PRIOR Scientific

LumaSpec 800S User Manual

PRIOR Scientific

bsi. ISO 9001 Quality Management FM 61600

Worldwide distribution

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Section 1 SAFETY INFORMATION

SAFETY WARNINGS

Always observe the following safety precautions:

- The LumaSpec 800 is powered via its USB connection. DO NOT attempt to connect the LumaSpec 800 to a power outlet.
- This equipment is for use in moderate climates only. NEVER use the equipment in damp or wet conditions.
- Avoid excessive heat, humidity, dust & vibration.
- Do not use where the equipment may be subjected to dripping or splashing liquids.
- This equipment contains no user-serviceable parts. Refer all repairs to qualified service personnel.
- It is the user/operators responsibility to ensure good laboratory practices are followed.

Section 2 PRODUCT OVERVIEW

The LumaSpec Model LS800S is a compact visible light spectrometer which provides quantitative spectral power data (microwatts per square centimeter per nanometer) for microscope/optical system illumination systems. The LumaSpec has a range of 350-800 nanometers and a resolution of 1.5 nanometers.

In Irradiance Mode, the information for the illumination system is displayed in both a graphical and numerical format on the LumaSpec main display. Simply clicking on the graph provides spectral power data for the wavelength selected. Ten selectable ranges are available which allow the user to view spectral power data at a glance for wavelength ranges of interest. Integration time is quickly changed on the main display which allows the LumaSpec to quantify light sources from the dimmest LED to the most intense mercury source. The user can overlay multiple saved spectrums (up to four) over the live graph to quickly compare illumination performance over time. The LumaSpec software will save and import settings for different illumination sources making calibrating multiple optical systems quick and easy. Collecting and saving time stamped spectral power data is accomplished with a click of the mouse.

In Transmission Mode, the LumaSpec software monitors and graphs 100% light output for the illumination system and then determines the wavelength and the percent transmission for each filter placed into the light path. This feature is extremely useful in determining the overall efficiency and remaining lifetime of optical filter sets.

Section 3 PRODUCT FEATURES

Major features of the LumaSpec LS800S include:

- Illumination target in 3” x 1” slide format measuring spectral power at the sample plane
- 1 meter fiber optic cable
- Small footprint of 13.5 square inches
- 350-800 nanometer range
- 1.5 nanometer resolution
- Software with irradiance and transmission modes
- Graphical and numerical spectral power data
- 10 selectable ranges for spectral power at wavelengths of interest
- Time stamped spectral power data collection function
- Export and import functions
- USB powered

Section 4 GETTING STARTED

Identifying the Components of your System

Check to see that all the required components have been included with your LumaSpec LS800S compact illumination spectrometer.

The standard LumaSpec 800 system consists of:

(1) - LumaSpec 800 Housing - LM407
(1) - One Meter Fiber Optic Cable - W4221
(1) - Illumination Target - LM408
(1) - USB Cable
(1) - Quick Start Guide
(1) - Software/Installation CD

Quick Start Guide

USB Cable

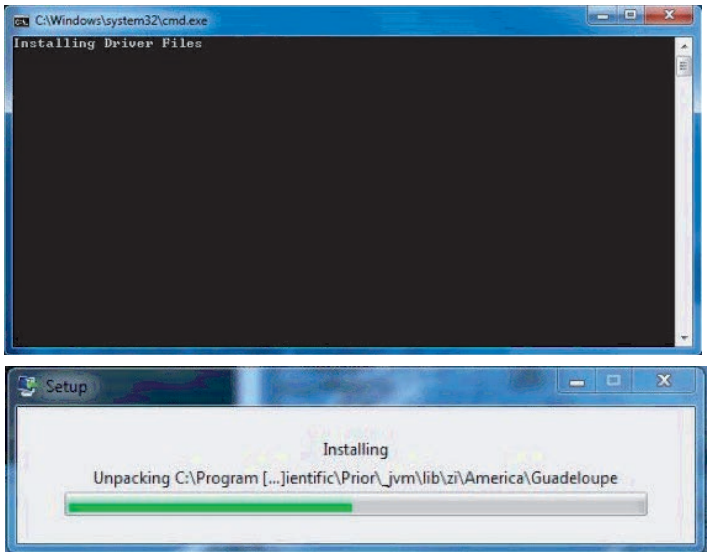
Software/ Installation CD

Section 5 SOFTWARE INSTALLATION

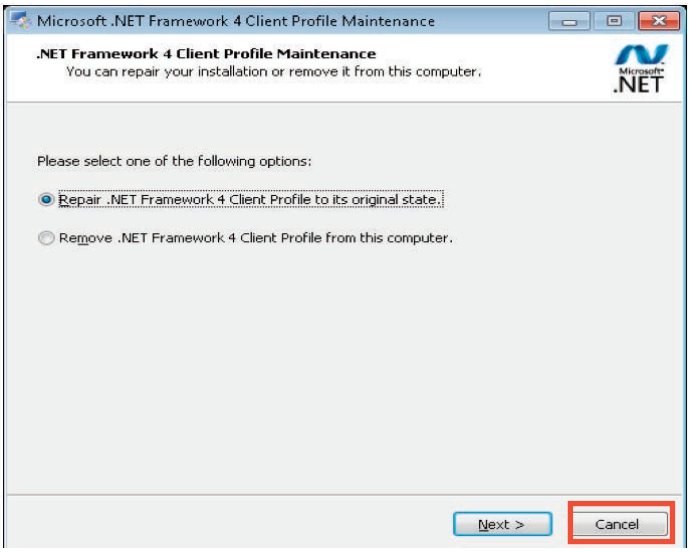
Note:
You must complete the following software installation before connection the LumaSpec 800 to your computer. Before installing the software, please uninstall the LumaSpec software and Omni driver if the software was installed previously. Please note that you will not have the Omni Driver program installed if you are running LumaSpec version 1.8 or later.

Step 1:
Double click on the 'Setup' file in order to begin the installation process. A command prompt window will open and the installation process will start.

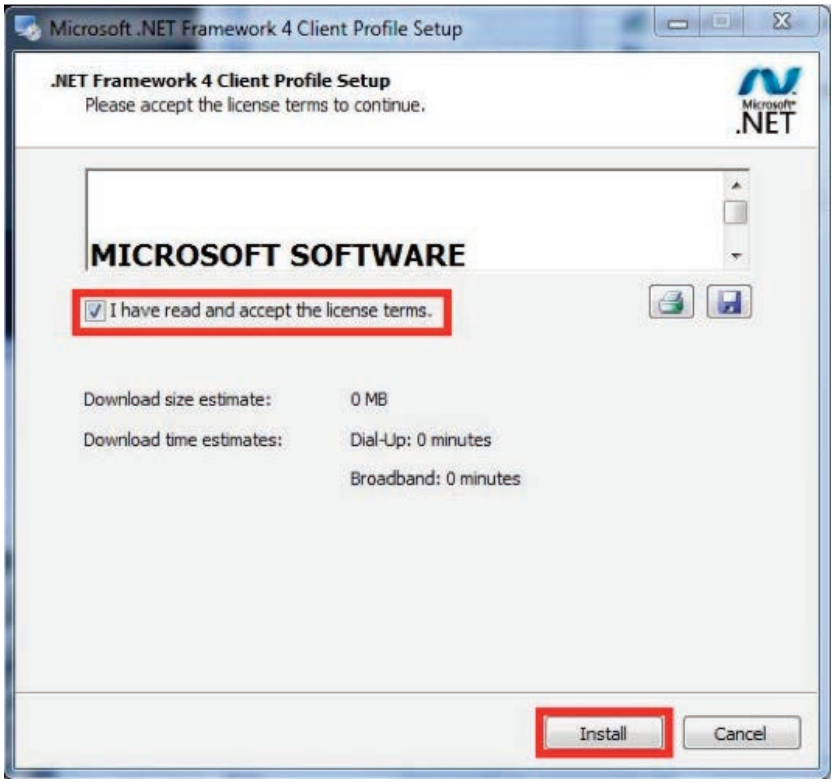
The installation will being by automatically installing the necessary driver files. Not action is required by the user during this part of the installation process. The command prompt and installation window that will be seen during this process are shown below for reference.



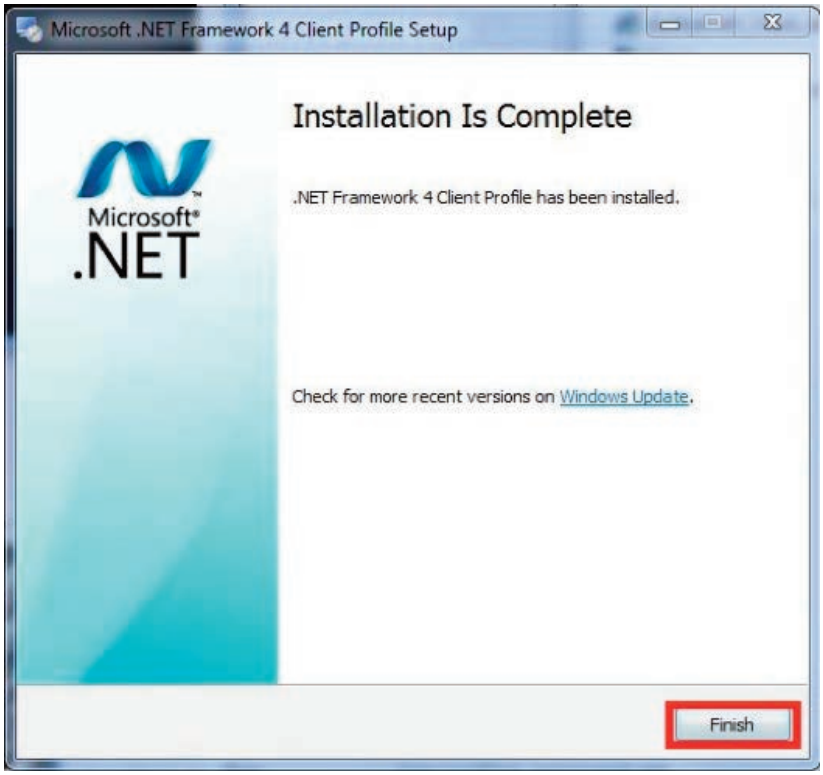
Step 2:
Install the latest .NET Framework onto your computer. If you already have the latest .NET Framework installed, you will see the window below. If you get this window, simply click 'Cancel' and then click 'Yes' to confirm.



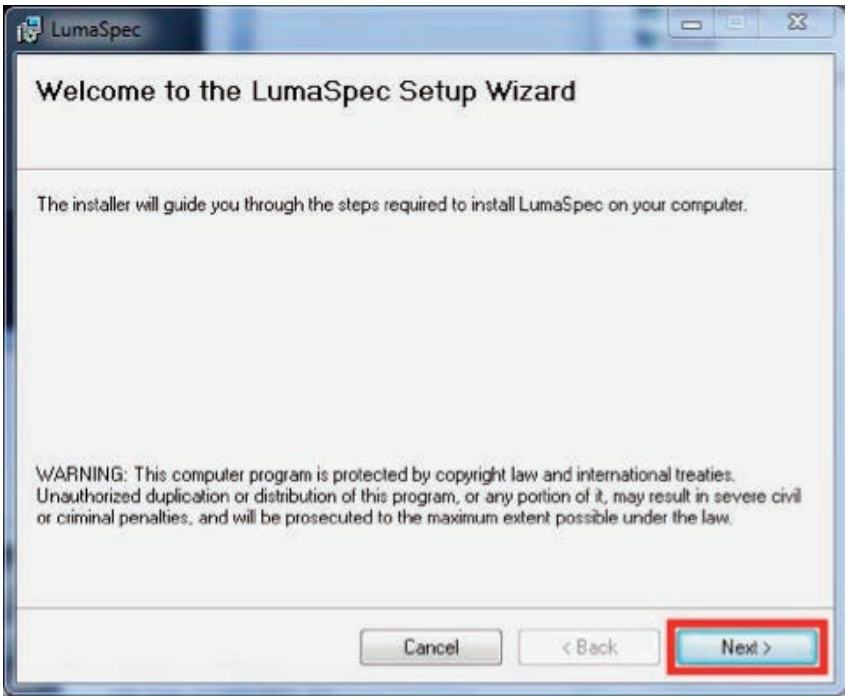
If you do not have the latest .NET Framework installed, you will receive the following window. In this case, you will need to proceed with the installation. In order to proceed with the installation, check the box to agree to the Microsoft terms and conditions and click 'Install'.



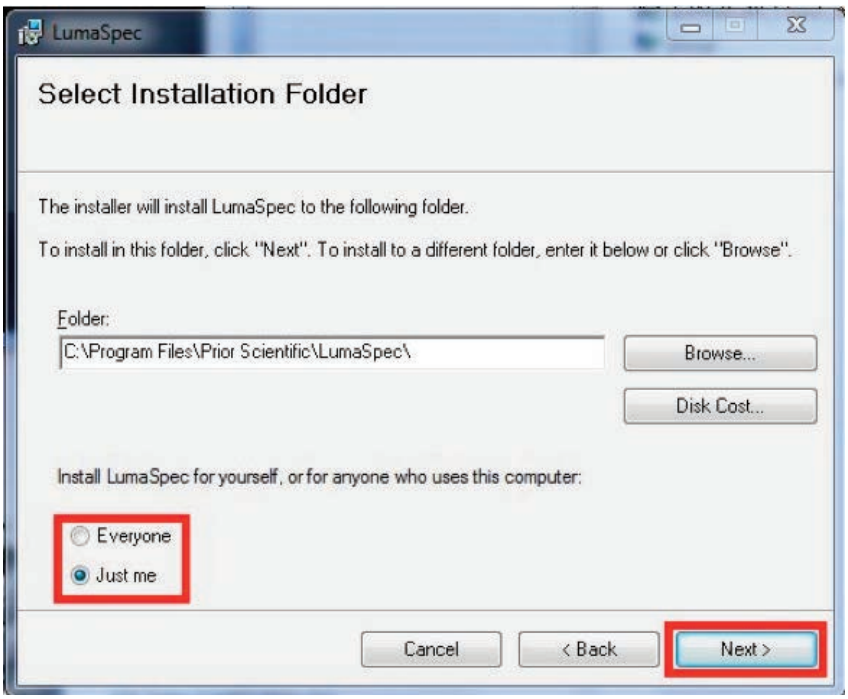
Once the installation has completed, click 'Finish'.



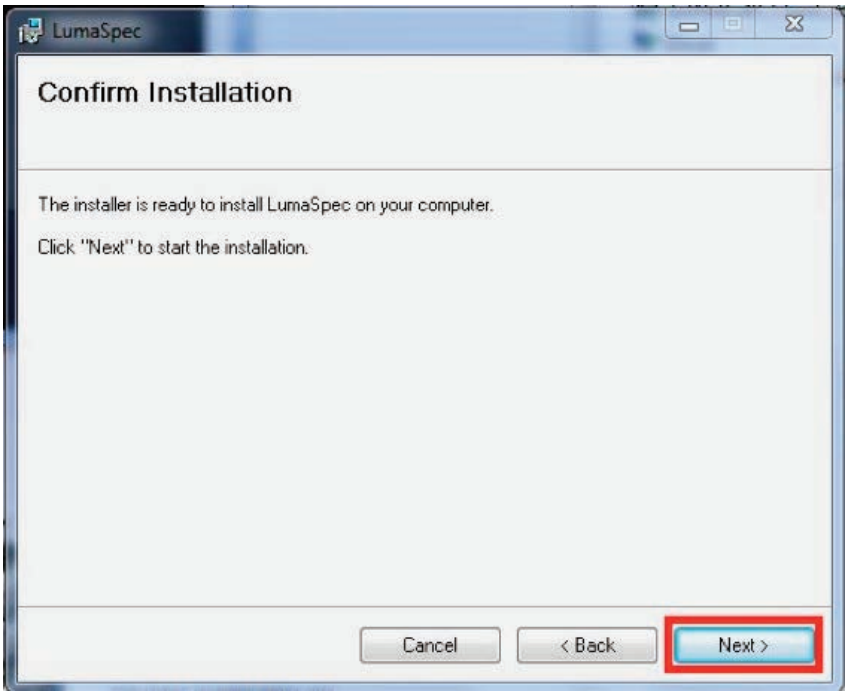
Step 3:
After the .NET Framework installation, the wizard for the LumaSpec software installation will open automatically. Click 'Next' on the first window that opens in order to begin the installation.



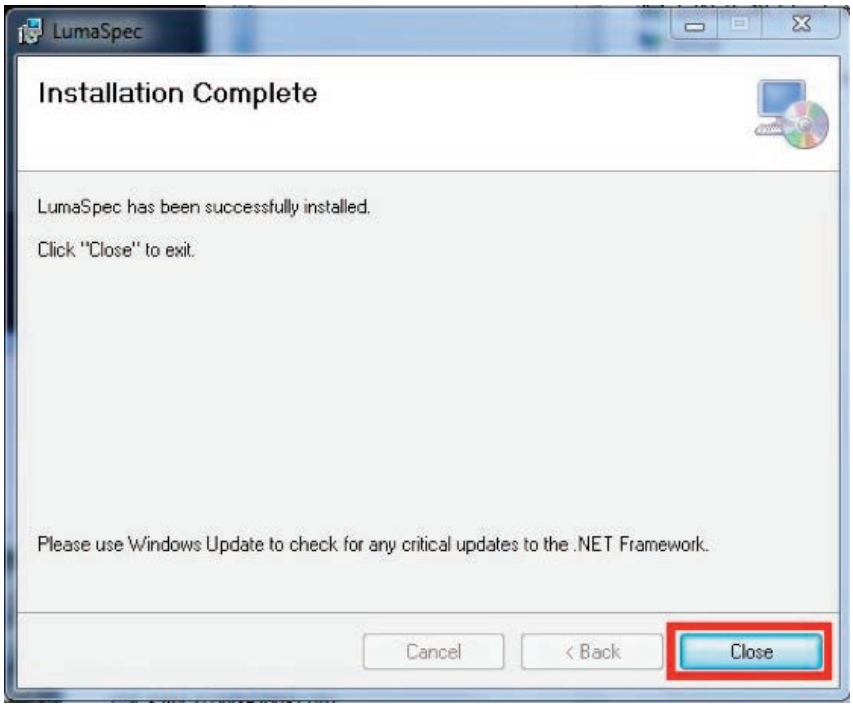
On the next window, select whether you would like to install the program for all users on the computer or just the current user by selecting 'Everyone' or 'Just Me', and then click 'Next'. In this window, you can also change the folder in which the program will be installed if you would like it to be a location other than the default. Prior recommends you do not change the default location unless it is a requirement for your system.



Click ‘Next’ in the confirmation window in order to begin the installation.



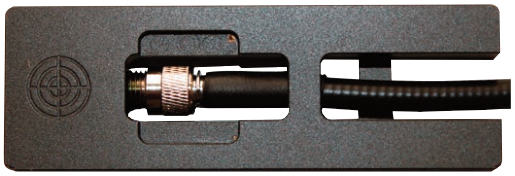
Once the installation has completed, click ‘Close’ to complete the LumaSpec software installation process.



Section 6 HARDWARE INSTALLATION

Connecting the Fiber Optic Cable

Connect the fiber optic cable part number W4221 to the LumaSpec Box. Connect the other end of the fiber optic cable to the Illumination Target as show below. Tighten both connections hand tight only. Do not use any tools when connecting the fiber optic cable.

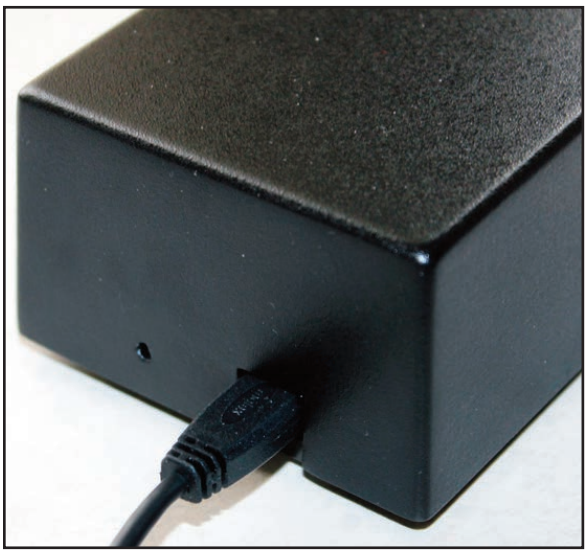


Fiber optic cable connected to the Illumination Target.

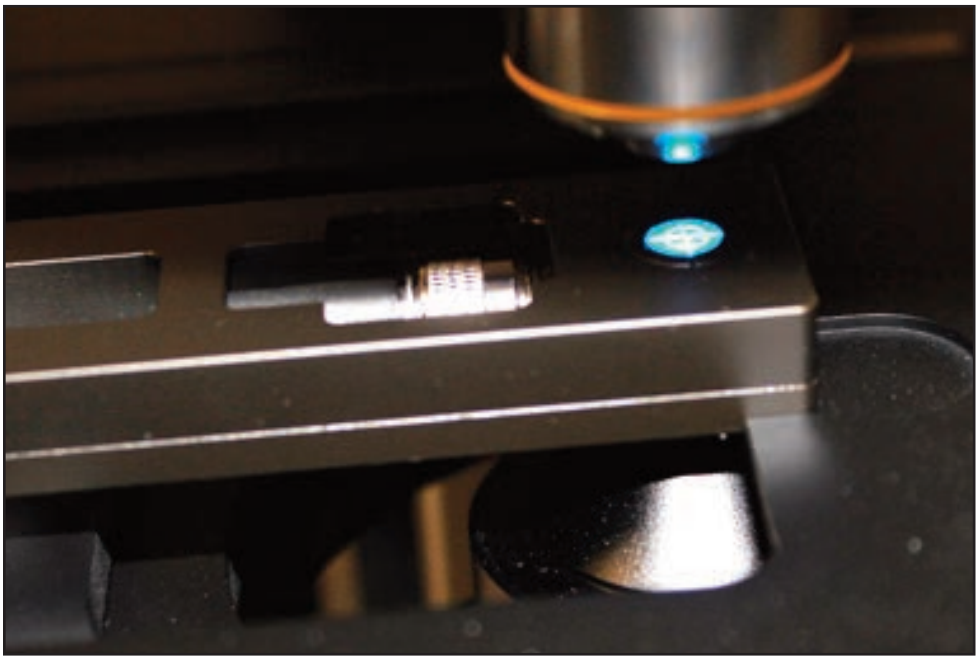
W4221 fiber optic cable properly connected to the LumaSpec box and Illumination Target.

Connecting the USB Cable

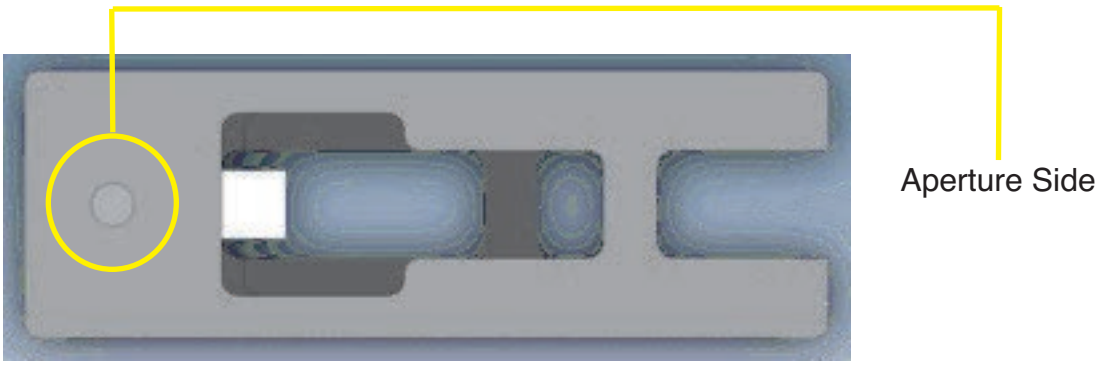
Connect the micro USB connector to the LumaSpec Box and the opposite USB connector to your computer.



Setting up the Illumination Target



Placing the Illumination Target aperture centrally on the optical axis of the microscope stage and at the correct focus height is critical to obtaining repeatable spectral power readings from your illumination source. The Illumination Target shown below has two sides, the crosshair side and the aperture side.



Setting Up the Illumination Target on a Motorized Stage

Upright Microscopes

Place the Illumination Target into the stage slide holder with the crosshair side UP. Adjust the XY stage position until the target is located below the objective and the light from the objective falls centrally on the crosshair target. See images below:

Objective Light is Off Center

Light is On Center of Crosshair

Use the microscope focus mechanism to focus on the crosshair inscribed on the surface of the Illumination Target. It is recommended to start with the lowest magnification objective when trying to find and focus on the crosshair. Note that if white light is not available the coating on the Illumination Target will allow you to view and focus on the crosshair with many of the common fluorescent filter sets. Carefully remove the Illumination Target and turn it over with the aperture side up. At this point the Illumination Target is ready to use.

Inverted Microscopes

Place a sample slide into the motorized stage slide holder and bring the slide into focus. Remove the sample slide and place the Illumination Target into the stage slide holder with the crosshair side UP. Adjust the XY stage position until the aperture is located above the objective and the light from the CONDENSER falls centrally on the crosshair target. At this point the Illumination Target is ready to use. See images below:

Condenser Light is Off Center

Light is On Center of Crosshair

Setting Up the Illumination Target on a Manual Stage

Upright Microscopes - With Integrated Slide Holder

Place the Illumination Target into the stage slide holder with the crosshair side UP. Adjust the XY stage position until the target is located below the objective and the light from the objective falls centrally on the crosshair target. See images below.

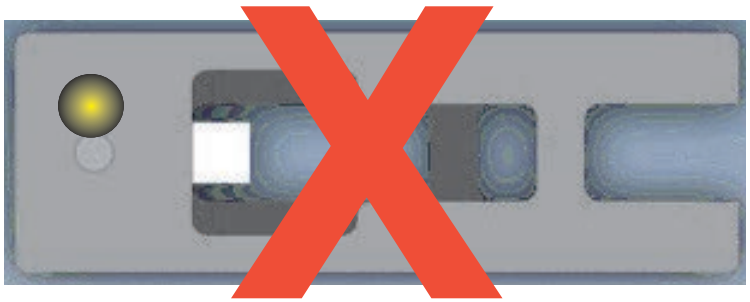
Objective Light is Off Center

Light is On Center of Crosshair

Use the microscope focus mechanism to focus on the crosshair inscribed on the surface of the Illumination Target. It is recommended to start with your lowest magnification objective when trying to find and focus on the crosshair. Note that if white light is not available the coating on the Illumination Target will allow you to view and focus on the crosshair with many of the common fluorescent filter sets. Carefully remove the Illumination target and turn it over with the aperture side up. At this point the Illumination Target is ready to use. Note if the manual stage moves while you are turning it from the crosshair side to the aperture side up you will need to redo the crosshair alignment and focus adjustment.

Upright Microscopes - Without Integrated Slide Holder

Place the Illumination Target onto the manual stage with the aperture side UP. Adjust the position of the XY stage until the light from the objective falls centrally on the aperture of the Illumination target. When centering the aperture it may be helpful to minimize the spot of light coming from the objective by adjusting the aperture stop so that the light coming from the objective is similar in size to the crosshair. Open the aperture stop completely after alignment is finished. Raise the illumination target until the top of the target is at the focus position. It will be necessary to move the stage slightly so that you can view and focus on the edge of the aperture. It is highly recommended to only move one axis when looking for the edge of the aperture and to move the stage and Illumination Target so that the light falls centrally on the aperture before taking measurements. This can be done iteratively by slowly moving the stage and maximizing the overall spectral power as viewed on the LumaSpec software or by looking under magnification and noting two edges of the aperture then moving the stage to the midpoint between the edges. See Images below:



Objective Light is Off Center

Light is On Center of Aperture

Inverted Microscopes – With Integrated Slide Holder

Place a sample slide into the slide holder and bring the slide into focus. Remove the sample slide and place the Illumination Target into the stage slide holder with the crosshair side UP. Adjust the XY stage position until the aperture is located above the objective and the light from the CONDENSER falls centrally on the crosshair target. At this point the Illumination Target is ready to use. See image below:

Condenser Light is Off Center

Light is On Center of Crosshair

Inverted Microscopes – Without Integrated Slide Holder

Place a sample slide onto the stage and bring the slide into focus. Remove the sample slide and place the Illumination Target into the stage slide holder with the crosshair side UP. Adjust the XY stage position until the aperture is located above the objective and the light from the CONDENSER falls centrally on the crosshair target. At this point the Illumination Target is ready to use. See images below:

Condenser Light is Off Center

Light is On Center of Crosshair

Section 7 INITIAL USE OF LUMASPEC SOFTWARE

Start the LumaSpec software….Start/Programs/LumaSpec

The main page for the LumaSpec program will appear and the following message will appear:

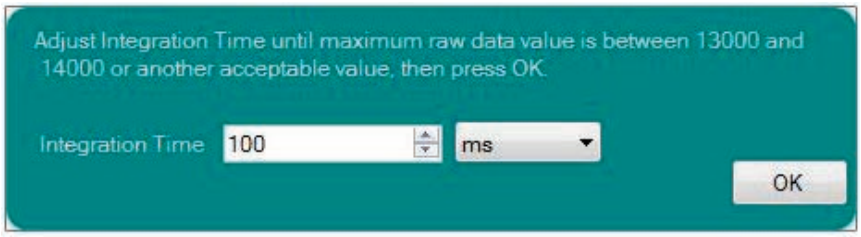
Press OK.

A message pops up that allows you to choose to automatically set integration time.

The LumaSpec software is not able to automatically set some intense illumination sources and so if this is the first time using the LumaSpec software, click on “NO”.

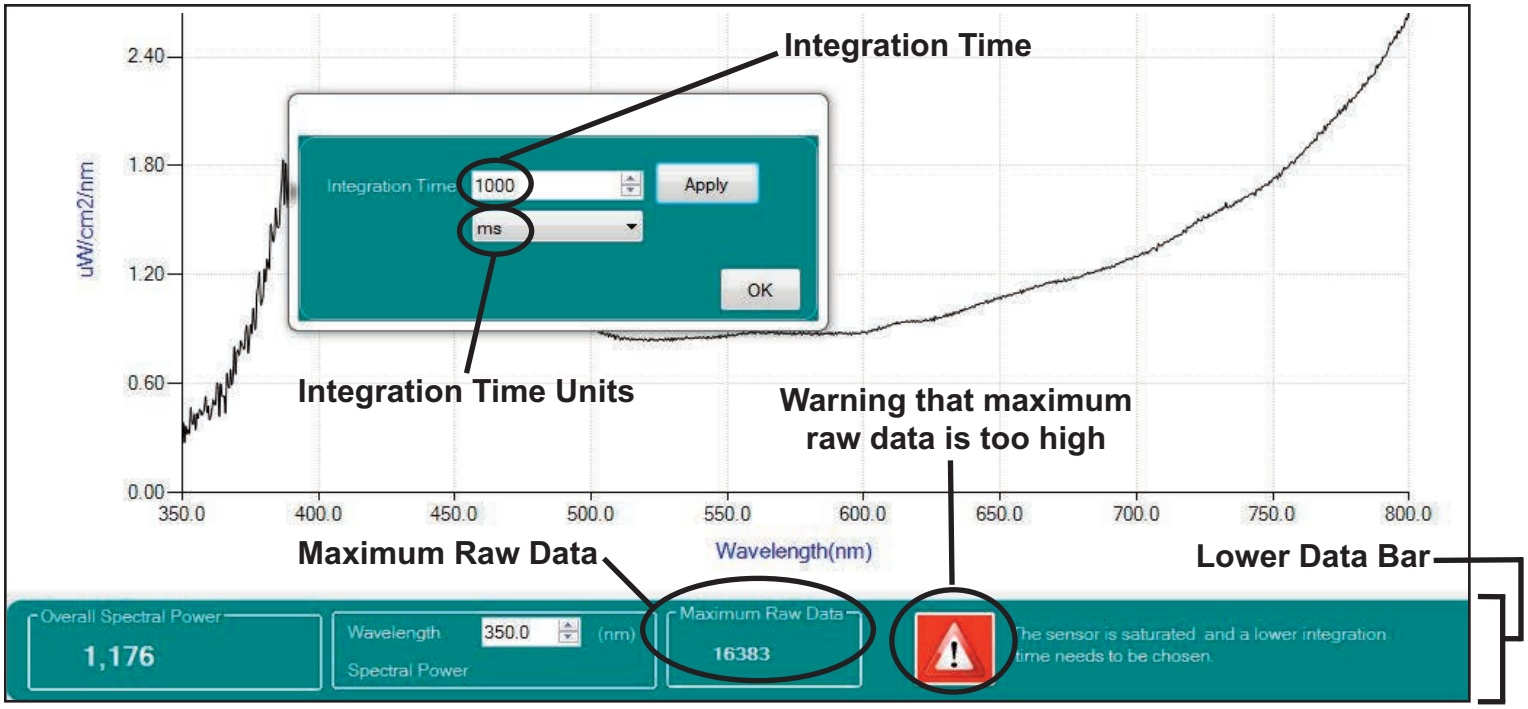
Manually setting Integration Time

A window will pop up asking the user to Adjust the integration time until the maximum raw data value is between 13,000 and 14,000 or another acceptable value (some light sources may be too dim to reach 13,000 but this would be a rare occurrence).



Manually Setting Integration Time (Continued)

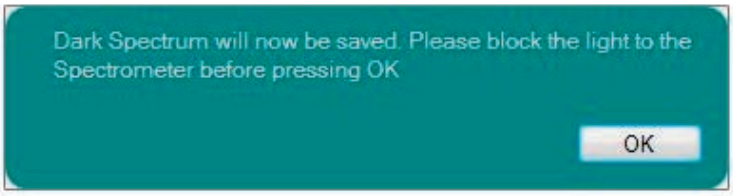
If the maximum raw data value is between 14,000 and 16,500, decrease the integration time until the value falls between 13,000 and 14,000. Please note that the minimum value that can be input is 1. Decimals are not allowed. The units of integration time can be changed from microseconds µs, to milliseconds ms, to seconds. Decreasing the integration time will lower the maximum raw data value, increasing the integration time will raise the maximum raw data value. If the LumaSpec sensor is saturated with too much light, the maximum raw data value will sit at approximately 16383. The maximum raw data value is continuously displayed in the lower data bar see below. A red warning icon will flash in the right hand side of the data bar if the maximum raw data value exceeds 15,000.



Automatically Setting Integration Time

To set integration time with the automatic feature, click “Yes”. A window will appear:

The LumaSpec software will automatically adjust the integration time until the value falls between 13,000 and 14,000. A new window will appear:



At this point the user needs to block the light going to the spectrometer. Blocking the light can be accomplished by closing a shutter, turning off the light source or even blocking the input aperture. Please note if you move the illumination target while blocking the light it will need to be relocated so that the light from the objective falls centrally on the input aperture.

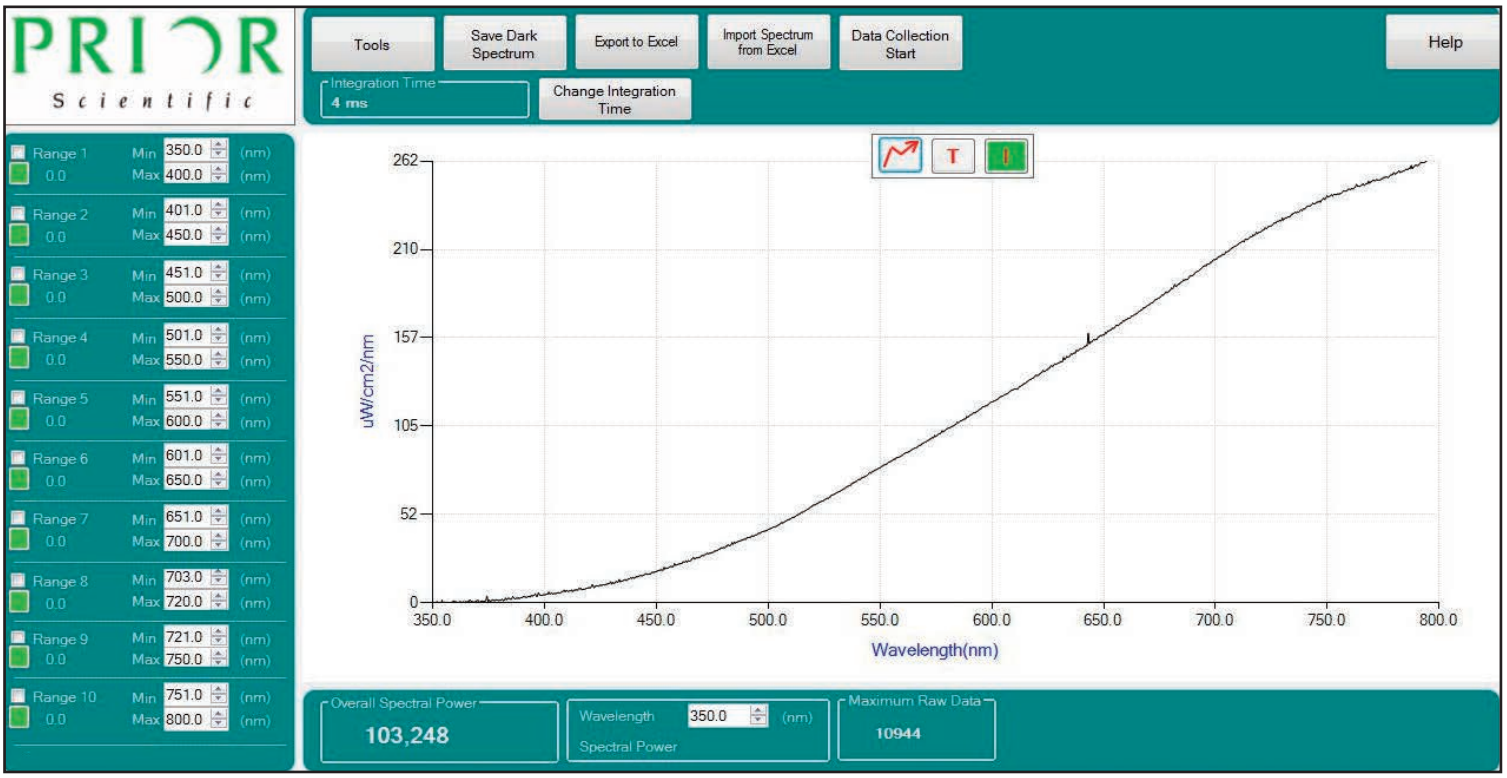
Unblock the light source to the LumaSpec and the LumaSpec Illumination Spectrometer and software are ready to use.

Section 8 LUMASPEC DISPLAY SCREEN

Overview

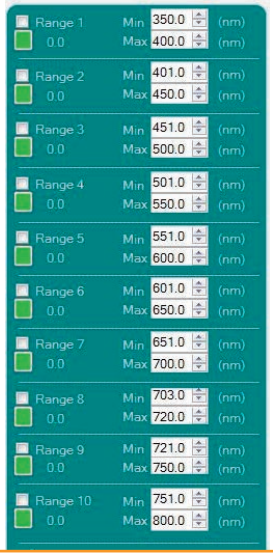
MAIN SCREEN

The LumaSpec software main screen provides detailed information for the illumination systems at a glance. A graphical representation of the current illumination spectrum is provided centrally located in the main screen.



The three buttons located at the top of the graph are for rescaling the graph and toggling back and forth between transmission and irradiance modes.

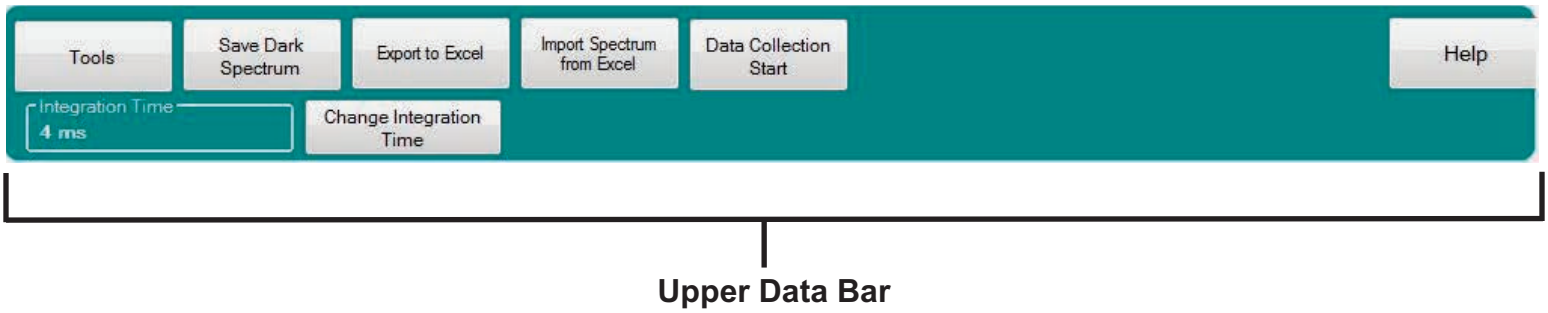
To the left of the graph are 10 selectable wavelength ranges which will provide spectral power information for user selectable wavelengths ranges of interest.



Overview (Continued)

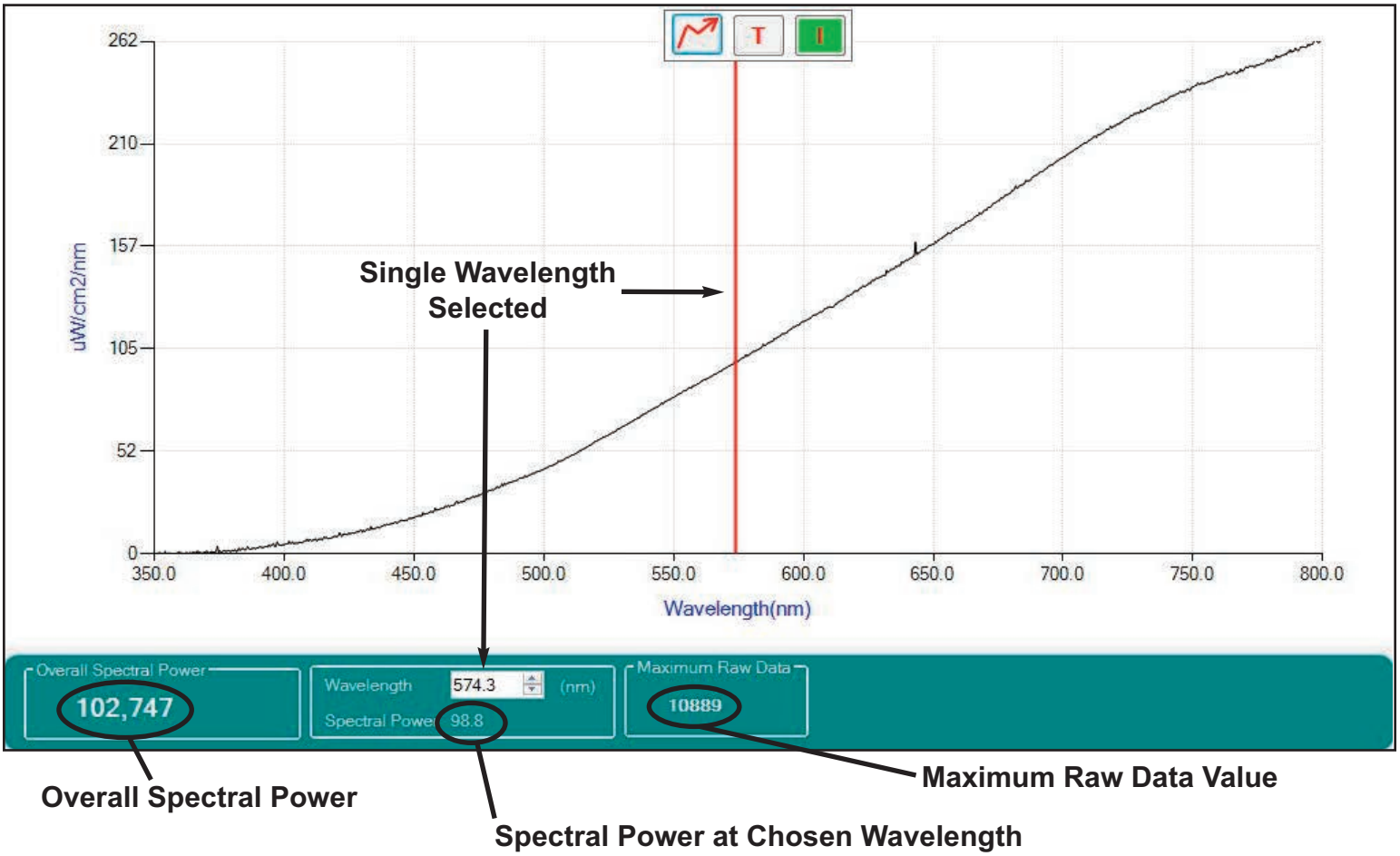
UPPER DATA BAR

The upper data bar has the Tools, Save Dark Spectrum, Export to Excel, Import Spectrum from Excel, Data Collection Start, Change Integration Time and Help buttons. Information on the functionality of these button are detailed separately.



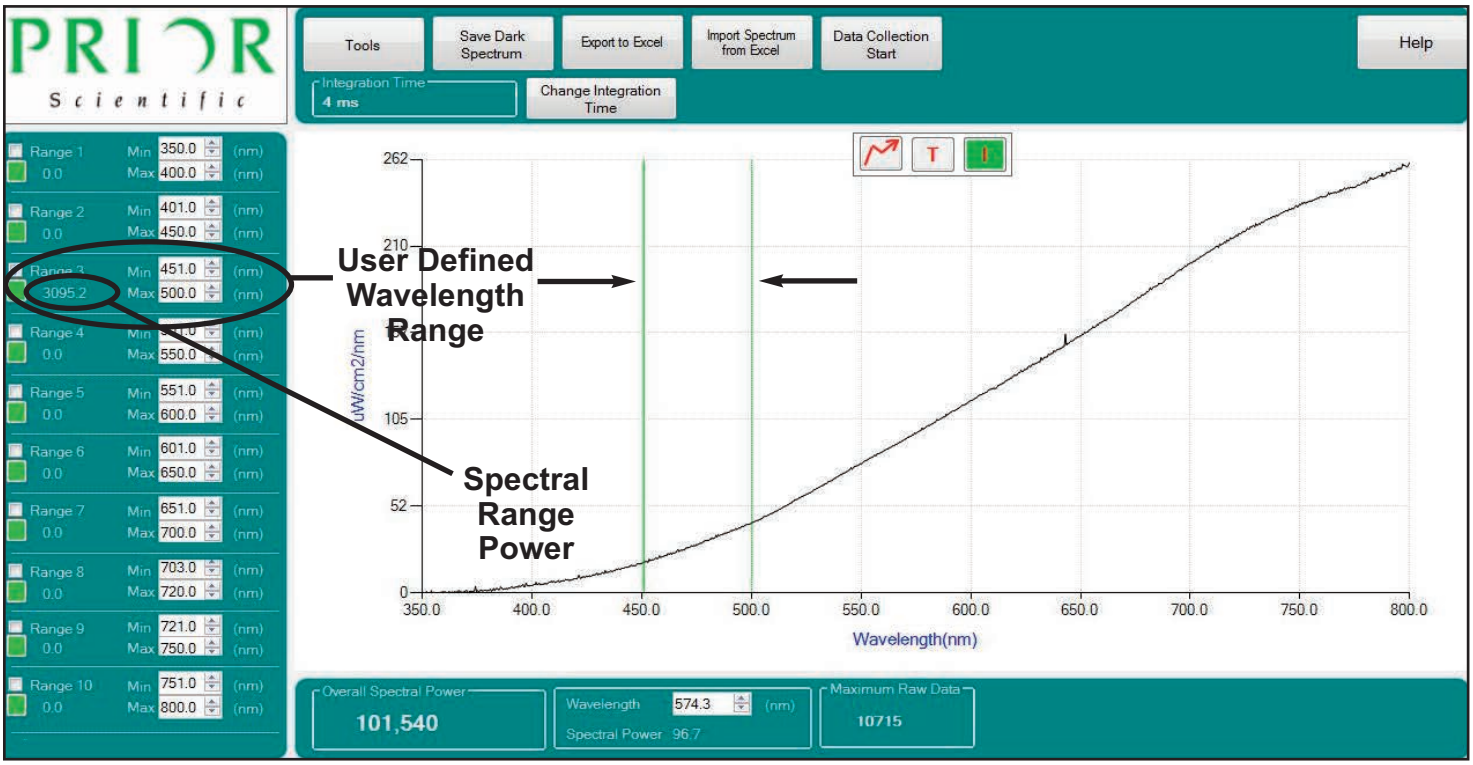
LOWER DATA BAR

The lower data bar displays the overall spectral power for the illumination system, the spectral power at a single wavelength (chosen by clicking on the graph) and the maximum raw data value. Viewing the maximum raw data value is useful when choosing the integration time for each illumination system.



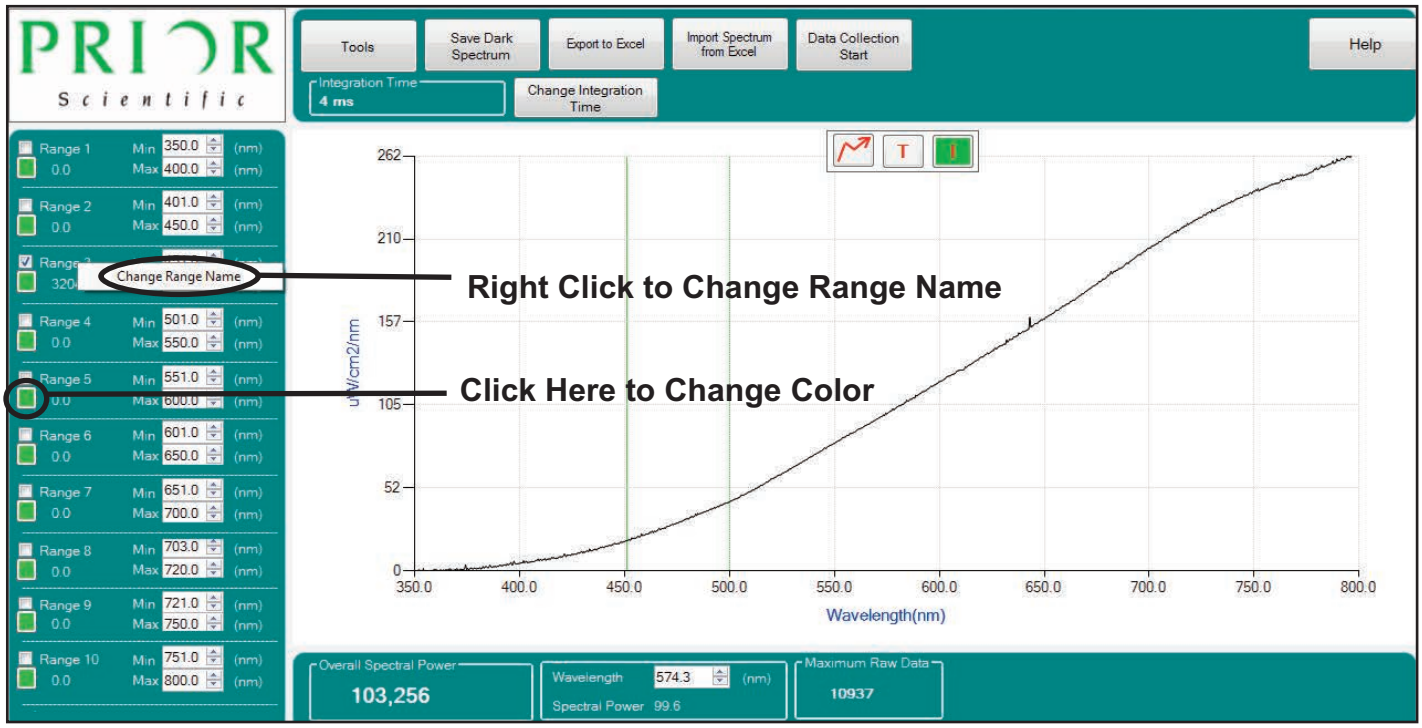
Section 9 SETTING RANGES 1 THROUGH 10

Ten user defined wavelength ranges are available. Clicking on the check box in each range allows you to view the range on the main graph. Two color coded vertical lines show at a glance the defined range. The overall spectral power for the range selected is displayed below the range name.



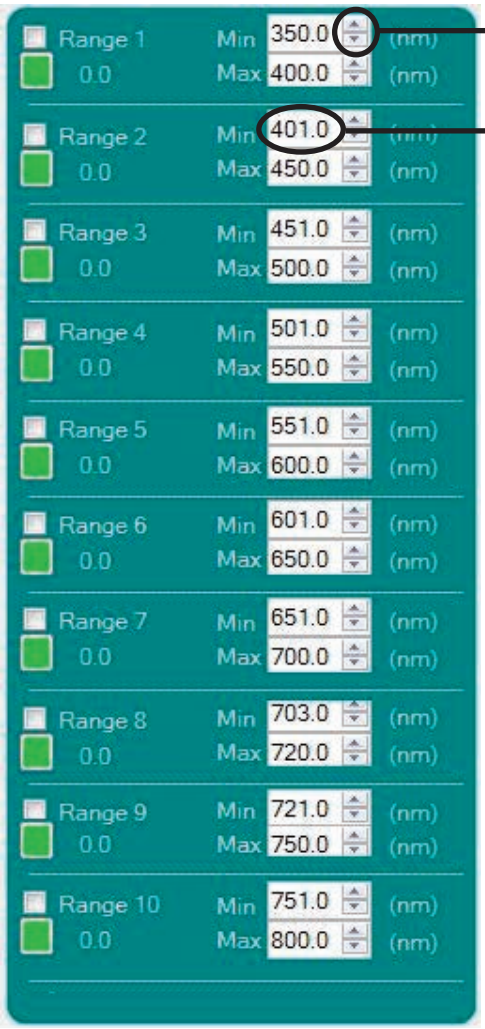
The range name can be changed by right clicking on the name and renaming.

The new name can include alphanumeric characters, but spaces are not allowed. The color of the range can be changed by clicking on the color chip and selecting a basic color or clicking on the color pallet.



Setting Ranges 1 through 10 (Continued)

The minimum and maximum ranges can be increased and decreased using the up/down arrows or by typing numbers directly into the min/max ranges.

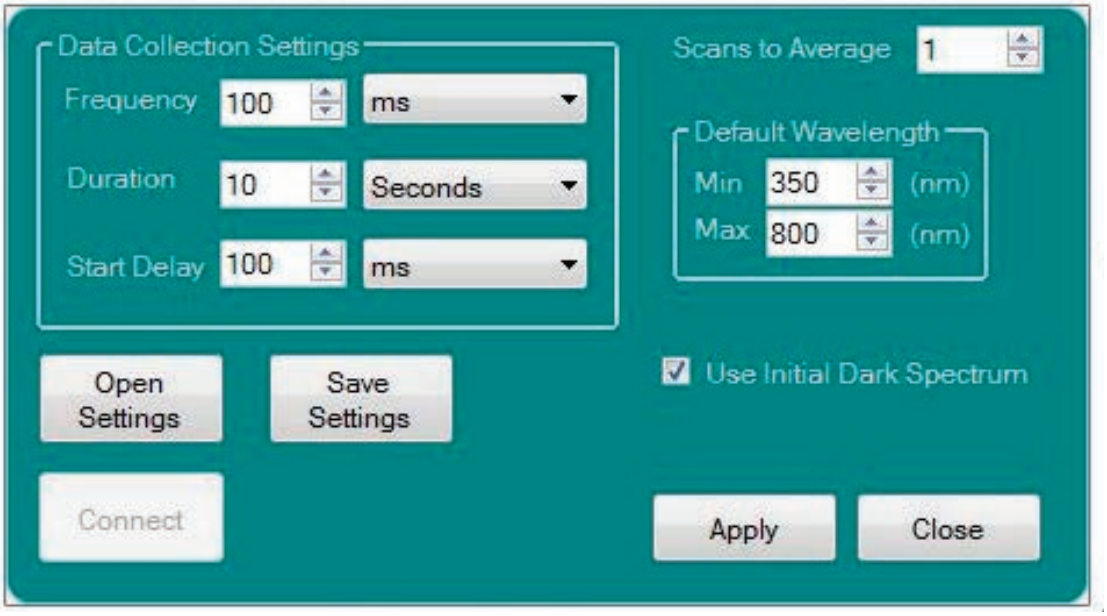


Use Arrows to Increase or Decrease Value

Users Can Also Type Value Directly Into Field

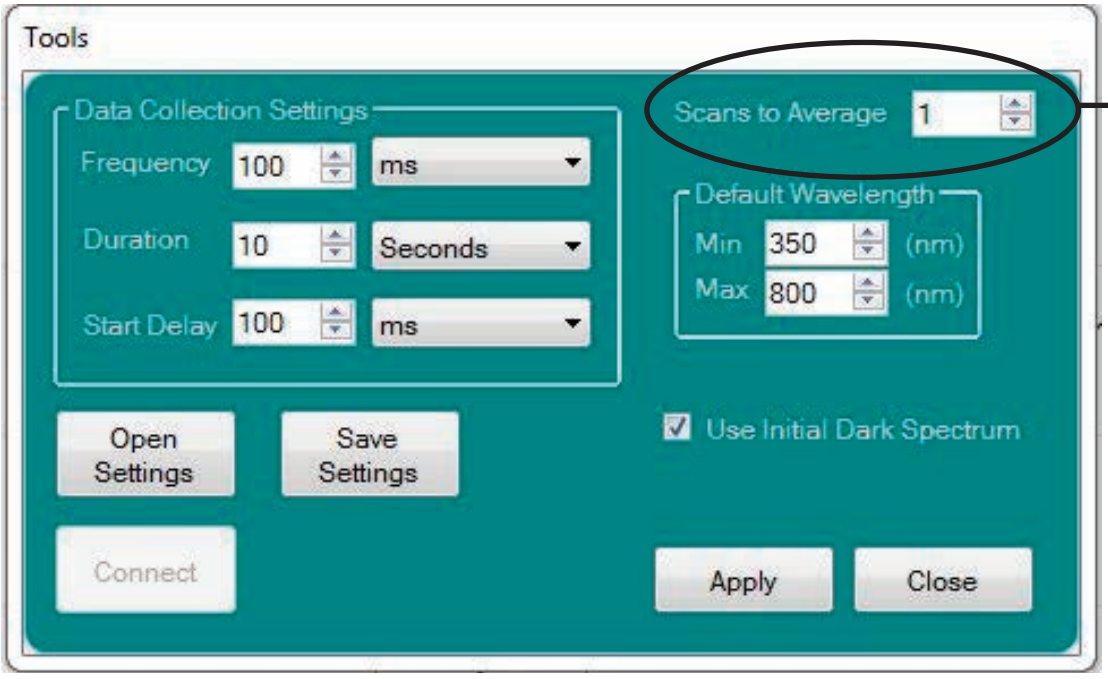
Section 10 TOOLS

Clicking on the tools button allows the user to modify Data Collection Settings, increase or decrease Scans to Average, increase or decrease the Default Wavelength (main display), open previous program settings, save current program settings, Connect to the LumaSpec spectrometer, and Use Initial Dark Spectrum.



Scans to Average

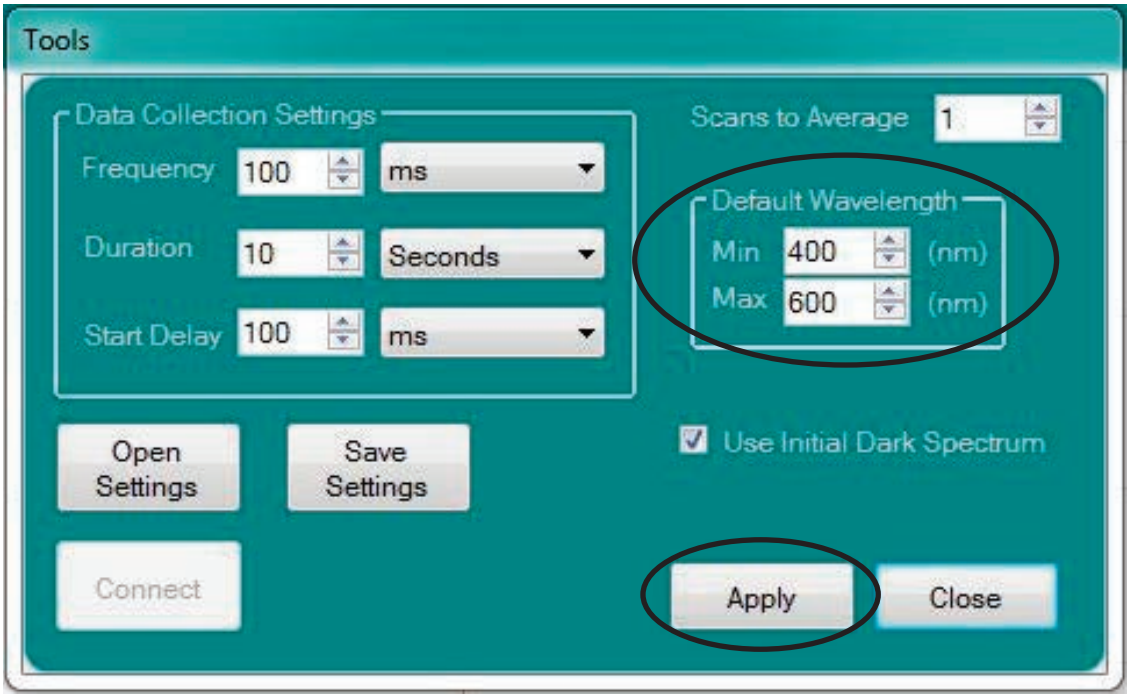
Specifies the number of spectral acquisitions that the device accumulates before the LumaSpec program displays a revised spectrum. The higher the value, the better the signal-to-noise ratio, but the slower the response.



Scans to Average Field

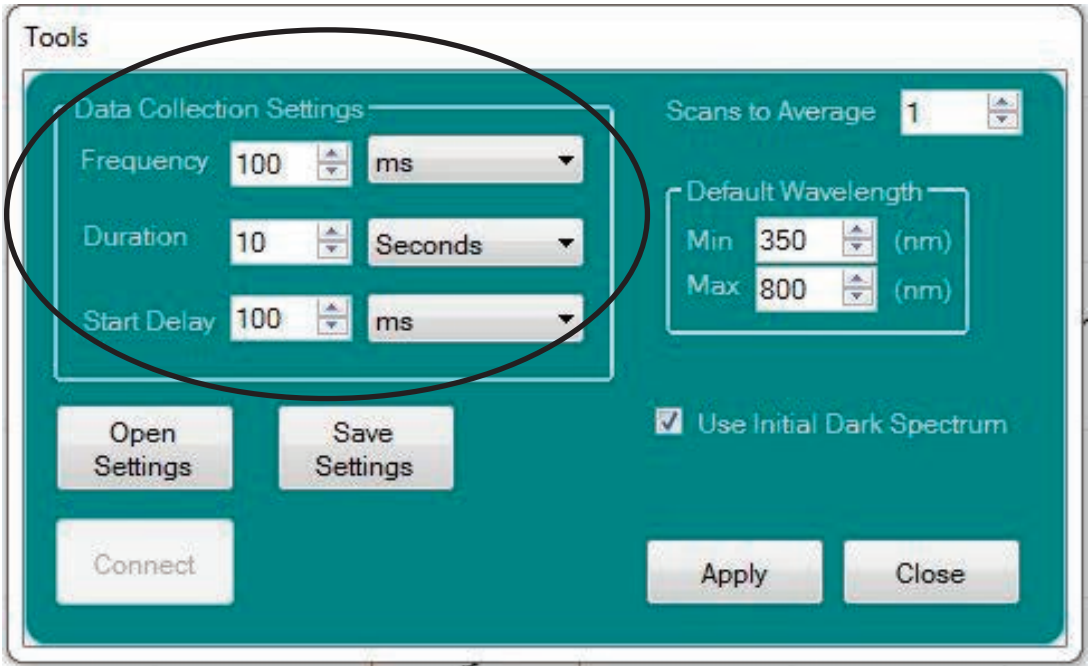
Default Wavelength

Allows the user to increase the minimum wavelength or decrease the maximum wavelength customizing the graph on the main display to show only the spectral information of interest to the user. Clicking on the apply button allows the user to evaluate the change before closing the tools menu.



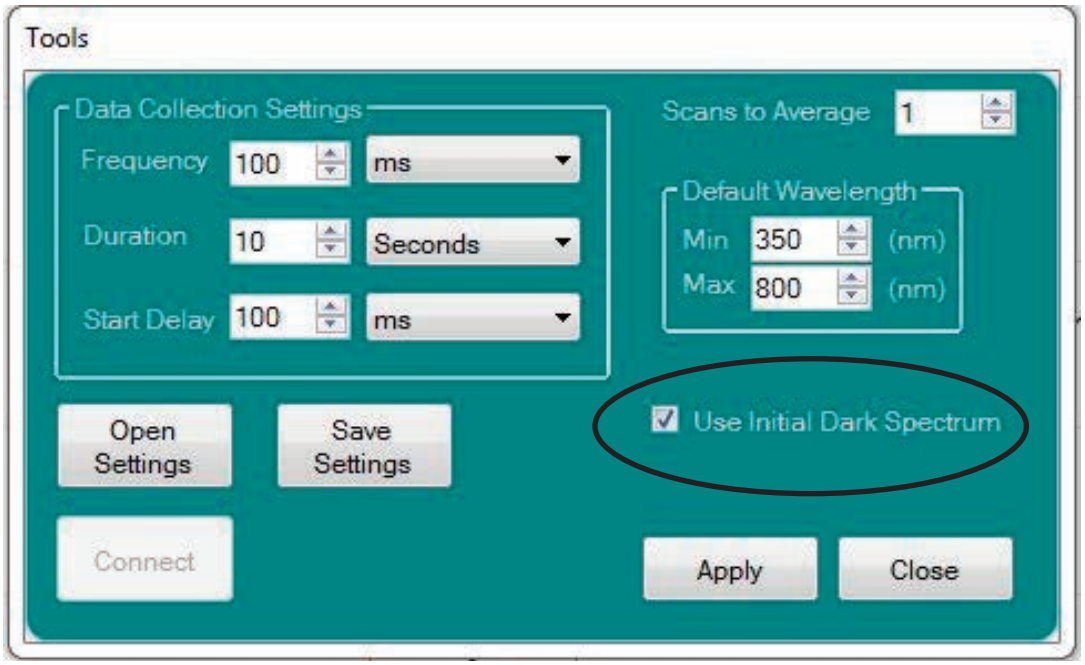
Data Collection Settings

The LumaSpec software allows the user to perform real time spectral data collection. The frequency, duration and start delay for the data collection function are adjusted in the tools menu. The acceptable range for each parameter, frequency, duration and start delay is 0-999. Values can be input directly or increased and decreased using the up/down arrows. Available units are in milliseconds, seconds, minutes and hours.



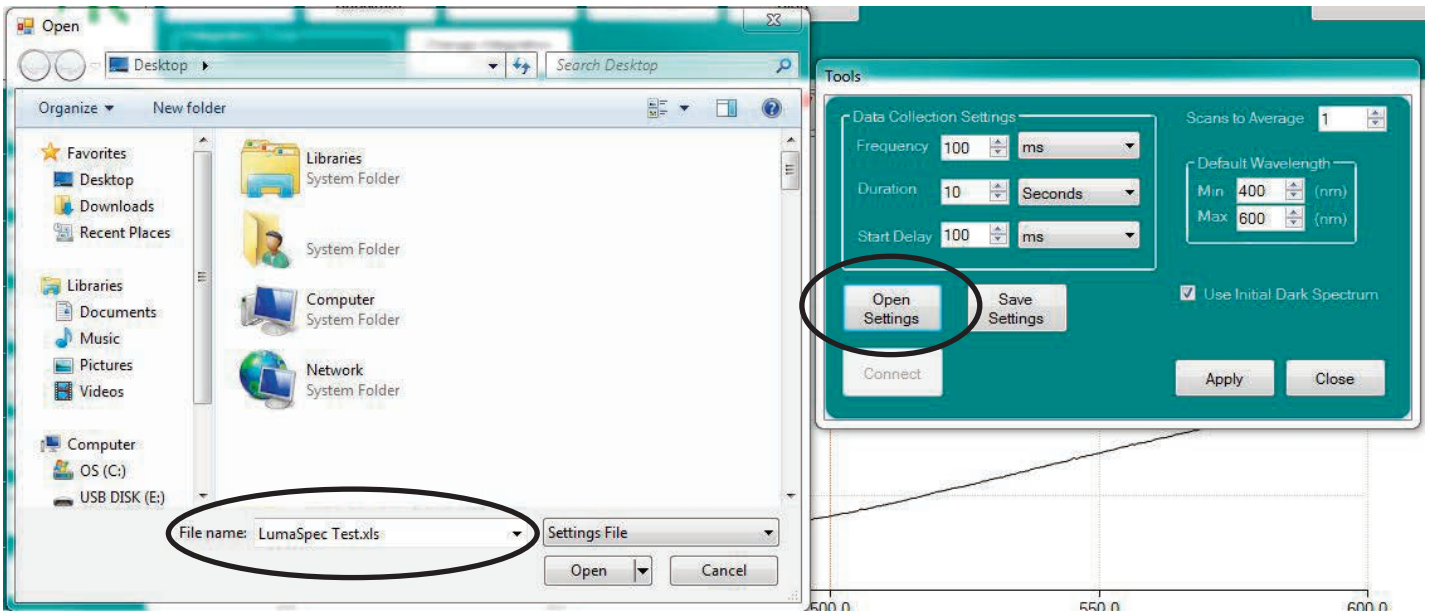
Use Initial Dark Spectrum

Checking the use initial dark spectrum box eliminates the need to save a new dark spectrum (zero calibration) each time the integration time is changed. Default state is unchecked.



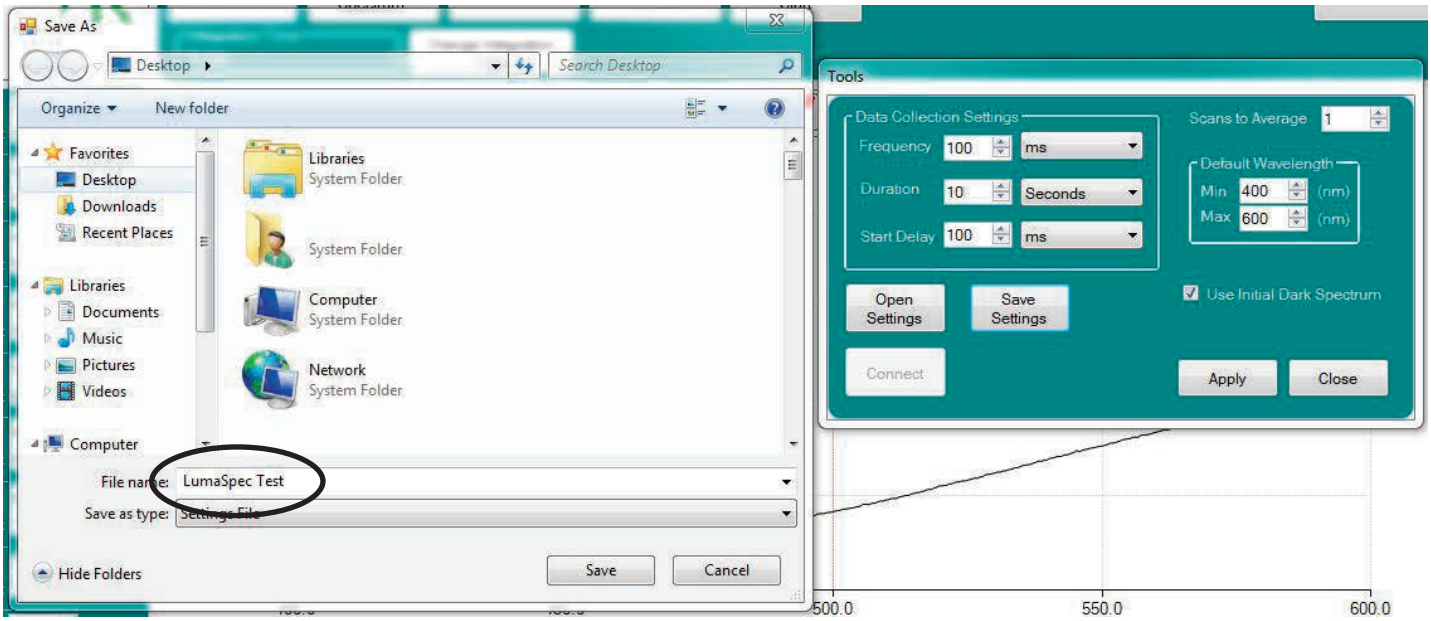
Open Settings

Clicking on this button allows the user to recall previous settings for range selection, data collection settings, scans to average. The user must have previously used save settings button.



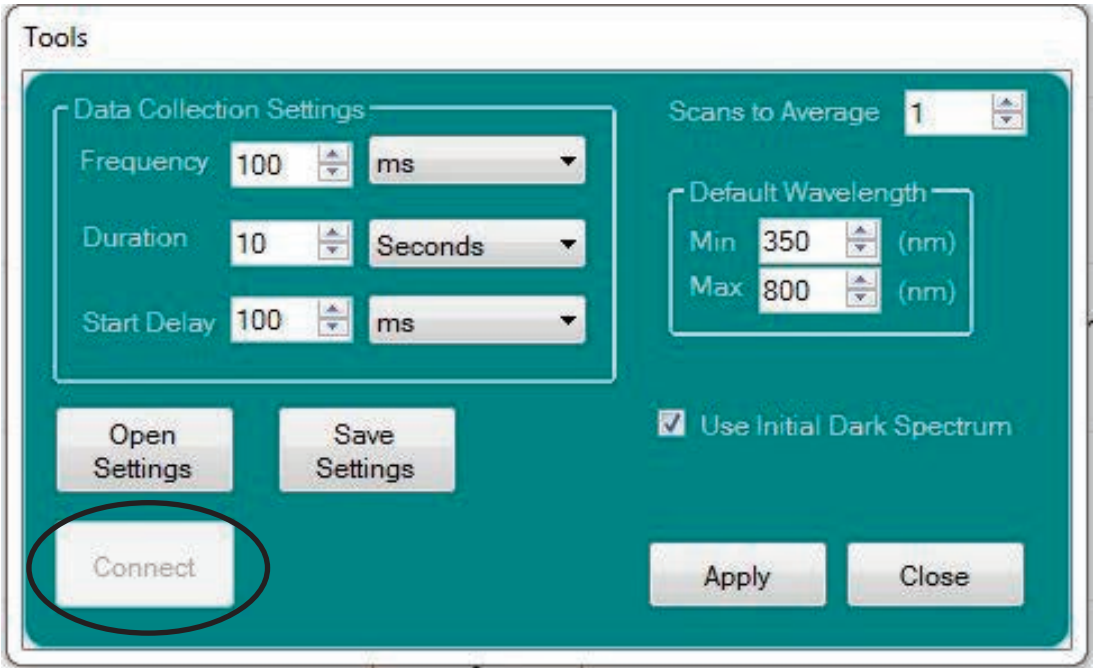
Save Settings

Allows the user to save current settings for range selection, data collection settings, scans to average. These settings can be recalled for later use. See Open Settings.



Connect

Allows the LumaSpec software to connect to the LumaSpec Spectrometer. If unit is connected to the PC upon start up, the LumaSpec software will connect automatically.

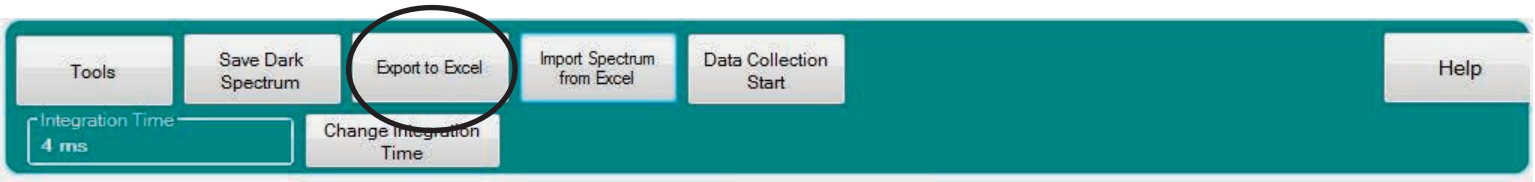


Save Dark Spectrum

Calculates and saves a new zero calibration (Dark Spectrum) for the LumaSpec.

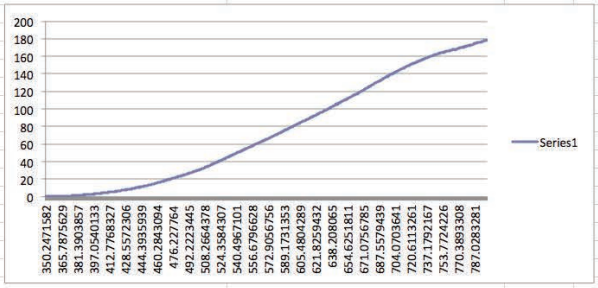
Export to Excel

Saves time stamped spectral power by wavelength in graphic and in numeric spreadsheet format. Also saves integration time, scans to average, dark spectrum, overall spectral power information and spectral power by range. See sample of saved data below.



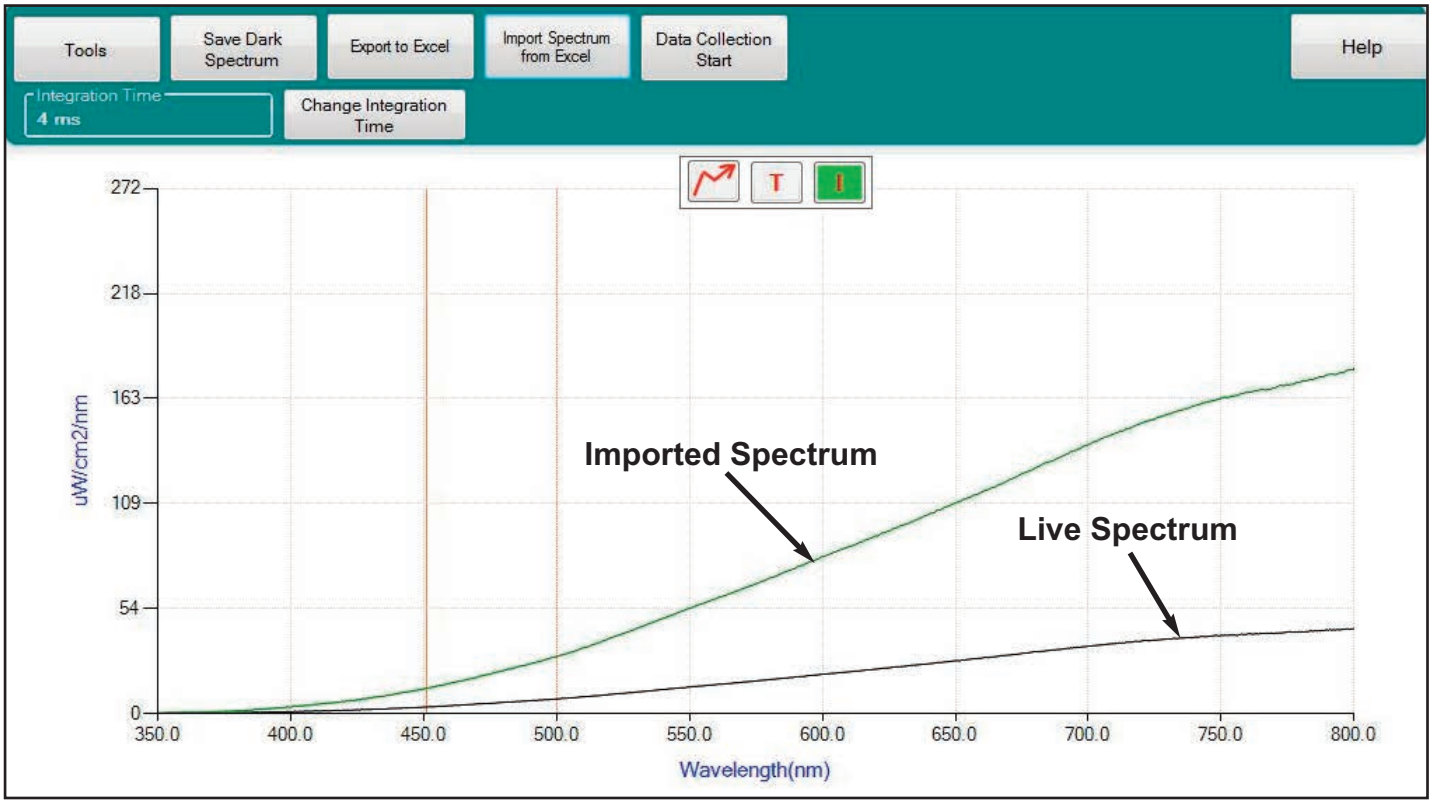
Sample Exported File

	B	C	D	E	F	G	H	I	J
1									
2									
3	Prior LumaSpec Microscope Spectrometer								
4						Name	Min (nm)	Max (nm)	Spectral Power
5		IntegrationTime	4	ms	Range 1	Range 1	350	400	
6		Scan to Average	1		Range 2	Range 2	401	450	
7		Dark Spectrum	TRUE		Range 3	Range 3	451	500	2173.65
8					Range 4	Range 4	501	550	
9		Number of pixel in processed spectrum	945		Range 5	Range 5	551	600	
10		Overall Spectral Power	70317.63413		Range 6	Range 6	601	650	
11		Date	Tuesday, January 08, 2013		Range 7	Range 7	651	700	
12		Time	3:46:34 PM		Range 8	Range 8	703	720	
13					Range 9	Range 9	721	750	
14					Range 10	Range 10	751	800	
24	Wavelength (nm)	Spectral Power							
25	350.2471582	0.475559395							
26	350.7033229	0.266381955							
27	351.1595429	0.310879859							
28	351.6158183	0.278570821							
29	352.0721489	0.360941355							
30	352.5285347	0.338897747							
31	352.9849757	0.385757396							
32	353.4414719	0.467743515							
33	353.8980232	0.245157668							
34	354.3546295	0.504258562							



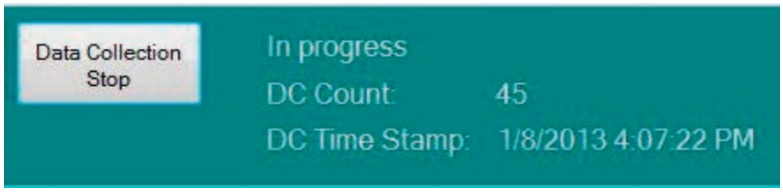
Import Spectrum from Excel

Overlays previously saved spectrum (See Export to Excel) over live graph. Up to four spectrums can be overlayed simultaneously.

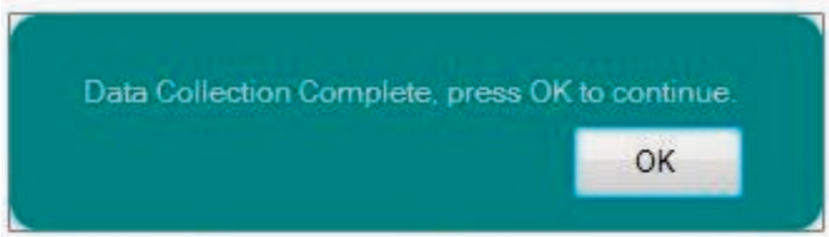


Data Collection Start

Saves time stamped spectral power data for spectral ranges 1-10. Clicking Data Collection start requires the user to select a location to save the data, then immediately begins collecting data. Pressing Data Collection Stop will end date collection immediately.

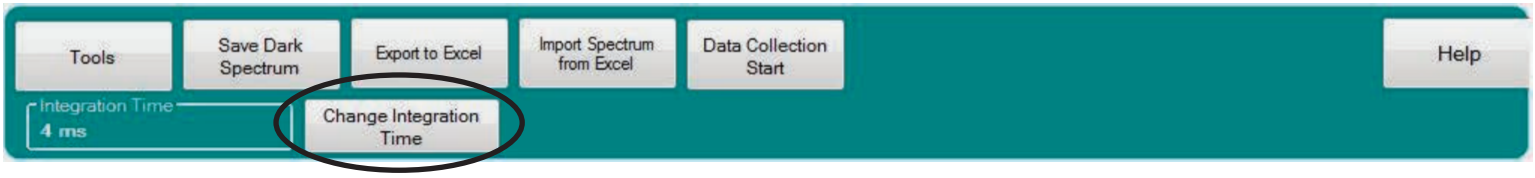


“In Progress” will flash during the data collection process and Data Collection Complete will pop up when the process is finished.

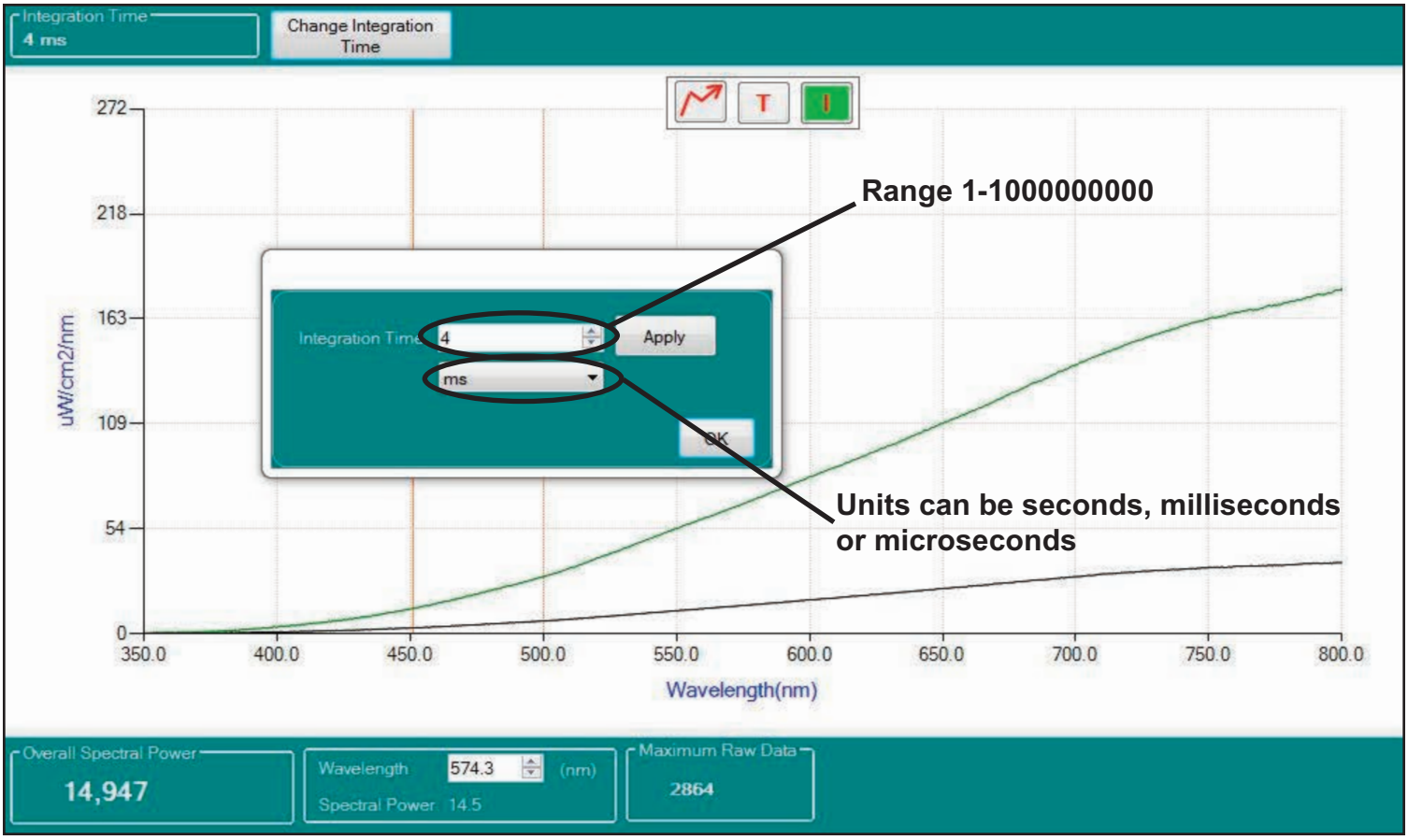


Change Integration Time

Allows the user to change integration time.

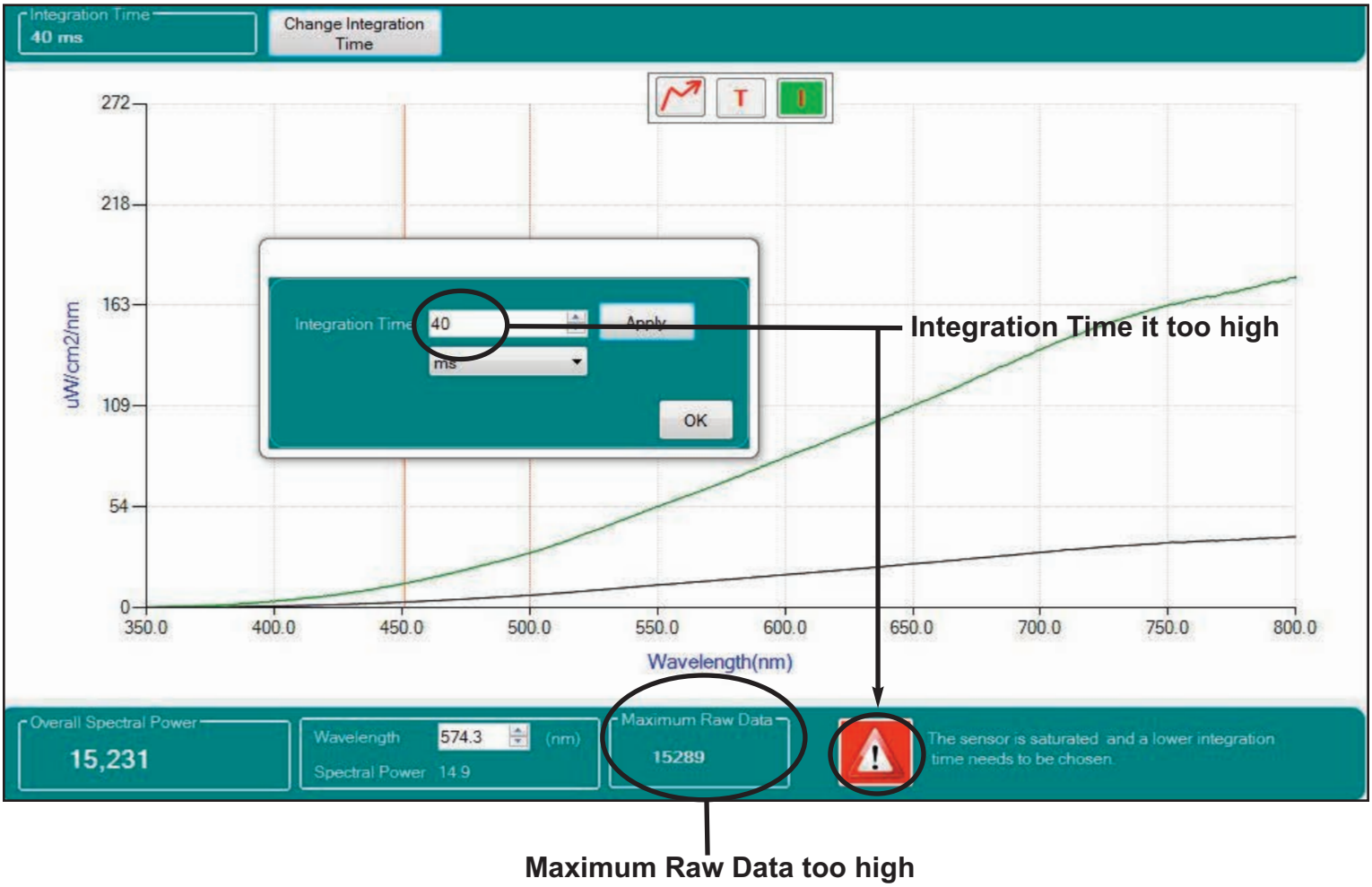


The acceptable range for Integration time is 1-1000000000, with units of seconds, milliseconds or microseconds.



Change Integration Time (Continued)

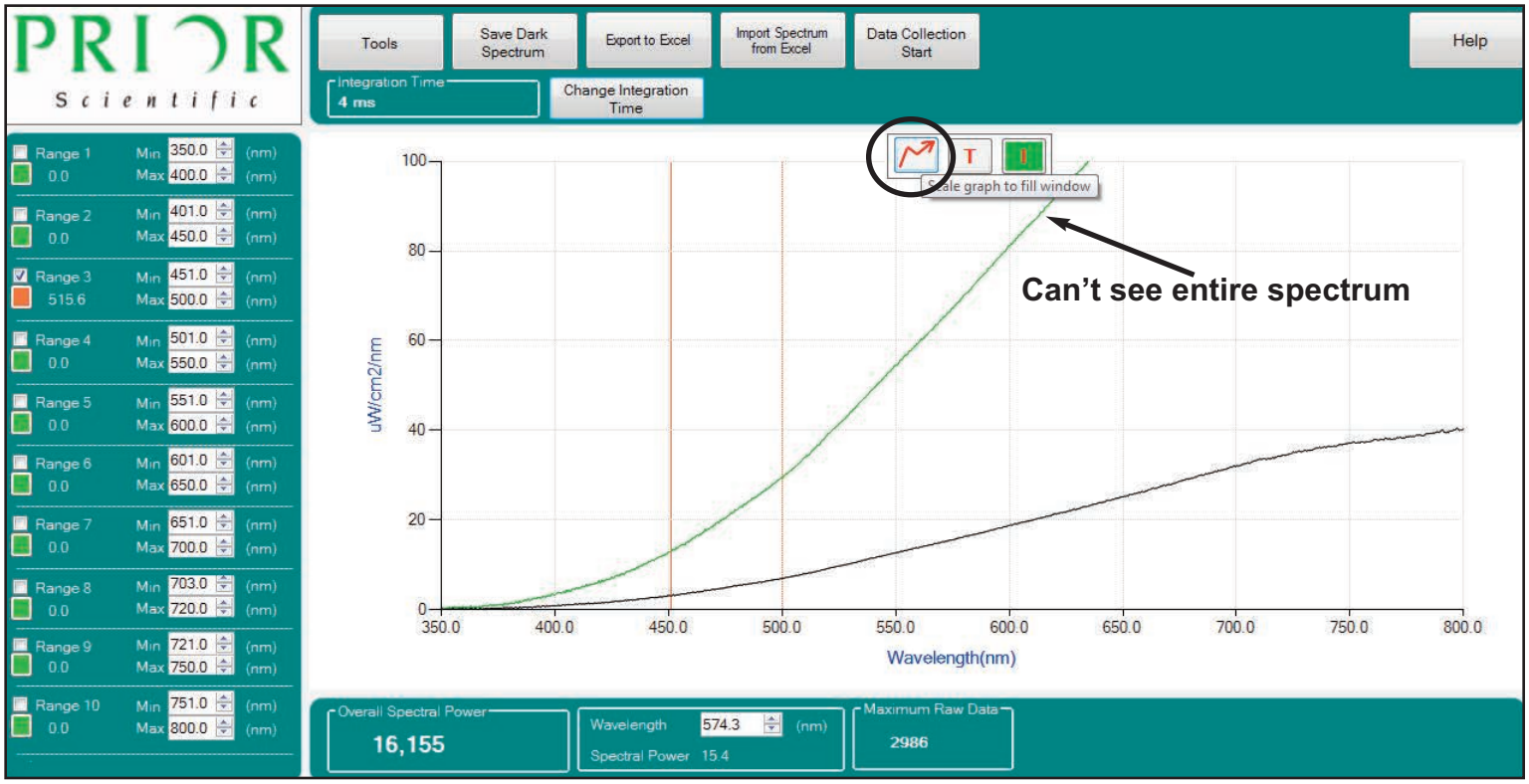
Higher integration times will increase the signal to noise ratio and provide more stable spectral power information. Increasing integration time will increase the maximum raw data value. Integration time must be decreased if maximum raw data value rises over 14,500. Integration time is ideally set to maintain the maximum raw data value between 13,000 and 14,000. The image below is an example of a situation where the current integration time is set too high. The red warning symbol in the lower right has appeared to indicate a lower integration time needs to be chosen. The maximum raw data value is also greater than 14,000 which again confirms the integration time needs to be lower.



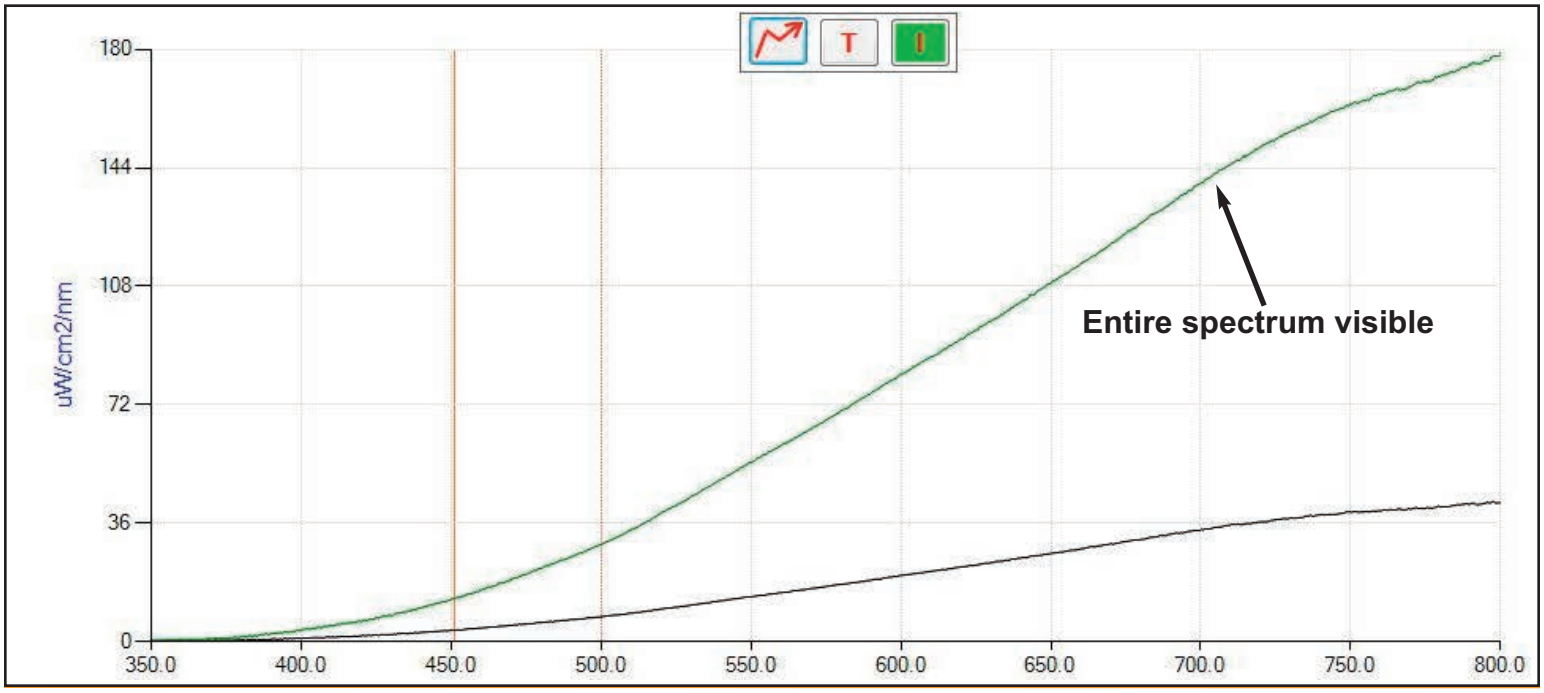
Section 11 GRAPH FUNCTIONS

Scale Graph to Fill Window

Scales Y axis of display to enlarge graph in display. Useful when overlaying multiple spectrums with widely varying spectral power.

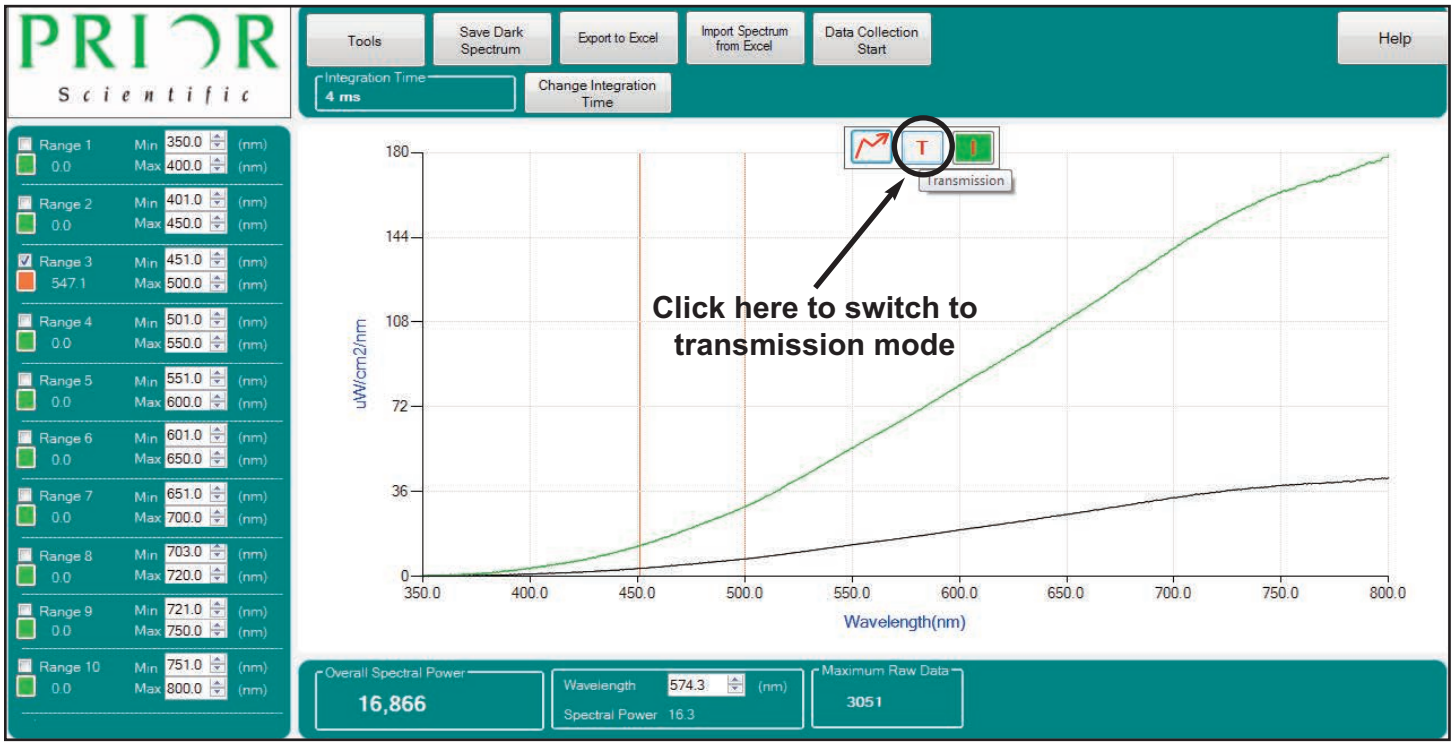


The green spectrum in the graph above is truncated. The entire green spectrum is visible in the graph below after using the scale graph icon.

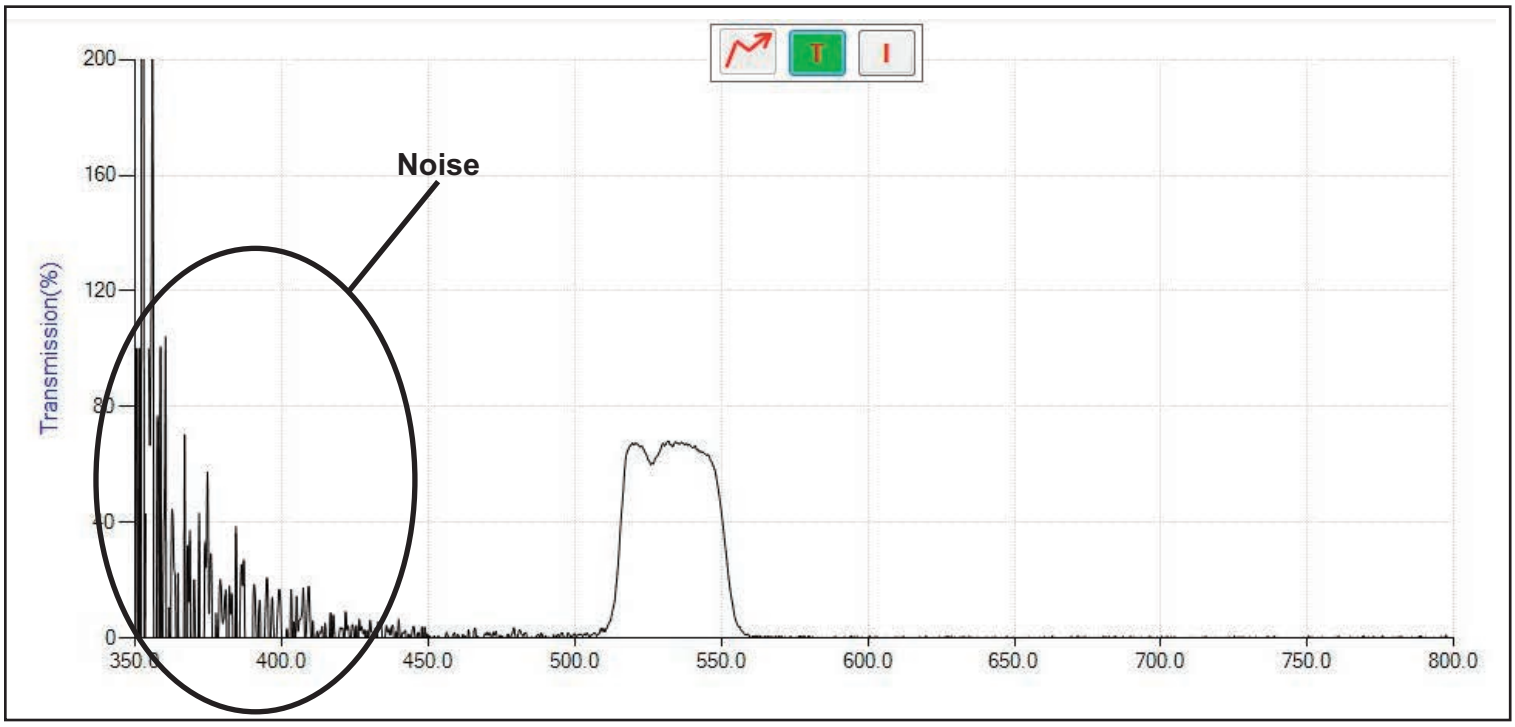


Transmission Mode T

Allows the user to place a filter in the light path and determine the percent transmission in the wavelengths transmitted. Useful for checking filter transmission efficiency and remaining lifetime.

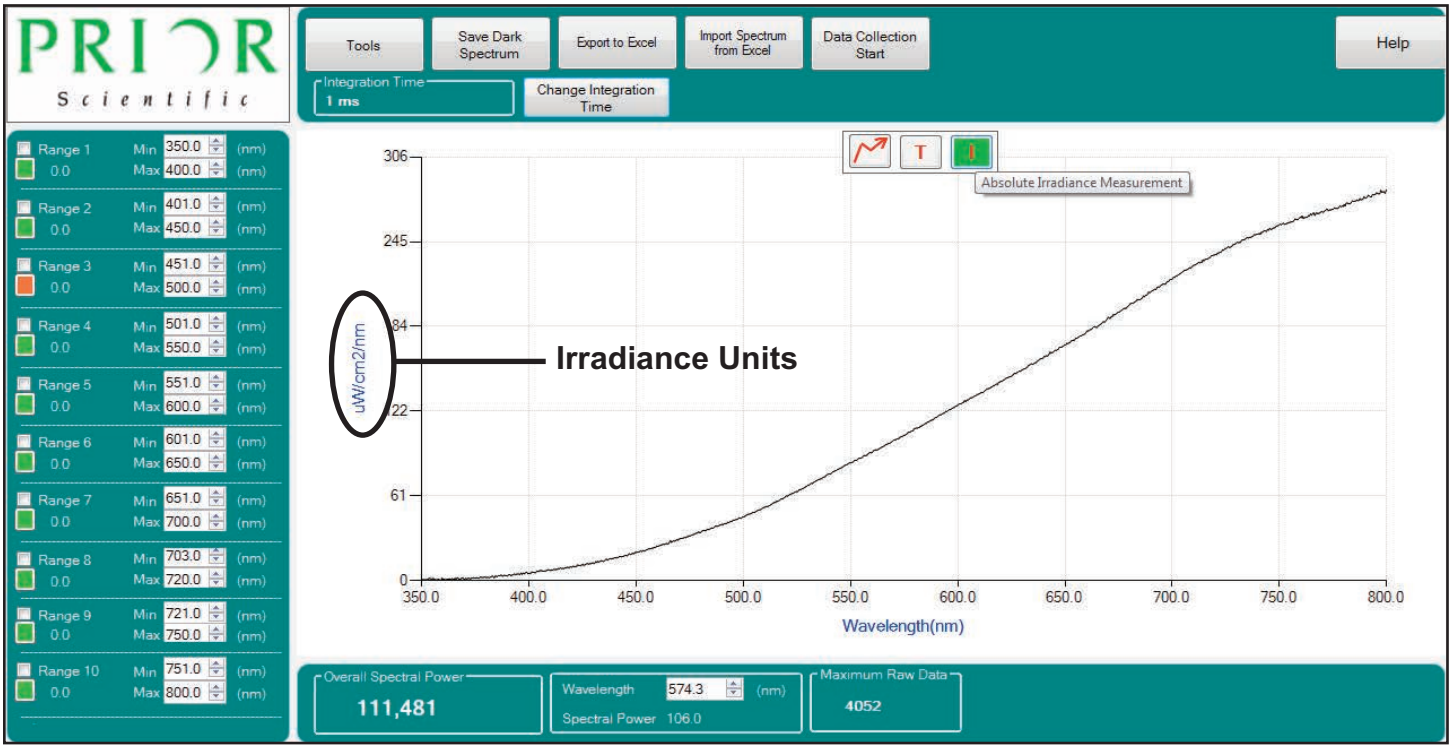


The graph below shows a halogen light source with a filter passing approximately 75% of the available light between 510-555 nanometers. Note: The large amount of “noise” in the lower wavelength range is a byproduct of the transmission calculation and indicates very low output in this range before inserting the filter.



Absolute Irradiance Measurement Mode

Default LumaSpec operating mode. In this mode the LumaSpec measures Absolute Irradiance in microwatts per square centimeter per nanometer.



Section 12 TROUBLESHOOTING

If you experiencing problems while trying to run the LumaSpec software, performing a complete uninstall and reinstall of the software may alleviate the problem you are having. Please follow the procedure below to ensure all of the program components are uninstalled and then reinstall the software using the installation procedure provided in the manual.

- Open your program list from the control panel.

  For Windows 7: Go to the start menu and click on Control Panel. Select Programs and Features in the control panel.

  For Windows XP: Go to the start menu and click on Control Panel. Select Add or Remove Programs in the control panel.

- Uninstall the following programs from the list of installed programs:

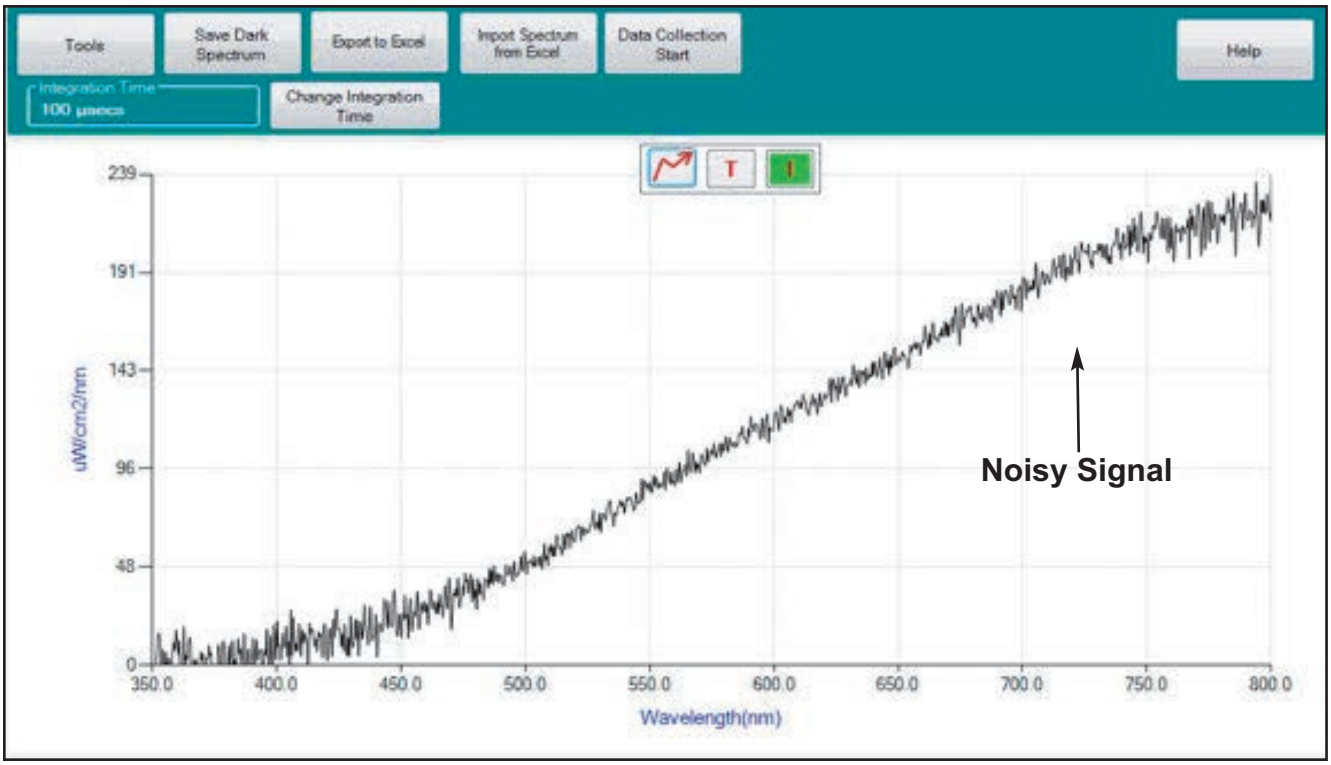
- LumaSpec
- Microsoft .NET Framework 4 Client Profile
- Microsoft Visual C++ 2010 x64 Redistributable (This program may be installed as the x86 version depending on the operating system of your computer. If you have both the x64 and x86 version installed, uninstall both programs.)
- OmniDriver-redistributable-win64-2.20 (This program may be installed as the win32 version depending on the operating system of your computer.)

- Restart the computer.

- Go through the installation process using the CD provided with the spectrometer.

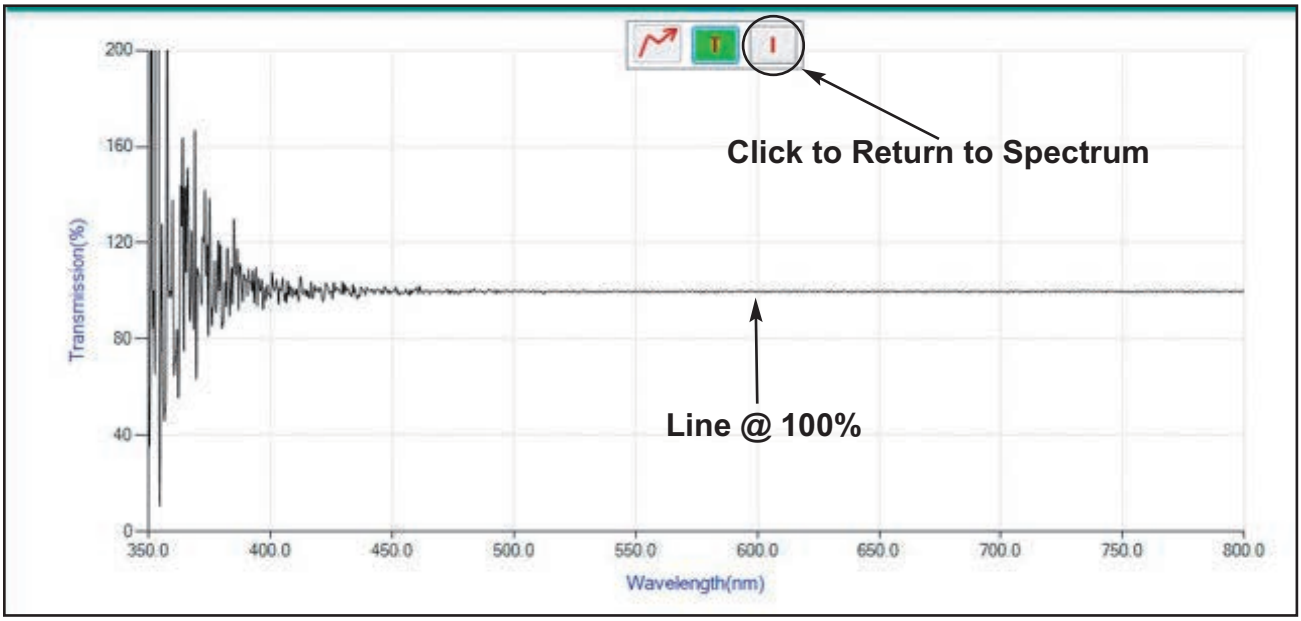
- Restart your computer after the installation has completed.

Issue: The spectrum graph is not smooth, very noisy signal



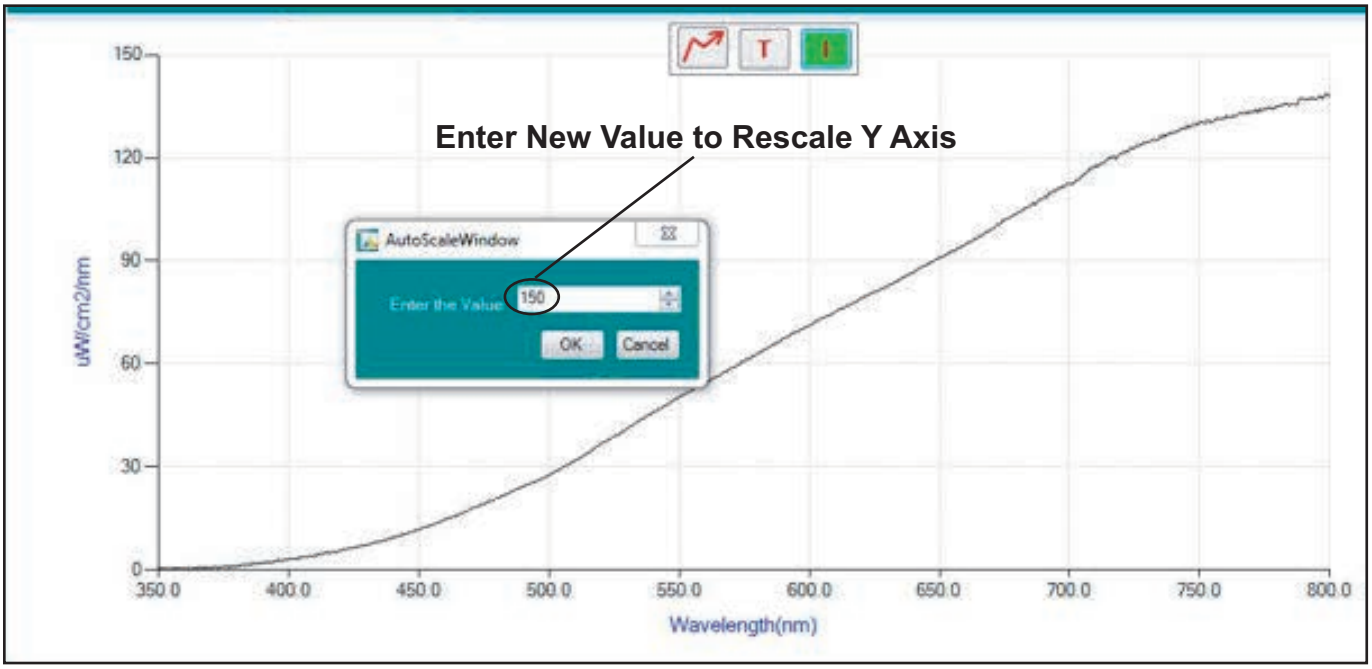
Suggestion: Increase the integration time until the Maximum Raw Data Value is between 13000 and 14000 counts.

Issue: The spectrum graph is displaying 100% output only, not the proper spectrum.



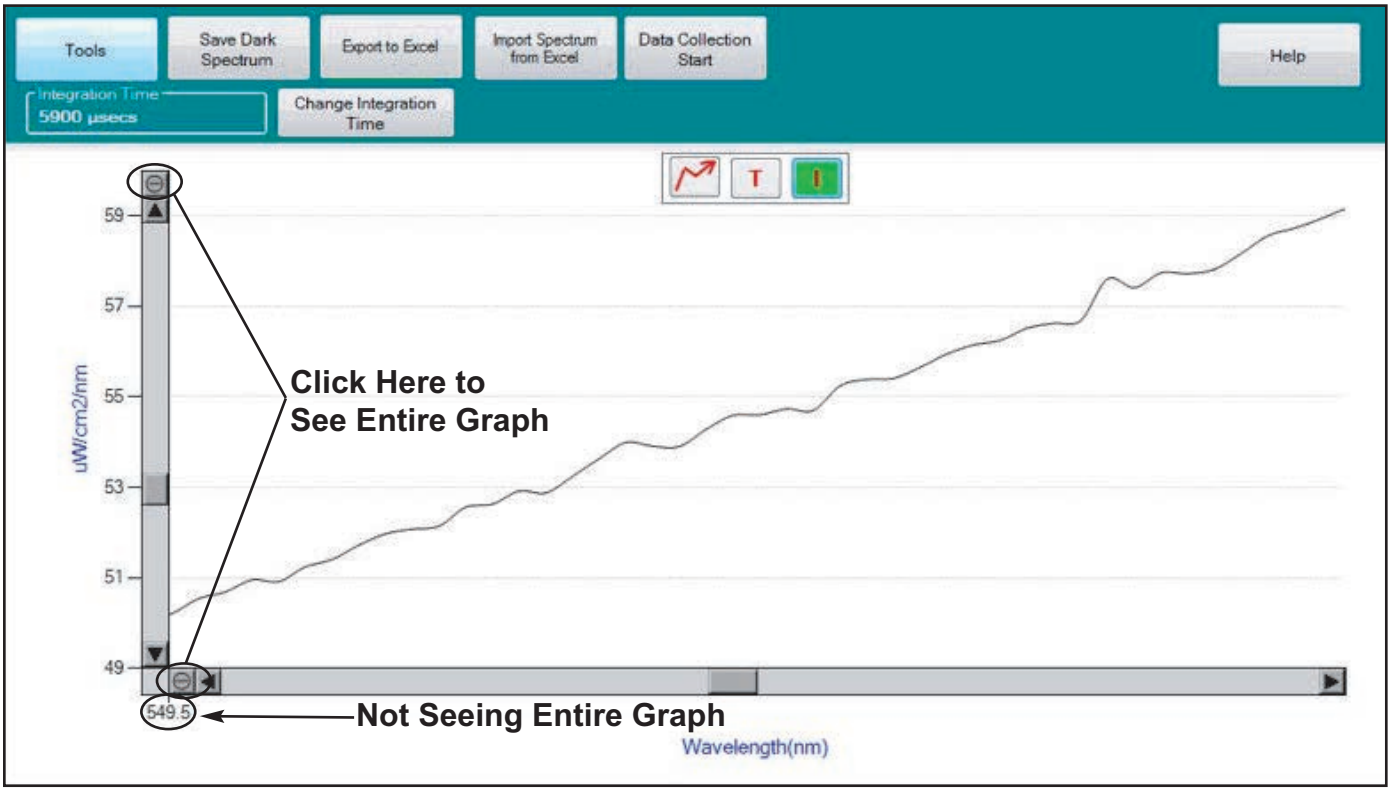
Suggestion: Click on the Irradiance Icon to change display from Transmission Mode to Irradiance Mode.

Issue: Want to adjust the Y axis range manually.



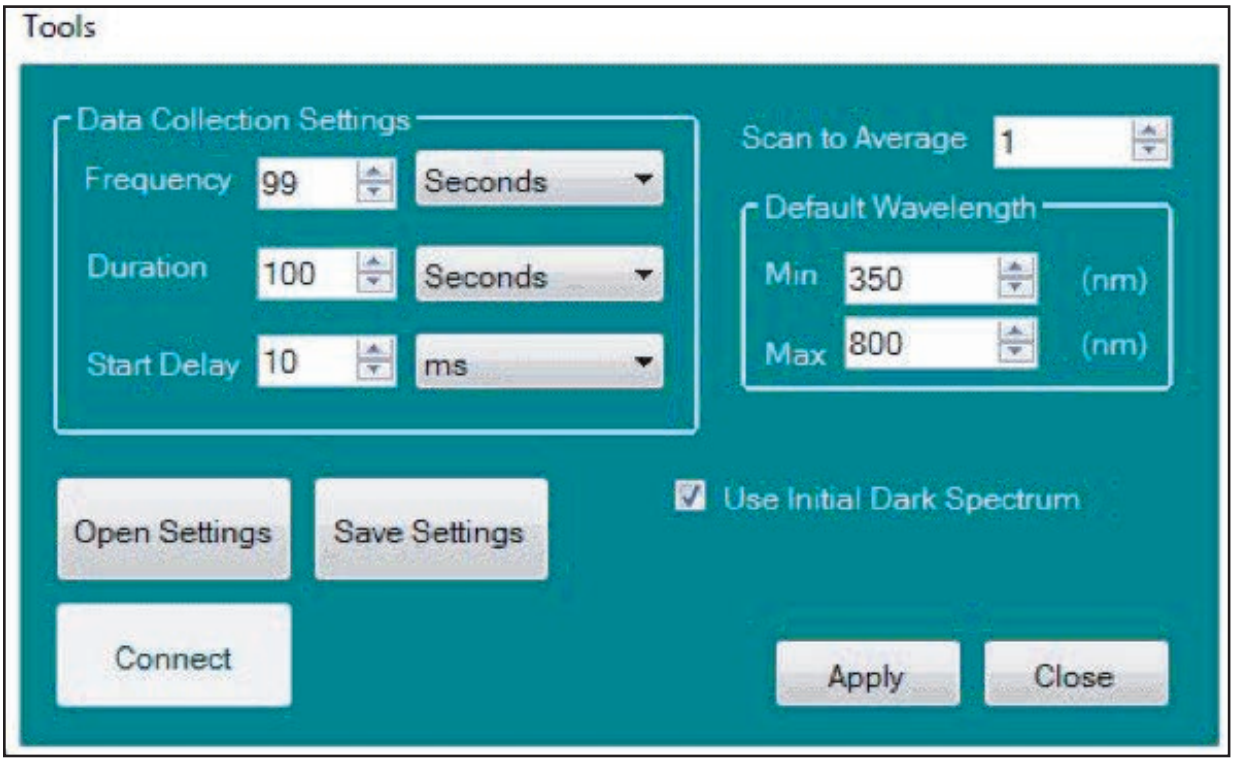
Suggestion: Right click on the graph and select Change Chart Y Axis Value. The AutoScale Window will pop up and allow the user to choose a custom spectral power range.

Issue: The main display is blank or only shows a small portion of the graph.



Suggestion: Click on the circles with the hyphen in the center on the left side of the graph to view the entire spectrum graph.

Issue: Saving a new Dark Spectrum (zero calibration) is inconvenient each time Integration Time is adjusted.



Suggestion: In the Tools menu, check “Use Initial Dark Spectrum” and the software will not require a new Dark Spectrum every time Integration Time is changed.

Section 13 RETURNS AND REPAIRS

Should you experience problems with your LumaSpec 800 and want to send it back for service, warranty or otherwise, a Return Material Authorization (RMA) number must be obtained from the appropriate Prior Scientific office before returning any equipment. For North and South America contact Prior Scientific Inc. and for the rest of the world call Prior Scientific Instruments Limited on the telephone numbers shown below:

Worldwide Locations

Prior Scientific, Ltd	**Prior Scientific, Inc**	**Prior Scientific, GmbH**	**Prior Scientific KK**
Cambridge, UK	Rockland, MA. USA	Jena, Germany	Tokyo, Japan
T. +44 (0) 1223 881711	T. +1 781-878-8442	T. +49 (0) 3641 675 650	T. +81-3-5652-8831
E. uksales@prior.com	E. info@prior.com	E. jena@prior.com	E. info-japan@prior.com

Prior Scientific recommends having the LumaSpec 800 calibrated annually to ensure reliable and accurate performance. Contact your local Prior Scientific office for more information.