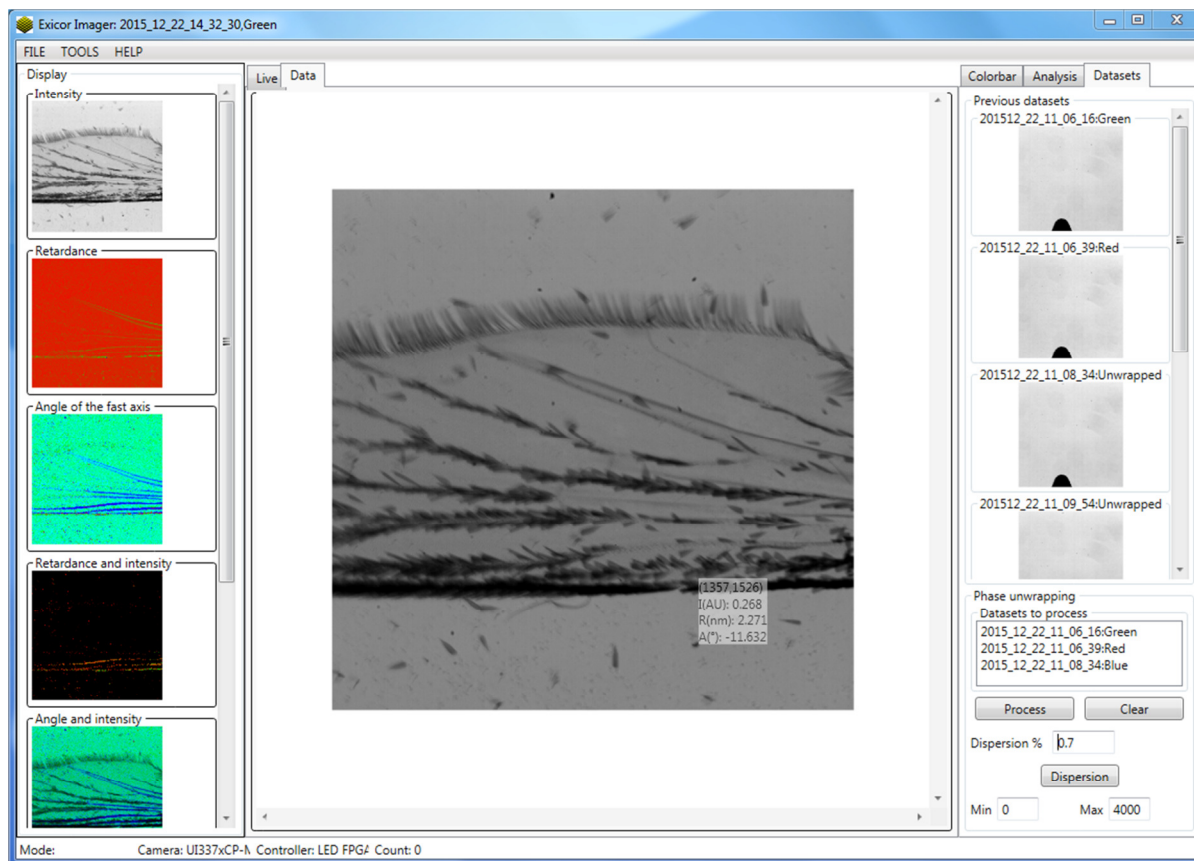


Figure 16 Datasets Window.

4. Although you will see all the previous datasets, click and drag only the datasets that you want to include in the multi-order analysis to the “Datasets to Process” area.
5. Then adjust the minimum and maximum expected retardation values if needed and click process. The maximum value for a three color system is about 4000nm of retardation.
6. It will take some time but the software will process the images and give you a multi-order result.

## Auto-Collect

Sometimes, it is desirable to collect a number of samples with some repeatable amount of time between them. To do this, you can use the auto collect feature. It is found in the bottom left corner as shown in Figure 17.



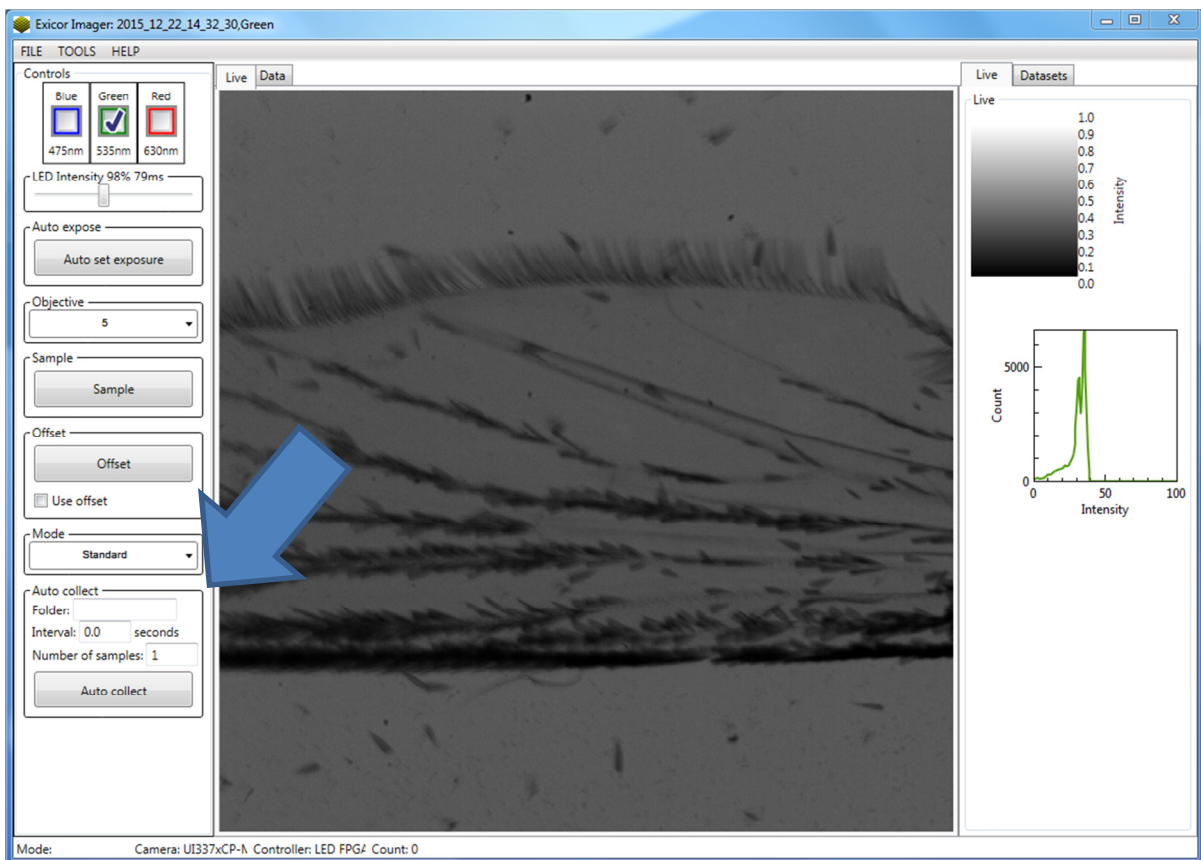


Figure 17 Auto Collect Main Window.

1. Start with click on the box next to “Folder:” This will allow you to choose where to store the files from the measurement.
2. Then input the interval of time in between each scan and the number of samples. Then click “Auto collect.”
3. A window similar to Figure 18 will appear. Click “Start” when ready.

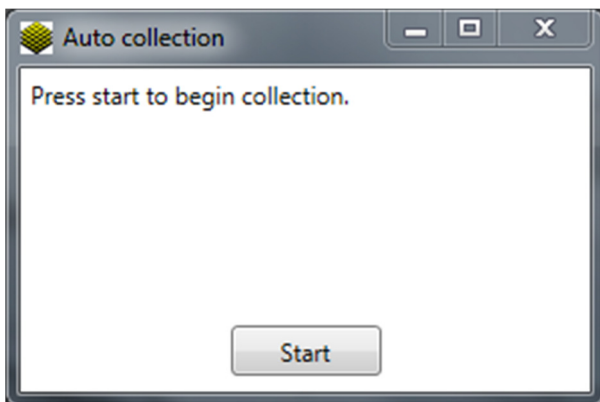
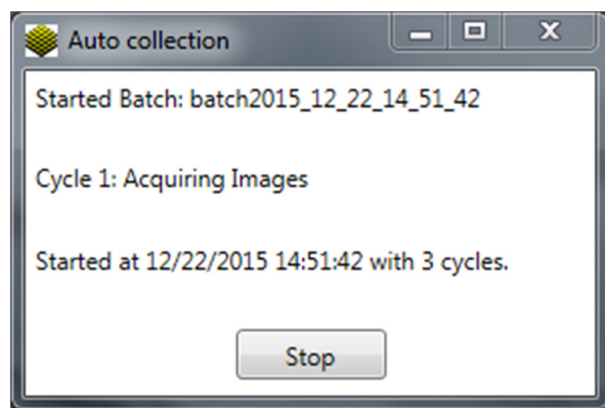


Figure 18 Auto Collect Start Window.

4. While the measurements are running, you will see a window similar to Figure 19. When the measurements are finished, you will see a window similar to Figure 18. If you are finished, simply close out the window.



*Figure 19 Auto Collect Status Window.*

# 5

## *Calibration*

---

### Calibration Procedure

#### Calibration Procedure:

1. First, make sure the stage is level. Measure each edge of the stage as shown in Figures 19 and 20. The stage will move slightly with light to moderate pressure. If it isn't possible to make the stage level, remove the panel behind the stage with a M3 hex wrench, then loosen the stage, level it, and retighten the screws. Check to make sure the stage is level again after retightening the screws.

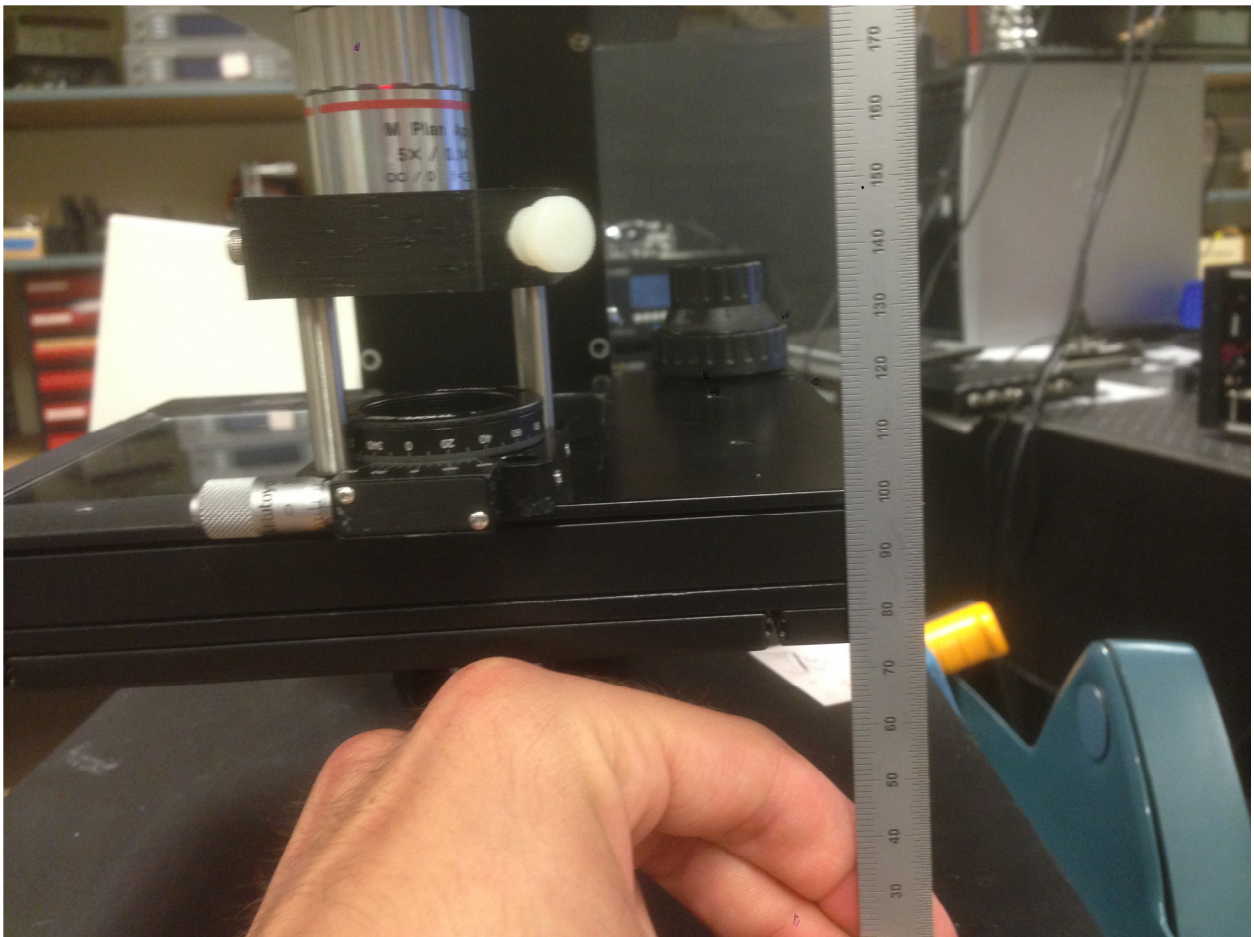


Figure 19.

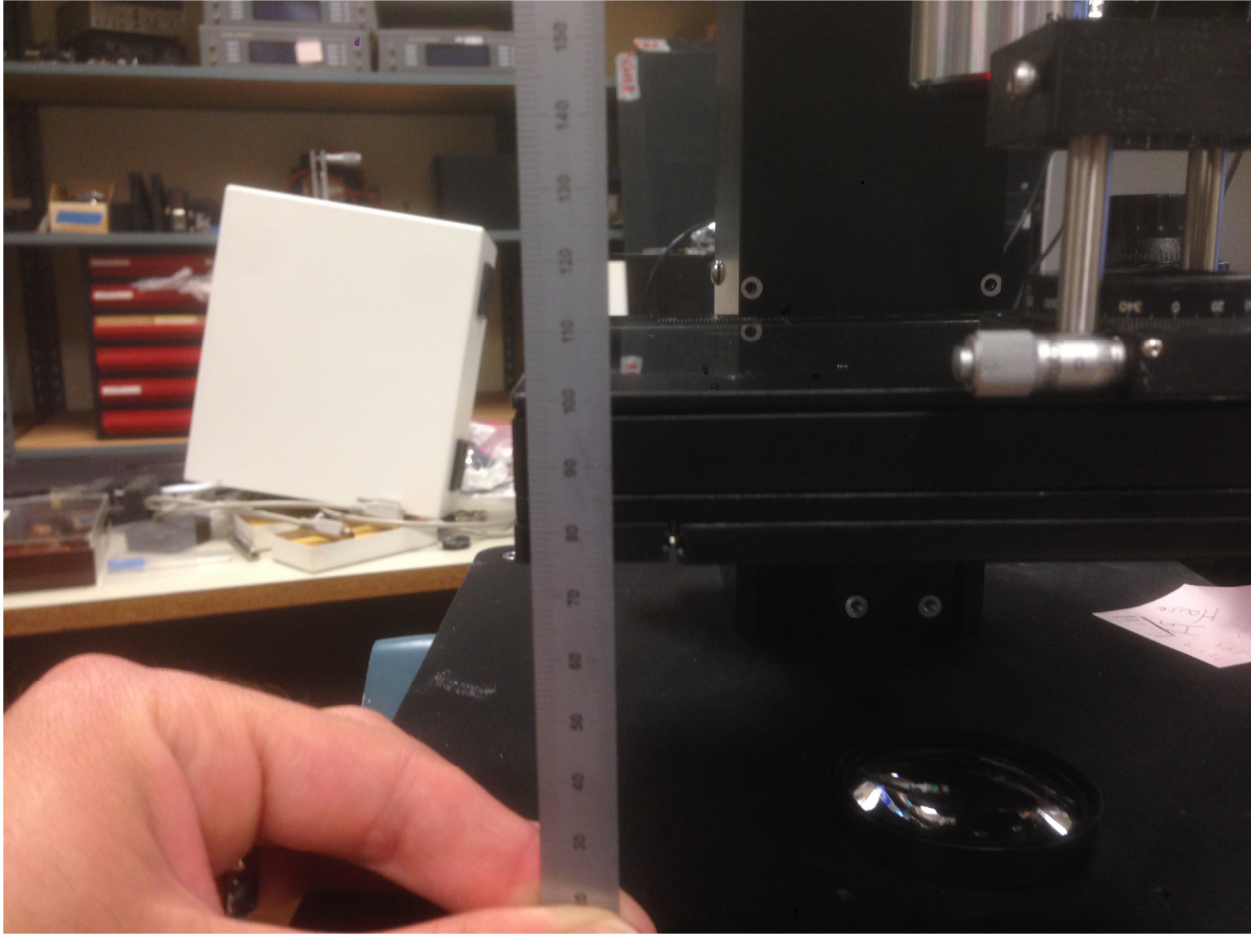


Figure 20.



2. Open software. You will see a screen similar to Figure 21.

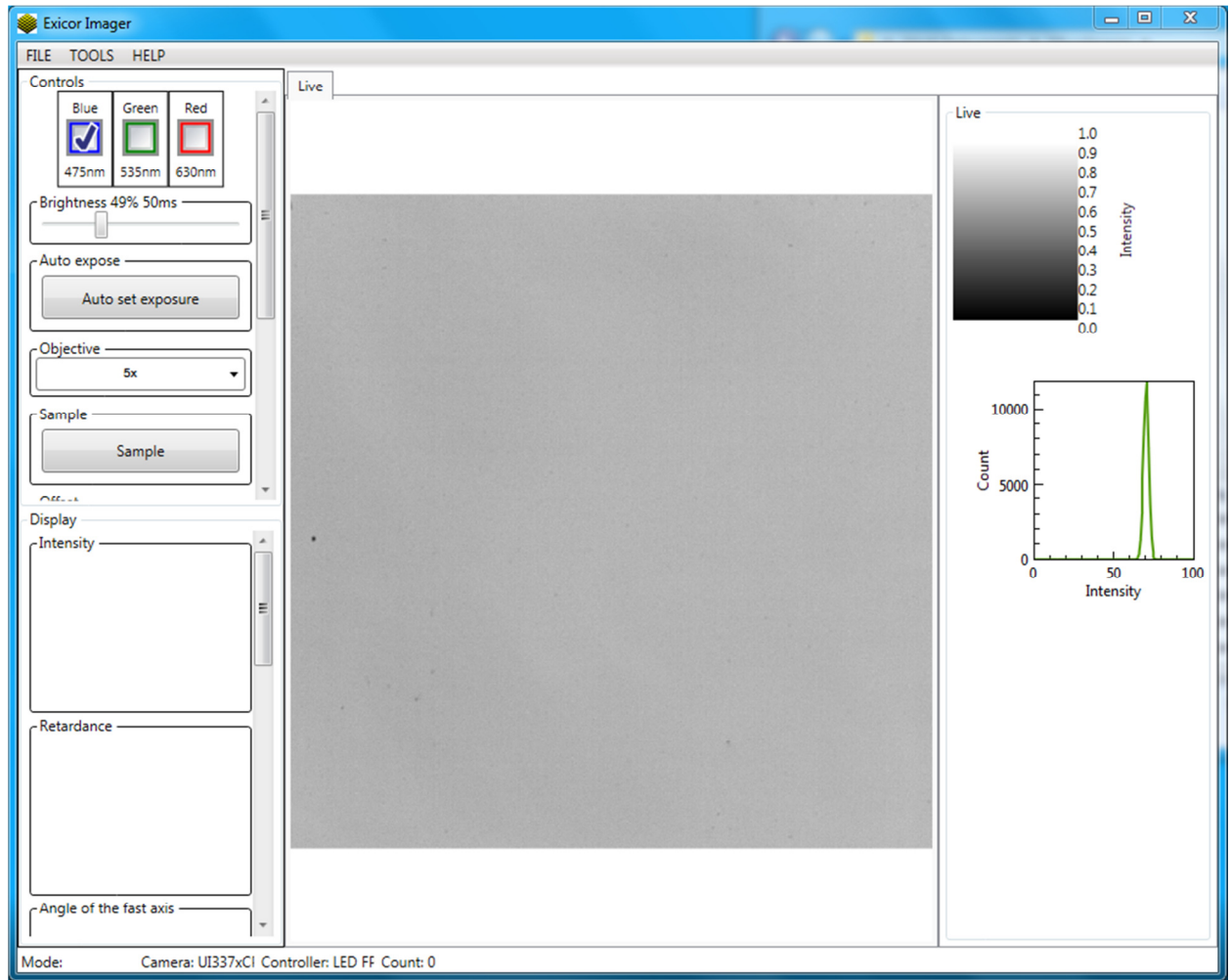


Figure 21.

3. Select Calibration from the Tools dropdown menu on the menu bar. You should see a screen similar to Figure 22.

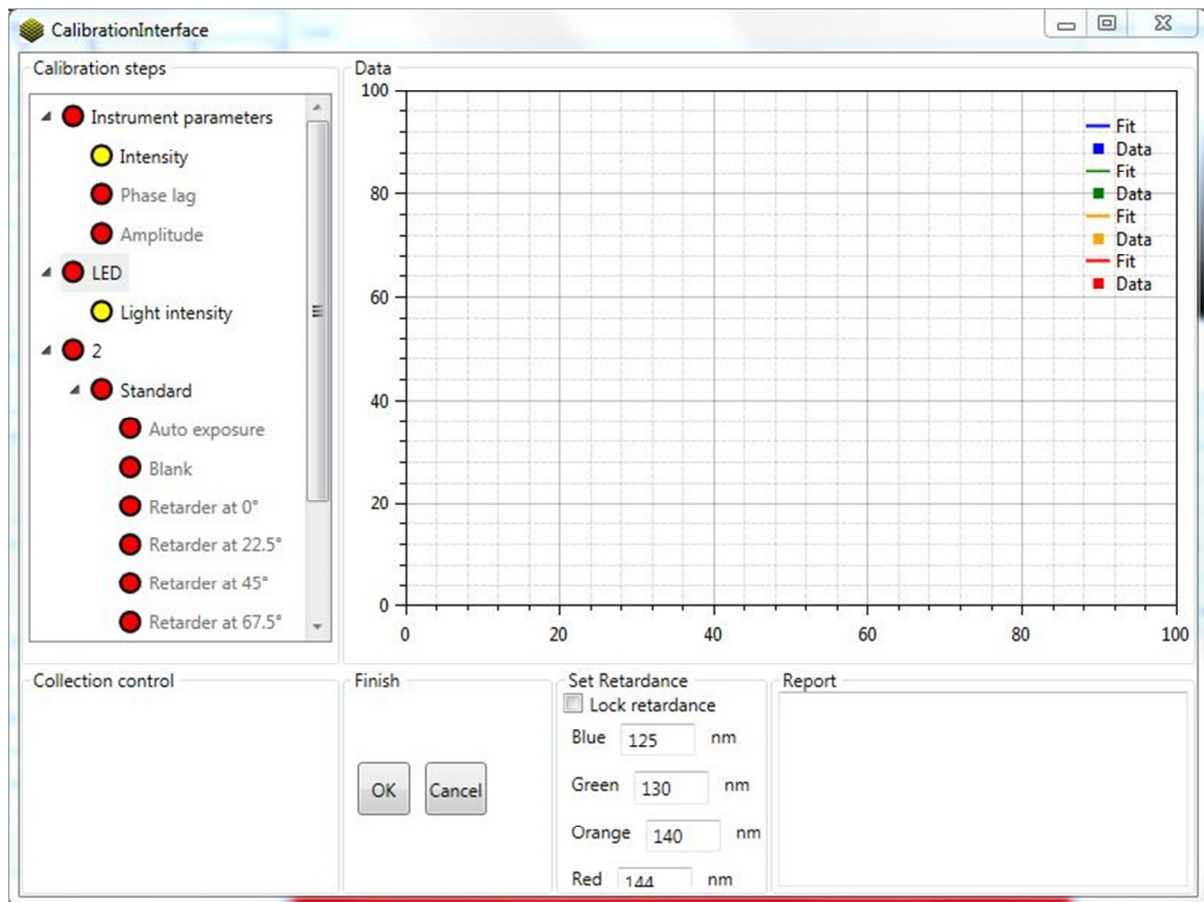


Figure 22.

4. In the initial calibration, you will start with the instrument parameter characterization. Taking data for the intensity, phase lag, and Amplitude. This however, should only need to be done one time.
5. After making sure that there is nothing in the light path, click on the words "Light Intensity." Then click on the button that reads "Collect."

- The software will run through a procedure and you will see results graphing to the side. When the software stops, click on the words “LED.” You should see a window similar to Figure 23.

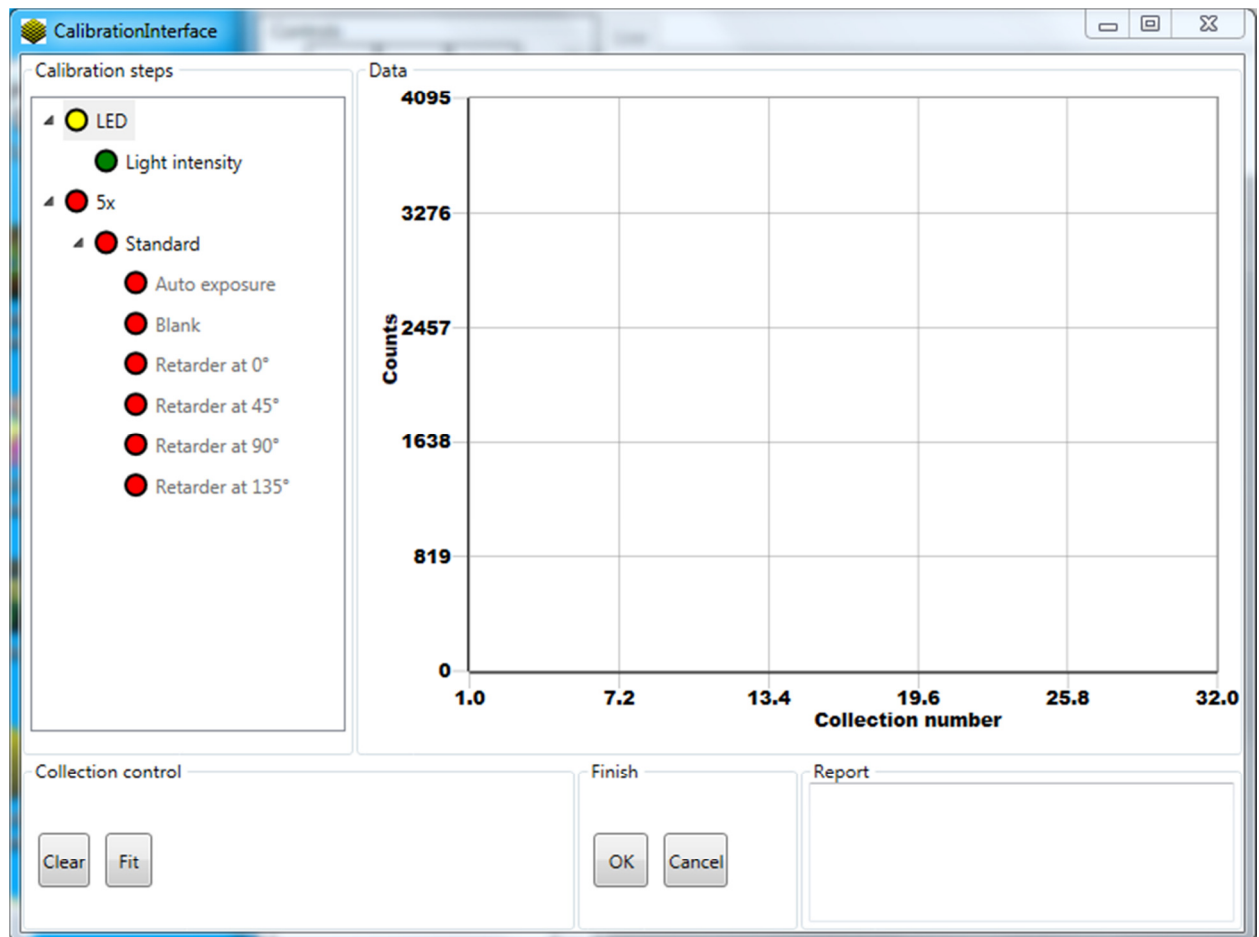


Figure 23.

7. Click on the “Fit” button. You should now see a screen similar to Figure 24.

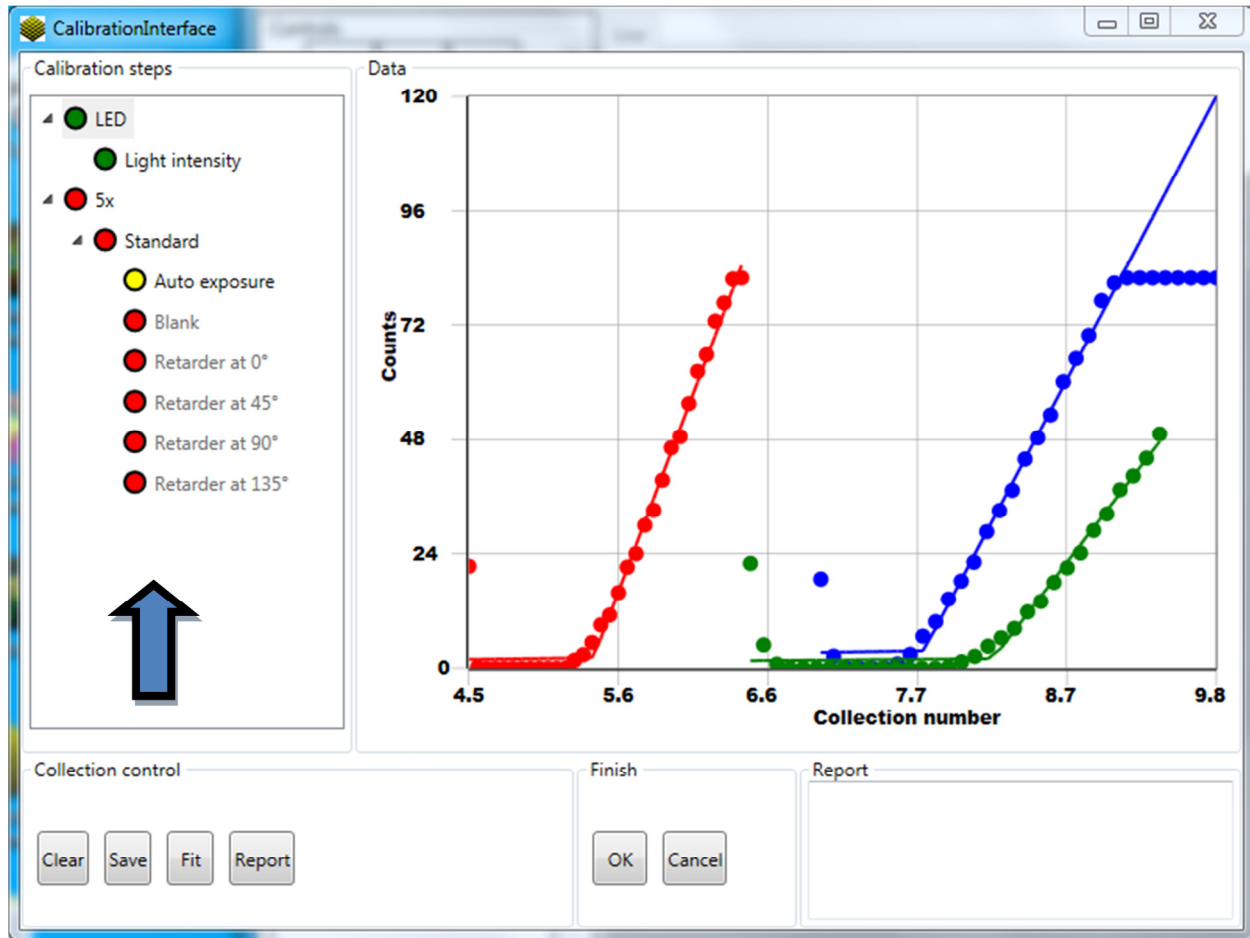
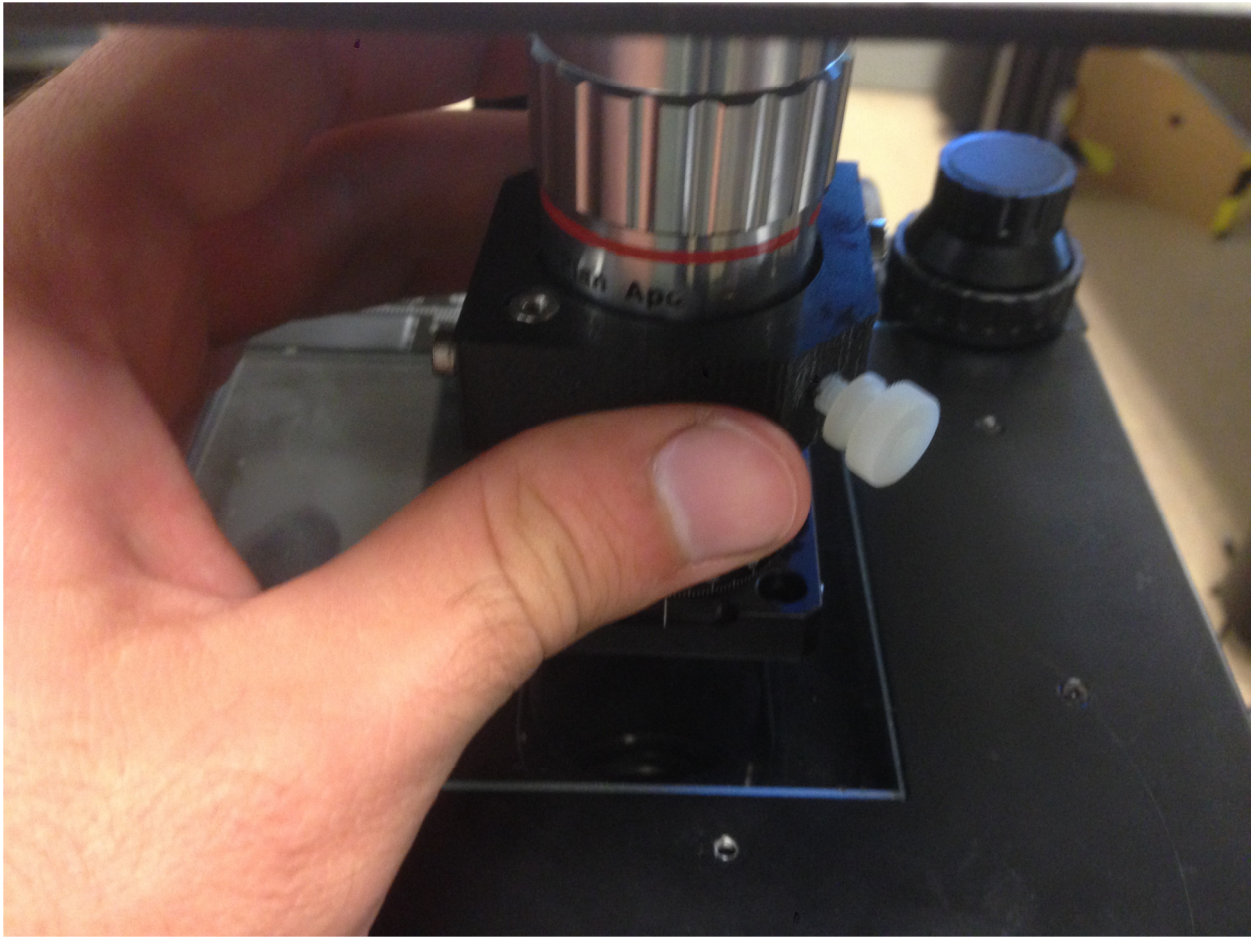


Figure 24.

8. Now you will calibrate the instrument for individual objectives. To add objectives, right click in the white area indicated by the blue arrow in Figure 24. This will allow you to add an objective.
  - a. The first time an objective is added, if the procedure is not completed the objective will be deleted.
  - b. After a full initial calibration, the software stores the last known configuration for that objective. If the calibration is interrupted or canceled for some reason, the software will revert to the previous calibration.
  - c. If you have calibrated one objective, exited, then opened the calibration window again to add another, there is no need to recalibrate each objective. The software will use the stored calibration for the known objective and only the new objective needs to be calibrated.

- d. **NOTE:** Optimal performance of the MicroImager system requires strict adherence to factory calibration procedures, including the calibration of optical objectives which have been sourced and characterized by Hinds Instruments, Inc. The use of non-authorized optical objectives, or any objectives that have not been fully-characterized according to factory specifications, may result in non-optimal data. While it is possible to calibrate the instrument with an objective not provided by Hinds Instruments, performance is not guaranteed and Hinds Instruments bears no responsibility for results with non-qualified objectives.
- 9. Using a similar procedure as before, click on Auto Exposure under the desired objective then click the Collect button. Redo the same process, clicking on the words and then clicking collect, for the rest of the configurations.
  - a. **NOTE:** Make sure that the light path is clear for “Auto Exposure” and “Blank.”

10. For the final eight configurations, line up the calibration sample provided by Hinds Instruments onto the objective as shown in Figure 25.



*Figure 25.*



11. Be sure the front of the rotator is square to the stage as shown in Figure 26. This is best accomplished by raising the stage to support the mount. (This also ensures that everything is flat)

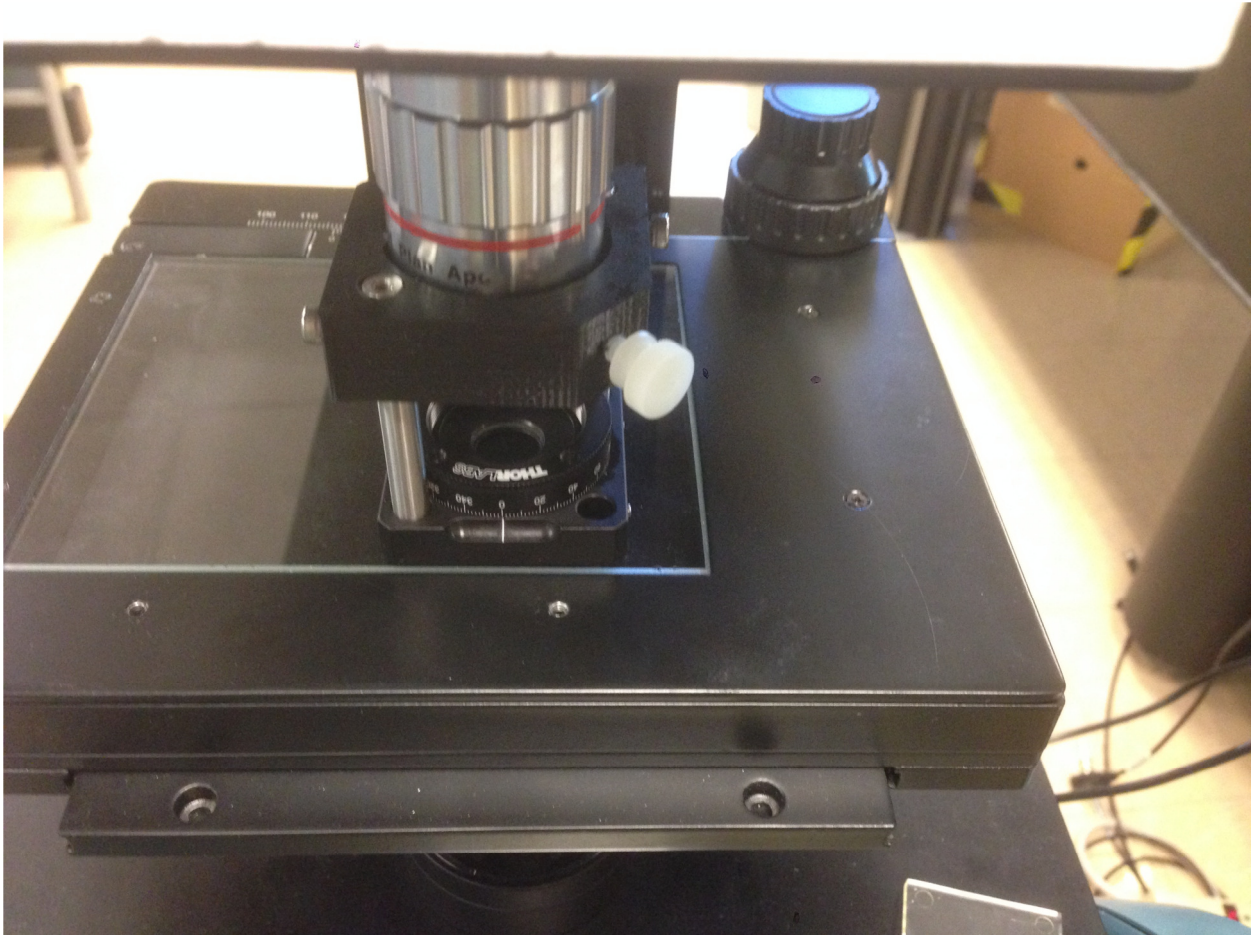


Figure 26.

12. Tighten the screw as shown in Figure 27 to center the optic under the objective, place blue mounting putty as shown in Figure 28 to keep the optic from moving. **It is important that the optic be as flat as possible with respect to the optical train.**

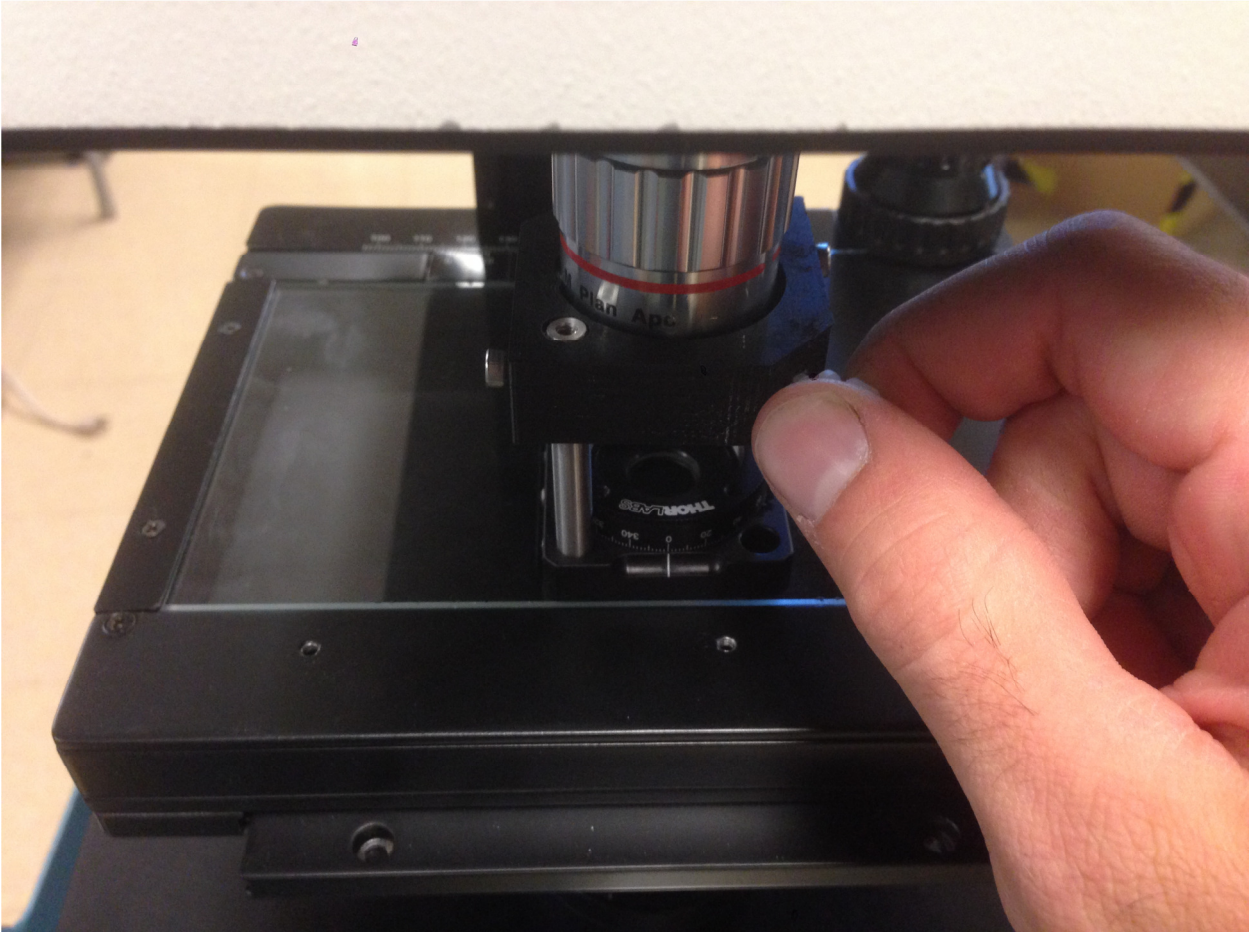


Figure 27.



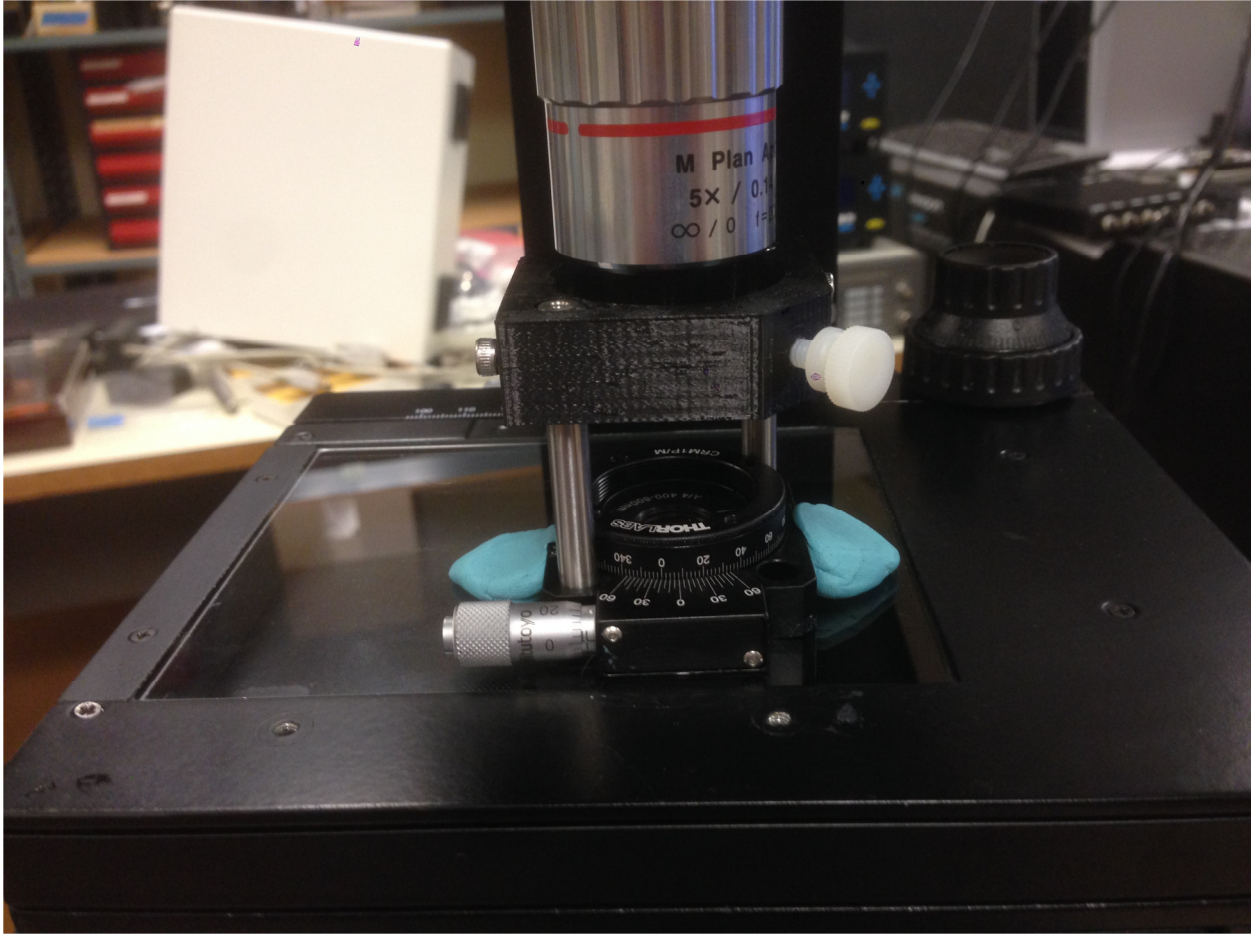


Figure 28.

13. The software requires the calibration sample to be measured at eight different orientations. These are represented in the software by 0, 22.5, 45, 67.5, 90, 112.5, 135, and 157.5 degrees. For sign convention continuity, rotate the optic to read 0 for the 0 degree measurement, 22.5 for the 22.5 degree measurement etc.

14. Measure the sample at each of the eight configurations. At the end, all the circles should be green as shown in Figure 29.

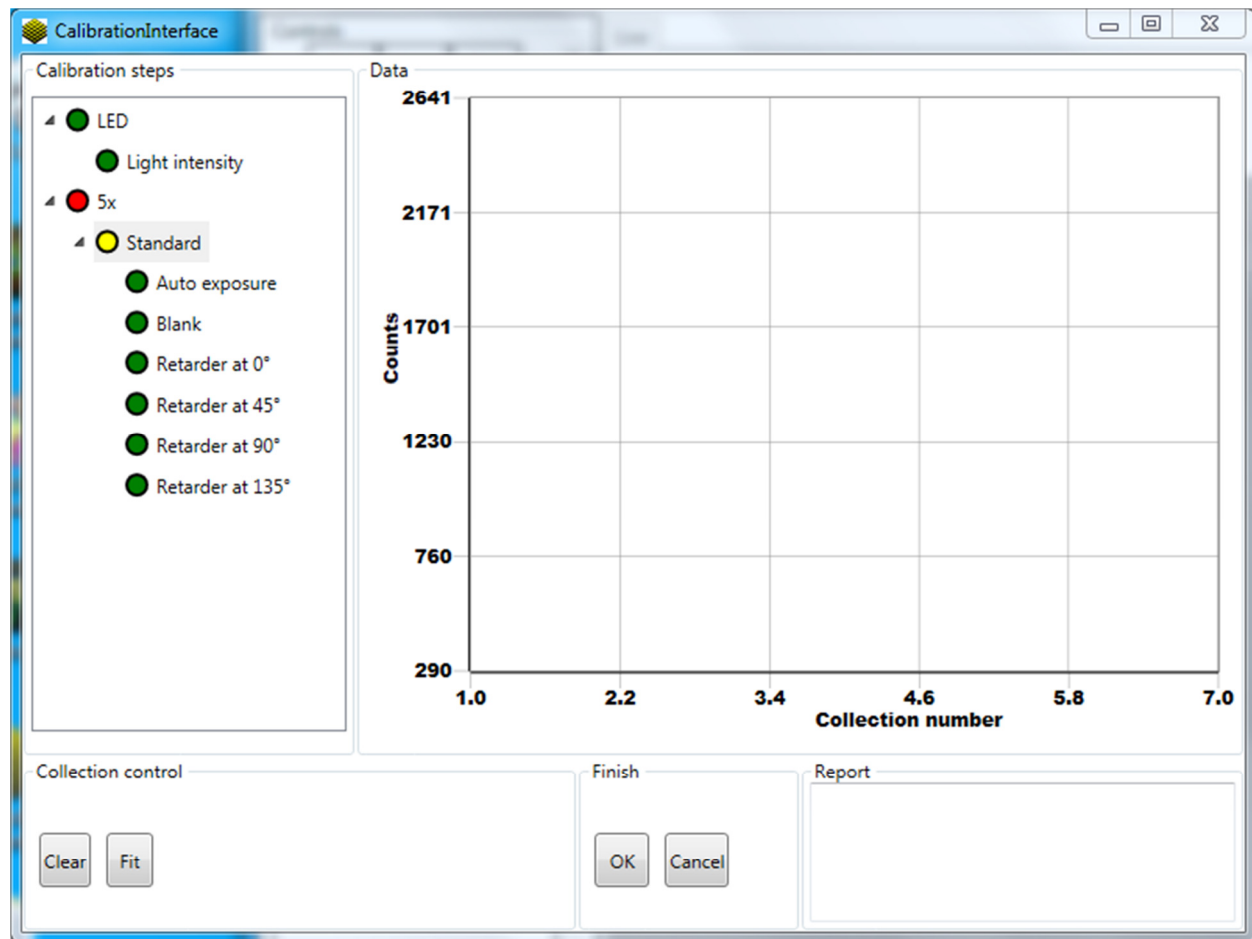


Figure 29.

15. Then click on the word “Standard” and then click the button labeled “Fit.”

16. If desired, a report of the data can be generated at this step by clicking ‘Report’. This file will contain comma separated text describing the results of the calibration.

17. If needed, it is possible to add objectives here and calibrate those following the same procedure. When finished click OK and restart the software.



# 6

## *Maintenance*

The Exicor® Microlmager requires very little maintenance.

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### Basic System Check

Check periodically, and when system maintenance is performed, that the covers on the source and detector modules and the control system are secured properly. Be certain that no unwanted light escapes from the source module.

Check periodically that interconnecting cables are free of sharp bends and cuts or abrasions.

For safety, the instrument housings should be opened only by authorized maintenance personnel.

Persons changing the cables or opening the covers on the system must:

- Remove power to the system.
- Understand the purpose, connections and voltages at each cable connection.
- Understand the hazards associated with bright LED light.
- Not allow eye exposure directly from LED light or any reflection of LED light from a mirror like surface.
- Understand all mechanical and electrical hazards that exist in the system.

---

### Cleaning the Exterior

When cleaning the exterior of the Exicor Microlmager, care should be taken not to scratch the surface or let liquids get inside the system.

An ammonia-based cleaner (such as glass cleaner) works well for cleaning the outside. Do not allow any liquids to get inside the sample stage components or top and bottom modules.

#### **CAUTION**

To avoid electrical shock and equipment damage, do not allow any liquids to get inside the Exicor Microlmager. Do not clean the system with the power ON or while the system is plugged into an AC outlet.



# Troubleshooting & Help

## Diagnosing Common Errors

Table 2 Diagnosing common errors lists some of the most common errors that have been encountered and suggestions on how to interpret or fix the error.

Symptom		Common Causes	Actions
1.	Start/Stop switch will not turn system on	DC power cord not plugged in	Plug in DC power cord
2.	The software can't connect to the camera	USB 3.0 cable not plugged in. USB is plugged into USB 2.0 port. The computer went into sleep mode.	Plug in the USB 3.0 cable. Make sure cable is plugged into USB 3.0 port. Unplug and then plug back in the USB 3.0 to turn the camera off and then back on again.
3.	Measurements are not close to expected values	Wrong setting of objective is being used The camera is being over exposed.	Verify that the objective in the machine matches the settings under which it was set. Use the factory setting for exposure or turn the exposure down manually.
4.	The software freezes	An error within the software	Unplug the USB cable from the computer and turn off the system. Then plug the cables back in and turn the system back on. Be sure to plug USB cables back into the same port on the PC.

Table 2 Diagnosing common errors

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## Contacting Hinds Instruments

If it is necessary to contact Hinds Instruments for support, refer to the following table for the company contact information.

Method	Information
Telephone	Monday - Friday 8:00 AM to 4:00 PM PST (503) 690-2000
FAX	(503) 690-3000
Email	<a href="mailto:support@hindsinstruments.com">support@hindsinstruments.com</a>
World Wide Web	<a href="http://www.hindsinstruments.com">www.hindsinstruments.com</a>
Shipping Address	Hinds Instruments, Inc. 7245 NW Evergreen Pkwy. Hillsboro, Oregon 97124

*Table 3 Contacting technical support*

When contacting Hinds Instruments for technical support, have the following system information available:

- Model name
- Serial number
- Problem symptom
- Exicor data files, .ini file, and offsets files (if applicable)

# Technical Specifications

The Exicor MicroImager is an easy-to-use system for imaging the birefringence in optical materials. The system includes a sample stage to move the sample for measuring areas up to 76 x 50 mm and function with 2X, 5X, and 10X objectives.

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## General Specifications

Software:	Exicor™ MicroImager (025-0000-075) Ver. 1.0
Computer System:	PC, Windows™ operating system, LCD monitor
System footprint area:	267 mm x 305 mm
System height:	705 mm
Stage Travel:	76mm x 50mm
Weight:	~ 12 kg
Power Required:	100-240VAC, 1.5A MAX, 50/60Hz

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## Measurement Specifications

Wavelength:	450, 530, 632 nm
Field of View:	
2X	5.69 mm square
5X	2.27 mm square
10X	1.14 mm square
20x	0.56 mm square
Resolution:	
2X	5 microns
5X	2 microns
10X	1 micron
20x	0.7 micron



**Microns/Pixel:**

2X	2.78 microns
5X	1.11 microns
10X	0.56 microns
20x	0.27 microns

**Fast Axis Angle**

Units:	degrees (°)
Range:	-90° → +90°
Resolution:	0.5 Degrees

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## Software Features

A system-specific software program provides the following:

- Graphical user interface
- Multiple wavelength Measurement
- Multi-order retardation measurement
- Auto-exposure
- Data saved in binary format
- Plot options
- Color plot of all measurements
- Copy and paste graph to MS Office applications
- Automated data collection and analysis of samples
- On-screen graphing of sample data
- Automatic calibration check, system initialization, and system status monitoring

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## CE Approval

1. To comply with CE regulations, all I/O cables connected to the Exicor MicroImager must not exceed 3 meters in length.
2. To comply with CE regulations, the Exicor MicroImager system connection cables, originally shipped with the system, must be used to connect the system. Only replacements configured the same way are allowed.



# ***B***

## ***Exicor<sup>®</sup> Microlmager Limited Warranty***

Hinds Instruments, Inc. warrants the Exicor<sup>®</sup> Microlmager to be free from defects in materials and/or workmanship for (1) year from the date of delivery, subject to the provisions contained herein. Hinds' warranty shall extend to the original purchaser only and shall be limited to factory repair or replacement of defective parts.

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### **Exclusions**

This warranty does not cover consumable parts, normal maintenance or damage resulting from improper use or repair, or abuse by the user. This warranty extends only to repair or replacement, and shall in no event extend to consequential damages. In the event of user repair or replacement, this warranty shall cover neither the advisability of the repair undertaken, nor the sufficiency of the repair itself.

THIS DOCUMENT REFLECTS THE ENTIRE AND EXCLUSIVE UNDERSTANDING OF THE PARTIES, EXCEPT AS OTHERWISE PROVIDED HEREIN. HINDS EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, PARTICULARLY THE WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR PURPOSE FOR THE PRODUCTS, SOFTWARE, OR SERVICES CONVEYED. THE OBLIGATIONS SET FORTH IN THIS SECTION SHALL BE HINDS' SOLE LIABILITY AND BUYERS' SOLE REMEDY, FOR BREACH OF THE FOREGOING WARRANTY. REPRESENTATIONS AND WARRANTIES MADE BY ANY OTHER PERSON, INCLUDING DISTRIBUTORS, DEALERS AND OTHER INDEPENDENT REPRESENTATIVES OF HINDS WHICH ARE INCONSISTENT OR IN CONFLICT WITH THE TERMS OF THIS WARRANTY SHALL NOT BE BINDING ON HINDS UNLESS REDUCED TO WRITING AND APPROVED BY AN EXPRESSLY AUTHORIZED OFFICER OF HINDS.

This warranty gives you specific legal rights, and you may also have other rights that vary from state to state.

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### **Warranty Service**

If you find any defects in material or workmanship or any failure to meet the specifications, you must notify Hinds within the warranty period and obtain a Return

Material Authorization Number (RMA#). This can be done by calling Hinds Instruments at 1-800-688-4463, or by emailing our [service department](#). Return the product to us in proper packaging, freight and insurance prepaid, and clearly marked with the RMA#, and we will either repair or replace it, at our option.

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## Non-Warranty Repairs

If a product that is not covered by the above warranty needs repairing, we will first provide an estimate of repair charges and then repair the product upon receiving authorization from you. Repairs are warranted for ninety (90) days from the date of delivery.

Reference chapter 7 (Troubleshooting & Help) on page 50 for contacting technical support.



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