



Software

Our comprehensive library of data acquisition and display software helps you make the most of your spectroscopic measurements and analysis. No matter what operating system you prefer, Ocean Optics has the software tool you need.

From analysis to drivers and from spectrometer operation to scripting and development, Ocean Optics software is the ideal partner.



Tip

You can get the latest updates to your Ocean Optics software online at www.oceanoptics.com.

Software

Software Overview



Ocean Optics offers a comprehensive library of data acquisition and spectral processing software for a variety of spectroscopic applications.

Depending on the type of work you do, you can choose from a full line of spectral processing software, development tools or application-support software.



Operating Software

Overture

Free Windows-based spectroscopy software. Perfect for new users and basic measurements

SpectraSuite

Spectrometer Operating Platform. Advanced spectral analysis and functions



Development Tools

OmniDriver

Java-based development tool. Multi-platform environment for acquisition, processing and analysis

SPAM

Spectral processing and manipulation

SeaBreeze

OEM package for software development

Jaz API

Development software for Jaz Spectrometers



Application Specific

SpecLine

Element and Compound Identifier (See Metrology section for details)

Analyze IQ Spectra Manager

Analytical software suite for Raman analysis of molecular spectroscopy data

Analyze IQ Spectral Library

Optional library of Raman Spectra. Library of over 1,800 spectra for use with Analyze IQ Spectra Manager (See LIBS and Raman section for details on Analyze IQ and other software products)

SpectraSuite

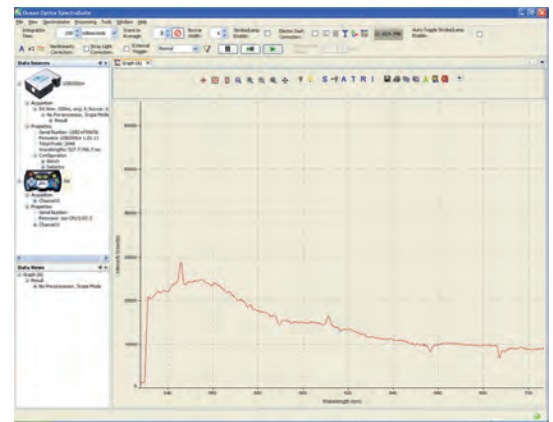
Spectroscopy on any Operating System

SpectraSuite is a completely modular, Java-based spectroscopy software platform that operates on Windows (both 32- and 64-bit), OS X and Linux operating systems. The software can control any Ocean Optics USB spectrometer and device. The SpectraSuite interface looks and feels the same on all operating systems, yet retains the familiar appearance of an application native to each OS.

SpectraSuite easily manages multiple USB spectrometers – each with different acquisition parameters – in multiple windows and provides graphical and numeric representations of spectra from each spectrometer.

All-in-One SpectraSuite

- Allows you to annotate graphs and to specify format and precision of displayed values
- Displays a color spectrum behind graphs
- Corrects for non-unity for reflection measurements
- Performs reference monitoring
- Displays x-axis in GHz, microns, pixel number, Raman shifts, wavenumbers or nanometers
- Stores data in a number of formats such as tab-delimited ASCII (for Excel or other analysis packages) and GRAMS SPC
- Provides Strip Charts using any processing mode (transmission, absorbance, etc.) to track processes, perform kinetic analyses and monitor spectral events – all as a function of time



Features for Reflective and Emissive Color and Absolute Irradiance

- Provides dominant wavelength and wavelength purity
- Calculates reflective or emissive color
- Provides chromaticity diagram of color-space values
- Offers CIE standard illuminants for reflective color (A, B, C, D50, D55, D65, D75, E, F1-F12)
- Calculates CIELAB, XYZ, xyz, u'v'w', hue, chroma, CCT (correlated color temperature), saturation, CRI and more

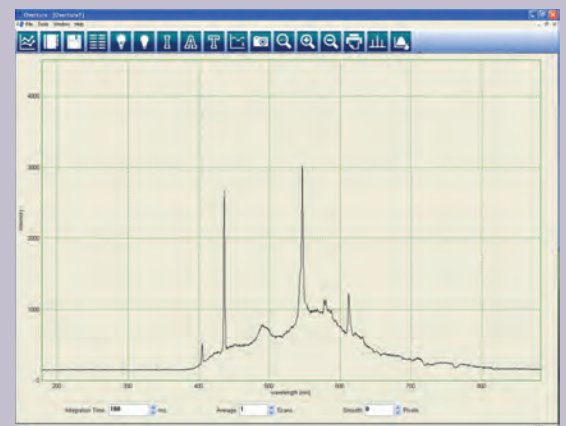
Overture

Overture Spectrometer Operating Software

Overture is our free, Windows-based software that is an excellent introduction software package for conducting basic spectroscopic measurements. This simplified operating software is the perfect choice for users who are new to spectroscopy or who do not require the more sophisticated functionality of our other offerings. Overture is for 32-bit and 64-bit Windows with support through XP, Vista and Windows 7.

Overture Features

- Works with all Ocean Optics USB Spectrometers
- Is compatible with Windows XP, Vista and 7; 32-bit and 64-bit
- Simplified interface has easy-to-follow icons and wizards
- Allows control of integration time and other spectrometer operating parameters
- Manipulates how data is displayed using tools such as smoothing, snapshot and zoom
- Allows user to open two graphs at the same time
- Has Absorbance, Transmission and Intensity Modes



Software

OmniDriver

OmniDriver is a powerful Software Developer's Kit for Windows, OS X and Linux operating systems that allows you to easily write custom software solutions for your Ocean Optics USB spectrometers and direct-attach devices. OmniDriver is the culmination of our best software driver packages; it's developed in Java and includes cross-platform native libraries to offer the following:

High-Res Timing

Time stamping that is accurate to sub-millisecond performance; great for chemical kinetics and other applications that require complex time accountability.

LabVIEW Support

OmniDriver provides drivers for LabVIEW (Version 7.1 or greater) to enable you to configure Ocean Optics spectrometers as real-time virtual instruments in National Instruments' LabVIEW graphical programming environment.

Support for Ocean Optics USB Spectrometers

- S2000 Spectrometer (with USB A/D Converter)*
- USB650 Spectrometer
- USB2000 Spectrometer*
- USB2000+ Spectrometer
- USB2000-FLG Spectrometer*
- USB4000 Spectrometer
- HR2000 High-resolution Spectrometer*
- HR2000+ High-resolution Spectrometer
- HR4000 High-resolution Spectrometer
- Jaz System
- QE65000 Scientific-grade Spectrometer
- NIR-512 Near-IR Spectrometer*
- NIR256-2.1 and NIR256-2.5 Near-IR Spectrometers*
- NIRQuest Model Spectrometers
- Torus Spectrometer
- Maya2000 Spectrometer*
- Maya2000 Pro Spectrometer
- MMS Raman Spectrometer*
- ARCoptix ANIR Series FTS Spectrometers*
- STS Spectrometer

*Legacy spectrometer models

Note: OmniDriver does NOT support PCI or ISA products.

Operating System Support

- Windows: Windows XP, Vista, Windows 7 ; 32- and 64-bit
- Mac: OS X 10.5 or later
- Linux: Many x86 distributions are supported, Kernel 2.4.20 and libusb 0.1.10 or later are required

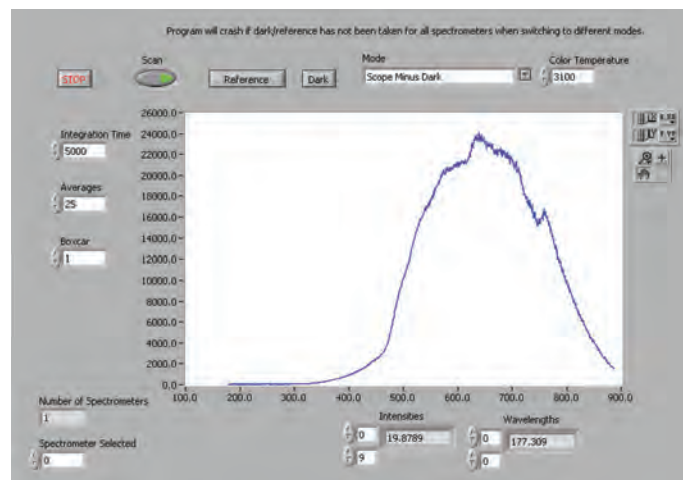
Measurement Corrections

- Detector nonlinearity
- Electrical dark (automatic baseline removal)
- Stray light
- Boxcar smoothing (averaging across pixels)
- Averaging multiple scans

Control of the following extended functions (depending on spectrometer model):

- Strobe enable
- Thermo-electric cooling (TEC) and reading detector and PCB temperatures
- Gated fluorescence mode
- Analog output (4-20 mA current output for LS-450 and AOUI); voltage out for HR4000
- Analog input for the supported spectrometers (voltage only)
- Digital (TTL) input/output (control of GPIO pins)
- Setting external trigger modes
- Reading out wavelength calibration
- Setting continuous strobe delays

Integrate OmniDriver into your own software application for complete control over USB spectrometers and devices in virtually any OS environment.



Software

SPAM Spectral Processing Math

SPAM is the perfect complement to OmniDriver since it features the additional functions needed to perform spectral processing such as peak-finding, radiometric and color analysis, etc. The SPAM library can be used to process spectral data.

SPAM Features

SPAM provides the following powerful tools for processing your spectral data:

- Scope mode
- Scope minus dark
- Absorbance
- Transmission
- Reflection
- Relative irradiance (with user-specified color temperature)
- Raman (with user-specified wavelength)
- Blackbody and CIE Relative daylight spectrum generators with user-defined color temperature
- Peak finding and metrics (centroid, full width at half max in units of pixels and wavelengths, center wavelength, integral, pixel number, 90% enclosing width)



Robust Set of Functions

- | | | |
|---|---|--|
| <ul style="list-style-type: none"> - Absolute irradiance <ul style="list-style-type: none"> • New calibration from lamp files • Photometry • Lumens • Lux • Candela • Luminance • μJoule • μWatt • μJoule/cm² • μWatt/cm² • dBm • Photons/cm² • Total photons • Moles of photons • Electron volts | <ul style="list-style-type: none"> - Color <ul style="list-style-type: none"> • Reflective and emissive color • Emissive color can use relative or absolute irradiance • CIE 1931 and CIE 1964 observers • CIE Illuminants A, B, C, D50, D55, D65, D75, E (unity), F1-F12 • Color spaces <ul style="list-style-type: none"> + CIE XYZ + x, y, z + Color Rendering Index (CRI) + General CRI Ra + Special CRI R1- R14 + Correlated Color Temperature (CCT) + Dominant wavelength and purity + $u'v'w'$, u,v hue angle, u,v saturation | <ul style="list-style-type: none"> + CIE Whiteness and Tint + CIELAB ($L^*a^*b^*$, hue angle, chroma) + CIE 1960 u,v + Hunter Lab |
|---|---|--|

Measurement Units

- Nanometers
- Microns
- Pixel number
- Gigahertz
- Wave numbers
- Raman shifts

SPAM Corrections

- Nonunity reference
- Reference Monitoring



SeaBreeze

SeaBreeze is the newest multi-platform device driver from Ocean Optics that was designed specifically for OEM use for embedded system applications. SeaBreeze is the scaled-down software device driver that is ideal for developers who want a leaner platform for their applications.

SeaBreeze provides some spectral correction and manipulation but is scaled down so that developers can add their own enhancements and features.



Application Notes

Blood Analysis Without Pain for Neonates

Background

Jaundice is a common and often harmless condition in neonates. However, especially preterm neonates have an increased risk for developing jaundice related brain damage, which is the reason for close monitoring of the blood bilirubin concentration (the indicator of jaundice) in these patients. The bilirubin concentration is determined from a blood sample obtained by a heel stick, often up to three times a day. Naturally, this is a very painful and harmful procedure for the child. In addition, this diagnosis creates an unwanted delay in the treatment of the patient, since it may last more than one hour.

Researchers investigated the possibility to measure the bilirubin concentration faster and non-invasively, by using optical spectroscopy. The absorption peak of bilirubin around 455 nm allows for spectroscopic assessment of its presence in the blood vessels of the skin. Although bilirubinometers based on this principle have been developed since 1980, no device has been found accurate enough to completely replace the heel stick. The focus of this study is therefore 1) to investigate the reasons for the inaccuracy of current bilirubinometers and 2) to develop a bilirubinometer that can replace the painful heel stick.

Ocean Optics Probe

To investigate the reasons for the inaccuracy of current bilirubinometers, a special bilirubinometer was developed by our customer, based on a multidistant fiber optic probe that was fabricated by Ocean Optics. Using diffusion theory, the customer obtained not only the bilirubin concentration from the skin reflection spectrum (430-600 nm), but also determined the blood volume fraction in the investigated tissue volume. In an explorative patient study at a neonatal intensive care unit, the customer found that the measured bilirubin concentration consists primarily of bilirubin in the tissue surrounding the blood vessels in the skin, instead of bilirubin inside the blood vessels themselves. Since the bilirubin concentration in the surrounding tissue is difficult to relate to the concentration in blood, this introduces an inevitable inaccuracy in the comparison of existing bilirubinometers to the heel stick determination.

Low Coherence Spectroscopy (LCS)

The only possibility to improve the accuracy of the existing bilirubinometers is by confining the measurement volume to the inner lumen of a blood vessel. Current spectroscopic techniques

are unable to do such a determination, since light scattering from the surrounding tissue always contributes to the measured value. Therefore, the customer developed a new spectroscopic technique – low coherence spectroscopy (LCS) – which, based on low coherence interferometry, allows for very careful control over the size and location of the investigated tissue volume. To validate our LCS measurements, the USB4000 was used repeatedly for measuring reference spectra. Currently, LCS is the only spectroscopic technique that can be used for the measurement of blood values inside a single blood vessel, without any influence from the surrounding tissue. The first in vivo measurements with this technique are very promising.

The relatively slow acquisition time of the LCS system limits the current clinical utility of the technique. Therefore, the customer investigated the possibility to replace the detecting photodiode in the LCS system by a spectrograph. The USB4000 proved to be very suitable for this purpose, resulting in an almost 4x faster acquisition time.

Outlook

Besides the applications described above, the customer also used the Ocean Optics probe for the determination of the optical properties of neonatal skin in the investigated patient population. This information is of great value for this research and other studies involving optics and neonatal skin.

For further improvement of the clinical utility of LCS, it is necessary to implement a spectrograph that has a higher acquisition rate than the USB4000. Since a spectrograph with the required specifications is not commercially available, such a spectrograph needs to be designed and developed. Furthermore, a fiber optic probe for clinical LCS measurements needs to be developed as well.

The future development of LCS offers additional opportunities for clinical applications. The technique may not only be used for bilirubin concentration measurements, but also for the determination of other blood values, such as hemoglobin concentrations and oxygen saturation. Also for the determination of these blood values, a localized measurement in a single blood vessel implies a very valuable improvement compared to existing spectroscopic determinations. The expected clinical utility of the technique is extensive, since it may be applied not only on neonates, but also on older children and adults. Furthermore, the customer found that LCS is also sensitive to the changes in tissue scattering that are related to the morphology and organization of cells. The latter offers new opportunities for the diagnosis of cancer.