



# OPTIGAUGE™

## Refractive Index Calculation System

# User Guide

Rev. 2.2

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Specifications are subject to change.

## Revision Notice

Every reasonable effort has been made to ensure the accuracy of this guide; however, product improvements may result in minor differences between this manual and the actual product shipped. If exact specifications for the product are required, please contact Lumetrics Inc. for assistance.

## Revision History

<b>Refractive Index Calculation System User Guide</b>	
<b>Release 1.0</b>	<b>03-24-2009</b>
<b>Release 1.1</b>	<b>12-28-2009</b>
<b>Release 1.2</b>	<b>01-26-2010</b>
<b>Release 2.1</b>	<b>04-01-2013</b>
<b>Release 2.2</b>	<b>02-25-2014</b>



## OVERVIEW

The OPTIGAUGE measurement system provides precision thickness measurement capability for a diverse range of clear and translucent materials, including tubing, sheet, and packaging components. It has numerous applications in medical, food processing, scientific, and manufacturing operations, and may be used in both production line and static laboratory environments. The OPTIGAUGE measurement system also provides index of refraction measurements.

The OPTIGAUGE system combines optical technology with the processing power of a specialized PC to measure and display thickness results in an easy-to-use format with high precision, and in a non-contact, non-destructive manner.

### How the OPTIGAUGE System Works

The OPTIGAUGE system is comprised of a low-coherence interferometer, a computer controller with specialized hardware and software, fiber optic cable(s), optical probe(s), and mounting hardware. Standard optical probes are available to meet a wide range of application requirements. Custom optical probes or mounting hardware can be provided on a per system basis to accommodate unique applications.

The OPTIGAUGE and Controller can be remotely located from the optical probes and measurement point. The controller runs the OPTIGAUGE Control Center software and provides a graphical user interface to display current measurement data. The OPTIGAUGE Control Center allows the user to adjust hardware and data collection settings, including LED intensity and measurement range to accommodate measurement of complex materials and layer configurations. Figure 1 provides a basic block diagram of the system.

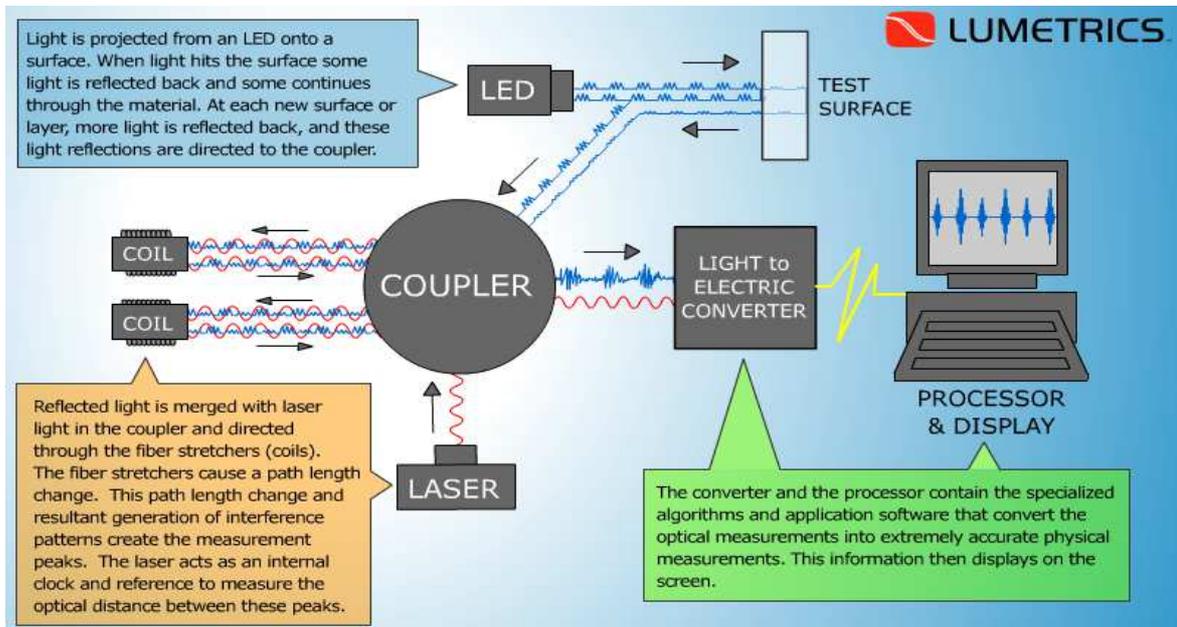


Figure 1 - OPTIGAUGE System Block Diagram

## INDEX OF REFRACTION —GETTING STARTED

The Refractive Index Calculation System (RICS) is an extension of the OptiGauge Control Center (OCC) which functions as the data reference. The OCC should be used in conjunction with this application for the validation of proper sample focusing. RICS quickly and easily measures the index of refraction (RI) of a sample using the data from the OptiGauge Kernel.



**Figure 2 – RICS Stand**

The RICS Stand creates a working measurement field using a lens on an adjustable bracket and a mirror fixed in the base of the stand. These components are used to create an optical reference through which the unknown refractive index of a sample material is calculated.

Visible in this image are three thumbscrews that control three positional references

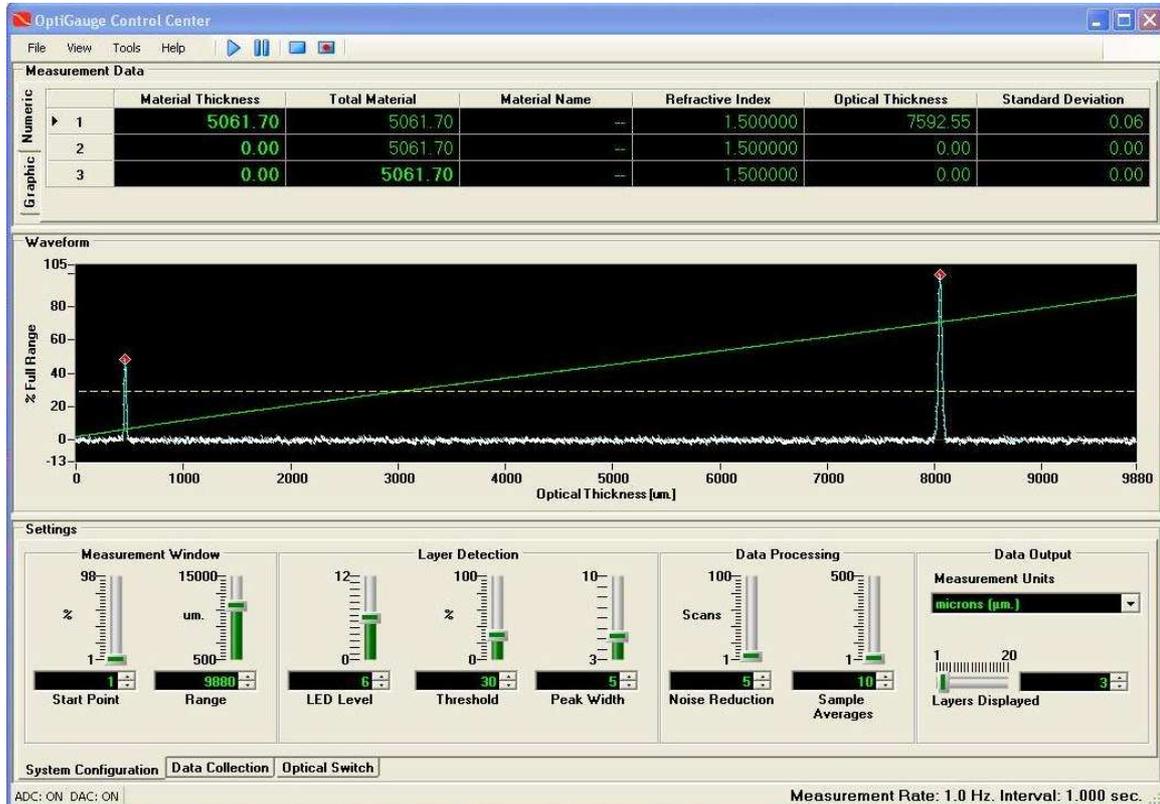
<b>Bracket</b>	<b>Position Control</b>
the probe mount	the height of the probe in the probe mount
the material guide	The position of the material clamp surface
the base plate	the position of the probe mount with respect to the base

*For detailed operating instructions for the OptiGauge Control Center software, please refer to the OptiGauge User's Guide.*

## Initial Startup Instructions

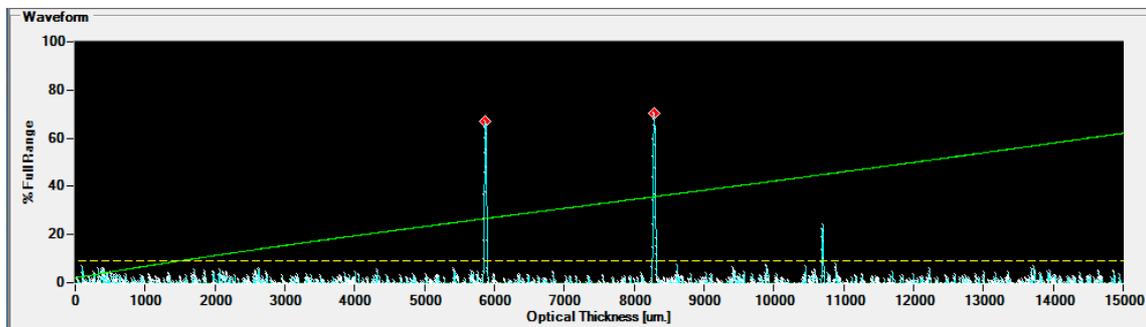
Follow these steps to set up the proper configuration for RI measurements:

1. Begin by launching the OCC through the desktop or the Start Menu shortcuts.



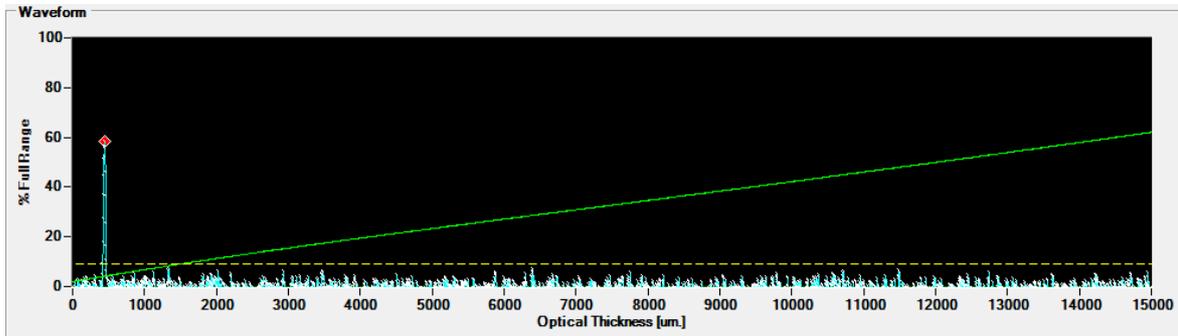
**Figure 3 - OptiGauge Control Center**

2. Loosen the two thumbscrews on the back of the stand and raise the probe mount to the top of its travel limit. This will put the mirror in the base outside the viewing range of the probe.
3. Place a 50 mm probe in the probe mount bracket and slowly lower it until the two peaks that represent the top surface lens appear on the waveform.



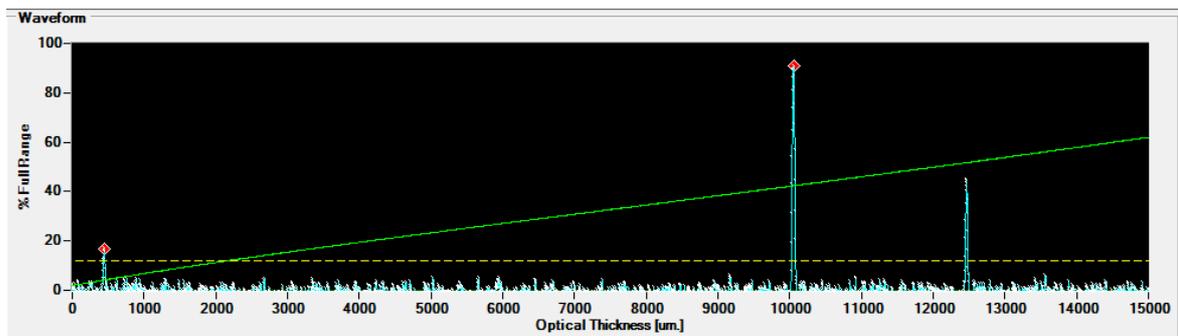
**Figure 4 – Top Surface Reference Peaks**

4. Continue to lower the probe until the first peak moves to the left off of the waveform and the second peak is at about the 500 micron position and tighten the thumbscrew.



**Figure 5 – Bottom Surface of Top Reference**

5. Loosen the 2 thumbscrews located on the spine of the fixture. Lower the L bracket until the peak from the base bottom surface mirror enters the waveform from the right and approaches the 10000 micron position. Note: the peak on the left does not move.



**Figure 6 – Top and bottom reference surface peaks**

6. Tighten the thumbscrews to lock the bracket in place.

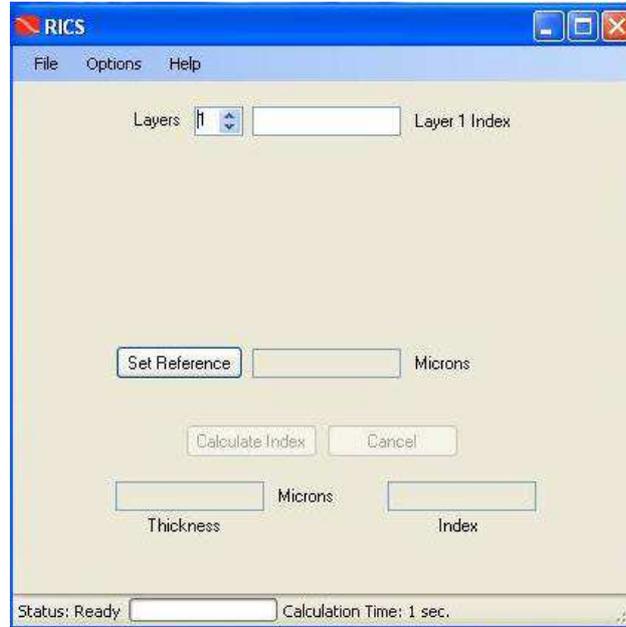
Note: the distance between the two reference surfaces needs to take into account the size of the sample to be measured and the changing optical path as the sample with a greater than air refractive index is placed in the path of the measurement beam.

7. Apply the following settings in the System Configuration tab:
  - a. Start Point = Lowest functional value
  - b. Range = Full Range
  - c. LED level = Lower until the signal is not saturated.
  - d. Peak Width = 5
  - e. Noise Reduction = 5
  - f. Sample Averages = 10

8. Start the RICS software.

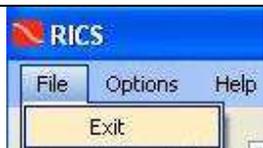
## User Interface

The following figure shows the screen that is displayed when the RICS is running. This screen is used for all sample measurements. It allows the user to determine the Index of Refraction and measure the thickness of a single layer.

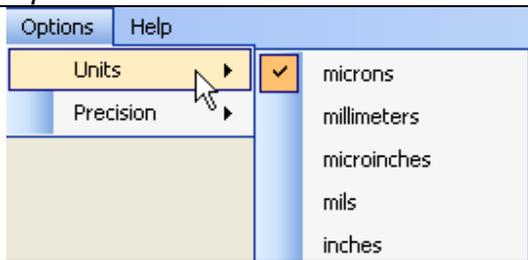
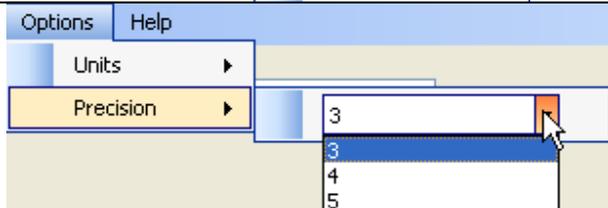


**Figure 7 – RICS Software Screen**

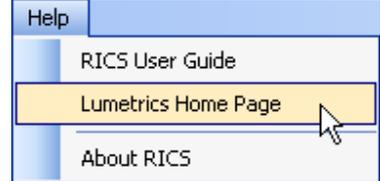
### File

	<p><b>Exit</b> – closes down the program</p>
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### Options

	<p><b>Units</b> – select the unit of measurement that the thickness will be calculated at. Changing the units will clear the referenced value (see below).</p>
	<p><b>Precision</b> – Allows the user to retrieve 3, 4 or 5 decimal points of precision in the Refractive Index measurement.</p>

*Help*

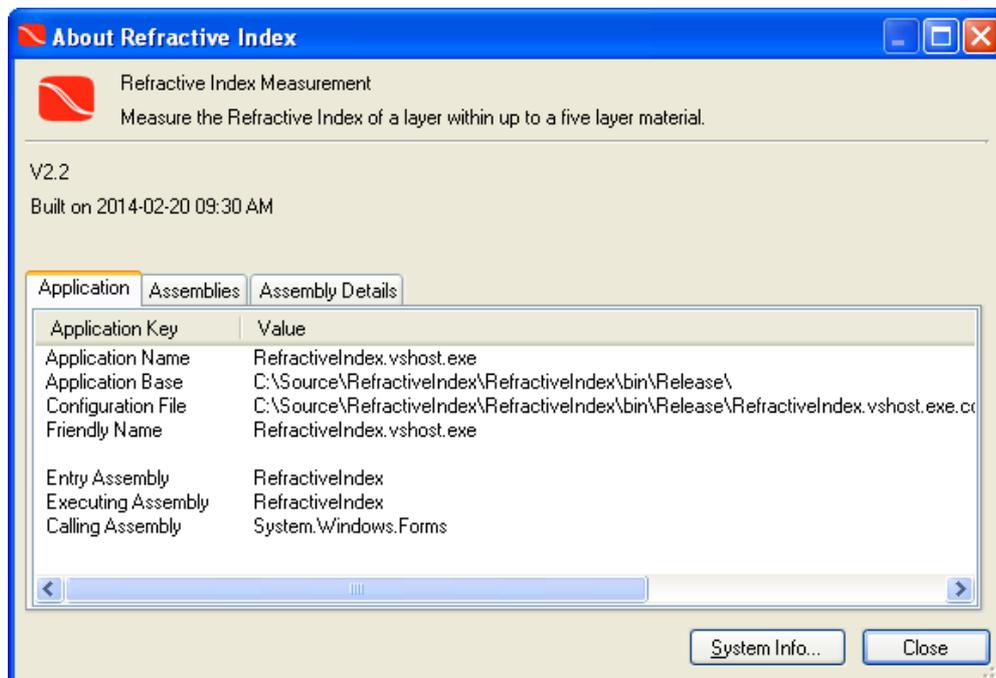
	<p><b>RICS User Guide</b> – launches the pdf of the user manual.</p> <p><b>Lumetrics Home Page</b> – launches the Lumetrics web site in a browser window (must have Internet connection).</p> <p><b>About OptiGauge Control Center</b>– shows a dialog with information about the application and system.</p>
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*RICS User Guide*

The RICS User Guide provides an electronic view of this User’s Guide. It is installed with the application in PDF format. The installation image includes a copy of Adobe Reader as a separate install. This may be used to read the electronic form of the manual.

*About RICS*

This is a “read only” screen used to verify the system software and hardware configuration. This information may be helpful when calling Lumetrics, Inc. for technical assistance.



**Figure 8 - About RICS Screen with Details expanded**

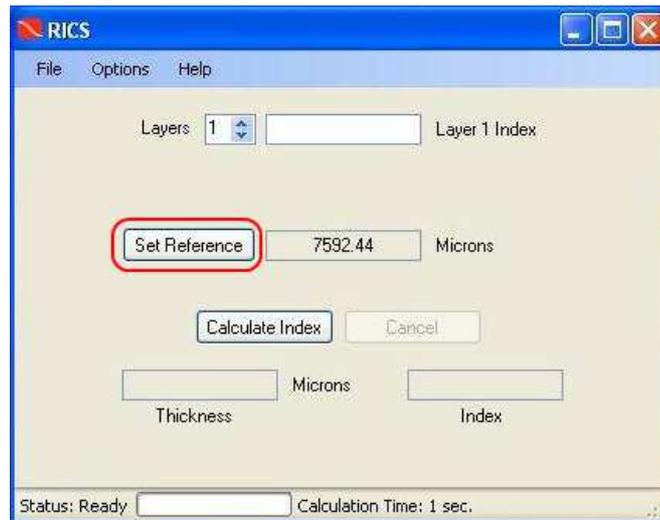
*Status Bar*

<p>Status: Ready <input type="text"/> Calculation Time: 1 sec.</p>	<p><b>Status Ready:</b> The system is ready to make a measurement</p>
<p>Status: ClearingBuffer <input type="text"/> Calculation Time: 5 sec.</p>	<p><b>Status Clearing Buffer:</b> The system is clearing stored data points in the buffer.</p>
<p>Status: Calculating <input type="text"/> Calculation Time: 5 sec.</p>	<p><b>Status Calculating:</b> The system is calculating the thickness and index of refraction.</p>

## ***Measurement Instructions***

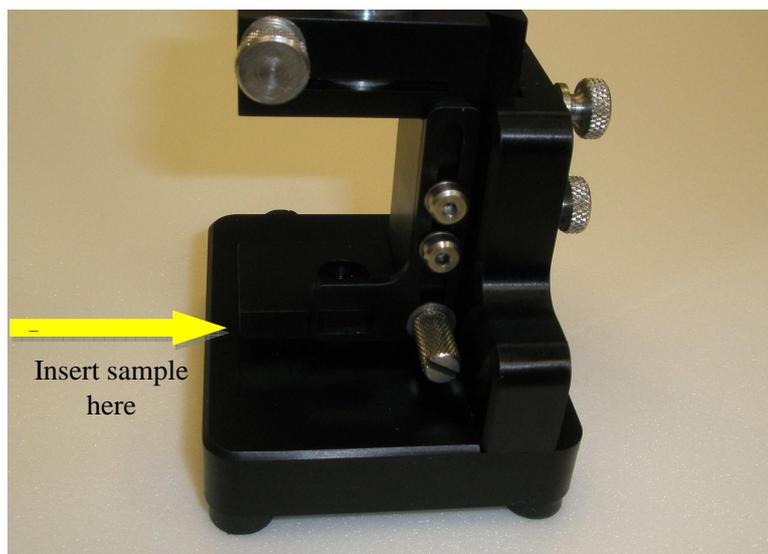
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1. Set the number of Layers
2. Set the Threshold such that all relevant peaks are above that level.
3. Verify two peaks are measured in the OCC and Click Set Reference. Once the reference is set, it is important not to adjust the placement of the probe in the RICS stand.



**Figure 9 - Set Reference**

4. Place the sample on the base plate under the L-shaped bracket and use the LED Level to obtain sufficiently strong peaks without saturating the signal. The signal turns red when saturated. There will be three more peaks than the set layers to measure.



**Figure 10 – Insert Sample**

- Once good peaks are obtained, select the Calculate Index button. Do not move the sample during measurement. Thickness and index values are displayed in their fields.

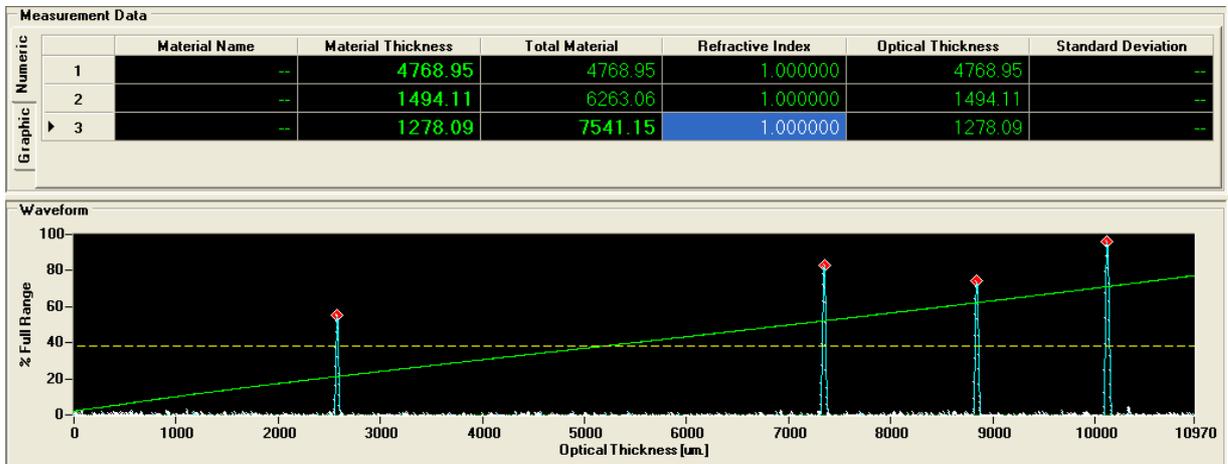


Figure 11 - Example of good peaks

Observe the following for each measurement case:

Single Layer

Set Layers to one.

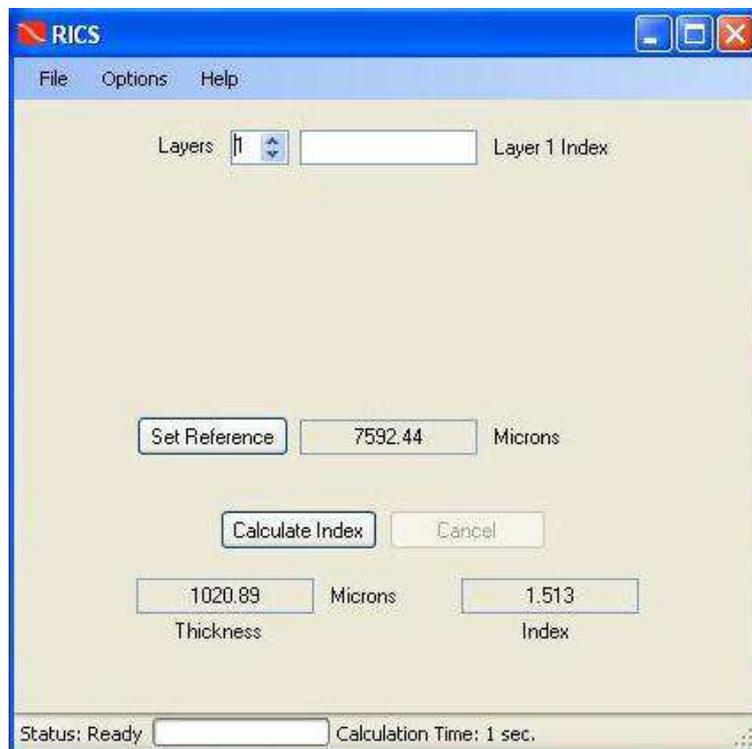
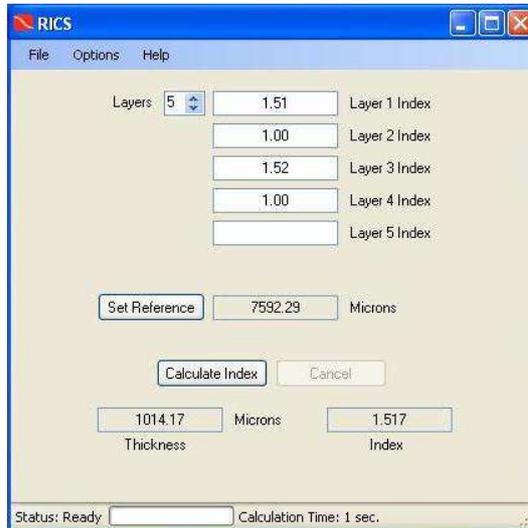


Figure 12 - Final Screen: Single Layer

Multiple Layer Reading

The software is capable of calculating the refractive index of one layer. If a multiple layer sample is being measured, the index of refraction of the other layers must be known and input into the software. The software can accommodate samples up to and including 5 layers.

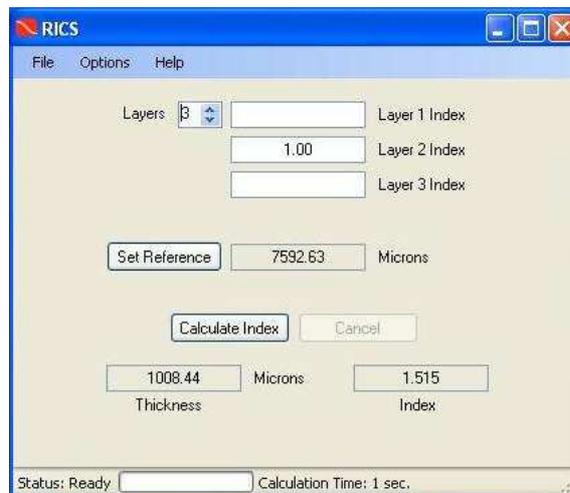


**Figure 13 - Final Screen: Multiple Layer**

Single Layer Tubing

The RICS software can measure the index of refraction of a single layer tube. Note – It is assumed that the RI of the tube walls is the same.

1. Set the Layers value to 3.
2. Input 1.00 into the Layer 2 Index box. Leave Layer 1 Index and Layer 3 Index blank.
3. Center the tube on the red light.



**Figure 14 – Single Layer Tube**

## ***IN CASE OF DIFFICULTY...***

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If you have difficulties or questions pertaining to the OPTIGAUGE system, please contact Lumetrics, Inc. at the numbers provided below, or write to the following e-mail address: [service@lumetrics.com](mailto:service@lumetrics.com)

### ***TECHNICAL ASSISTANCE***

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Technical assistance for Lumetrics products is available during business hours (9:00 A.M. to 5:00 P.M. Eastern Time). When contacting us, please include the complete model numbers of the equipment you have, and a description of the trouble symptom(s) you are experiencing. Often, difficulties can be resolved over the telephone, without the need for returning the equipment to Lumetrics.

Please use these telephone numbers for product assistance:

(585) 214-2455 ext. 123 (Phone)

(585) 214-2458 (FAX)

### ***FACTORY REPAIRS***

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Component level repair of Lumetrics equipment is not recommended in the field. The equipment should be returned to the factory for any PC board repairs. The factory is best equipped to return your equipment to its proper specifications and ensure highly accurate measurement results.

If return of equipment is needed, a Returned Material Authorization (RMA) number will be issued. This number will help expedite the repair and ensure that your equipment is returned to you as soon as possible. Please include the RMA number on all correspondence related to the repair. A statement should accompany the equipment describing the problem(s) experienced, as well as the name of a person who can be contacted if there are further questions.

Equipment being returned for repair must be properly packed for shipping. The original shipping materials should be used when possible, or a durable container capable of supporting the weight of the equipment. All returns should be returned to:

Lumetrics, Inc.  
Technical Support Dept.  
(RMA No.)  
Eagle's Landing Business Park  
1565 Jefferson Road #420  
Rochester, NY 14623

After repairs have been made, the equipment will be returned to you by the same shipping method used to send it to the factory. Please specify if you wish to make different shipping arrangements.