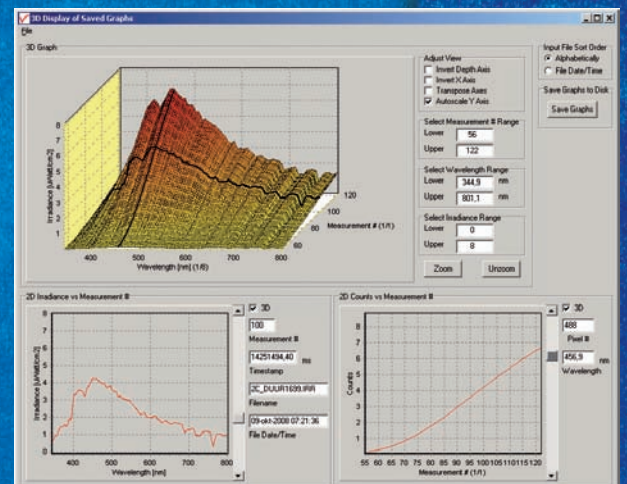
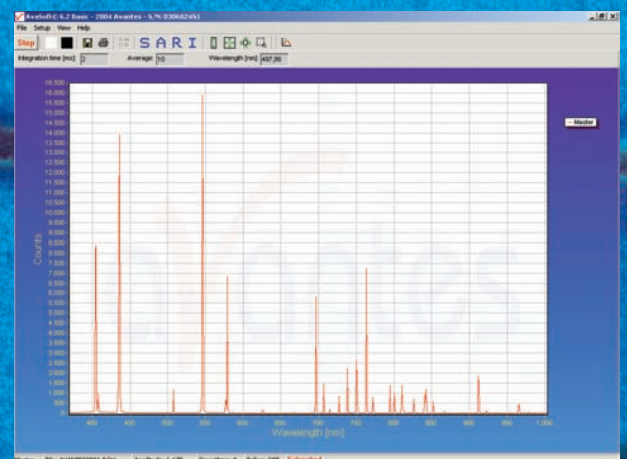


Software



Introduction

AvaSoft is the software package to control all Avantes product line spectrometers under Windows 95/98/ME and NT4.0, 2000, XP, Vista and Windows-7. AvaSoft software was developed in 1996 to support an increasing demand of data processing applications for spectroscopy.

Since 1996 more than once a year official upgrades have been released with many new features and options.

The newest version is AvaSoft 7.4, has been released in the fall of 2009 and works under 64-bit operating systems of Windows-XP, Vista and Windows 7.

In the following paragraphs the different AvaSoft software packages are presented:

- AvaSoft-Basic for controlling the Avantes spectrometers, including basic data acquisition, save and display data in scope-, transmission-, absorption-, and irradiance mode.
- AvaSoft-Full version adds many options to the basic version, like history channel functions, auto-calibration, external triggering, etc.
- Application add-ons only available in combination with AvaSoft full software for color measurements, irradiance, chemometrics, oxygen measurements, process control and Export to Excel (XLS).

- AvaSoft-ALL has been recently introduced as a combination of AvaSoft-FULL and all add-on application modules
- Stand-alone AvaSoft software packages for pre-configured spectrometer systems, such as AvaSoft-Raman for the AvaRaman system, AvaSoft-FOM for full integration of the Fiber Optic Multiplexer, and AvaSoft-Thinfil for the AvaThinfil measurement system.
- Dynamic Linking Library (DLL) interface packages with functions for basic spectrometer control, color measurements and LED measurements.

The most recent release of AvaSoft can be downloaded free of charge from our website www.avantes.com. The downloaded AvaSoft for AvaSpec package can be used by customers who already have an AvaSpec spectrometer and want to update their software version, but also by anyone who wants to try out the AvaSoft-FULL version and/or add-on applications. If AvaSoft is started without an AvaSpec spectrometer connected, it will switch automatically to simulation mode, in which all AvaSoft-FULL features and add-on applications (color, irradiance, chemometrics, process control, excel output) are available (similar to AvaSoft-ALL).

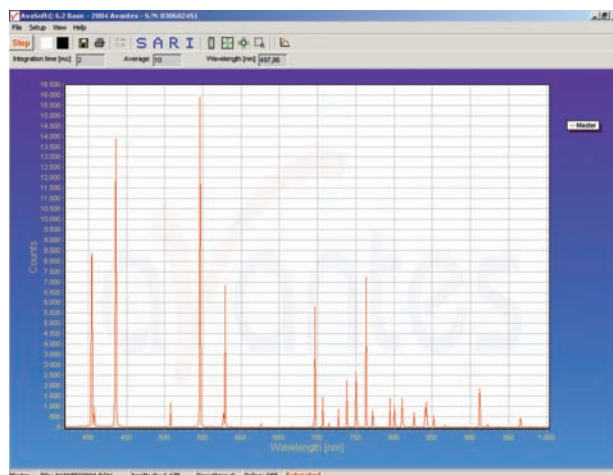
AvaSoft - Basic Software

AvaSoft-Basic, the standard software package that comes with each AvaSpec spectrometer system, is free of charge. AvaSoft-Basic features user friendly, mouse oriented pull down menus. Mouse clicks control movements of a data cursor for instantaneous readout of wavelength, pixel and y-axis magnitude. Mouse dragging is a fast and elegant way to zoom in both x and y direction at the same time.

Buttons in the main window are available for on-line/off-line spectral analyses (start/stop) and for easy saving of reference, dark and experiment spectra. Additional buttons are available for printing, changing the view to absorbance, transmittance, irradiance or raw scope data, rescaling the y-axis, set scale for x- and y-axis and peak/valley searching.

The user sets the data collection parameters, such as detector integration time, auto-dark correction, signal averaging and spectral smoothing in common dialog boxes. The saved graphical data can be exported to ASCII, to be imported to Excel and other data processing programs.

New features in AvaSoft-7.4 basic are the 3D display option, the support for Windows 64 bit operating systems, such as Vista, XP and 7 and the option to save a graph directly to a RTF file.



The most recent version of the AvaSoft-basic software can be downloaded from the website, if an upgrade to AvaSoft-Full is desired, please contact us for upgrade ordering information.

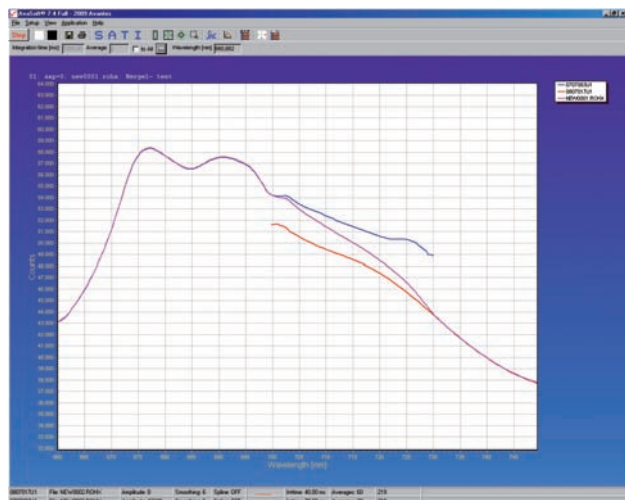
ORDERING INFORMATION

AvaSoft-Basic

Free Basic Spectrometer software for Windows95/98/2000/NT/ME/XP/Vista/7



AvaSoft-Full



The AvaSoft-FULL version needs to be ordered separately and has a lot of additional features (see table below) over the basic version. We strongly recommend to check our website www.avantes.com regularly for the newest upgrade.

In the table below, the options are summarized for the basic and full version of AvaSoft 7.4

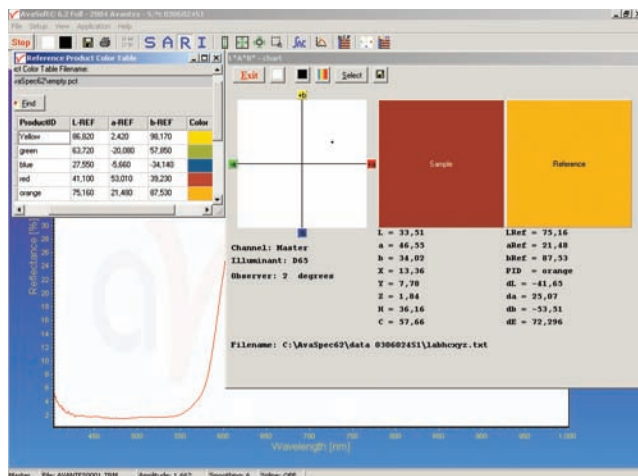
Most important new features of the AvaSoft 7.4 are the support for Windows 64 bit operating systems, such as XP, Vista and 7, the conversion of spectra directly to Excel, ultrafast data saving with Store to RAM (USB2 only), and merging spectra from multiple channels to one line in the display (USB2 only)

Option	Basic	Full
Editable data collection parameters per channel, such as detector integration time, auto-dark correction, signal averaging, spline interpolation and spectral smoothing	X	X
Display data in scope-, transmittance-, absorbance-, or relative irradiance mode. Multiple spectrometer channels are displayed in the same graph, optional grid display. 3D display for multiple spectra in time series (USB2 only)	X	X
Zoom-, (Auto)scale- and panning functions to expand quickly an interesting part of the spectrum (both X- and Y-axis) to the full graph, save graph to RTF file.	X	X
Mouse drag controls movement of a data cursor for instantaneous readout of wavelength- and y-axis magnitude. Peak finder for moving cursor fast to nearest peak	X	X
Save spectra, and display online measurements against (multiple) saved spectra background. Print (multiple) spectra in color. Convert saved spectra to ASCII format in equidistance (nm) with start wavelength in nm	X	X
Help menu option to find quickly a description about any AvaSoft topic	X	X
History Channel Application, in which the output of (up to 8) user defined functions, integrals, peaks (intensity, wavelength) can be followed simultaneously against time. Functions can be entered in Visual-Basic script. Time series measurements can be saved/loaded and printed. Zoom- and panning functions can be applied to expand quickly an interesting part of the time series measurement to the full graph.		X
Auto Wavelength Calibration. In combination with a Mercury-Argon Light Source, a number of peaks can be detected automatically. These peaks are then compared with the wavelengths where they should have been detected, and a regression fit is performed to calculate the best wavelength calibration coefficients.		X
Correct for drift. Master and slave channels with similar range can be used to correct for changes in the light source. This option also works for the FOS-2-inline to correct for one channel spectrometer temperature fluctuations.		X
Automatic save spectra periodically (save a spectrum every x seconds)		X
Store to RAM for ultrafast Data saving for a limited amount of scans (USB2 only)		X
External Trigger control to acquire spectral data only if a TTL signal is presented with optional integration time delay settings		X
Convert spectra to J-CAMP format for further data processing e.g. in GRAMS32		X
Convert spectra to Excel, multiple spectra in one file, multiple channels in worksheets		X
Merging spectra of multiple channels to one spectrum (USB2 only)		X
Full Width Half Max calculations, online or on saved spectra. Graphically displayed		X
Integral calculations, online or on saved spectra, graphically displayed		X
Auto-configure integration time: AvaSoft searches for an optimal integration time		X
Automatic Save Dark by TTL shutter.		X
Auto-detect saturated pixels in a spectrum, optionally autocorrect inverted saturated pixels, optionally visualize saturated pixels and log saturated wavelength regions in time series.		X
LIBS application (USB2 platform)		X

Custom made modifications are possible, please contact us for more details.

ORDERING INFORMATION	
AvaSoft-Full	Full version Spectrometer software for Windows95/98/2000/NT/ME/XP/Vista/7
AvaSoft-All	Full version AvaSpec software incl. all applications

AvaSoft Application Software - Color



The AvaSoft Color Application has been developed to perform on- and off-line color measurements with a spectrometer system. It can be used for reflective color measurements. This application provides a precise way to perform color measurements using the basic principles and techniques defined by the International Committee on Illumination (CIE). The CIE 1976 $L^*a^*b^*$ color parameters are calculated, as well as other frequently used parameters, like Hue, Chroma and X, Y, Z.

These parameters can be displayed in a CIELAB chart or in a graph versus time. It is also possible to save the measured $L^*a^*b^*$ values online to a database and use one of the products from the database as a reference color. By comparing the measured $L^*a^*b^*$ values to the stored database values, color differences (ΔE_{Lab} , ΔL^* , Δa^* , or Δb^*) can be measured as well.

The color of an object can be expressed by the CIE 1976 ($L^*a^*b^*$) color space. L^* describes the brightness of the color. A positive value of a^* describes the redness of the color, a negative a^* the greenness. Similarly, yellowness or blueness is expressed by coordinate b^* , which is positive for yellow and negative for blue. The $L^*a^*b^*$ values are derived from the CIE tristimulus values X, Y and Z of the sample (object) and the standard illuminant tristimulus values X_n , Y_n and Z_n . The standard illuminant tristimulus values for X_n , Y_n , and Z_n are constant and depend only on the type of standard illuminant that has been chosen.

The CIE tristimulus values X, Y and Z of the color of an object are obtained by multiplying the relative power P of a standard illuminant, the reflectance R (or the transmittance) of the object, and the 1931 CIE standard observer functions x_n , y_n and z_n (2 degrees angle). The integral of these products over all the wavelengths in the visible spectrum (380 to 780 nm with a 5 nm interval) gives the tristimulus values.

Color Chart

The color chart display features:

- Display in CIELAB chart, the actual sample color as well as the reference color with the corresponding ΔE_{Lab} , ΔL^* , Δa^* , or Δb^* values are displayed and saved as well.
- The settings for the LAB chart display can be changed, such as no graphical display of reference and sample color in order to speed up the measurements.
- New additional option is to select the standard observer angle for 2° or 10°.
- The reference color can be saved to and loaded from a color database. This color database contains next to all color parameters a product ID and a display of the actual color. The database can be sorted alphabetically or on either value column.

Time series

The time series display has following features:

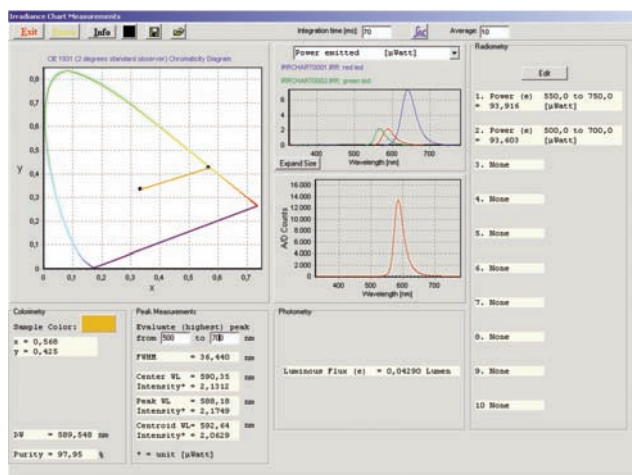
- Display in time series can be done for up to 8 functions.
- For each channel a color parameter (L^* , a^* , b^* , hue, Chroma, X, Y, Z, ΔE_{Lab} , ΔL^* , Δa^* , or Δb^*) can be selected. For each channel a different reference color can be selected, enabling the use as a color sorter.
- For each channel the time axis can be set to a different scale, allowing simultaneous display of long time and short time monitoring of the same parameter.
- For each channel the actual measured color, as well as the reference color (if in ΔE_{Lab} , ΔL^* , Δa^* , or Δb^* mode) are displayed.
- The saved time series data can be loaded again and displayed with extensive zooming and dragging options.

ORDERING INFORMATION

AvaSoft-COL	Color application add-on software, to be ordered with AvaSoft-FULL
COLOR-DLL	32-bit DLL for Color application (see chapter COLOR-DLL)



AvaSoft Application Software - Irradiance



Radiated optical energy, as measured by Avantes spectrometers, can be quantified as a radiant flux, a measure in energy per second (Watt) radiated from a source. The radiated optical energy can be correlated with human vision (photometry) as defined in the CIE to obtain a spectral luminous efficiency function to characterize the vision of an average human observer.

Both radiometric and photometric quantities can be measured with an irradiance calibrated Avantes spectrometer system. Radiometric quantities are radiant energy (in Joule), Radiant power or flux (in Watt) or irradiance (Watt per cm²). Related photometric quantities are luminous flux (lumen) or illuminance (lux or lumen per m²).

With the AvaSoft Irradiance Application it is possible to calculate the above parameters from the measured spectral distribution. A calibrated light source AvaLight-HAL-CAL or AvaLight-DH-CAL with known energy output (in $\mu\text{Watt}/\text{cm}^2/\text{nm}$) is used as a reference. This calibration can be performed, saved and loaded by the end user.

An other option is to have your Avantes spectrometer system calibrated in our irradiance calibration lab, so there is no need to have an additional calibrated light source. The calibration can be loaded into the AvaSoft-IRRAD software.

Color of light parameters can be expressed by the chromaticity coordinates x, y and z. These chromaticity coordinates are

obtained by taking the ratios of the tristimulus values (X, Y and Z) to their sum. The tristimulus values X, Y and Z and the spectral irradiance are computed in a wavelength range from 380 nm to 780 nm, using a 5 nm interval. These parameters, as well as the coordinates u and v and the color temperature of an external light source can be calculated and displayed in real-time.

New in AvaSoft-IRRAD 7.4 is that the CRI color rendering index of a light source is calculated as well. The color rendering index of a light source with a color temperature <5000K is a measure of how close a light source matches a perfect black body radiant.

New in AvaSoft 7.4 is also that there is a setting for auto-adjust the integration time, so a large dynamic range can be achieved for applications that have both very high light level and very low light level, such as solar measurements.

The same experimental set up (spectrometer with fiber optics and cosine corrector or integration sphere) is used to calculate the intensity of the light.

The calculated output can be displayed and saved in two ways:

- In the Irradiance Chart the data can be displayed as spectral irradiance in $\mu\text{Watt}/\text{nm}$ versus wavelength, like in the screen-dump above. Further, the following output parameters can be displayed: radiometric quantities $\mu\text{Watt}/\text{cm}^2$, $\mu\text{Joule}/\text{cm}^2$, μWatt or μJoule , photometric quantities Lux or Lumen, color coordinates X, Y, Z, x, y, z, u, v, color rendering index, color temperature and number of photons $\mu\text{Mol}/\text{s}/\text{m}^2$, $\mu\text{Mol}/\text{m}^2$, $\mu\text{Mol}/\text{s}$ and μMol . In addition raw data in Scope mode is displayed as well as the X-Y Chromaticity diagram, including parameters, specially useful for LED measurements, such as: Dominant Wavelength, Purity, Central Wavelength, Peak Wavelength, Centroid, etc.
- In Time Measurement mode, up to 8 functions can be displayed simultaneously versus time. For each function, a different radiometric, photometric or color coordinate output parameter and/or wavelength range may be selected, as well as a different spectrometer channel.

ORDERING INFORMATION

AvaSoft-IRRAD	Irradiance application add-on software, to be ordered with AvaSoft-FULL
IRRAD-DLL	32-bit DLL for Irradiance/LED application (see chapter Color-DLL)

AvaSoft Application software - Chemometry

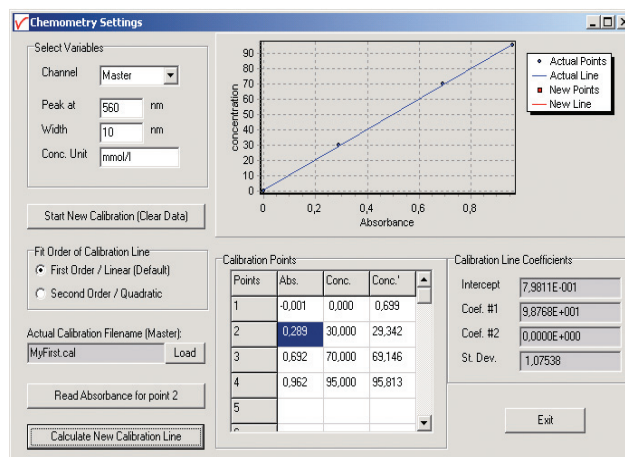
AvaSoft-CHEM has been developed to enable on-line concentration determination with a spectrometer system. According to Lambert-Beer's law, there is a linear relationship between absorbance and concentration:

$$A = e * c * l$$

Where A is the absorbance (or extinction), e is the extinction coefficient of the compound to be measured, c is the concentration and l is the optical path length.

In practice, this relationship is only linear at reasonably low absorbance levels (say less than 2). The wavelength at which the absorbance is measured must be kept constant. If a few samples with known concentration are available, these can be used to measure the absorbance.

These absorbance values can be used in AvaSoft-CHEM to calculate a linear (or second order) calibration line. Then, this calibration line is used to measure the concentration of unknown samples or to measure a changing concentration versus time.



AvaSoft-Chem can display and save the calculated concentration in two ways:

- The concentration can be displayed on-line in a separate display window, for up to eight spectrometer channels (if available).
- Up to eight history channels functions can be selected to display and save concentration values against time. This application can be combined with the Excel and Process-Control applications.

ORDERING INFORMATION

AvaSoft-CHEM	Chemometry application add-on software for concentration measurements, to be ordered with AvaSoft-FULL
---------------------	--



AvaSoft Application Software - Export to Excel

AvaSoft-XLS is an add-on application that enables Avasoftware Full to output history channel data and/or complete spectra to Microsoft Excel.

It uses OLE (Object Link Embedding)-Automation, which is a technology that enables AvaSoft to remotely control Excel, opening sheets and copying data into cells.

With AvaSoft-XLS two different modes are possible:

1. Exporting data online in a paste format to Excel workbooks, for each spectra or function output a new column or row is generated. At the end of a predefined number of scans the export is stopped and the Excel sheet(s) can be saved to a file.
2. Exporting data to a fixed position in a predefined Excel worksheet. Each spectrum or function output is copied to the same position as the previous spectrum or function output in an overwrite mode. The user can now address those data cells from another application, like Labview or Matlab and perform on-line data processing and analyses.

On modern hardware, a data transfer speed to copy complete 2048 pixels spectra to Excel with as little as 50 ms overhead per scan can be reached.

The output functions to be exported can be history channel functions, color parameters (in combination with AvaSoft-COL), irradiance parameters (in combination with AvaSoft-IRRAD) and chemometric parameters (AvaSoft-CHEM).

AvaSoft-XLS can be ordered as add-on to AvaSoft-Full for the AvaSpec.

ORDERING INFORMATION

AvaSoft-XLS

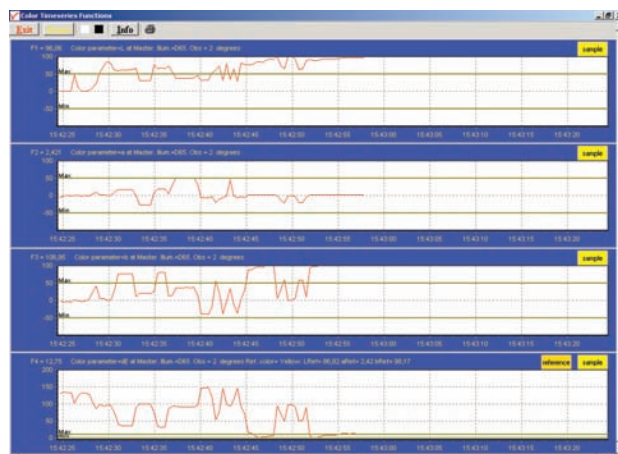
Export online to Excel add-on software, to be ordered with AvaSoft-FULL

AvaSoft Application Software - Process Control

The Process Control Application software allows the user to define minimum and maximum threshold values for the 8 time series functions. The time series functions can be the user defined functions, integrals or peak values (intensity, wavelength) as defined in the History application or, in combination with AvaSoft-CHEM, AvaSoft-COL and/or AvaSoft-IRRAD, the chemometrics, color and/or irradiance parameters.

With the AvaSpec spectrometers, 8 on-board TTL-output signals are available that will respond to exceeding the user defined output range for the 8 time series functions. These TTL's can e.g. be connected directly to PLC's in an industrial environment.

In combination with the AvaSpec-USB2 platform the option is available to convert 2 of the History Channel Functions outputs to analog output signals (0-5V).



ORDERING INFORMATION

AvaSoft-PROC	Process control application add-on software, to be ordered with AvaSoft-FULL. Controls 8 on-board TTL output signals.
---------------------	---

AvaSoft-FOM Fiber Optic Multiplexer Control



AvaSoft-FOM has been written to integrate the Fiber Optic Multiplexer with a one channel AvaSpec spectrometer. A single spectrometer can be used to measure at 8 different locations sequentially.

AvaSoft-FOM includes all features of AvaSoft-full.

The software simulates an environment of one master and seven slave spectrometers, and repositions the multiplexer before each new measurement. At present, the maximum number of channels supported by AvaSoft-FOM is eight, as this is the current channel limit of AvaSoft.

For applications where the multiplexer is used without an AvaSpec or when custom-specific software is written, the FOM-DLL interface software package is available.

AvaSoft-FOM and the Fiber Optic Multiplexer can be used with all AvaSpec-USB1 platform spectrometers. Multiplexing spectrometer channels is particularly for the AvaSpec-NIR256 spectrometer a very interesting option, to reduce cost for a multi-channel version.

ORDERING INFORMATION

AvaSoft-FOM	Fiber Optic Multiplexer integration stand-alone Software
FOM-DLL	Interface DLL package for Fiber Optic Multiplexer (FOM-XX400-1x16 and FOM-XX400-2x8) for Windows-95/98, 2000, ME, NT, XP, Vista and 7



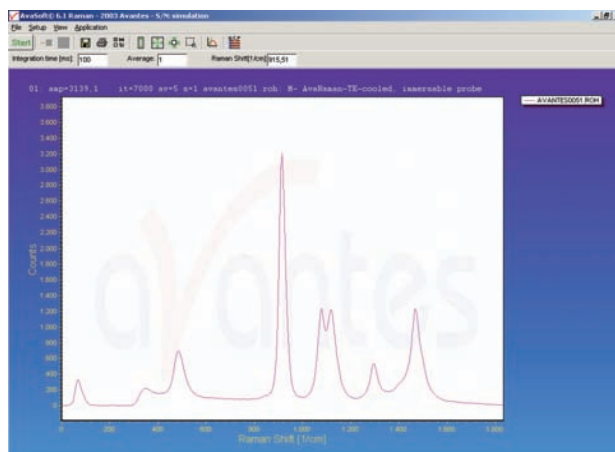
AvaSoft-Raman

AvaSoft-Raman software is a stand-alone software package, that comes with the AvaRaman system. The AvaRaman system is described in detail in the spectrometer section of this catalog.

The AvaSoft-Raman software features following options, next to most of the standard AvaSoft-full options:

- display of the wavelength axis in cm^{-1}
- autocalibration routine to determine the excitation laser peak (AvaRaman-Calibration tile needed)
- Integration time progress bar to indicate integration time status
- View signal in normalized counts
- Software baseline correction for fluorescence suppression

A useful feature in the AvaSoft-Raman software is the history channel functions to follow peak values or concentrations versus time.



The AvaSoft-Raman software can be optionally extended with the Process-control add-on and the Export to Excel add-on for on-line analyses and control.

ORDERING INFORMATION

AvaSoft-Raman

Raman stand-alone Software for the AvaRaman system

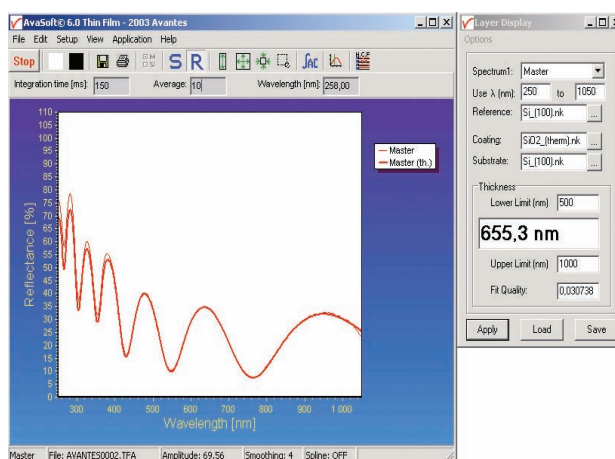
AvaSoft-Thinfil

AvaSoft-Thinfil software is a stand-alone software package, that comes with the AvaThinfil system. The AvaThinfil system is described in detail in the application section of this catalog.

The AvaSoft-Thinfil software calculates a layer thickness from the reflection interference spectrum for optical transparent layers with known optical parameters.

Two methods for thin film calculations are implemented in the AvaSoft-Thinfil software, the Fast Fourier Transform (FFT) method and the best fit optimization algorithm (match spectrum). With the FFT method the frequency of the interference pattern is determined, this method is mostly used for thick layers. With the match spectrum optimization method the best fit is determined for various thickness calculations. Fitting parameters are available for quality of fit monitoring and to speed up the data processing.

A comprehensive database of the optical parameters n and k of substrates and coatings is implemented in the software and includes products for important application fields as semiconductor and coatings.



The AvaSoft-Thinfil supports multiple channels and 8 time series for layer thickness and fit quality.

The AvaSoft-Thinfil software can be optionally extended with the Process-control add-on and the Export to Excel add-on for on-line analyses and control.

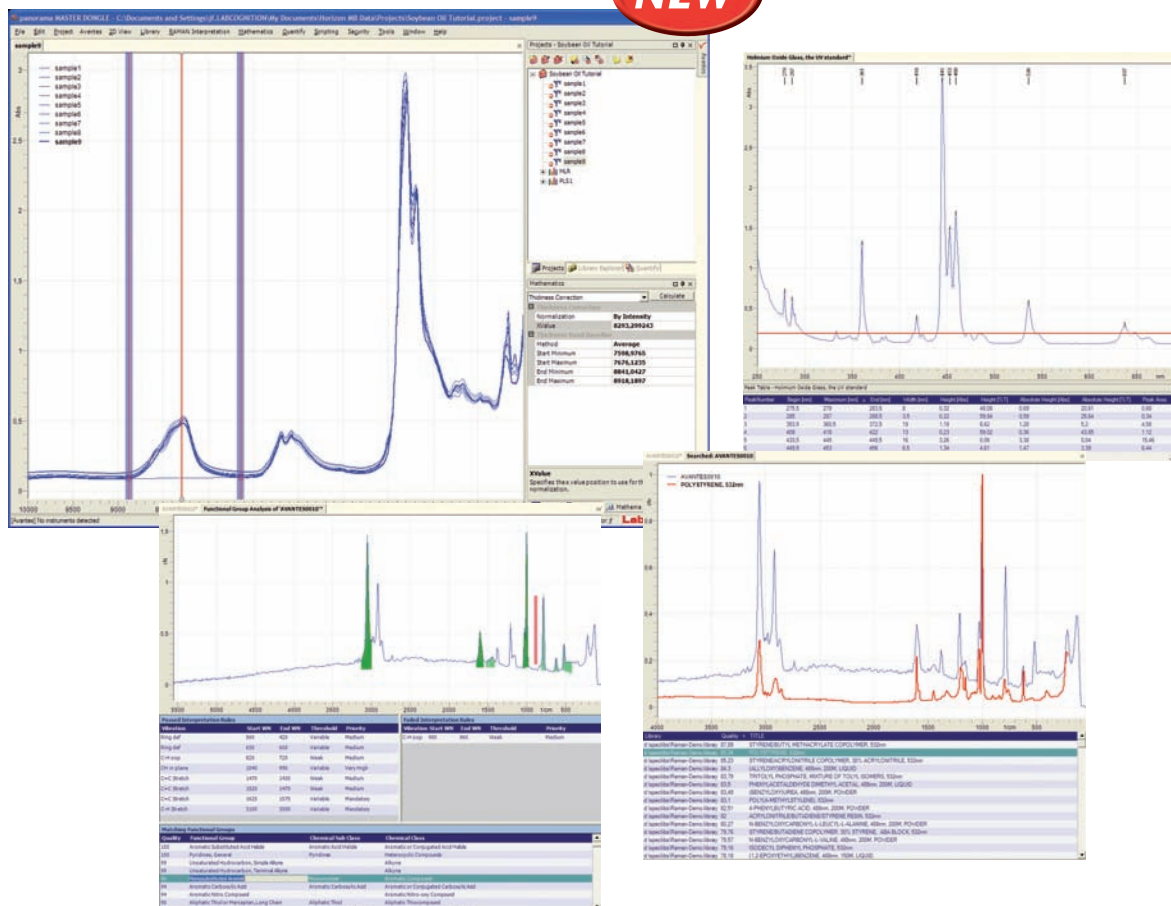
ORDERING INFORMATION

AvaSoft-Thinfil

Thin film stand-alone Software for the AvaThinfil system

Panorama software

NEW



Panorama software works with all AvaSpec-USB2 spectrometers. All 2D and 3D spectroscopic data can be manipulated with just a few mouse clicks. Manipulation operations can easily be undone and redone unlimited times. Frequently used mathematical operations are automatically stored in a math operation history and can be applied to subsequent data sets.

All data manipulations are logged in an audit trail. This audit trail is attached to the manipulated object for full **CFR 21 part 11** compliance. The change control history of an object can be tracked easily in the audit trail window.

Some of the mathematical functions included in the Panorama pro software are:

- ATR correction / Multiplicative scatter correction / Standard normal variate correction
- Exponential functions
- Zapping / Cutting

- Arithmetic calculation / Spectrum arithmetics
- Noise statistics / User defined peak evaluation
- Detrending / Stretch x-Axis
- Data Point Manipulation
- Thickness Correction / Advanced 2-Point Baseline Correction
- Unit Conversion for X- and Y-Axis

Different add-on modules to Panorama-Pro are available, such as:

- The **Search add-on module** includes a powerful library module which allows **archiving** and **searching** of spectroscopic data on libraries or even directly on your hard disc.
- The **Quantify add-on module** provides all major multivariate analysis methods like PLS-1, PLS-2, SIMPLS, MLR, PCR.

ORDERING INFORMATION

Panorama-Pro	Spectroscopic Mathematic Data processing Software package, 2D/3D display
Panorama-Search	Add-on to Panorama Pro, incl. library module & spectrum search module
Panorama-Quantify	Add-on to Panorama Pro, incl. Multivariate Data Analysis with PLS, MLR
Panorama-Raman	Add-on to Panorama Pro, incl. Raman Interpretation and functional group assignment
Panorama-Security	Add-on to Panorama Pro, full 21 CFR part 11 compliance. Ideal for FDA/GXP regulated environments



Specline analytical Software

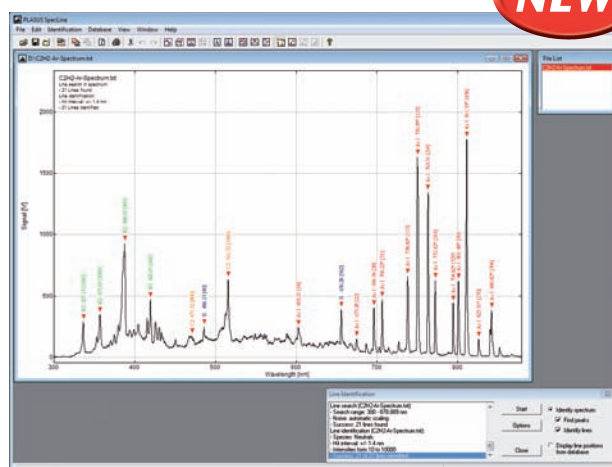
The Specline software has an extensive database for identification and analysis of atoms, ions and molecules.

The Specline Software enables analysis of spectral data, imported directly from the AvaSoft software.

The unique database for atoms and molecules makes line identification fast and easy. Many evaluation functions will support you in analyzing and comparing your spectra.

Functionality of Specline software:

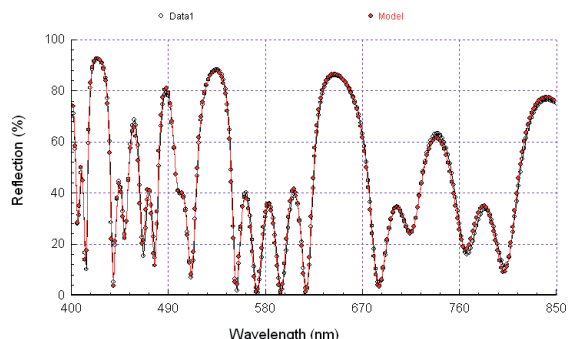
- Automatic peak finding Search algorithms for peak finding in the spectra.
- Line identification; Identification of atoms, molecules and their ions using the included database.
- Data evaluation, Data smoothing, integral, scaling, peak value, calibration, arithmetic of spectra (+, -, *, /).
- Comparison of data; several spectra - even with different file formats – can be overlaid and compared.
- Selection for database search Periodic table for atoms and ions, wavelength and intensity range.
- Data export Data export to ASCII, Binary and Excel (CSV) format, graphic export to BMP, WMF and WPG format.



ORDERING INFORMATION	
AvaLIBS-Specline-A	Spectroscopy software for peak finding and identifying spectral lines, complete version with data-base for atoms and ions
AvaLIBS-Specline-AM	Spectroscopy software for peak finding and identifying spectral lines and molecular bands, complete version with data base for atoms, molecules and ions
AvaLIBS-Specline-AMS	Spectroscopy software for peak finding and identifying spectral lines and molecular bands, complete version with data base for atoms, molecules, extended by many special molecules (e.g molecular hydrogen and polyatomic molecules)

TFProbe Thinfilmmultilayer measurement Software

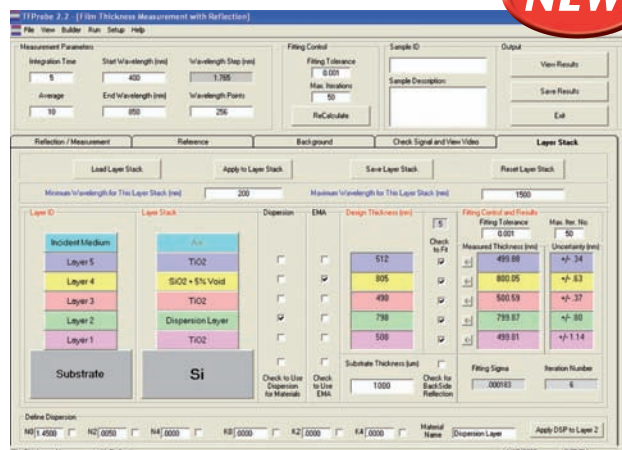
The TFProbe software package works with AvaSpec-USB2 spectrometers and is useful for multilayer thinfilm measurements.



The software measures film thickness and optical constants (N & K) up to 5 layers.

TFProbe can be used for real time or in-line thickness and refractive index monitoring. The software package comes with a comprehensive optical constants database and library.

Included is an advanced optical constants editor, which allows users to use either NK table, dispersion or effective media approximation (EMA) for each individual film or substrate. TFProbe Supports AvaSpec spectrometer systems with vision integration, SRM Mapping system, and Multiple channel systems.



The software can run simulation on reflection, transmission and optical constants and perform a simulation or measurement at non normal incident angles. The Graphical user interface has various data output options and 2D and 3D graphic presentation.

TFProbe supports RS-232 Communication with a Host Controller. Included are auto log functions for spectrum, measured results and fitting graphs. The software enables save fitting graphs as image for easy presentation. Backside reflection correction for measuring film on transparent substrates is also supported.

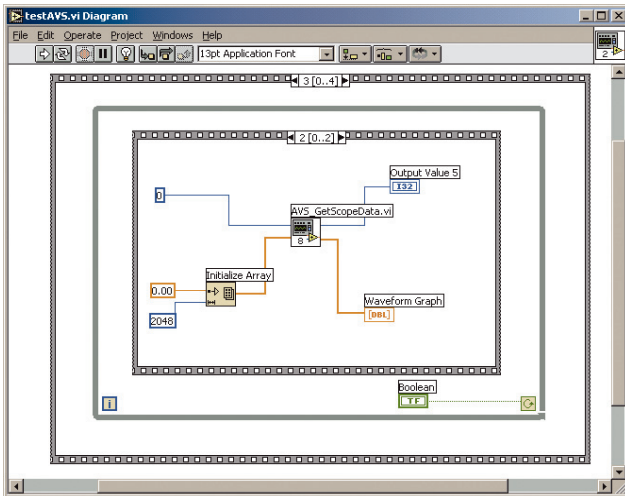
ORDERING INFORMATION

TFProbe

Thinfilmmultilayer measurement software



Dynamic Linking Library (DLL) Interface packages



AS-161-DLL Windows Interface Package for AvaSpec –USB1 platform spectrometers

The AS-161-DLL is the Windows Interface DLL-Package for Windows 95/98/2000 and Windows NT/ME/XP/Vista/7 that allows you to easily write custom software solutions for AvaSpec-128, AvaSpec-256, AvaSpec-1024 and AvaSpec-2048 spectrometers with USB1 interface.

The software contains functions that can be grouped into three categories:

1. Setting/Getting the hardware parameters from the spectrometers EEPROM. This group includes functions to set- and get the number of spectrometer channels, the wavelength calibration per channel, gain and offset values per channel, and a function to specify the pixel-range for data transfer per channel
2. Functions for data acquisition to get the spectra into your application
3. Functions to communicate with other devices by using TTL signals. The AvaSpec-USB1 platform spectrometers contain a 15-pin digital IO connector: 1 ground, 1 digital-in which is predefined for external hardware trigger, 1 programmable digital-in, 1 digital-out fixed at 1kHz, 1 digital-out to control a pulsed light sources (AvaLight-XE), and 10 programmable digital-out signals. The AS-161-DLL package includes functions to control the TTL's of this external IO connector.

The interface package also includes a number of sample programs developed to show you how to write your programs. The sample programs were developed in Visual C++, Visual Basic, Delphi, C++ Builder and LabView. The sample programs provide an excellent starting point to write your own applications.

AS-161-Linux drivers for AvaSpec USB1 platform spectrometers

A special set of designated Linux drivers for the AvaSpec USB1 platform spectrometers can be downloaded for free from our website www.avantes.com. These driver routines are available in source code.



AS-5216-DLL Windows Interface Package for AvaSpec –USB2 platform spectrometers

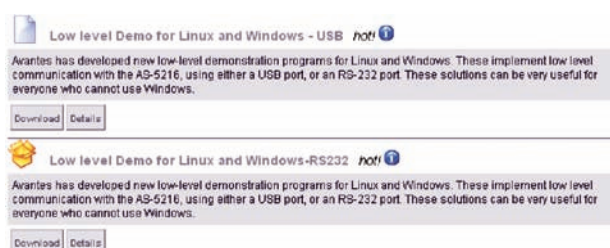
The AS-5216-DLL is the Windows Interface DLL-Package for Windows 95/98/2000 and Windows NT/ME/XP/Vista/7 that allows you to easily write custom software solutions for AvaSpec-128-USB2, AvaSpec-256-USB2, AvaSpec-1024-USB2, AvaSpec-2048(L)-USB2, AvaSpec-3648-USB2, AvaSpec-2048x14 and AvaSpec-NIR256 spectrometers with USB2.0 interface. The AS-5216-DLL is a 32 bit DLL, and will run under 64-bit Windows operating systems in the so-called WOW64 mode. The software contains functions that can be grouped into 4 categories:

1. Communication establishment with one or multiple USB connected spectrometers. These functions offer support to activate and deactivate connected spectrometers .
2. Setting/Getting the device hardware parameters from the spectrometers EEPROM. This group includes a function to set- and get the wavelength coefficients, gain and offset values, and optional parameters that can be added include Non-linearity calibration, Irradiance calibration and others. Data collection parameters, such as integration time, averaging, smoothing, start/stop pixel and others can be stored to the EEPROM.
3. Functions for data acquisition to get the spectra into your application
4. Functions to communicate with other devices by using TTL and/or Analog output signals. The AvaSpec-USB2 platform spectrometers are equipped with a 26-pin digital IO connector: 3 grounds, 1 digital-in which is predefined for external hardware trigger, 3 programmable digital-in, 1 digital-out to control a pulsed light sources (AvaLight-XE), 1 digital-out to synchronize a pulsed laser (LIBS applications), and 10 programmable (TTL level with 6 outputs programmable with Pulse Width Modulation) digital-out signals. 2 Analog-out and 2 analog-in are included as well. The AS-5216-DLL package includes functions to control the TTL's of this external IO connector. The hardware synchronization between the connected spectrometers can be software controlled.

The interface package also includes a number of sample programs developed to show you how to write your programs. The sample programs provide an excellent starting point to write your own applications.

AS-5216-Linux drivers for AvaSpec USB2 platform spectrometers

A special set of designated Linux drivers for the AvaSpec USB2 platform spectrometers can be downloaded for free from our website www.avantes.com. These driver routines are available in source code.



FOM-DLL Windows Interface Package for Fiber Optic Multiplexer

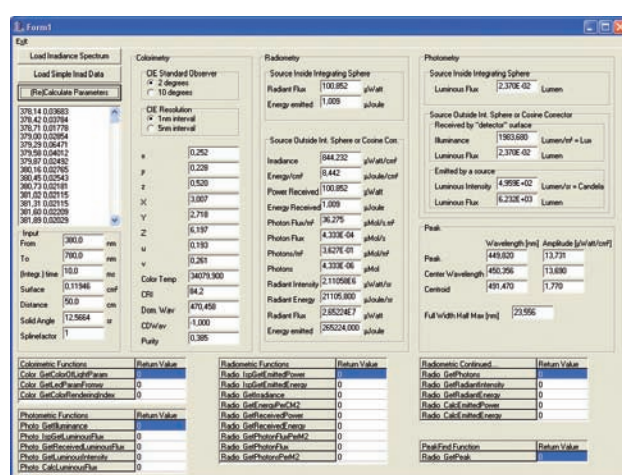
The FOM-DLL is the Windows Interface DLL-Package for Windows 95/98/2000 and Windows NT/ME/XP/Vista/7 that allows you to easily write custom software solutions for the Fiber Optic Multiplexer. The software contains functions to control the position in the multiplexer to one of the 16 positions, to travel to the stepmotor's reference position, and to request status information. Example source code developed in Visual C++, Delphi, C++ Builder and LabView that demonstrate how to use these functions is included in the software package.

Color-DLL

The Color-DLL is a routine to calculate the color parameters L^* , a^* and b^* as well as their hue angle (h^*) and Chroma (C^*)

and X, Y, Z values from an array of reflection values, representing the reflectance values between 380 and 780 nm with a 5 nm interval. It runs under Windows 95/98/2000 and Windows NT/ME/XP/Vista/7.

Besides the reflectance array, the function requires another input variable: the illuminant. A choice can be made between 7 different illuminants: A, B, C, D50, D55, D65 and D75. An example program in Delphi is provided with the software package.



Irradiance-DLL

The Irradiance-DLL includes functions to calculate colorimetric, radiometric, photometric and peak parameters from an array of irradiance values ($\mu\text{W}/\text{nm}/\text{cm}^2$) as well as the CRI.

A list of parameters, that can be calculated, is depicted in the C++ Builder sample program screendump above. An example program in Delphi is included as well. It runs under Windows 95/98/2000 and Windows NT/ME/XP/Vista/7.

ORDERING INFORMATION	
AS-161-DLL	Interface DLL package for AvaSpec-USB1 platform for Windows-95/98, 2000, ME, NT, XP, Vista/7
AS-5216-DLL	Interface DLL package for AvaSpec-USB2 platform for Windows-95/98, 2000, ME, NT, XP, Vista/7
FOM-DLL	Interface DLL package for Fiber Optic Multiplexer (FOM-XX400-1x16 and FOM-XX400-2x8) for Windows-95/98, 2000, ME, NT, XP, Vista/7
COLOR-DLL	DLL to calculate color coefficients, for Windows-95/98, 2000, ME, NT, XP, Vista/7
IRRAD-DLL	32-bit DLL for Irradiance/LED application for Windows-95/98, 2000, ME, NT, XP, Vista/7