

# **Operating Instructions**

## **VersaSpec**

**Software Version: 5.6**



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## 1. Installation of Software

### 1.1. Installation of PC Software

Execute the following steps on the PC to install the software **VersaSpec**:

- Start Windows Vista/7/8/10
- Insert the CD in the CD-ROM drive
- Click on setup.exe in the folder Software/VersaSpec of the CD ROM

## 2. Operation of Program

### 2.1. Starting the Program

- Start Windows and then activate the Start menu
- Select **VersaSpec** under Programs

The software will automatically search for all JETI devices connected to the PC. If more than one unit was found then a selection list will appear.

By default, next time the software is started, it tries to establish connection with the last used device to save time on searching through all ports and interfaces.

There are some command line arguments that can be used to change this default behaviour. They cause to use fixed ports and interfaces:

**COM number** (e.g. "COM 64") – connection through a given COM-port

**FTDI address** (e.g. "FTDI A6015FTH") – USB-connection via FTDI driver

**BT address** (e.g. "BT 0x0013430FCFEB") – connection via BlueTooth

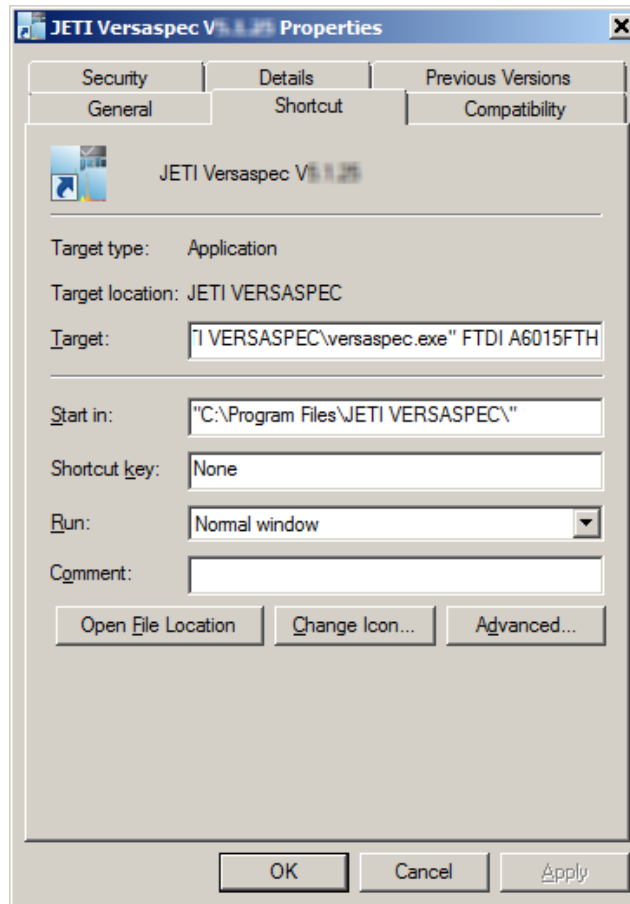
**TCPIP address** (e.g. "TCPIP 192.163.115.163") – connection via TCP/IP (for LAN-devices)

Other arguments:

**SEARCH** – force searching of devices. May be useful if more than one device are connected. In this case **VersaSpec**'s attempt to open the last connected device is omitted.

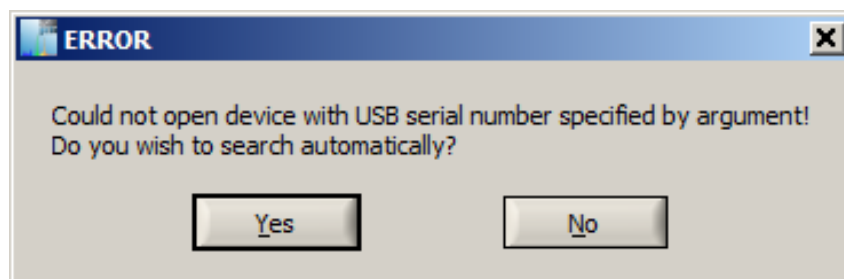
**OFFLINE** – start **VersaSpec** in offline mode.

To insert command line arguments, edit the program's shortcut as follows: right-click the '**JETI VersaSpec**' icon on the desktop and select '**Properties**'. The following dialog appears:



Type the arguments after the last quotation mark in the 'Target' box (FTDI A6015FTH in this example). Use a space sign between the quotation mark and the arguments.

If no device can be found on the specified port the software asks to perform an automatic scan.



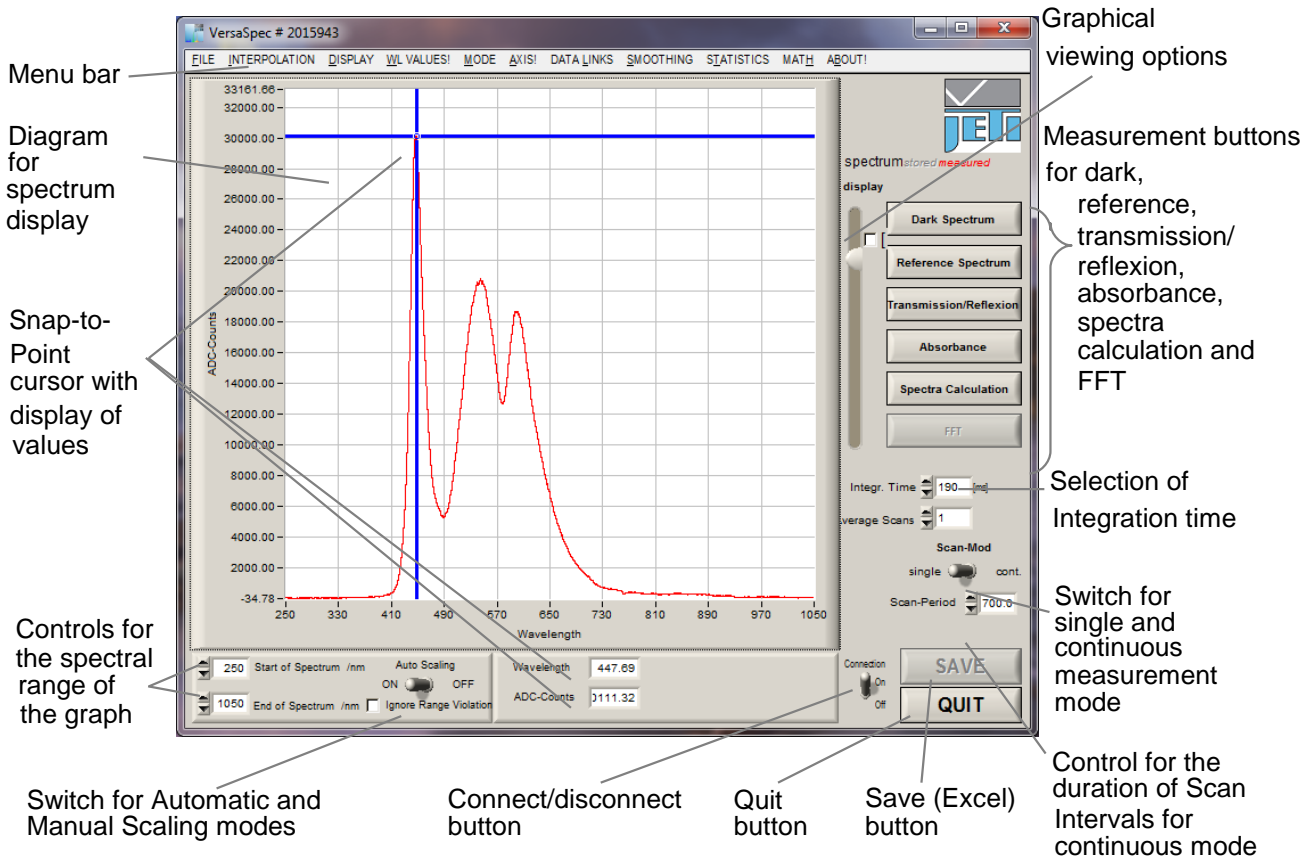
## About

**Info/About** shows an information window, which contains the software version, serial numbers, connection type (with a COM-port if used) and the firmware version.



Press **X** to close the window.

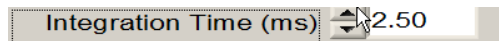
## 2.2. Main Panel





## 2.3. Measurement

### 2.3.1. Integration Time

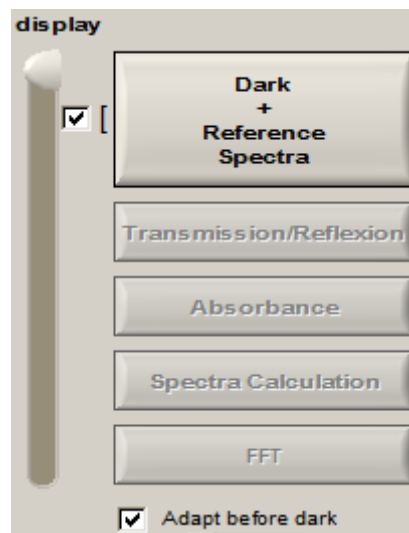


The integration time can be selected between 0.01 and 60 000 ms with a step of 0.01 ms, but fractional values have sense only for SDCx3 electronics (or devices on its basis as spectraval or BlueSpecCube). The default value is the time used during the last measurement. It can be also set directly with up/down arrows as well as entered with the keyboard. A new dark scan will be required after a change of the integration time.

**Remark:** Select the integration time to keep the count rate below the detector maximum count rate (approx. < 28 000 ... 30 000 for 15 bit setting of the ADC and < 55 000 ... 60 000 for 16 bit setting) to avoid overexposure.

The following buttons are used for spectral measurements and calculations:

### 2.3.2. Dark Spectrum



The measurement of the dark spectrum of the spectrograph must be done before the first measurement and **after any change of the integration time**. One has to ensure that no external light can enter the fiber input during the procedure. The acquisition starts with clicking the **DARK SPECTRUM** button.

### 2.3.3. Reference Measurement

The reference acquisition is done by selecting the button **REFERENCE SPECTRUM**. The displayed spectrum is calculated as the difference between the measured and the dark spectrum.

### 2.3.4. Combined Dark/ Reference measurement

It is possible to combine each reference measurement with an own dark measurement by clicking the check box left of both buttons. In this case it is also possible to get the integration time automatically by clicking the check box below the measuring buttons.

### 2.3.5. Transmission / Reflection Measurement

After the reference measurement, it is possible to make transmission/reflection measurements by clicking the correspondent button. The measured spectrum is divided by the reference spectrum. It is possible to measure the spectral transmission or reflection, depending on the measurement set up.

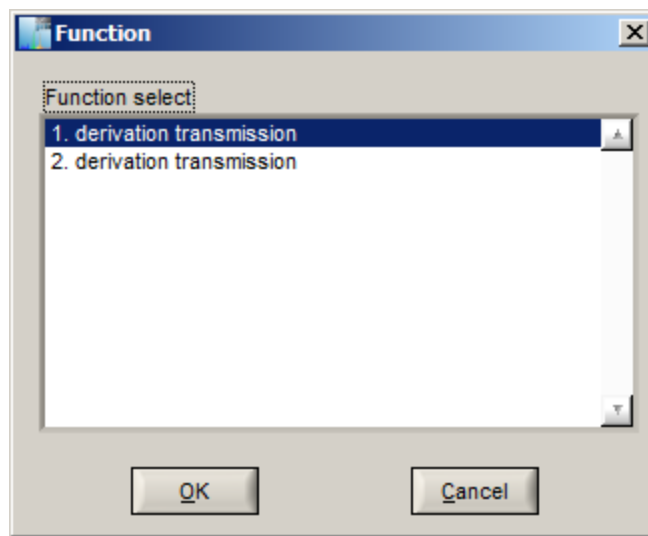
### 2.3.6. Absorbance Measurement

Absorbance measurements are possible by selecting the **ABSORBANCE** button.

### 2.3.7. Functions

Several mathematical operations can be applied to the measured spectrum. To select the operation, double click on the **SPECTRA CALCULATION** button.

A list of possible operations is displayed. The first and second derivation of the spectra.



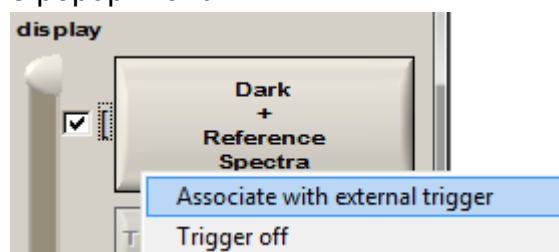
### 2.3.8. FFT

Switch axis to pixel mode, then select Menu **MATH** → **FFT**. Input the type and number of measurements. When the measurements are done, the **FFT** button becomes active and one can see the **FFT** diagram by clicking on it.

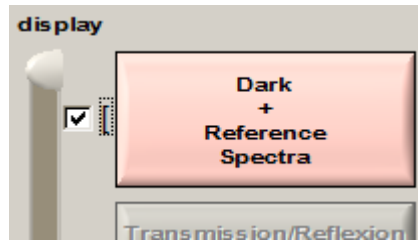
### 2.3.9. Using of External Trigger

Some of JETI devices are equipped with a hardware “Measure”-button (spectraval, BlueSpecCube) or with a connector for an external trigger. It can be used to initiate measurements directly with the device, what can be especially useful in combination with BlueTooth.

To make **VersaSpec** react on an external trigger, do the following: right-click on the measuring button you want to associate with the trigger. Then choose “Associate with external trigger” from the popup-menu.



The button will change its color, and then you can use the trigger to start the corresponding measurement.



Choosing of “Trigger off” from the popup menu ends the triggering mode.

## 2.4. Display

After actuation of a measurement or calculation button the displayed spectrum can be switched back to another previously acquired type of spectrum with the slide control **DISPLAY**. If a file was loaded, stored spectra can also be viewed by using the slide control (see chapter SET UP). The acquired spectra are displayed in dark colors and the spectra loaded from file are displayed in light colors.

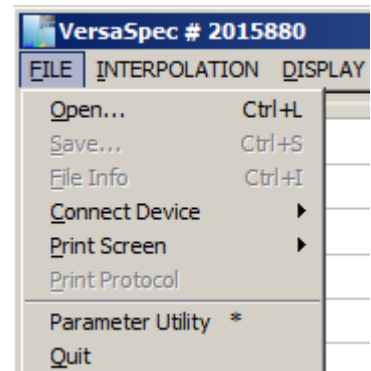
### 2.4.1. Snap-to-Point Cursor

Single data points of the acquired and/or the stored spectrum can be viewed using the Snap-to-Point Cursor option. The respective wave-length and the intensity value of the selected data point are displayed below the wavelength axis.



### 2.4.2. Open File

Selecting the sub menu item **OPEN...** from menu **FILE** will open the file-select dialog. A file has to be selected which can be loaded to compare with the actually measured spectrum.



### 2.4.3. Save File

To save all data of one measurement select **SAVE...** from menu **FILE**. A file-save dialog will appear. After a file is selected a short comment can be entered. Click **OK** to save the file.

<b>Remark:</b> The file extension for reference files is .val.
--

### 2.4.4. Close File

Selecting the sub menu item **CLOSE** from menu **FILE** will remove the reference spectrum from the screen diagram.

### 2.4.5. File Info

By selecting **FILE INFO** or pressing CTRL-I the following information appears when a reference file was loaded.

File info : e:\test.val

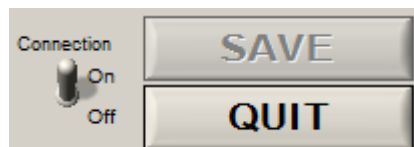
Date	08-31-2012	Spectrum	Comments	
Time	13:16:32	Dark Reference Absorbance Transmission/Reflexion	it's test	
Device Name	M30626_SPEC_R×£D?210812	Version	1.63	Version Date
Integr.Time	0.00	Lamp pre-heat	200	Channels
Pixel-Counts	2048	Direction	1	0
fit0	-2.518362E +2	fit1	5.861272E -1	fit2
		fit3	3.542315E -4	fit4
			-2.076718E -7	3.982704E -11
OK				

- Date and Time:  
The date and time when the file was saved.
- Spectrum:  
Shows the spectra which are stored in file
- Comments:  
A short comment about the file
- Device Name, Version, Version Date  
The internal name, firmware version and date of the **VersaSpec**, which was used for measuring
- Integr.Time, Pixel-Counts, Lamp pre-heat, Channels, Direction:  
The settings of the device used for measuring.
- fit0 – fit4:  
The wavelength fit-parameters of the device

## 2.4.6. Connect Device

This item duplicates the **Connection** –switch on the main screen.

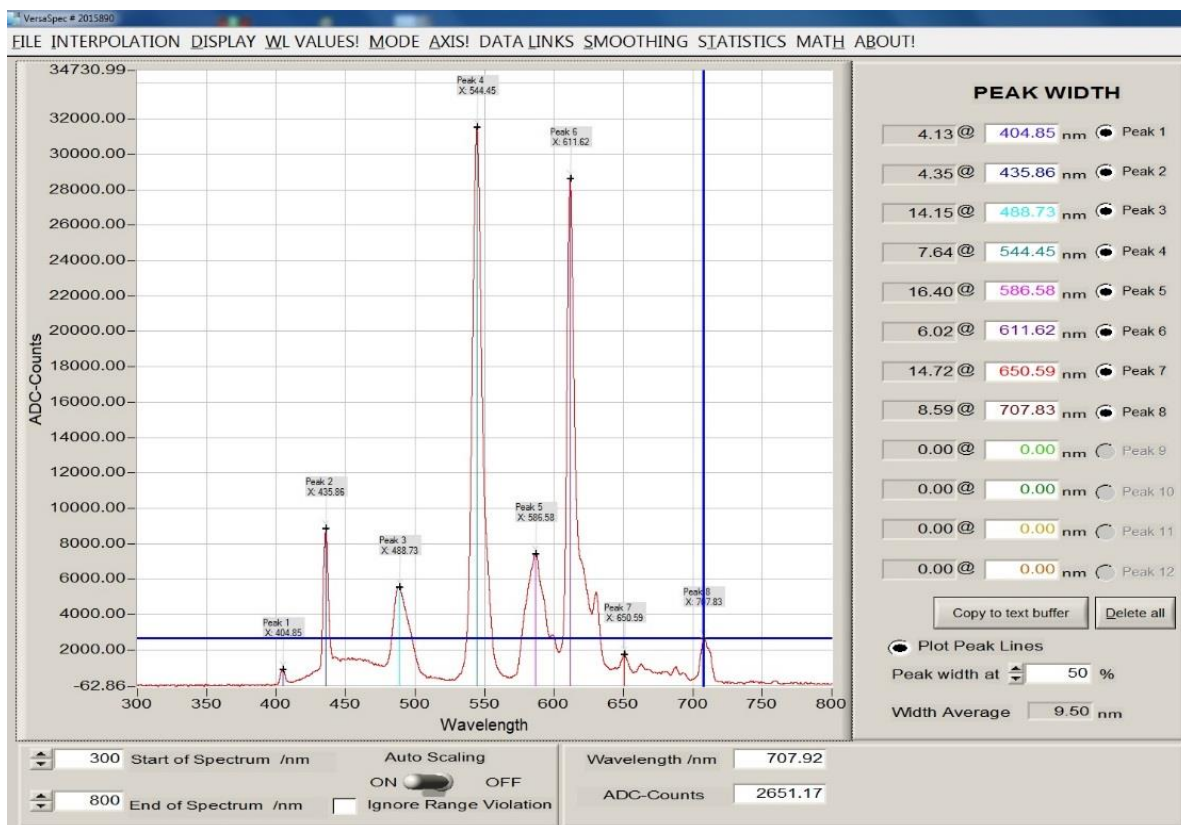
The menu item or the switch can be used to disconnect the device from the PC to use the connection interface for other tasks. Afterwards it can be reconnected in the same manner.



## 2.5. Operation Modes

### 2.5.1. Peak Width Mode

Activating the **Peak Width Mode** (PWM) scales down the diagram and opens the PWM-window. The PWM-window consists of:



- Twelve indicators, each indicator with the peakwidth, the wavelength(pixel)-value, a Delete-Button and a Delete-all-Button
- Copy to text buffer-Button
- Plot-line-Button
- Threshold-control (Peakwidth at)
- Width-Average-Indicator

### 2.5.2. Valley Width Mode and Symmetry


Valley Width Mode(VWM) and Symmetry Mode can be called similarly as PWM, but in this case no Width-Average-Indicator will be shown.

### 2.5.3. Using PWM, VWM and Symmetry

A double click into the spectrum adds a peak (valley or symmetry point) to the additional window, displays the width of the peak (valley or symmetry point) at the defined threshold and shows labels with point number and coordinates.

It is possible to monitor up to 12 points simultaneously with wavelength or pixel – reference.

Each marked peak gets a colored line to locate it easier in the diagram. This option can be turned off with clicking the plot peak lines-button.

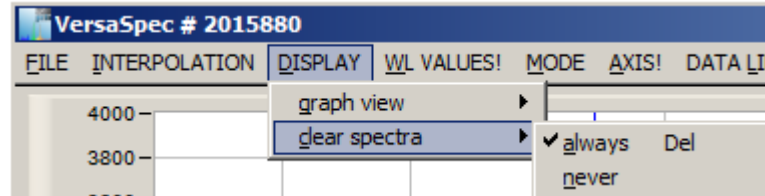
The  -buttons remove the according peaks out of the list and frees the space for other values. The Delete all-button removes all the chosen peaks/valleys/symmetry points and their labels.

At the bottom of the PWM-window the average peak width of the pitched peaks is displayed to monitor the deviation of all peaks.

Please note, ALL peaks are calculated depended on the adjusted threshold in the **Peak width at-control**.

## 2.6. Set Up

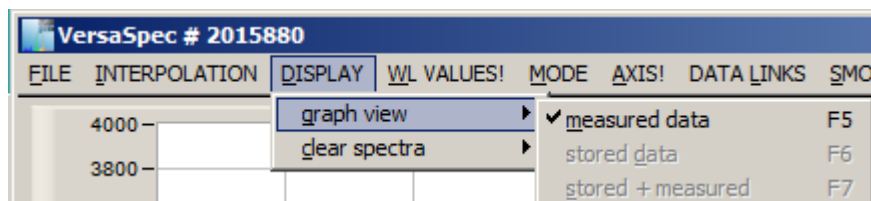
### 2.6.1. Screen Update Mode



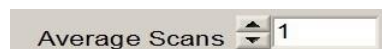
There are different spectrum display options which can be selected in the DISPLAY menu. The sub menu CLEAR SPECTRA contains the following items:

<b>IMMEDIATE</b>	The acquired spectra are deleted at once (actuation of the DEL key also deletes the current spectrum display!). The setting ALWAYS/ NEVER will remain.
<b>ALWAYS</b>	The acquired spectra are deleted before a new measurement. Only the most recent acquisition is displayed.
<b>NEVER</b>	The measured spectra will not be deleted. Further measuring curves are displayed one on top of previous ones. The sub menu GRAPH VIEW contains the items:
<b>MEASURED DATA</b>	Shows only the spectra in diagram, which are just acquired from <b>VersaSpec</b> (also selected by pressing F9)
<b>STORED DATA</b>	Shows the spectra, which were loaded from a file (also by pressing F6)
<b>STORED+MEASURED</b>	Displays acquired and stored spectra in one diagram for visual comparison (also by F7)

The selected graph view option is also shown between the diagram and the JETI logo.



### 2.6.2. Averaging

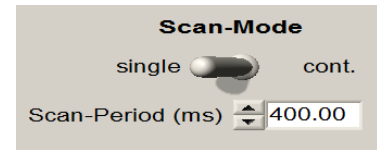


The **AVERAGE SCANS** setting can be used to obtain the spectrum as the mean value from up to 10000 successive measurements (though such a huge number of averages can hardly make sense).



### 2.6.3. Single/ Continuous Measurement

**SCAN-MODE** can be used for single or continuous measurement. In case of continuous measurements, **SCAN-PERIOD** becomes active. This is the time difference between the start of a scan and the start of the successive scan. The minimum possible value depends on integration time.

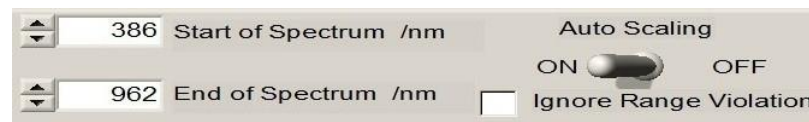


When running in continuous scan mode be certain that the ASCII link and Excel link are in the desired state.

Usually continuous mode is used with **CLEAR-SPECTRA ALWAYS** on. A continuous measurement can be stopped by setting the **SCAN-MODE**-switch back to 'single'.

If the export to Excel was activated (see below), then the **Save continuously** toggle button appears in the main menu and can be used to export every measured spectrum automatically.

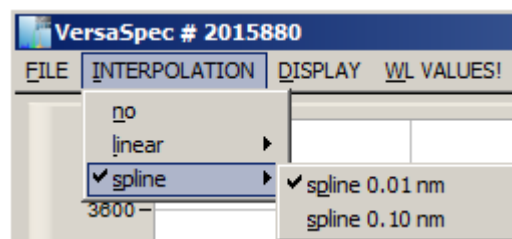
### 2.6.4. Zooming of Wavelength



The start and end of the displayed spectrum can be adjusted at the screen edge below the diagram with **START OF SPECTRUM** and **END OF**

**SPECTRUM**. In addition to use the up/down arrows, the displayed spectral limits can be selected using the keyboard number pad. The largest possible interval is determined by the calibration parameters of the instrument. If a file was loaded the largest values are used. If a file was loaded the larger values are used. For measurements always the full spectral range of the connected spectrometer device is used.

### 2.6.5. Interpolation



Different options for the interpolation of spectra can be selected under the menu item **INTERPOLATION**. Besides the display of the raw data without interpolation (**NO**), **LINEAR** and **SPLINE** can be selected. Step widths of 1, 2, 5 or 10 nm are possible in case of linear interpolation. If **SPLINE** was selected, the calculation is done even in 0.1 nm or 0.01 nm steps by partial cubical interpolation.

### 2.6.6. Axis

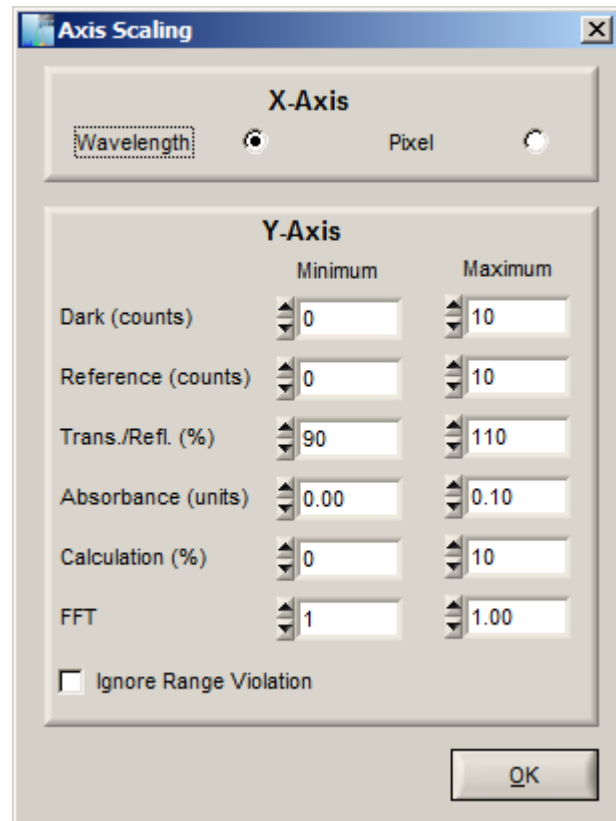
Selection of **AXIS!** in the menu bar opens a window, where the following can be selected:

#### x-axis:

- Scaling in **WAVELENGTH** or **PIXEL**

#### y-axis:

- For each type of measurement the displayed axis-range can be defined. If **Ignore Range Violation** is switched off, the program will generate a warning in every case the measured data exceeds the manual adjusted range.
- If **Ignore Range Violation** is activated, every violation of the manually adjusted range is ignored by the program and the graph is displayed with clipping values outside the diagram area.
- Scaling in **Counts** or **Percent** of maximum (in this case a selection of minimum (min) and maximum (max) value is possible). In addition to using the up/down arrows, the Y axis values can be input use the keyboard number pad.



The **Axis Scaling** dialog box is used to configure the X and Y axes. The **X-Axis** section has two radio buttons: **Wavelength** (selected) and **Pixel**. The **Y-Axis** section contains a table for defining ranges for various measurement types:

	Minimum	Maximum
Dark (counts)	0	10
Reference (counts)	0	10
Trans./Refl. (%)	90	110
Absorbance (units)	0.00	0.10
Calculation (%)	0	10
FFT	1	1.00

Below the table is a checkbox for **Ignore Range Violation**, which is currently unchecked. An **OK** button is located at the bottom right.

### 2.6.7. Peak/Valley

#### FWHM

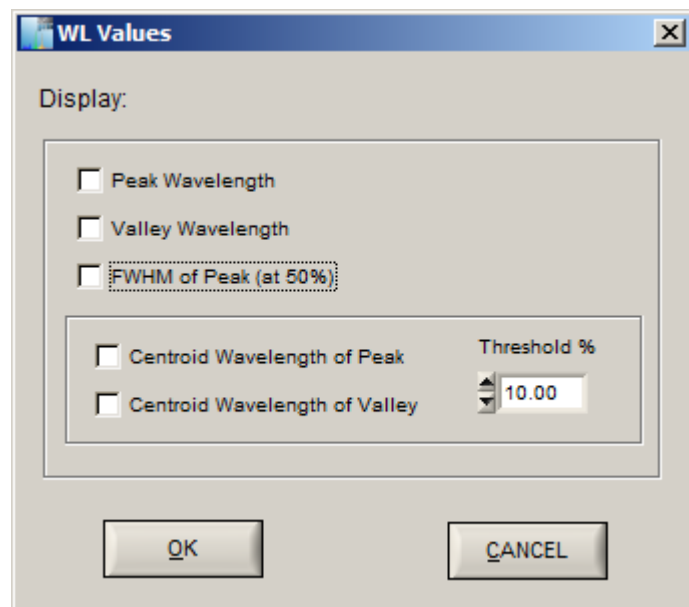
The cursor jumps to the nearest peak by clicking into the spectra and the full width half maximum value of this peak is displayed in the indicator-box below the graph.

#### Peak/Valley

Wavelength at Cursor Function displays the wavelength of the nearest peak(valley) from a pitched position in the peak(valley) indicator box.

#### Centroid Wavelength

Displays the centroid wavelength of a fixed position in the graph with the adjusted threshold. A vertical line is plotted to the position of the dominant wavelength.

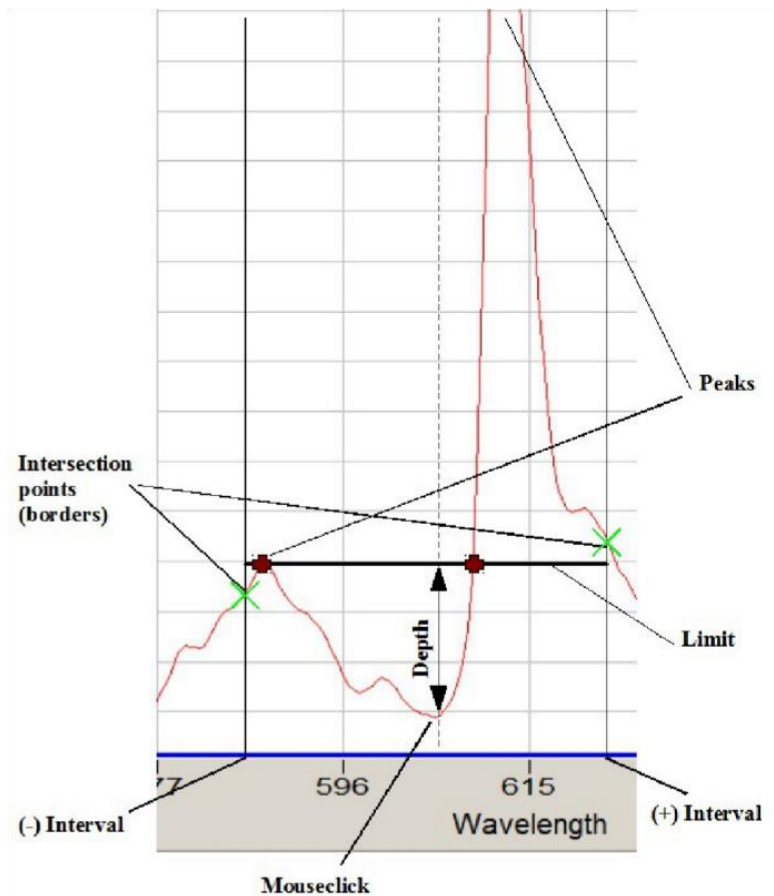


The **WL Values** dialog box is used to select which wavelength values are displayed. It has a **Display:** section with three checkboxes: **Peak Wavelength**, **Valley Wavelength**, and **FWHM of Peak (at 50%)** (which is selected). Below these is a section for **Centroid Wavelength** with two checkboxes: **Centroid Wavelength of Peak** and **Centroid Wavelength of Valley**. To the right of these is a **Threshold %** label and a spinner box set to **10.00**. At the bottom are **OK** and **CANCEL** buttons.



## Centroid Wavelength for Valley

For the COG Valley calculation it is necessary to give the interval value (it is symmetrical), threshold (in %) and mouse position. The program searches the nearest valley to the mouse click position and a limit at the top. The limit is defined as the smallest (y – coordinate) and the nearest point from two greatest peaks on the left and on the right to mouse click between borders of the given interval and the spectrum. Depth is defined as a distance between the mouse click point and selected intersection point. Then, the real threshold is defined as a product of the depth and the given threshold, and finally COG Valley value is calculated.



## 2.7. Print Screen

The print out of the actual screen on the connected printer is possible by **PRINTSCREEN**. If no printer is connected the action is ignored without an error message.

## 2.8. Data Links

There are three possibilities to store spectra – as ASCII file, Excel or CSV file. The desired format can be selected in the menu item **DATA LINKS**.

### 2.8.1. CSV



CSV are database files, which can be opened with database programs (EXCEL, ACCESS...). Start the automatic transfer with **DATA LINKS/ LINK-CSV/ Start CSV Link**. The file name, operator name and file destination has to be selected. Afterwards every measured spectrum will automatically be stored linewise into this file. The x axis is stored in pixel related wavelength steps.

## CSV file, opened with Excel:

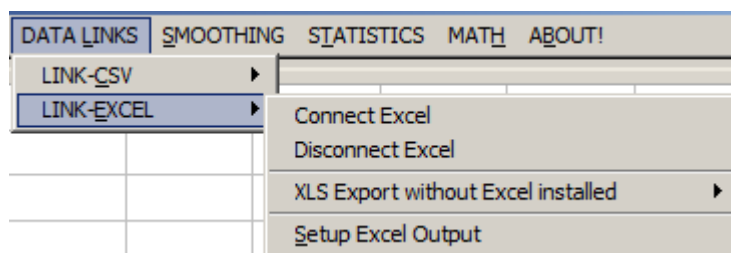
Date:	27.11.2014	27.11.2014	27.11.2014	27.11.2014	27.11.2014
Time:	08:39:52	08:39:54	08:39:55	08:39:57	08:39:57
wavelength	dark:	reference:	transmission:	absorbance:	1.derivation:
496,73	771,00	1203,000	98,088	0,011	1,850
497,58	788,000	1098,000	102,914	0,004	1,972
498,43	796,000	963,000	101,454	0,000	-3,534
499,29	786,000	899,000	96,885	0,008	-0,347
500,14	800,00	813,000	100,861	0,012	1,22

## CSV file, opened with an editor program:

```
Date;;27.11.2014;27.11.2014;27.11.2014;27.11.2014;27.11.2014;
Time;;8:39:52;8:39:54;8:39:55;8:39:57;8:39:57;
wavelength;dark;;reference;;transmission;;absorbance;;1.derivation;;
496,73;7,710000E+02;1,203000E+03;9,808811E+01;1,096762E-
02;1,849687E+00;
497,58;7,880000E+02;1,098000E+03;1,029144E+02;3,973445E-
03;1,972363E+00;
498,43;7,960000E+02;9,630000E+02;1,014538E+02;0,000000E+00;-
3,533527E+00;
499,29;7,860000E+02;8,990000E+02;9,688543E+01;8,291107E-03;-
3,474658E-
01;
500,14;8,000000E+02;8,130000E+02;1,008610E+02;1,191406E-
02;1,220605E+00;
...
```

## 2.8.2. EXCEL

It is possible to store the measured values in Excel files in two ways: if Excel is installed on the computer or if it is not installed.



If it is installed, Excel starts as a background application and the measured data are saved linewise into spread sheets.

First one has to open **DATA LINKS/ LINK EXCEL/ Setup EXCEL Output**. A window appears, where one has to select, if the spectra and/ or the PWM-mode values have to be stored.

Afterwards the Excel link is started with **DATA LINKS/ LINK EXCEL/ Connect Excel**.

Every desired measurement can be stored by pressing the **SAVE** button. The serial number and the used integration times will always be stored automatically.

If the displayed wavelength range has changed between two data savings, two

columns will be written to the Excel-spread sheet (wavelength and intensity values), whereas without changes in the spectral range only one column with the intensity values is written.

If one spread sheet is almost completely filled, the next sheet is opened automatically.

The connection to MS Excel is finished and the data are stored (\*.xls) by selection of the sub menu item **DATA LINKS/ LINK EXCEL/ X**.

If Excel was not installed select **DATA LINKS/ LINK EXCEL/ XLS Export without Excel installed** item. Choose **Start XLS link** and type in the desired file name. Stop the export by pressing **End XLS link** in the same menu.

To store a measurement press the **SAVE** button in the same way as above.

**Attention:** Please ensure that the Excel worksheet has enough rows to store all data. This could be critical if the interpolation is set to a fine value, e.g. 0.01.

## 2.9. Smoothing

Under the menu item **SMOOTHING** are two types of smoothing – Savitzky-Golay smoothing and Boxcar, on default nothing is chosen, i.e. “no”.

## 2.10. Statistics

Select Menu **STATISTICS** → Start Statistics. Input the type and number of measurements. When the measurements are done, the table with statistics is shown and average values of intensity and standard deviation are calculated.

## 2.11. Abort a measurement

The **ESC** button can be used to abort a measurement.

## 2.12. Finishing the Program

The program can be closed by selecting the **Quit** button or by typing **Alt-Q** on the keyboard.

**Remark:** Do not disconnect the instrument until the program is not finished yet. This is also valid if the device is used with its firmware commands.


## 2.13. Session Logging

**VersaSpec** generates a log-file for each session (**VersaSpec** overwrites it at every program start), which is normally located under C:\Users\[username]\AppData\Roaming\JETI\VersaSpec\versaspec\_session.log. The file contains important information about internal calls of system functions which are responsible for communication with the device.

If you notice any reproducible error, you can backup this file before you restart **VersaSpec** and send it to JETI with an explanation of what exactly has happened. This can help us to make **VersaSpec** better in the future.

### 3. Parameter

**VersaSpec** allows to display and to change all parameters, which are stored in the connected instrument.

The access to the Parameter Utility is via the menu File or by pressing the  button. It opens a window with several slides, where the parameters are grouped in different topics. It is also possible to access to a special parameter by clicking on the related firmware command in the list on the left side of the Parameter Utility. Clicking on a parameter command highlights the related argument in the sliders.

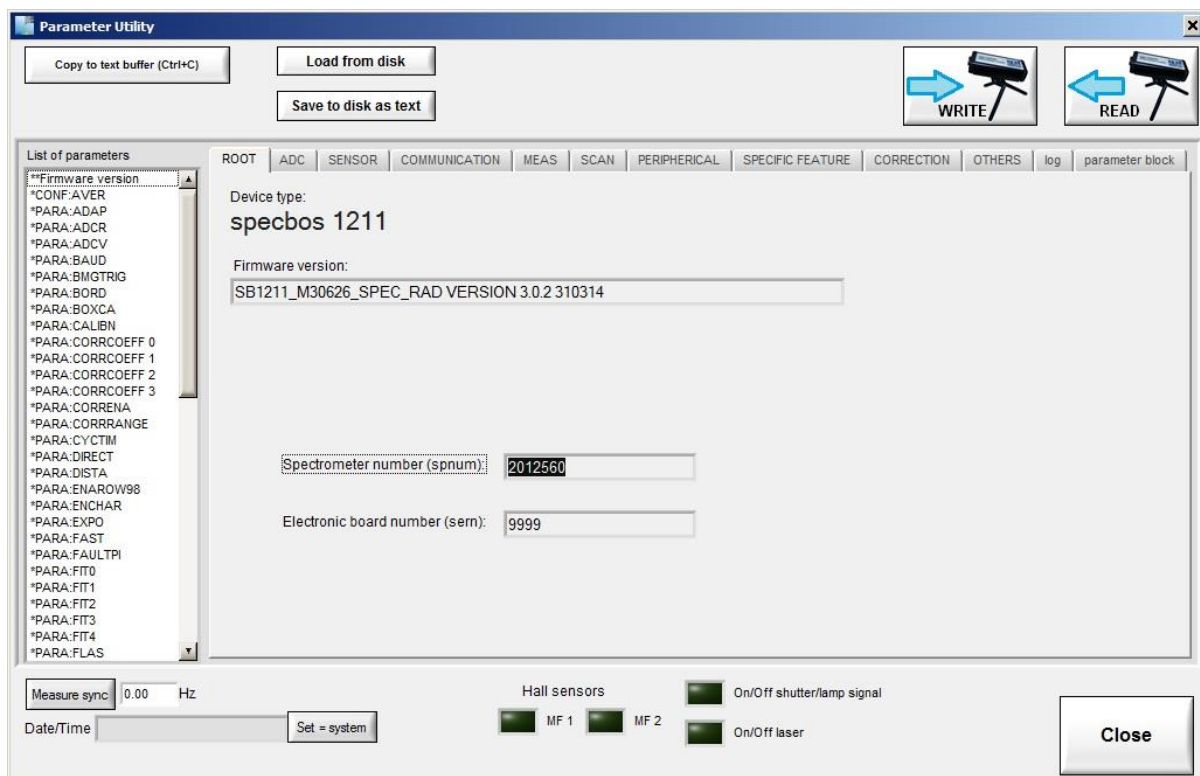
The display of the different parameters depends on the type of connected instrument or spectrograph. The meaning and range of each parameter can be found in the related firmware description of the attached instrument.

Every parameter change is saved temporarily immediately after pressing of ENTER or leaving of the input field. It is possible to save changes permanently by clicking on the **WRITE** button. This change is password protected for security reasons. Please ask at JETI if you need it.

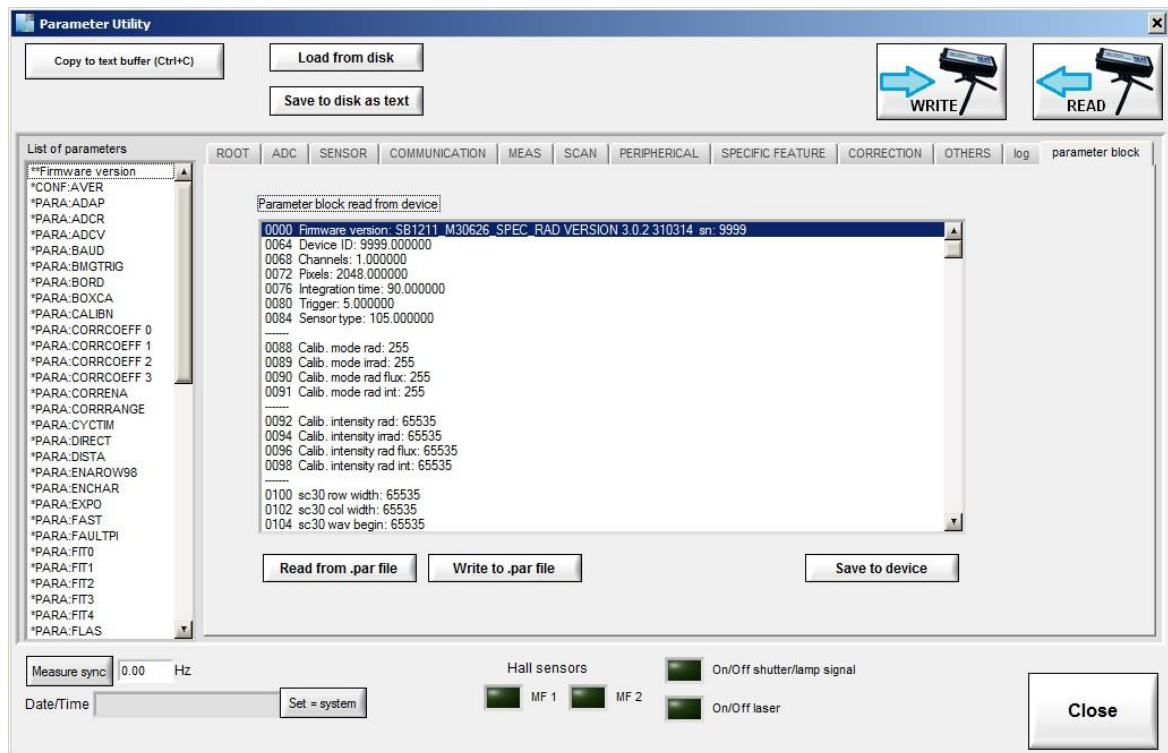
The READ button causes a transfer of parameters from the attached device to the PC. This is always done during start of **VersaSpec**, so the actual purpose of this button is restoring of parameter values after they were temporarily changed.

Additionally it is possible to load parameter sets with the **Load from disk** button and to store them as text or to copy them to the text buffer for further use.

The check boxes on the bottom of the window are valid only for the JETI spectroradiometers (operation of shutter, target laser, measurement of repetition rate of a source and check of Hall sensors).



The slider Parameter block allows to store the parameters of all devices except those based on SDCx3 to .par files.



## 4. Error Messages

Error messages	Reason	Removal
No device found! Switched to offline-mode	Device not connected or USB driver not installed correctly.	Connect the device to the PC or check the installation of the device driver (see install.txt on the Setup-CD).
Could not read parameter.	The software cannot read the necessary parameters from the instrument.	Contact your supplier.
Could not read file!	It was not possible to read a selected reference file.	Check the readability of the file.
Could not write file!	It was not possible to write a measured file as reference.	Start again.
Error on USB- Transfer	It was not possible to read or write data via USB	Check the USB-connection and restart the software



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