Gigahertz-Optik

Version 2018.3

S-BTS2048
measurement software

www.gigahertz-optik.com

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6. Product Overview

This software package includes all you need to control your BTS2048 device and perform measurements with it.

7. Requirements

- Minimum space required on your HDD approx. 300MB, more space is needed when performing large measurement sequences
- Minimum RAM required: 2 GB , recommended 4 GB or more
- Processor: recommended 2 GHz or more
- OS: Windows XP, Windows 7 (32-bit/64-bit), Windows 10 (32-bit/64-bit)
- minimum monitor resolution: 800 x 600 pixel, recommended 1600 x 900 pixel or more
- USB-port or LAN
- BTS2048 measurement device

8. Installation

8.1 S-BTS2048 Software Installation

To install S-BTS2048 from the product installation CD, follow these steps:

1. Read this manual before you begin the installation procedure.
2. Close all other applications before starting the installation.
3. Insert the CD into your CD drive.
4. Start installation by double-clicking “setup.exe”.
5. Follow the installation instructions.

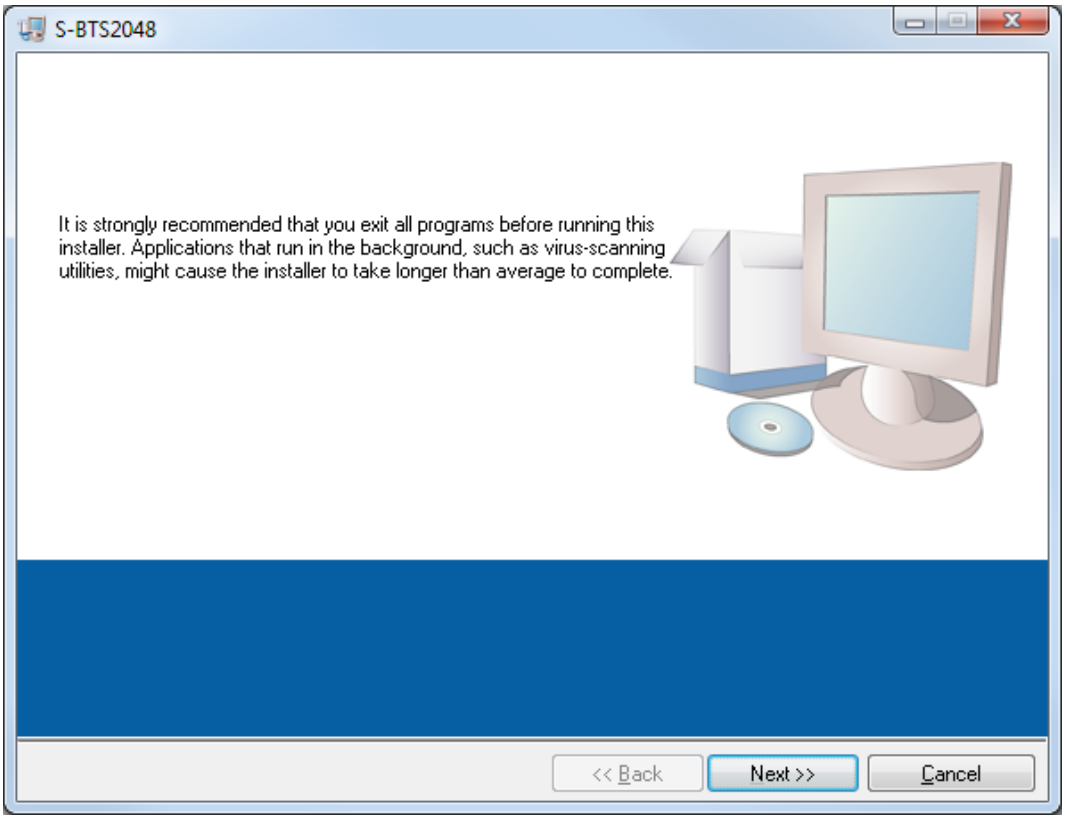


Figure 1: Before starting the installer, it is recommended to close all running programs

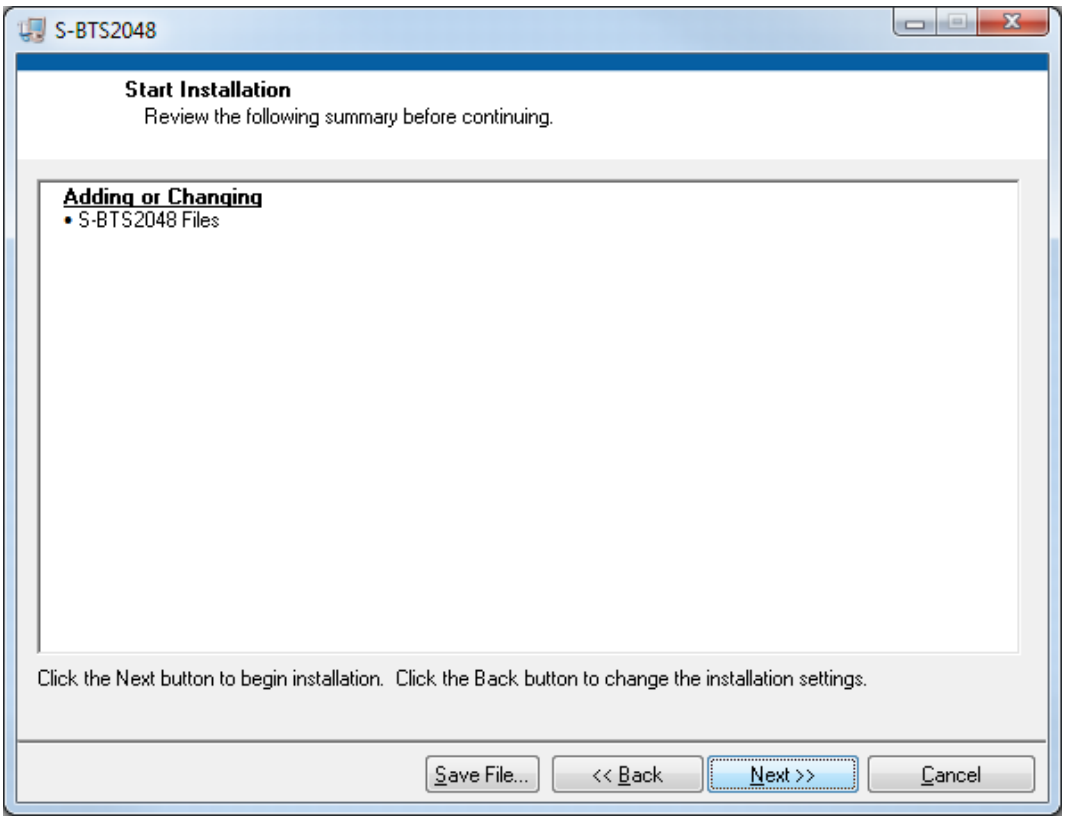


Figure 2: You see this message, when you install the software for the first.

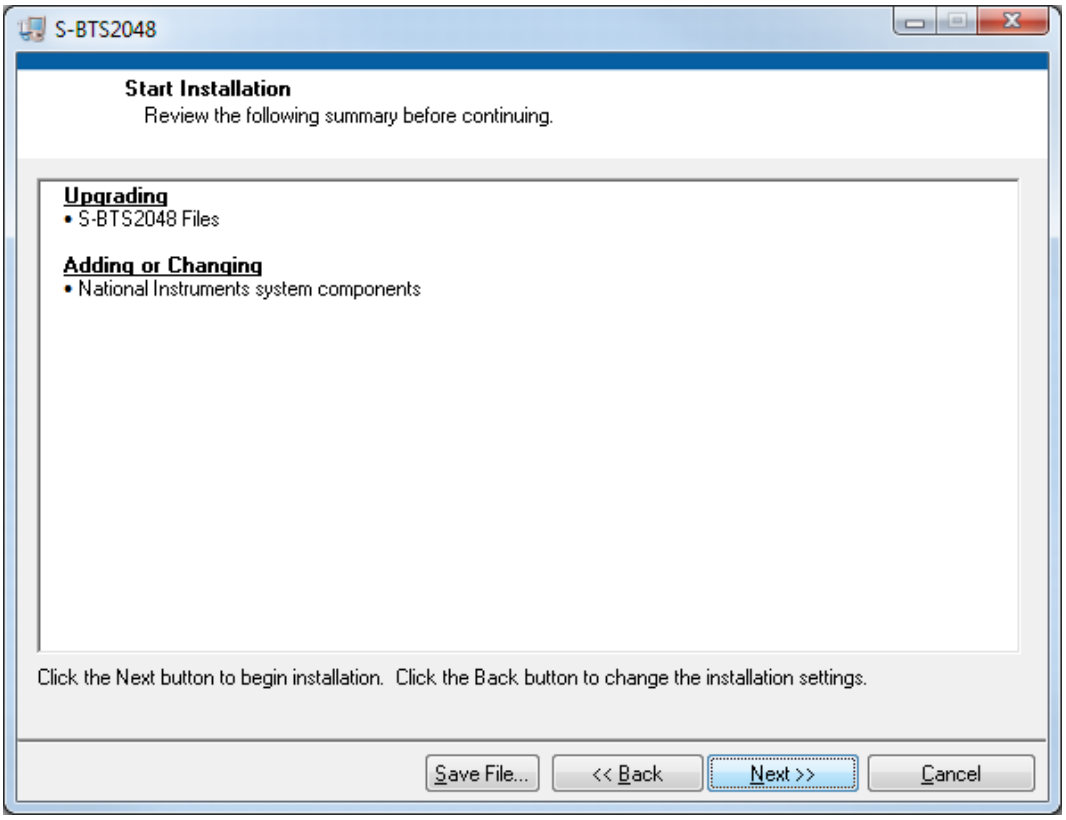


Figure 3: If you have already installed an older version, the software just needs to be updated.

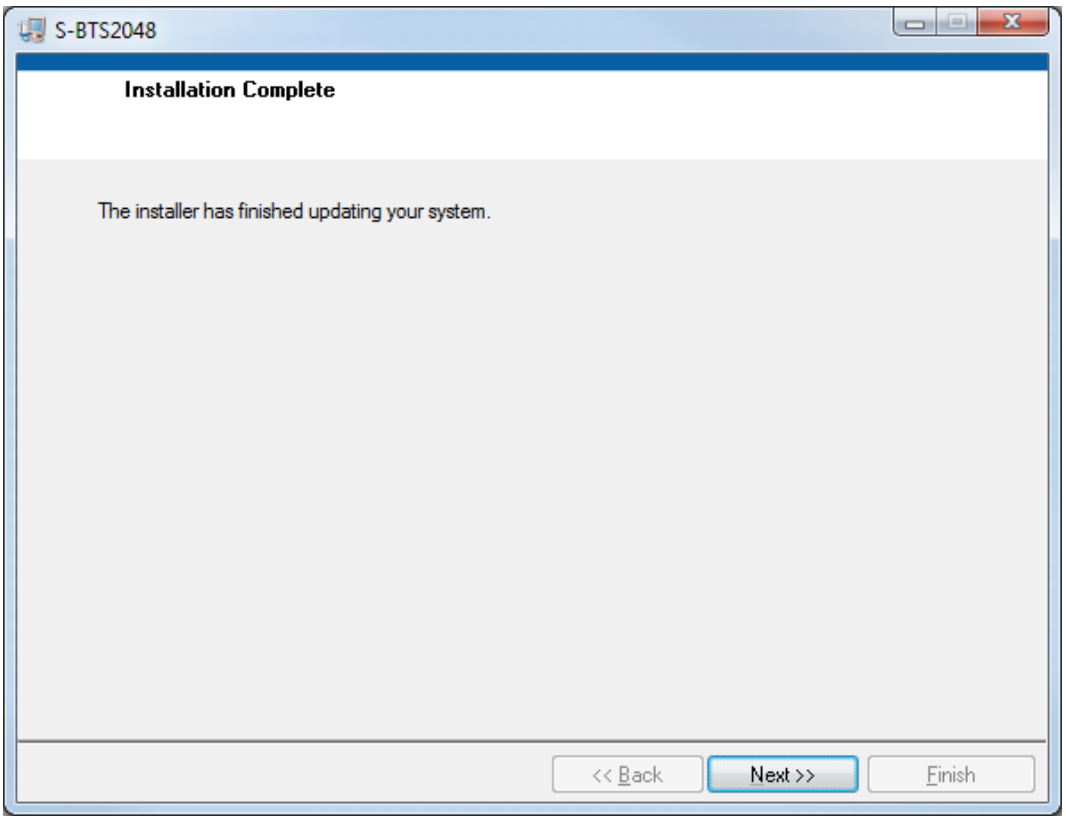


Figure 4: After everything went right you should see this screen

8.2 Driver installation

1. Plug the USB-cable of your measurement system into a USB-port of your computer.
2. Standard drivers will be installed automatically.

8.3 Copy datauser folder (if delivered and necessary)

If a datauser-CD was delivered from Gigahertz-Optik GmbH, then select the “datauser” folder on your datauser-CD and copy it to your selected installation folder of S-BTS2048 (e.g. C:\Program Files\Gigahertz-Optik\S-BTS2048). At the end you must have a “datauser” subfolder within this installation folder.

The datauser folder holds device specific information about your measurement device! These user specific files are only necessary, if you own additional hardware, like Gigahertz-Optik GmbH power supplies or goniometer devices.

If you own a measurement device only, and system relevant data is stored within your measurement devices memory already, then no additional files are necessary to copy.

You only need the preinstalled files “colorFields.goi” and “company_logo.jpg”

9. Preparing your System

9.1 Connect with USB

Connect the BTS2048 device to the computer with a USB-cable. Drivers will be installed automatically.

9.2 Connect with LAN

Connect your device with a LAN cable to your network. The device obtains an IP-address from your DHCP server.

10. Starting S-BTS2048

Start your application by clicking the program icon in your program folder.

After first start of S-BTS2048, the application recognizes that no database exists. The database has to be created, because all measurement data will be stored within that database.

In the next screen you must enter a filename for your new database. You can enter a new, non-existing filename or select an existing database you created earlier. You mustn’t select the file “S-BTS2048_DBTemplate.FDB” as this is a template for creation of new databases. This will not be accepted.

When you have entered a filename you can close the window by clicking the “OK” button. It’s recommended to store the database file in the documents folder, especially if working with Windows 7 or Windows 8.

Clicking the cancel button will not be accepted. You must define a filename for a database at this point.

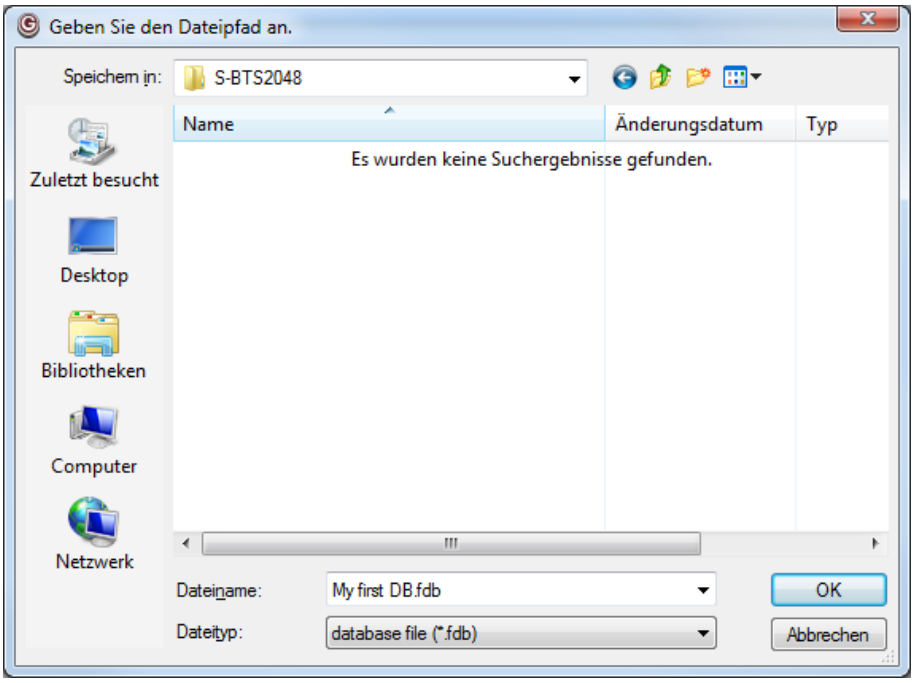


Figure 5: Dialog Window, to choose or Enter Path of the DB File

If a Database is created the Hardware Initialization starts and the following screen appears.

Figure 6: Hardware Initialization

Depending on type of hardware, configured in your system, the initialization procedure may take up to a minute.

If starting the software the first time, you may be asked to grant the software access to use network functions. This is necessary, if you connected the BTS2048 via LAN.

11. Main screen

After the Hardware Initialization, the program shows its main screen. This screen contains the application menu, from where all relevant functions and views are started, the navigation bar with options for measurement and navigation and the desktop, where all the views will be displayed.

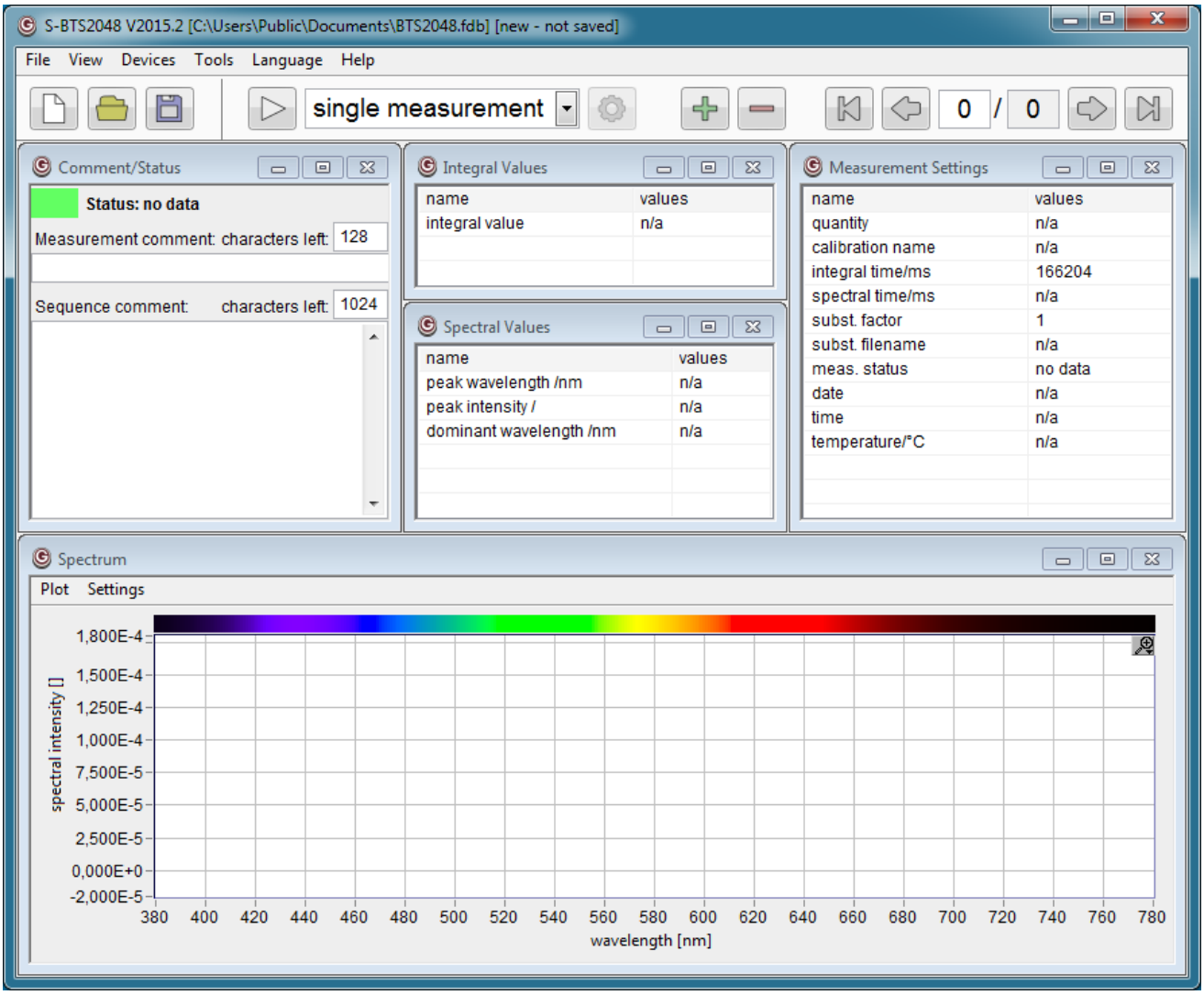


Figure 7: The main screen with default desktop settings

12. Navigation Bar

The Navigation Bar offers buttons for measurement and data navigation. Measurements can be done here. Data can be added to a data container. You can navigate forward and backward within all stored data in data container.

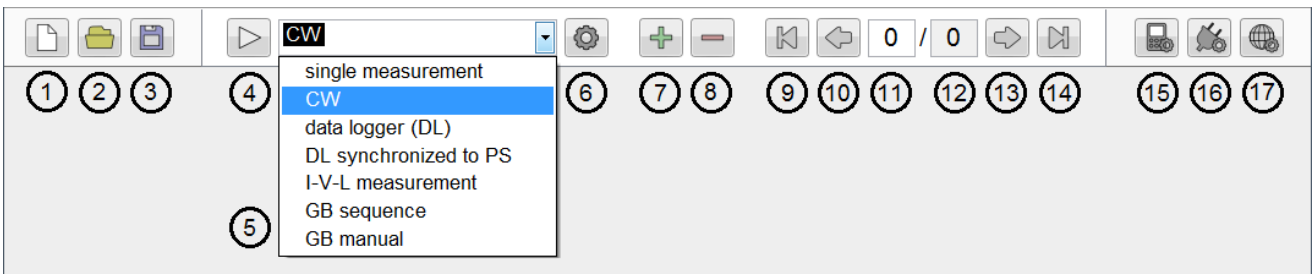


Figure 8: The navigation bar with drop down menu for the different measurement routines

1. See Section Application Menu: File->New
2. See Section Application Menu: File->Load

3. See Section Application Menu: File->Save
4. start/stop button: performs a measurement of the type selected in combo box [4] with all settings done in measurement device setting screen (see later). Dependent on selected measurement type additional setup can be done by clicking the setup button [5]. If measurement type consists of repeated measurements, then a second click on measurement button [1] will stop the performed measurement.
5. measurement type combo box: Here you can select the type of measurement / measurement routine you want to perform. The different measurement routines are described later.
6. Setup can only be called for some of the measurement routines. If the setup is not available, the button is grayed out.
7. Add to container button: adds actual measurement to the data container.
8. Delete from container button: deletes actual measurement entry from data container.
9. go to first element button: shows first element stored within data container
10. go one step back button: navigates one measurement back within measurements stored in data container
11. actual position field: shows the actual measurement number of data container that will be displayed in display windows
12. maximum number field: shows the number of measurements stored in data container
13. go one step forward button: navigates one measurement forward within measurements stored in data container
14. go to last element button: shows last element stored within data container
15. open the setup screen for the active BTS256 measurement device
16. open the setup screen for the active power supply
17. open the setup screen for the active goniometer device

These Measurement Routines exist:

- **single measurement**: only one measurement is done (actual device configuration is used).
- **CW**: repeated measurement is done until start/stop button [1] is clicked again. For further setting click the setup button [6]:

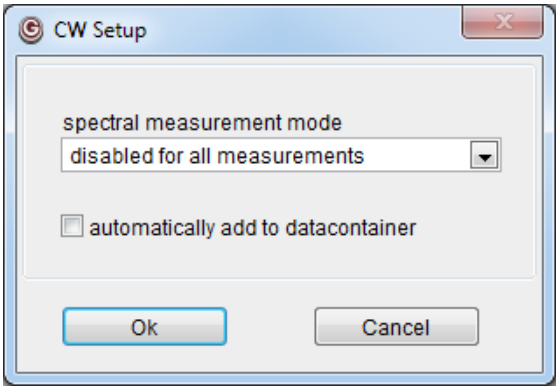


Figure 9: Dialog Box for the CW Routine

There are three spectral measurement modes for this routine: you can ether disable it completely, you can enable it for the first measurement and then disable it, or you can enable it for all measurements.

- **data logger (DL)**: repeated measurement is done and the result of each measurement is added to the data container. The measurement will stop by clicking the measure button again or until predefined parameters are reached. With the setup button [6] you can enter further settings for this measurement mode:

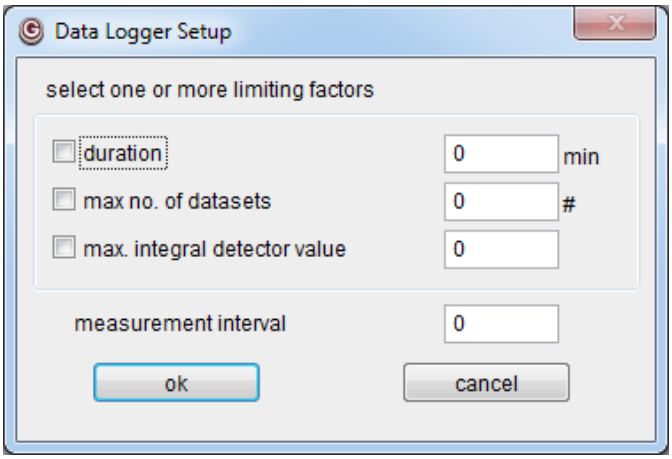


Figure 10: Dialog Box for the data logger

You can decide whether a parameter should be evaluated for termination or not. Every parameter can be specified with additional values. Measurement will be stopped, if any of the specified values is reached.

The measurement interval defines the amount of time after which a new measurement will be triggered. The trigger will be send at every whole-number multiple of the measurement timing amount. If timing is 0s then next measurement will be triggered immediately after the old measurement has finished. If measurement takes longer than the defined measurement timing, than next measurement will be triggered after the measurement is finished and the next whole-number multiple of timing amount is reached.

- **DL synchronized to PS**: This is a special application where measurement starts directly after the power supply is switched on. The switch on of the power supply will be done automatically when clicking the start/stop button. After the determination conditions are reached, power supply will be switched off, if configured before. Otherwise power supply will not be switched off.

  This setup screen looks similar to the datalogger setup screen with one exception: you can choose to switch the power supply off at the end of the measurement.

- **IVL measurement**: a predefined sequence of current, voltage and light measurements. Every single measurement will be added to the container. You can choose if the measurement should be added to the existing container or if a new container should be created.

  For this measurement an I-V-L routine file has to be loaded. This file can be created with the Tool: “I-V-L Routine -> Course Generator”

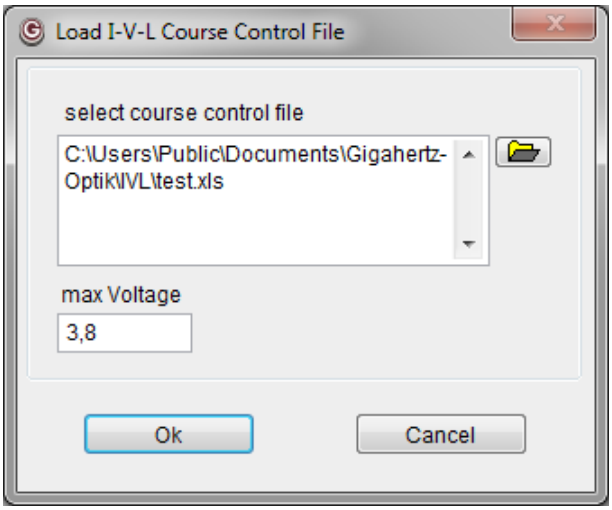


Figure 11 Dialog Box for I-V-L measurements

The value max. voltage ensures, a maximal voltage will not be exceeded, no matter what course file is loaded.

- **GB sequence**: a predefined sequence of goniometer positions will be driven and a measurement will be done at every position. Every single measurement will be added to the container.

  You can define a delay time between each measurement, to ensure the goniometer is not moving anymore and you can choose if the goniometer should go to park position at the end of the sequence.

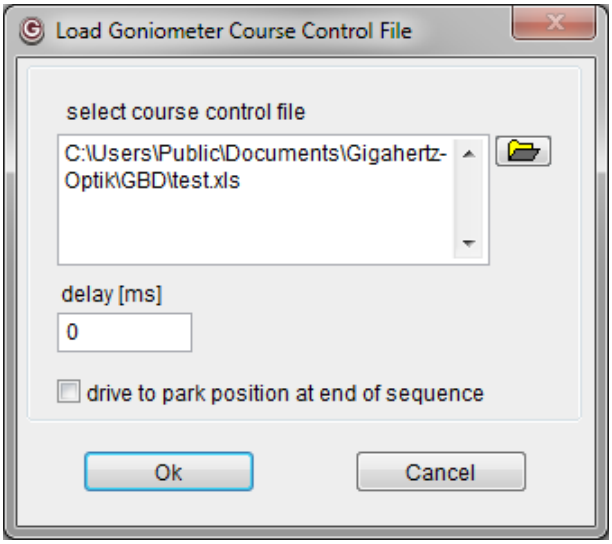


Figure 12: Dialog Box for the GB sequence

For this measurement an GBD routine file has to be loaded. This file can be created with the Tool: “GBD Routine -> Course Generator”

- **TEC sequence**: a predefined sequence of temperature values that should be driven by a Temperature Controller. Each measurement starts, when the preset temperature values are reached.

If you want to add your measurement to an existing container no new data container will be created at the start of your measurement.

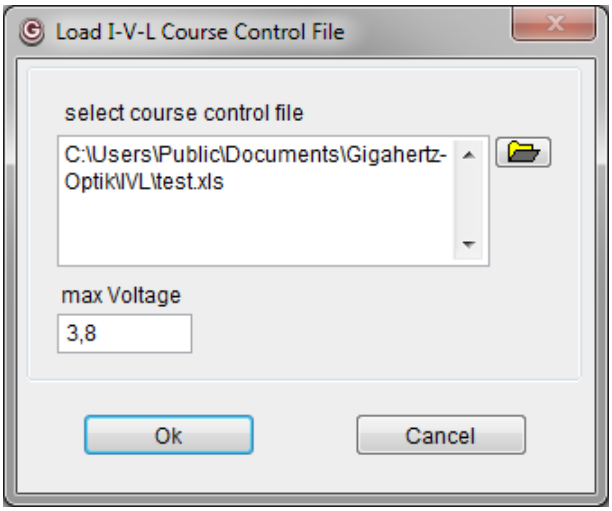


Figure 13: Dialog Box for the TEC sequence

For this measurement a TEC routine file has to be loaded. This file can be created with the Tool: "TEC Routine -> Course Generator"

- **GB manual**: a CW measurement will be performed and goniometer positions will be evaluated for every GB position.
- **Measurement script**: a measurement routine following a script file that was created previously. For more information see the Chapter Tools->Generate Measurement Script.

13. Application Menu

In this section the elements in the "Main Application Menu" will be described.

13.1 Application Menu "File"

This menu contains elements for file handling.

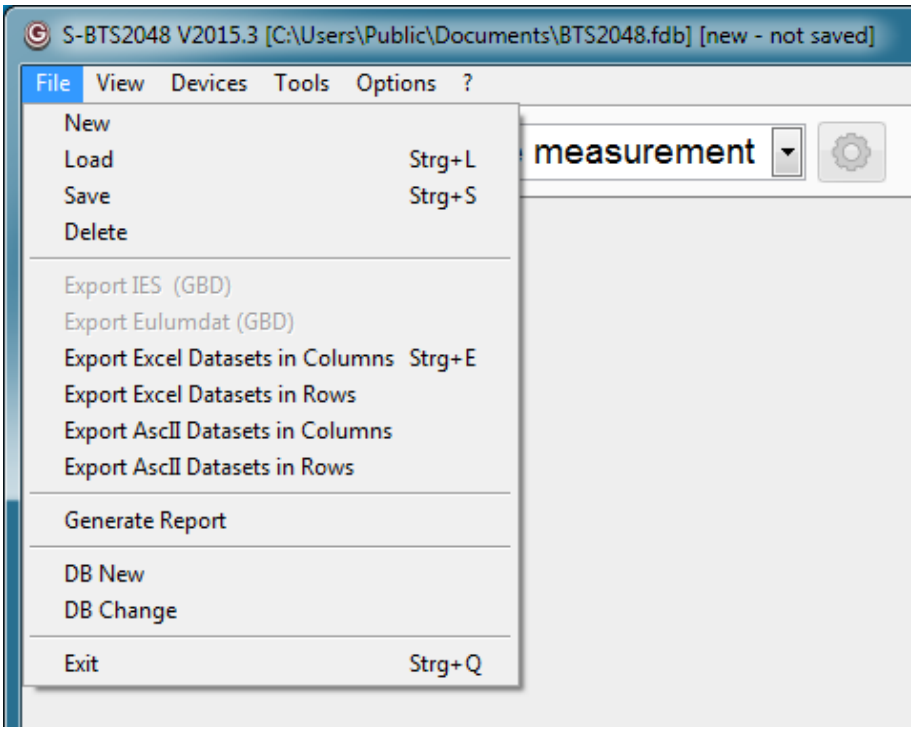


Figure 14: Application menu -> File

13.1.1 File->New

This menu creates an empty data container, where your measurements can be stored within. If the actual container has already measurement data inside, it asks you, if you want to save old data.

13.1.2 File->Load

This opens an open file dialog where you can select a previous saved measurement container to reload into memory. When data is loaded you can step within your measurements by using the forward and back buttons in „Measurement and Datanavigator“-display

13.1.3 File->Save

This opens a save file dialog where you can specify a name for your container and the name of the author resp. engineer. The stored container can be reloaded with File->Load.

13.1.4 File->Delete

Use this file dialog to delete saved containers from your DB.

13.1.5 File->Export IES

This option is only available if you have unlocked this function in the software and if you have data measured with a goniometer device

If your data matches the IESNA standard (LM-63-02 for more information see below) you will be asked to add some additionally information for your IES file.

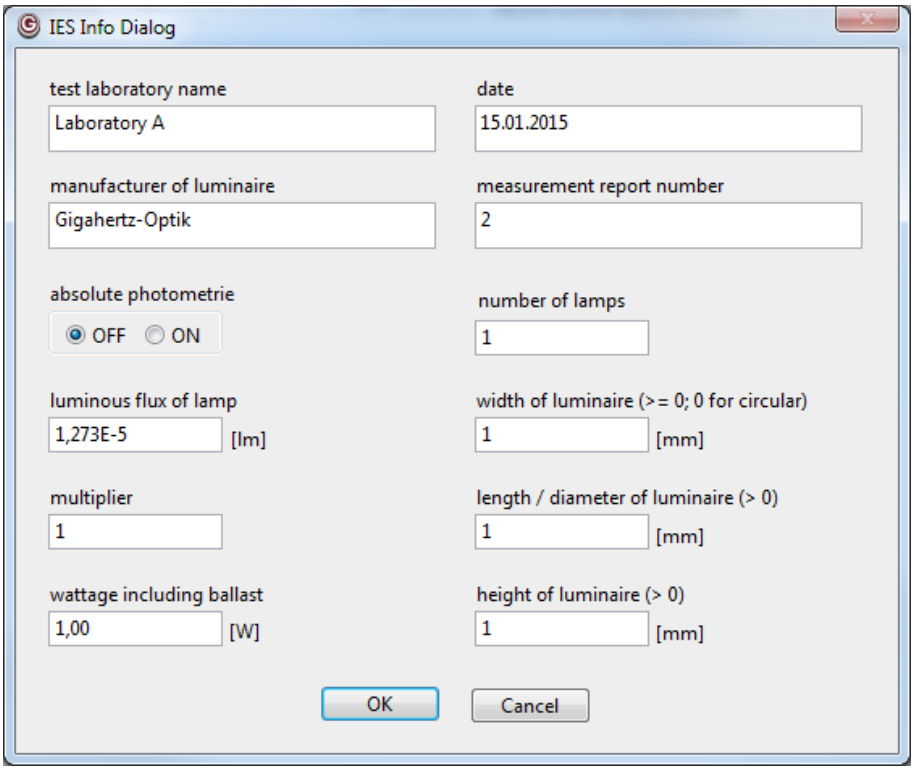


Figure 15: IES Info Dialog for additionally information

After clicking the OK you will be asked to choose the path and filename of the IES file. In addition your file will be created.

IES preconditions on input file for measurement routine:

The input file can be generated by using the GB Sequence Generator in “Tools”-menu

- horizontal axis (axis 1, column “A”, technical number=0 in sequence file): equidistant values beginning with 0 and ending with 0, 90, 180 or 360 degree.
- vertical axis (axis 2, column “B”, technical number=1 in sequence file): equidistant values beginning with 0 or 90 degree and ending with 90 or 180 degree.
- the matrix has to be complete; every combination of angles of the two axes has to be measured. If not the generated file is not workable.

13.1.6 File->Export Eulumdat

This option is only available if you have unlocked this function in the software and if you have data measured with a goniometer device

Before saving your file, you can add some additionally information to your EULUMDAT file.

EULUMDAT preconditions on input file for measurement routine:

The input file can be generated by using the GB Sequence Generator in “Tools”-menu

- Axis 1 (column “A”, technical number=0 in sequence file): At least values -180°, -90°, 0°, 90° have to be measured; additional values between -180° and 180° are optional; values don’t have to be equidistant

- Axis 2 (column "B", technical number=1 in sequence file): At least 0° has to be measured; to get a good profile additional values between 0° and 90° should be defined; values don't have to be equidistant
- the matrix has to be complete; every combination of angles of the two axes has to be measured.

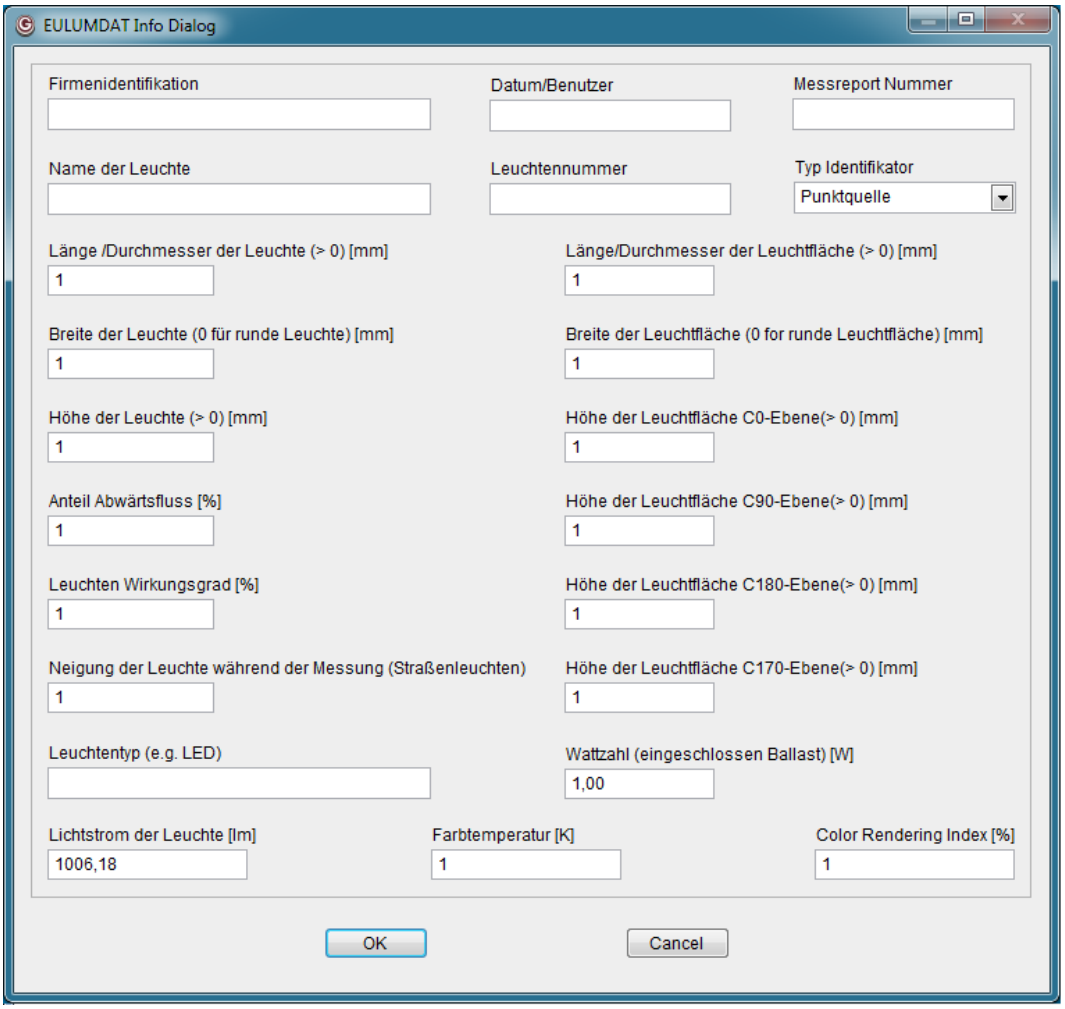


Figure 16: EULUMDAT Info Dialog for additionally information

13.1.7 File->Export Excel Column

This will export actual container to an excel file. All values shown in several displays will be exported to Microsoft Excel Format. The data will be arranged in columns. One column per measurement. Only 255 measurements can be exported that way.

13.1.8 File->Export Excel Row

This will export actual container to an excel file. All values shown in several displays will be exported to Microsoft Excel Format. The data will be arranged in rows, one row per measurement.

13.1.9 File->Export AscII Column

This will export actual container to an excel file. All values shown in several displays will be exported to AscII Format. The data will be arranged in columns, one column per measurement.

13.1.10 File->Export AscII Row

This will export actual container to an excel file. All values shown in several displays will be exported to AscII Format. The data will be arranged in rows, one row per measurement.

13.1.11 File->Generate Report

This function creates a document in Microsoft Word format. Microsoft Word must be installed on your computer. It's recommended to use Microsoft Word 2007 or later.

The data you want to create a report for has first to be added to the data container of the "Measurement and Datanavigator"-Window.

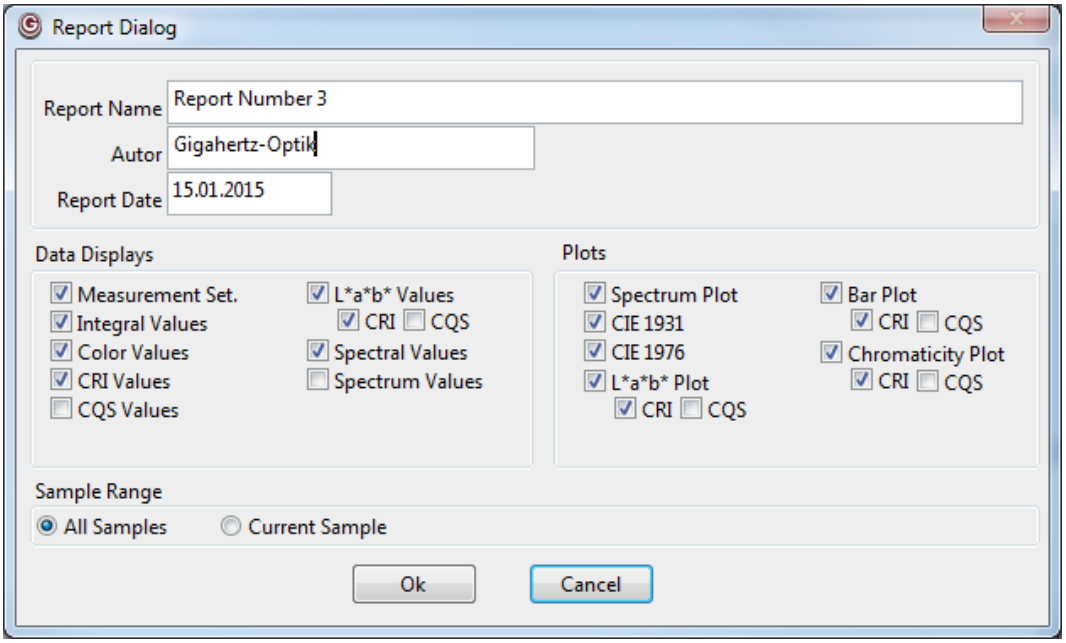


Figure 17: Report Dialog

Report name: The name used when saving the data. This value can be changed.

Author: The author name used when saving the data. This value can be changed.

Report Date: The current date. This value can be changed.

Numeric data contains some categories that you can include in / exclude from your report. The data corresponds to the different numeric displays of your application.

The plots section contains all graphic displays that can be included in your report.

If you select an option and there is no data to be reported (e.g. Color Values option is activated, but you didn't perform a measurement with your spectral device, because it wasn't active), then the option has no effect.

The sample range section defines the number of samples in your report.

"all samples" will include every dataset of your current data container to your report. Data within your data container must be stored to database before.

"current sample" only includes the currently selected dataset in your measurement and datanavigator window.

The first page of the generated report contains a company logo, which can be customized with your own logo. Just replace the “company_logo.jpg” file in “datauser”-folder with your own JPG.

After report is generated, you will be asked to enter a filename for saving your report to your hard disk. If filename already exists, you will be asked, if you want to replace the original file.

During report generation you will see the word icon in your taskbar. Don’t close the word instance, otherwise an exception will occur. It’s recommended, not to maximize the word instance, because it will reduce report generation speed dramatically.

13.1.12 File->DB New

This will create a new database file. You can use one database for storage of several measurement containers. Each data container can include more than one measurement, e.g. data that is recorded with the data logger.

It’s up to you, in what manner you want to organize your data.

To create a new database you will be asked choose the path and filename.

After creation of the new database, it will be active immediately for storage. Successful database creation can be seen in the window title, where the actual database filename will be shown

13.1.13 File->DB Change

This allows you to change the database; you want to use for storage of your measurement data. The database must be changed before measurements are performed, as the DB Change deletes the data from actual container.

Successful database change can be seen in window title where the new database filename should appear.

13.1.14 File->Exit

This will close the application. You can also close the application by clicking the „X“-button in right of your title bar or by key combination Alt + F4.

13.2 Application menu “View”

This menu contains all displays that can be opened for measurement and display of measurement data. There are also methods for saving and reloading the desktop, speaking of composition and placement of your working windows (displays and measurement window).

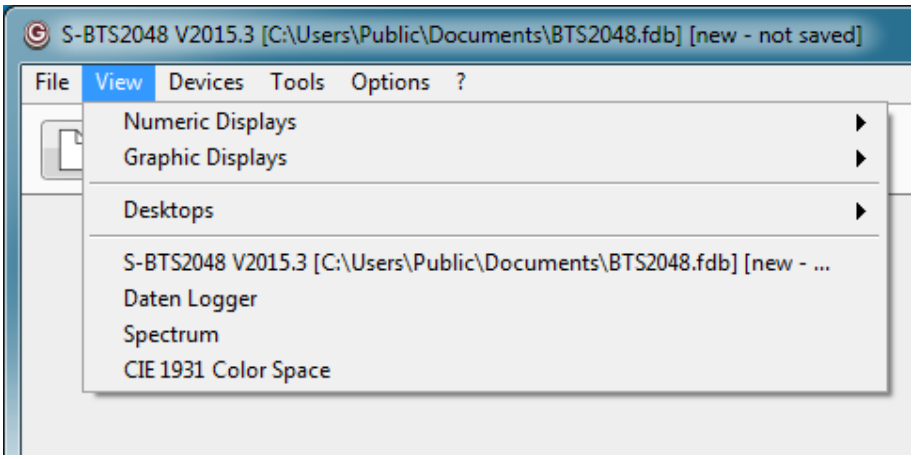


Figure 18: Application menu -> View

13.2.1 View->Data Displays

This submenu contains all available displays where data values are shown in numeric format.

13.2.2 View->Graphic Displays

This submenu contains all available displays where data values are shown in graphical format. For more information look in the section “Graphic Displays”.

13.2.3 View->Desktops

Multiple measurement setups have need for different composition and placement of displays. The actual desktop can be saved and reloaded by using this functionality.

13.2.4 View->Open Views

All open views are shown at the end of this menu.

13.3 Application Menu “Devices”

Depending on your hardware configuration the menu will contain different entries.

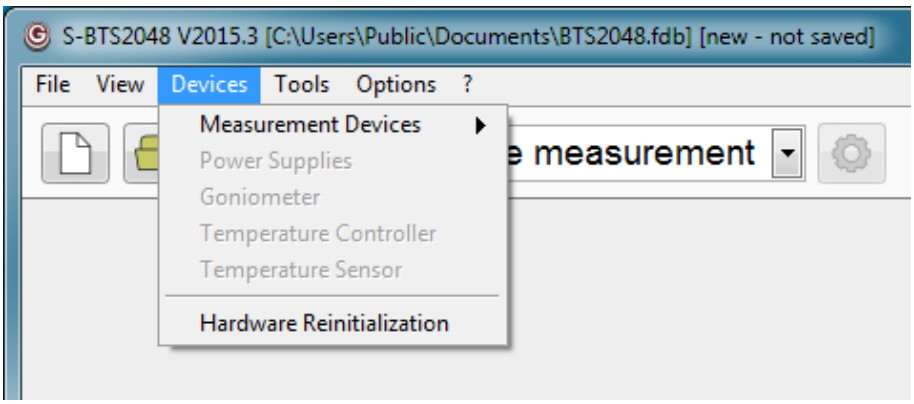


Figure 19: Application Menu - Devices

You will see entries for your measurement device, power supplies, goniometer, temperature controller and temperature sensors.

Every hardware entry contains a “Setup” subentry and an “Activate” subentry. Devices that are not found during hardware initialization will not be shown within this menu or will be disabled. The active measurement device has a check mark in front of its main entry. The active measurement device is the one, which performs all measurements. This is particularly important, if you own more than one measurement device. If you have more than one measurement device connected to your computer, then you can change the active measurement device by clicking the “Activate” submenu entry of its corresponding device entry. After the software starts, the first measurement device found is activated.

By pressing “Setup” the corresponding device setup screen is opened. For more information about the setup screens look into the section “Devices”.

The “Hardware Reinitialization” lets you reinitialize your hardware. You can use this to connect another BTS2048 device after the application is already started or if initialization process has already finished and you forgot to switch on your BTS2048 device. At the moment this works only for measurement devices.

13.4 Application Menu “Tools”

All tools are placed in this menu. It depends on your system configuration which tools are listed.

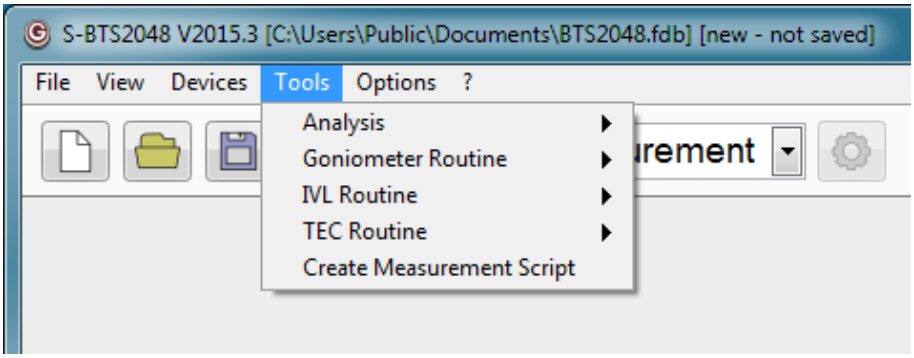


Figure 20: Application Menu – Tools

For more information on the different tools available, look in the section “Tools”.

13.5 Application Menu “Options”

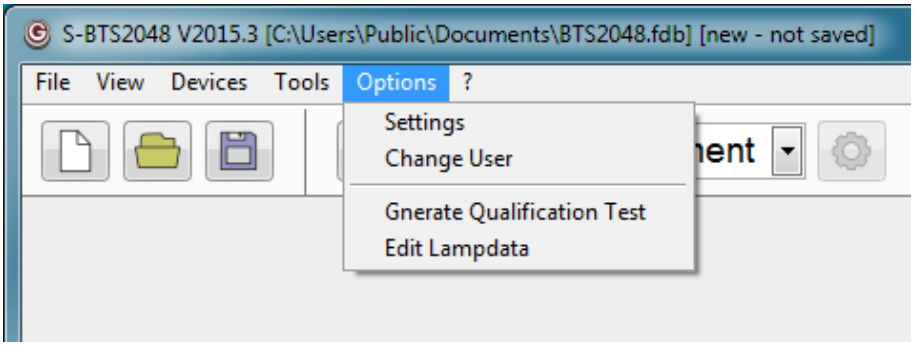


Figure 21: Application Menu - Options

13.5.1 Options->Settings

This opens a Window where you can change all available Software Settings. See next Chapter (Software Settings) for more information

13.5.2 Options->Change User

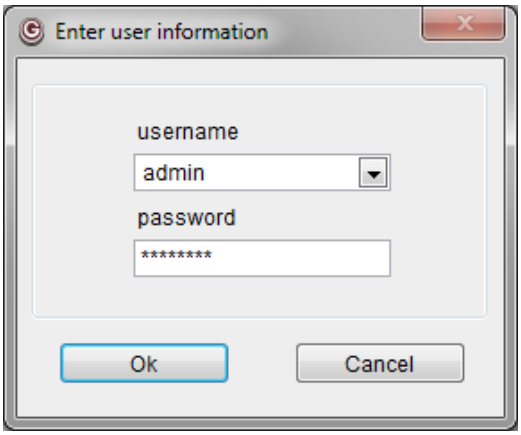


Figure 22: Enter username and password

Click here to change log into your Software as a different user. This is only available if you own the "Measurement Control Tool" and if you activated the user registration in the Software Settings.

13.5.3 Options->Generate Qualification Test

Here you can create a Qualification Test. If the Test is activated, each measurement is checked, if it fits certain conditions. The result is shown in the graphic view "Qualification Test".

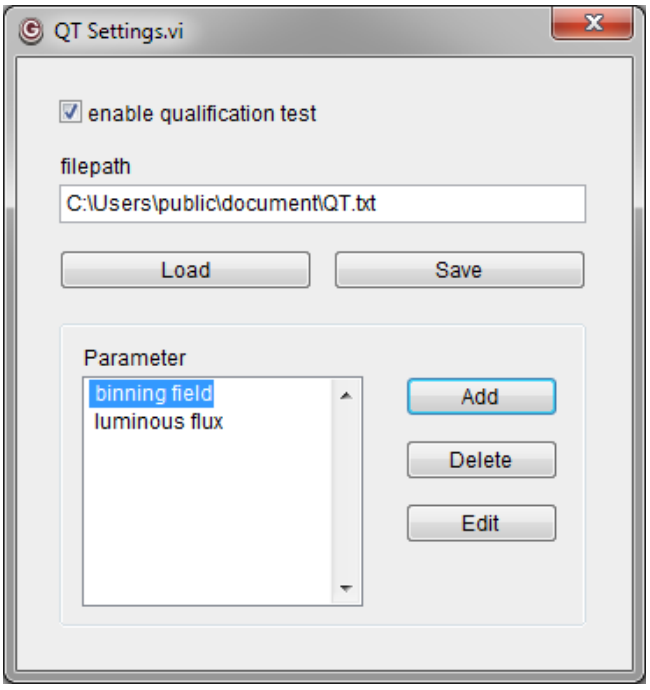


Figure 23: Generate a Qualification Test

You can load and edit an existing test or create a new one. To add a condition/parameter click the “Add” button. A window will displayed to specify the parameter and the minimal or the maximal value. You can also choose a binning field as measurement condition.

Don’t forget to save your test or all changes will be lost.

13.5.4 Options->Edit Lampdata

Enable or disable the lampfile, whether you want to the data specified in the selected file to be added to each measurement automatically or not.

Type info, dimension and technical properties of the luminaire you want to measure. And save the data to a file.

You can also change the lampdata of your measurement afterward by clicking the “Apply to meas. sequence” Button.

The lamp data of the current measurement is displayed in the data view “lamp information”.

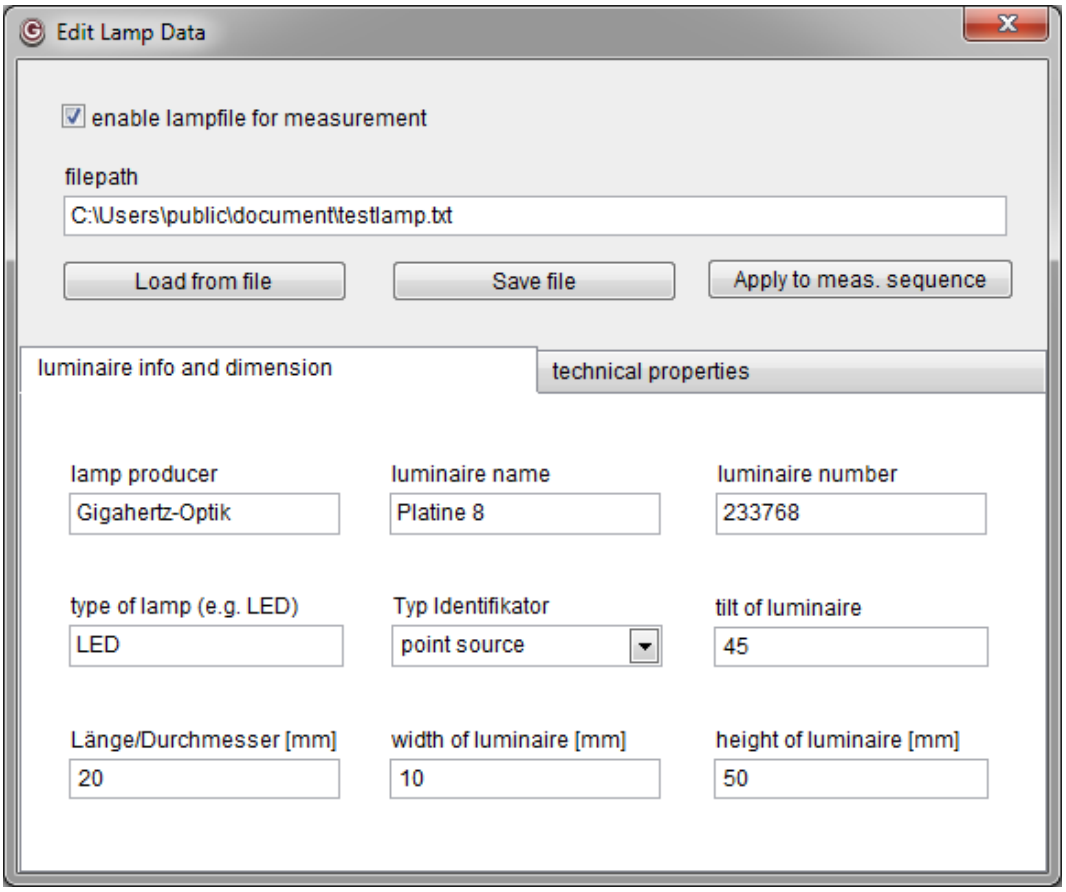


Figure 24: Window to edit Data of the measured lamp

13.6 Application Menu “?”

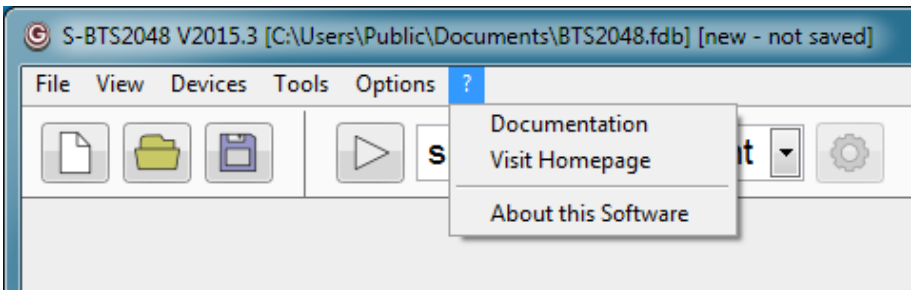


Figure 25: Application Menu - ?

13.6.1 ?->Documentation

This menu entry opens the software documentation. (the file you are reading at the moment)

13.6.2 ?->Visit Homepage

This opens the Gigahertz-Optik Homepage in your Browser.

13.6.3 ?->About

This shows a screen with further software information.

14. Software Settings

This Window shows all editable Software Settings and lets you edit them. Some functions may not be available for you if have not unlocked them in the “Licence Manager”.

14.1 General Settings

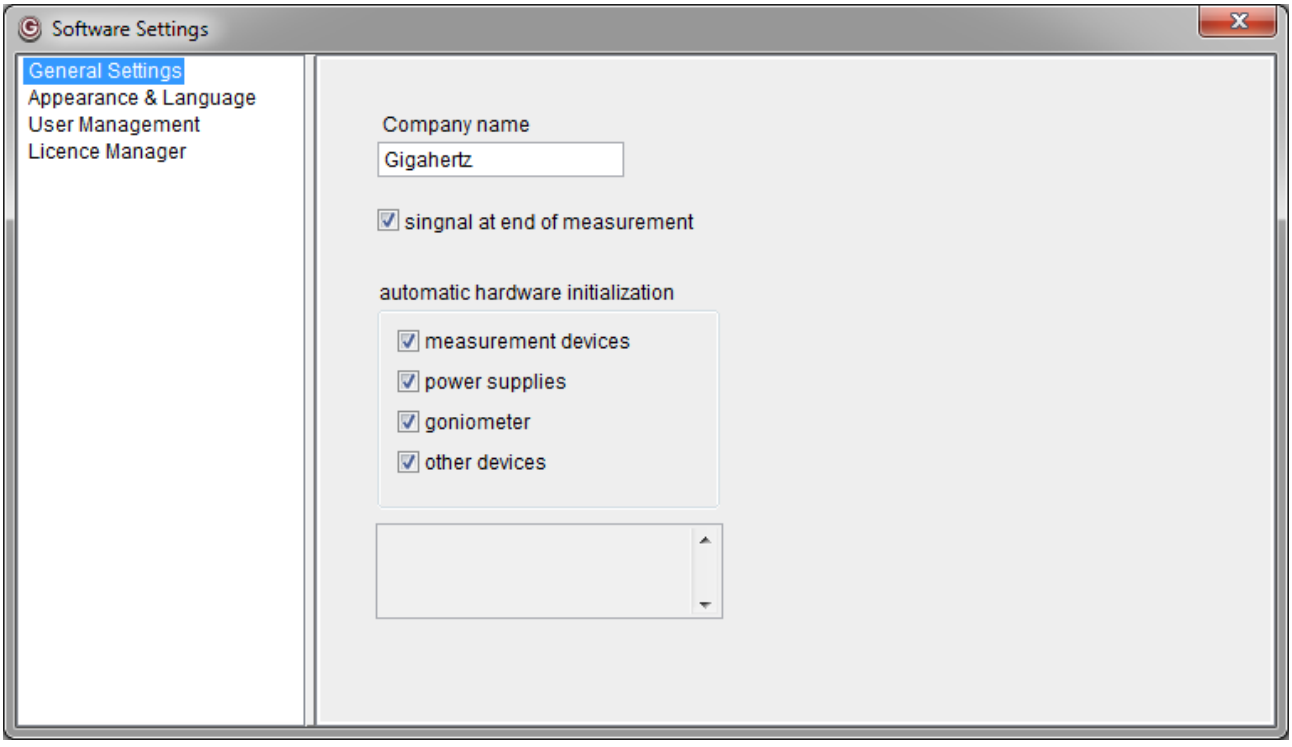


Figure 26: Software Settings - General Settings

Company Name: For some data exports this name will be automatically added to the export header.

If you activate the “signal at the end of the measurement”, an alarm tone depending on your system will be played after a measurement sequence id finished.

Automatic hardware initialization: Deactivate some point if you do not want to initialize all hardware at the software start. This can reduce the initializing time. You can always initialize them later by clicking the reinitialize entry in the hardware menu.

The Textbox at the end displays additional hardware that is connected to the PC and recognized by the software. This can e.g. be a door mechanism. For these devices, there are no further settings available.

14.2 Appearance & Language

Choose a language: This application has multilingual ability. At the moment only “English and German” is provided. But further languages will follow. Feel free to send us translation of our language file.

Select template: This software is able to run in two different appearance modes. The standard mode has light colors and is for normal operation,. The other one, which is called darkroom mode, has dark colors and is specialized for dark environments to rest your eyes and not to disturb the measurement.

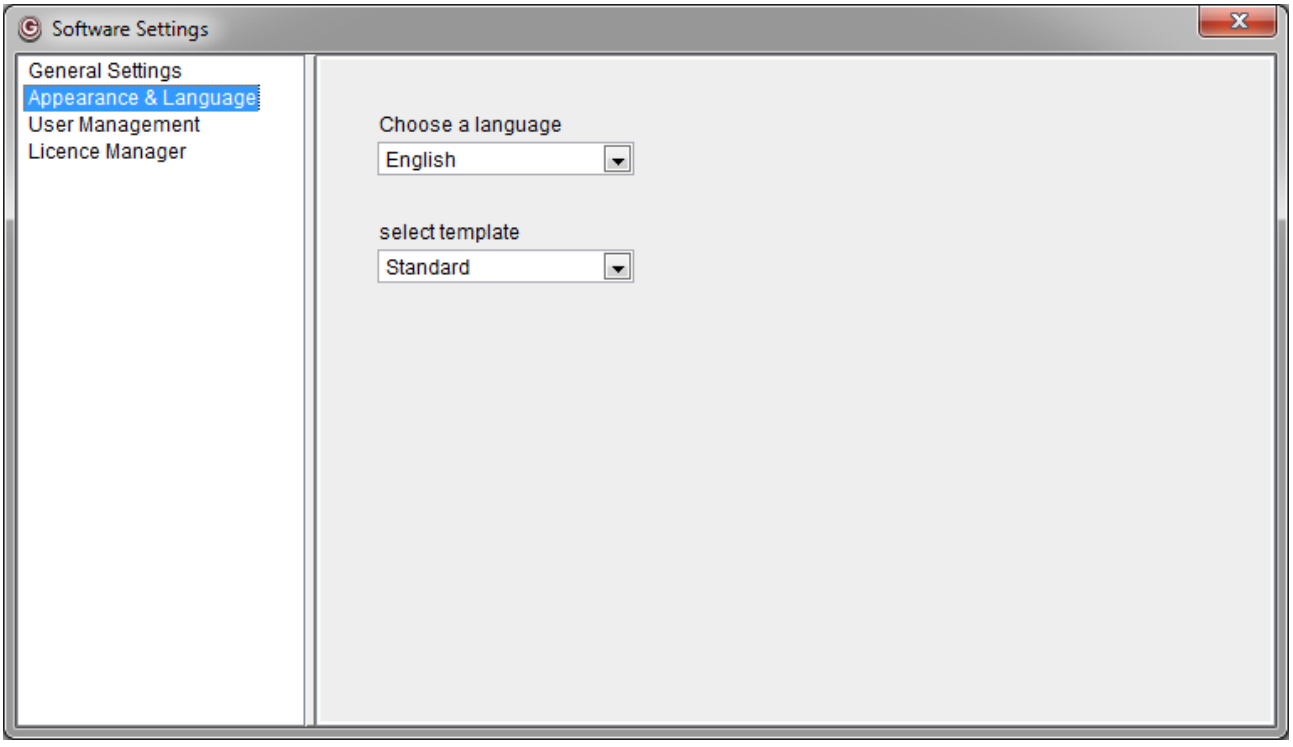


Figure 27: Software Settings - Appearance & Language

14.3 User Management

Here you can choose if you want to activate the user registration at the start of the software. This is only available if you own the “Measurement Control Tool”.

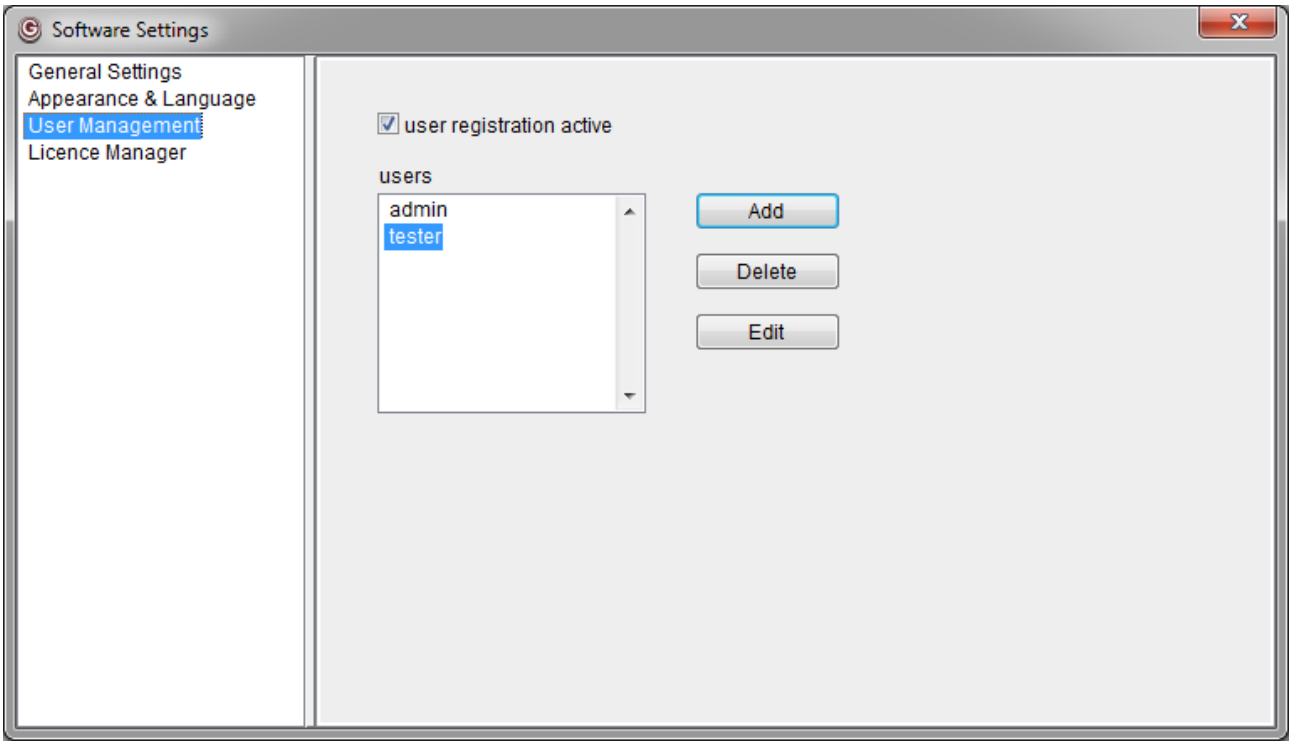


Figure 28: Software Settings - User Management

All active users are listed under users. You can add delete or edit a user by clicking on the correlated button. The following figure shows the dialog to add or edit the user information.

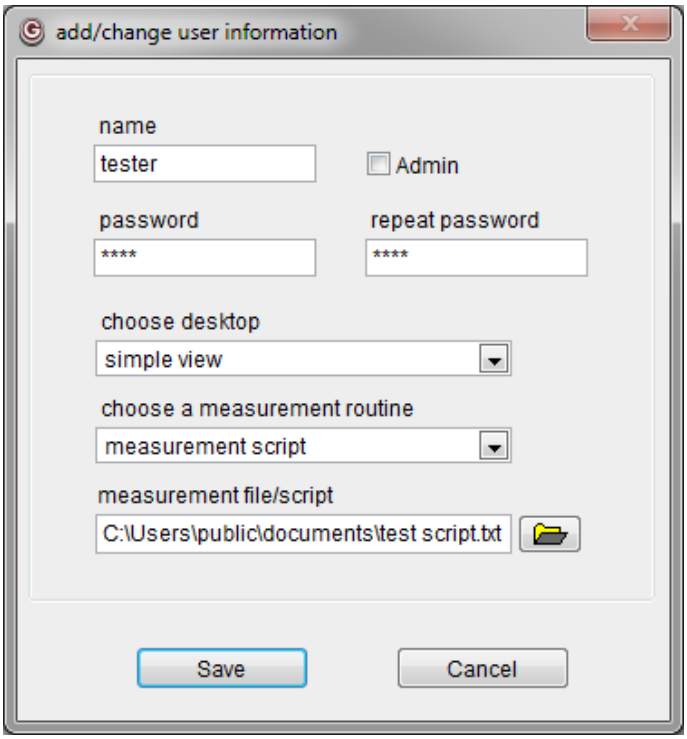


Figure 29: add/change user information

name: name of the user you want to create/edit.

admin: choose if the user should have admin rights. There has always to be at least one admin to activate the user registration. If the user is no admin, he cannot change software settings, device settings and measurement settings, he cannot create his own desktop and he can only use one measurement routine.

password: you can leave this empty if you do not want to specify a password.

choose desktop: this desktop will be displayed after the user logs in.

choose a measurement routine (only available if user is no admin): select the available measurement routine for the user.

measurement file/script: If a file is necessary for the selected measurement routine it can be specified here.

14.4 Licence Manager

Main activation code: This is the code you entered at the first start of your software. It activates the basic features of the application.

Additional Licences: This shows all additionally unlocked tools and features. Please contact the support if you are interested in buying additionally software tools.

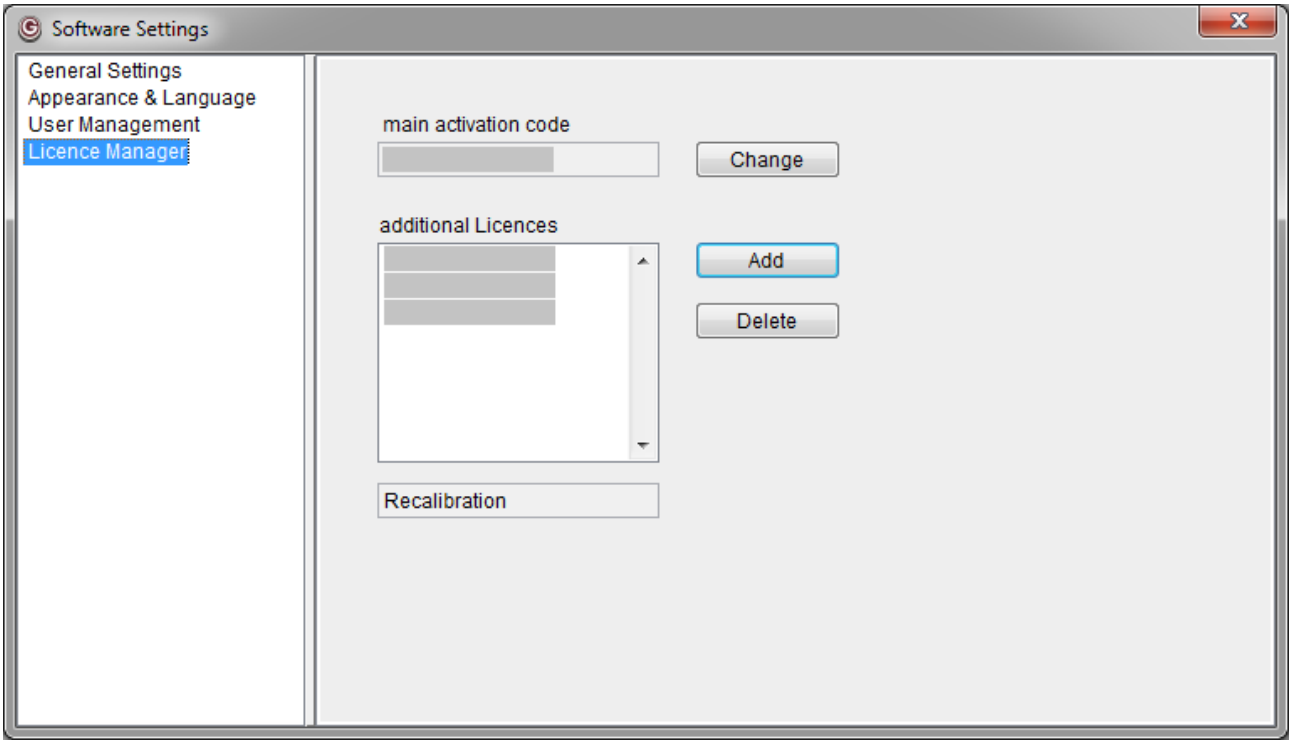


Figure 30: Software Settings - Licence Manager

14.5 Export

On the left side of this window you can choose the data that you want to add to the export. Common, spectral and integral numerical data is always includes into the export.

On the right side you can specify the number of datasets, which should be combined in one file. This will cause the export to be spitted into several files. If you choose zero, all datasets will be included in one file. Keep in mind, that the in excel export one file can contain a maximum of 250 datasets.

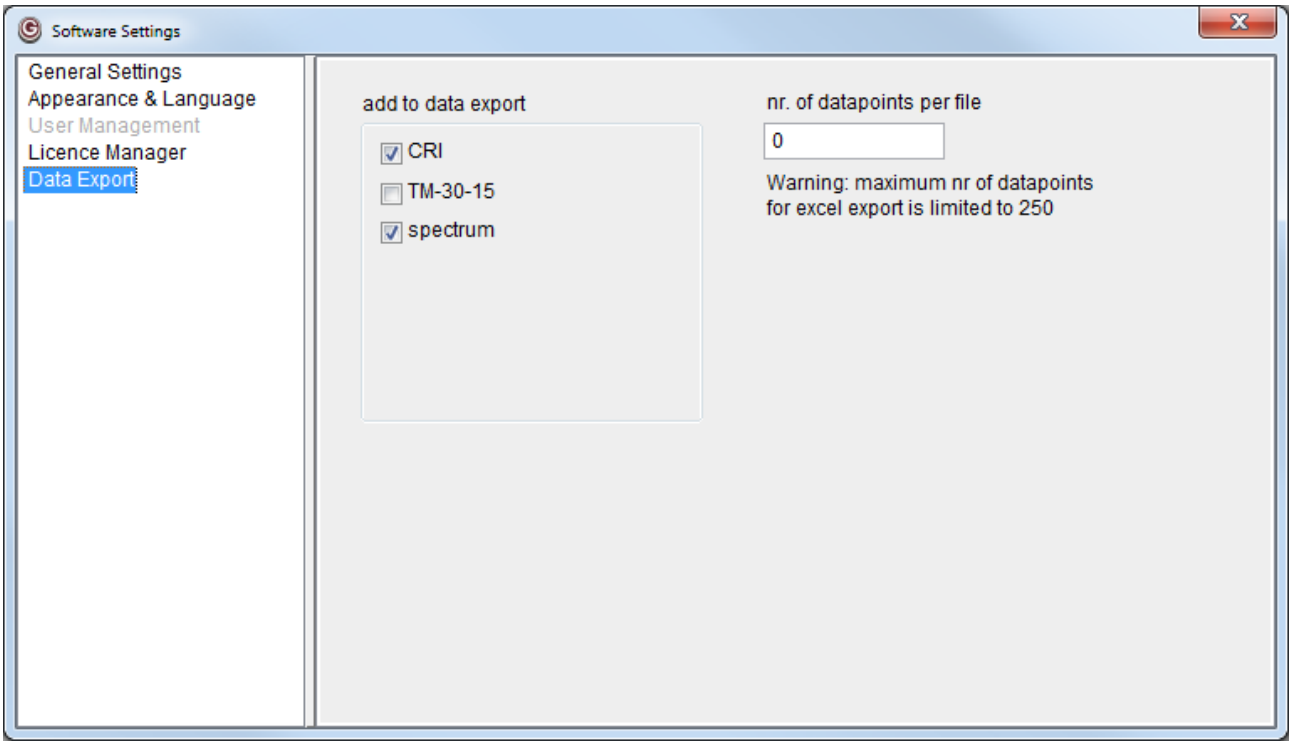


Figure 31: Software Settings - Export

15. Data Displays

Data Displays can be opened in the Application Men -> Views -> Data Views. There are many different views to display all the data that is collected during the measurement in numeric form.

15.1 Data Displays: Any Data Window

The any data window is an all-purpose data window where one or two numeric fields will be displayed depending on the selected data type. The size of the window can be changed and it's text will be resized dynamically.

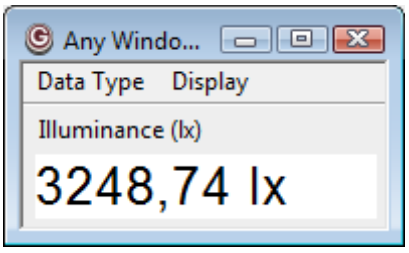


Figure 32: Any Data Window

The "Data Type" menu contains the possible data types you can select to be displayed. Most of the numeric data is available.

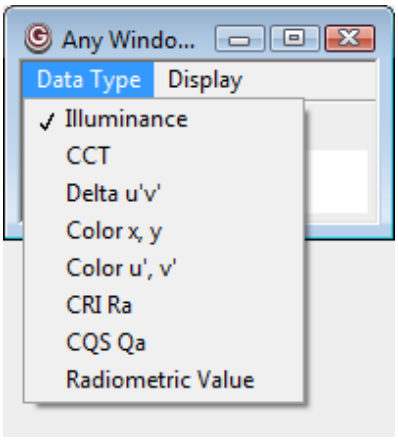


Figure 33: Data types of the Any Data Window

Under the menu “Display” you can choose between decimal and scientific notation, you can set the precision and you can switch the unit on and off. The unit is always shown in the capton.

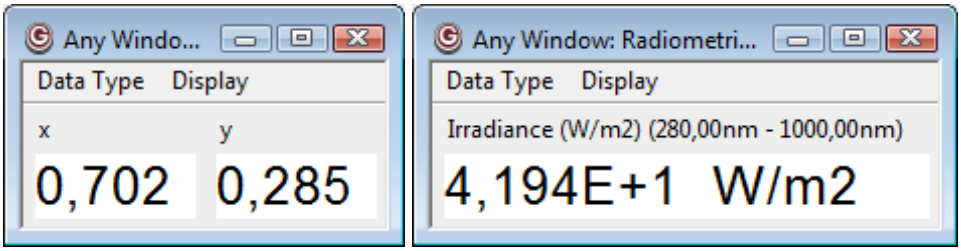


Figure 34: Any Data Window with different data types and settings

15.2 Data Displays: Integral Values

Values of your integral sensors are shown in this table. The first line contains the main measurement value of the sensor. Additionally lines show the all available weighting factors.

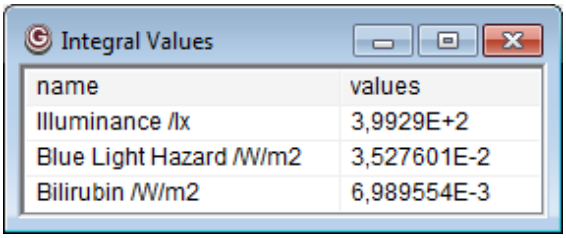


Figure 35: Data View - Integral Values

Weighting Factors are only shown if the spectral range of your measurement overlap with the range of the weighting function. At the moment following weighting factors are available:

- Blue Light Hazard (380nm – 490nm) // BGI 5006 BLH ISO 10936
- Bilirubin (410nm – 520nm) // DIN 5031-10: 2013-01
- Erythem (200nm – 400nm) // DIN 5050: 2009-07
- ICNIRP (200nm – 400nm) // ACGIH ISO15004-2-2006

If you have selected a “I-Calibration” for goniometer measurement, the last line of this window shows you the distance from your light source to your device. This value can be changed in the measurement settings under the tab “calibration related”.

15.3 Data Displays: Spectral Values

These are values which are calculated from spectral measurement. If you don’t perform spectral measurement, you won’t get values in this display.

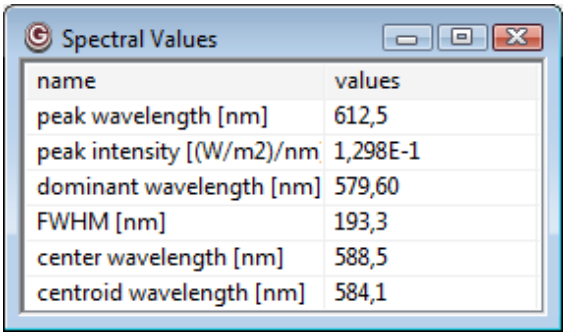


Figure 36: Data View - Spectral Values

15.4 Data Displays: Color Values

These are values which are calculated from spectral measurement. They only appear when color calculation is activated in the settings.

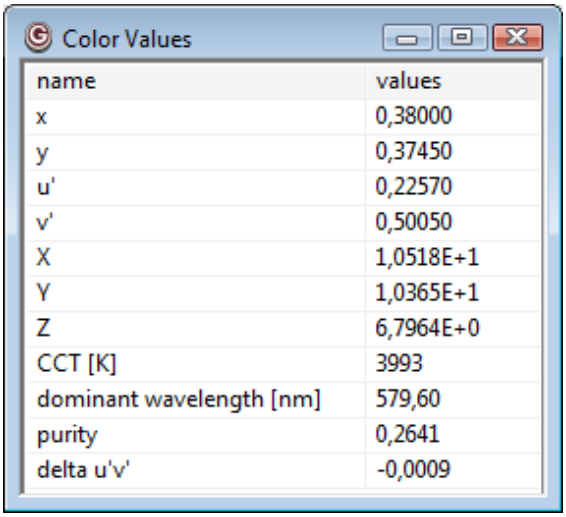
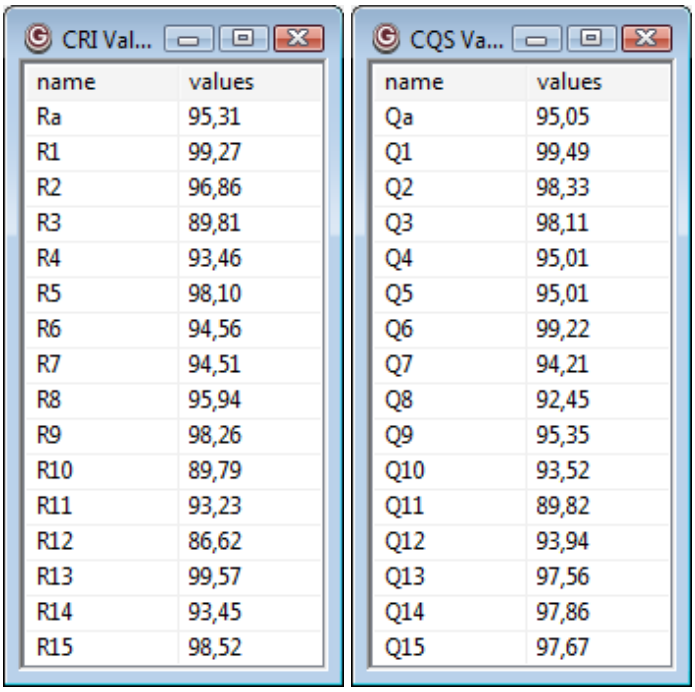


Figure 37: Data View – Color Values

15.5 Data Displays: CRI/CQS

Color rendering: Effect of an illuminant on the color appearance of objects by conscious or subconscious comparison with their color appearance under a reference illuminant

The color rendering index (CRI) (sometimes called *color rendition index*), is a quantitative measure of the ability of a light source to reproduce the colors of various objects faithfully in comparison with an ideal or natural light source. Light sources with a high CRI are desirable in color-critical applications such as photography and cinematography. It is defined by the International Commission on Illumination.



CRI Val...

name	values
Ra	95,31
R1	99,27
R2	96,86
R3	89,81
R4	93,46
R5	98,10
R6	94,56
R7	94,51
R8	95,94
R9	98,26
R10	89,79
R11	93,23
R12	86,62
R13	99,57
R14	93,45
R15	98,52

CQS Va...

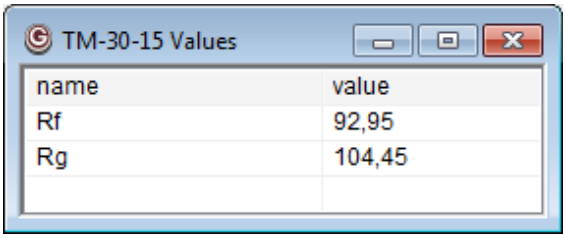
name	values
Qa	95,05
Q1	99,49
Q2	98,33
Q3	98,11
Q4	95,01
Q5	95,01
Q6	99,22
Q7	94,21
Q8	92,45
Q9	95,35
Q10	93,52
Q11	89,82
Q12	93,94
Q13	97,56
Q14	97,86
Q15	97,67

Figure 38: Data Views - CRI/CQS Values

The Color Quality Scale (CQS) is a newer but not yet accomplished Index.

15.6 Data Displays: TM-30-15 Values

This view shows the values Rf and Rg as calculated in the IES TM-30-15. Rf is a Qualification Index for the Rendition of Color by a light source and Rf shows the Chroma Shift of that source.



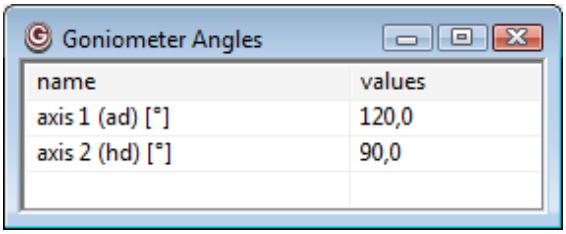
TM-30-15 Values

name	value
Rf	92,95
Rg	104,45

Figure 39: Data View – TM-30-15 Values

15.7 Data Displays: GBD Angle

This view is only available, if you own a goniometer device. It shows the goniometer angles of the actual measurement in axis 1 (axial drive) and axis 2 (horizontal drive).



Goniometer Angles

name	values
axis 1 (ad) [°]	120,0
axis 2 (hd) [°]	90,0

Figure 40: Data View – GBD Angles

15.8 Data Display: IVL Values

If you have a power supply connected, the current and the voltage will be displayed.

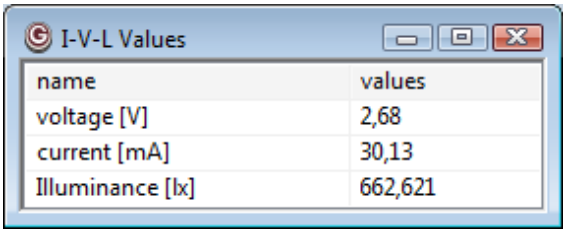


Figure 41: Data View – IVL Values

15.9 Data Displays: Lamp Properties

In this view the Lamp-Information are displayed. To change them open the “Edit Lampdata” in the “Options Menu” and click on “Apply to current meas. sequence”.

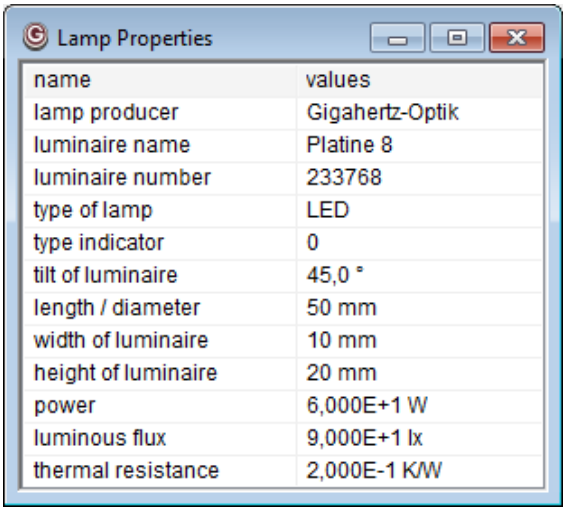


Figure 42: Data View - Lamp Properties

15.10 Data Displays: Status/Comment

This View shows you the status of the current measurement. If there has been an error the signal field shines red and the Status names the description of the error. If everything went fine, the signal field is green and the status says ok.

In the comment section you can edit the user comment for the current measurement and you can choose a comment for the whole measurement sequence. For each comment there is a field that shows the maximal amount of character left.

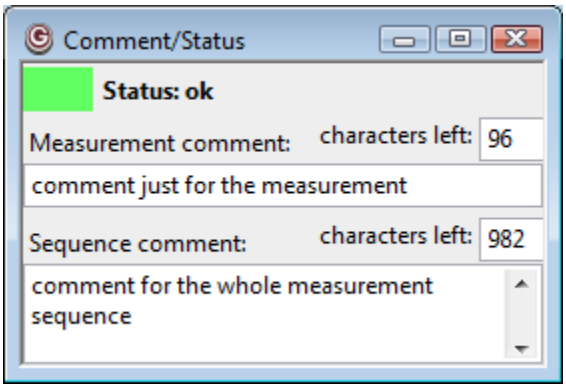


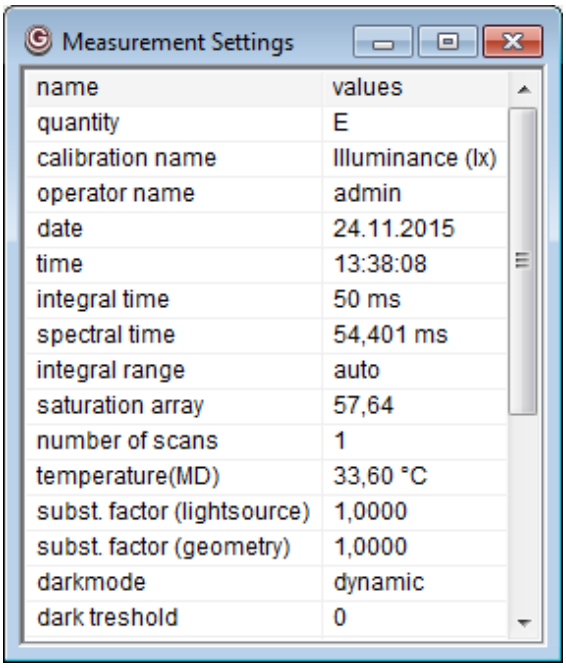
Figure 43: Data View - Status /Comment

15.11 Data Displays: Measurement Settings

These values are values of general interest.

First line shows the quantity name of your performed measurement. This value depends on your selected calibration values within measurement setup. The selected calibration values must match to your measuring system, otherwise calculated values will not be correct. It doesn't make sense to perform Phi-measurement, if you measure without an integrating sphere.

Second line displays the name of your selected calibration.



name	values
quantity	E
calibration name	Illuminance (lx)
operator name	admin
date	24.11.2015
time	13:38:08
integral time	50 ms
spectral time	54,401 ms
integral range	auto
saturation array	57,64
number of scans	1
temperature(MD)	33,60 °C
subst. factor (lightsource)	1,0000
subst. factor (geometry)	1,0000
darkmode	dynamic
dark treshold	0

Figure 44: Data View - Measurement Settings

Third to fifth lines show the name of the operator that performed the measurement followed by the date and the time.

The other lines show all relevant device settings of that measurement beginning with the integration time.

At the end there are some general device and software settings displayed e.g. serial number and version of the software.

16. Graphic Displays

This submenu contains all available displays where data values are shown in graphical form.

16.1 Graphic Displays: Spectral

This diagram shows the spectral power corresponding to its wavelength. The resolution of the x-axis is defined in the measurement device setup (wavelength from, wavelength to).

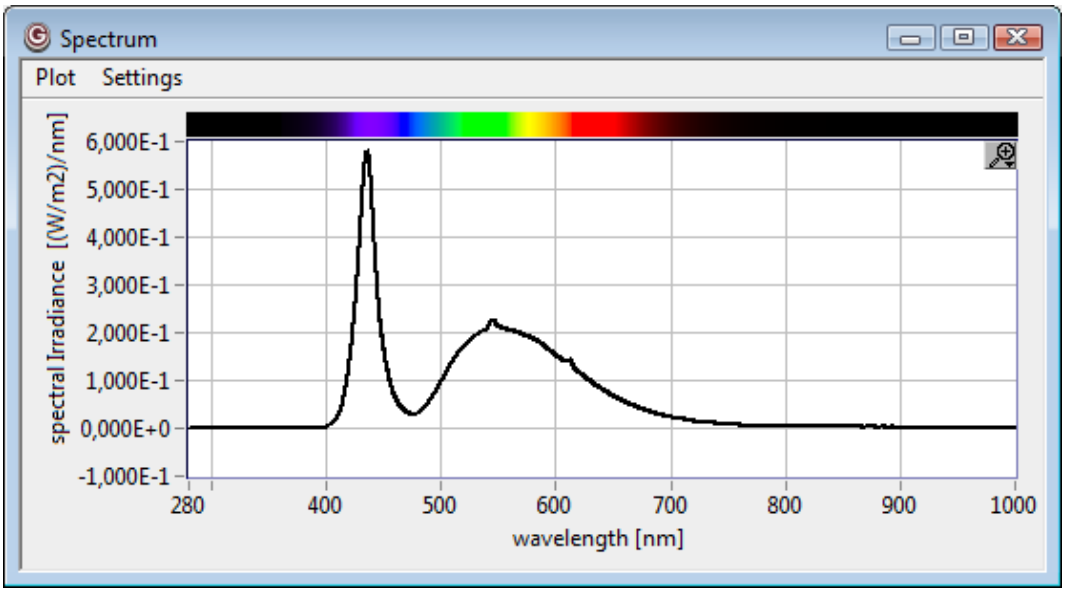
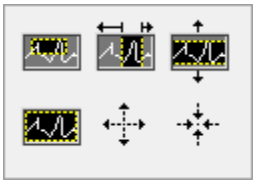


Figure 45: Graphic View - Spectrum

If you can't see a result in the "graphic spectral display", please resize the graphic by clicking the zoom symbol in the upper right corner of your graphic.

A submenu shows up:



This is a description of all the function of the six buttons from right to the left and from top to down:

1. You can specify a free region in the graphic. Click to the top left point of your zooming area, hold mouse button pressed and drag to the bottom right point of your zooming area and release the mouse button. The defined zooming area becomes repainted in full size.
2. You can specify a region in x direction (wavelength). Click to the left point of your x range, hold mouse button pressed and drag to the right point of your desired x range and release mouse button.
3. You can specify a region in y direction (intensity). Click to the top point of your y range, hold mouse button pressed and drag to the bottom point of your desired y range and release mouse button.
4. Auto scale once to the bounding edge of your locus.

5. Zoom into the graphic by clicking with left mouse button within the graphic area.
6. Zoom out of the graphic by clicking with left mouse button within the graphic area.

There are some settings you can change in the view's menu. Changed settings will be stored.

- Menu Plot->Add: Keeps the last locus in memory to be shown together with other loci.
- Menu Plot->Clear: Deletes all loci from graphic area
- Menu Plot->Save: Saves actual graphic to a file in jpg format
- Menu Settings->Autoscale: Activates auto scaling for every locus visualized in the graphic area. This functionality can be switched on/off. Default is "on".
- Menu Settings->Color bar: Switch the spectral bar on and off.
- Menu Settings->Colors->Plot: Plot color of active plot can be changed
- Menu Settings->Colors->Background: Background color can be changed
- Menu Settings->Colors->Grid: Grid Color can be changed
- Menu Settings->Colors->Linewidth: The width of the Line in the Plot

16.2 Graphic Displays: Data Logger

This diagram shows the intensity of the integral detector in dependence to time or sample number. You can switch the dependency in menu Settings->View By->Time or Settings->View By->Samples. Default value is "Time". Values are only shown if measurement mode is „data logger" or „synchronized data logger".

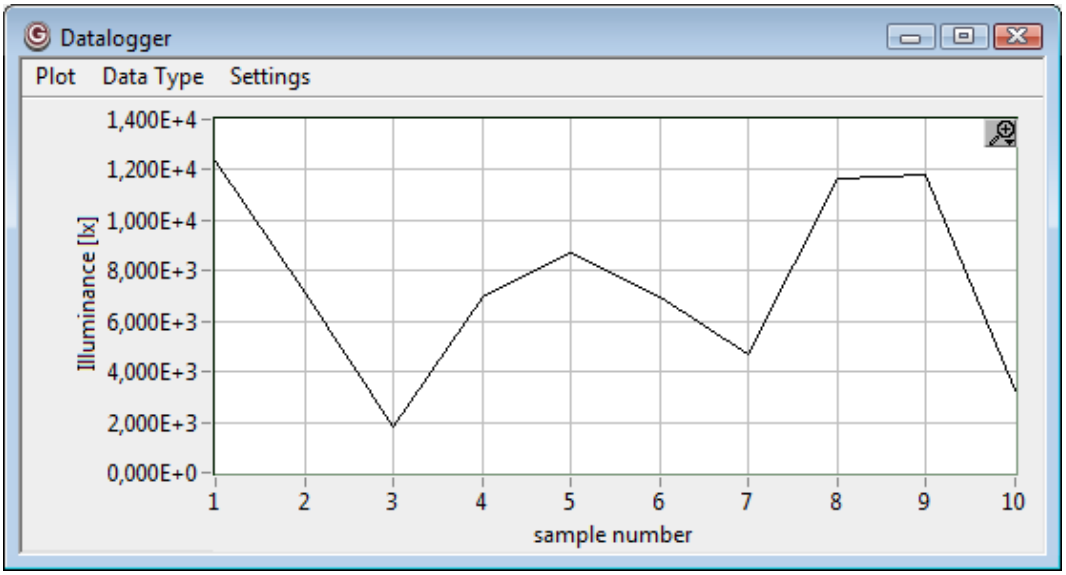


Figure 46: Graphic View - Datalogger

In the view's menu you can change different settings, which will be stored:

- Menu Plot->Save: Saves actual graphic to a file in jpg format
- Menu Data Type: Similar to the "Any Data Window" you can select the displayed value.

- Menu Settings->Autoscale: Activates auto scaling for every locus visualized in the graphic area. This functionality can be switched on/off. Default is “on”.
- Menu Settings->Colors->Plot: Plot color of active plot can be changed
- Menu Settings->Colors->Background: Background color can be changed
- Menu Settings->Colors->Grid: Grid Color can be changed

16.3 Graphic Displays: CIE 1931/1976

The CIE 1931 and CIE 1976 color space and chromaticity diagram. The outer boundary is the spectral (or monochromatic) locus. Note that the image itself describes colors using sRGB, and colors outside the sRGB gamut cannot be displayed properly. Depending on the color space and calibration of your display device, the sRGB colors may not be displayed properly either. This diagram displays the maximum saturated bright colors that can be produced by a computer monitor or television set.

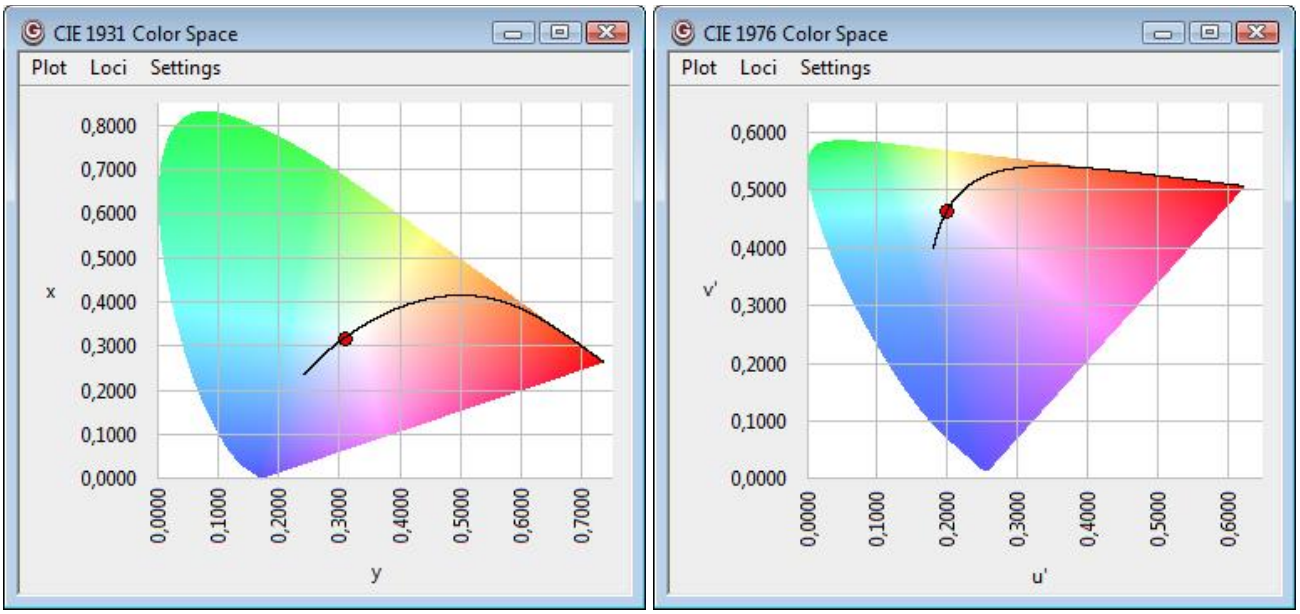


Figure 47: Graphic Views - CIE 1931/1976 color space

You can zoom within the graphic by defining a rectangle around the desired zooming area. Click to the top left point of your zooming area, hold mouse button pressed and drag to the bottom right point of your zooming area and release the mouse button. The defined zooming area becomes repainted in full size. To zoom out to 100% size, just click within the area, hold the mouse button, move a bit left up and release the mouse button or just click once with your right mouse button. 100% CIE graphic will be shown.

The view’s menu lets you set different settings:

- Plot->Save: a file save dialog opens where you can export the plot to a jpg file.
- Plot->Add: adds the actual datapoint to the plot for comparison with other points.
- Plot->Clear: Deletes all added datapoints
- Loci->Whitepoint: shows the whitepoint in the plot. In 1931 color space the coordinates of the whitepoint are x=1/3 and y=1/3

- Loci->Plancian Locus: enables/disables the plancian locus; In physics and color science, the Plancian locus or black body locus is the path or locus that the color of an incandescent black body would take in a particular chromaticity space as the blackbody temperature changes. It goes from deep red at low temperatures through orange, yellowish white, white, and finally bluish white at very high temperatures (from wikipedia.com)
- Loci->Isotherms: Shows the isotherm lines which define the CCT of a point in the color space

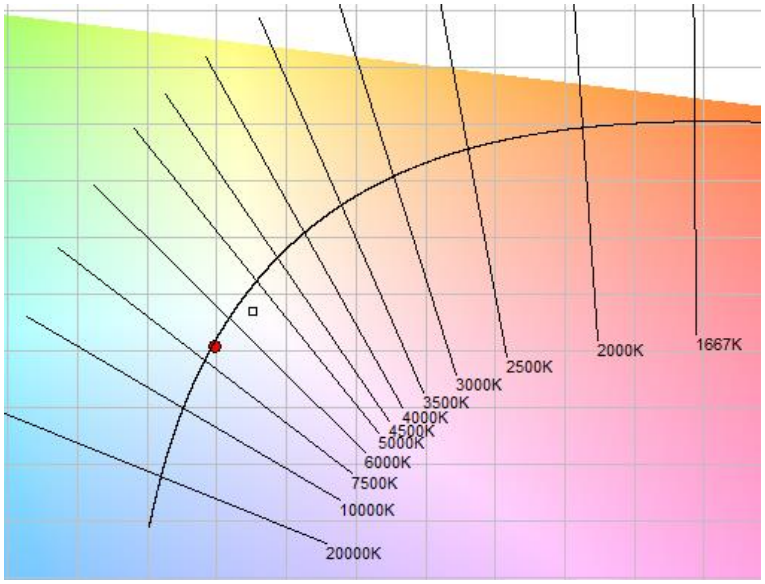


Figure 48: Loci enabled: Whitepoint, Plancian and Isotherms

- Loci->MacAdams: Clicking “add new MacAdams Ellipses”, opens a Dialog Box that asks to set the radius of the ellipses to be display. After pressing “ok” these appear in the color space diagram and can be disabled/enabled in the “loci menu”. “Clear all ellipses”, will delete all ellipses from the plot and the menu.

  In the study of color vision, MacAdam ellipses refer to the region on a chromaticity diagram which contains all colors which are indistinguishable, to the average human eye, from the color at the center of the ellipse. The contour of the ellipse therefore represents the just noticeable differences of chromaticity. (from wikipedia.com)

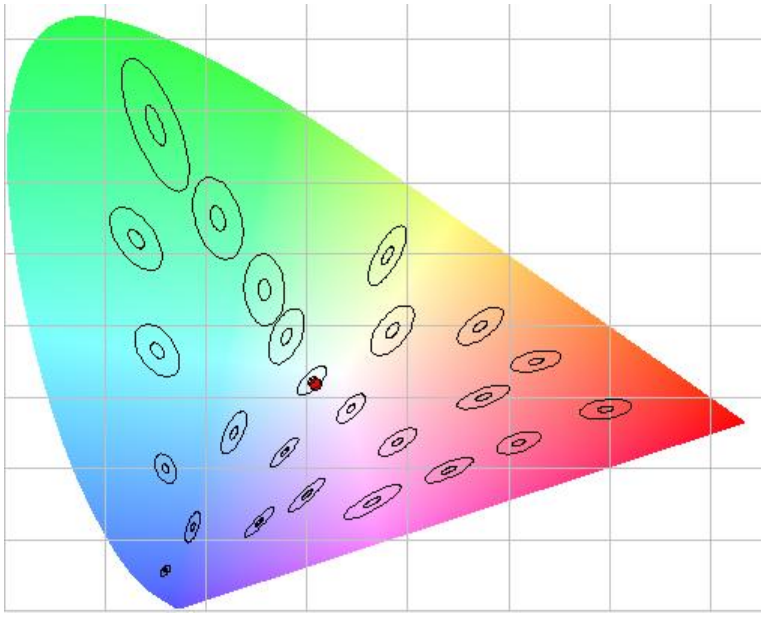


Figure 49: Mac Adam Ellipses with radius 3 and radius 10

- Loci->u'v'-circles: These loci are only available in the 1976 color space. If you want to add new circles the following Dialog box appears:

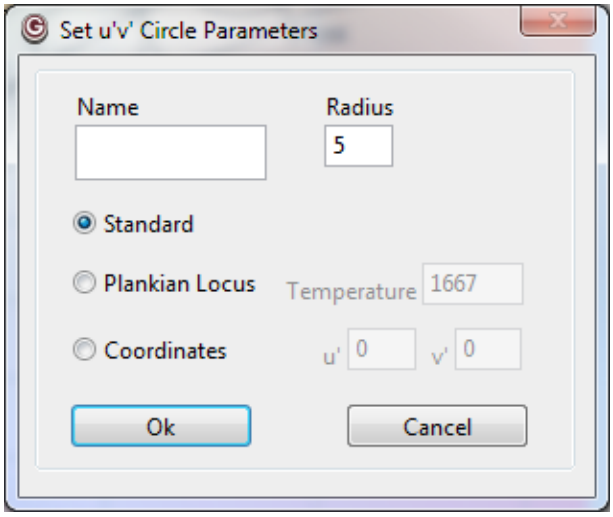


Figure 50: Dialog for the u'v'-circle parameters

  - You can choose a name if you want to. If you do not choose a name the locus will get the default name.
  - The Radius can be chosen manually
  - "Standard" will display the 6 u'v'-circles that are used to describe fluorescent lamps.
  - Plancian Locus, sets the u'v'-circle to the plancian, you only have to type in the corresponding temperature.
  - When you choose Coordinates you can set the whole coordinates of the u'v'-circle

- Loci->ANSI: There are two predefined ANSI binning fields: ANSI C78.377-A and ANSI C78.377-2011. There is the ability to add user defined ANSI fields. After setting the Temperature a binning field appears as defined in the ANSI_ANSLG C78.377-2011 standard.

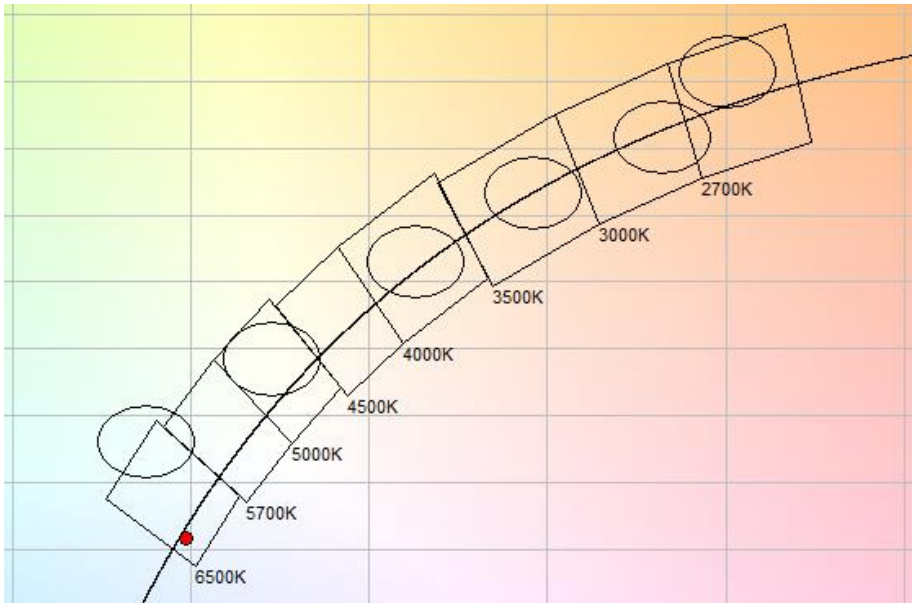


Figure 51: Standard Mac Adam Ellipses with radius 5 and ANSI C78.377-A Loci in the 1976 color space

- Loci->userLoci: This Point is only shown, if you have defined your own binning fields. This has to be done in the file “userLoci.goi” which has to be created by a text editor and saved in the “datauser” folder. The exact syntax is described at the end of the document under the section: additionally files->userLoci.goi.

16.4 Graphic Displays: CIE L*a*b* color space

The Lab color space is a color-opponent space with dimension L for lightness and a and b for the color-opponent dimensions, based on nonlinearly compressed coordinates. (from Wikipedia.com)

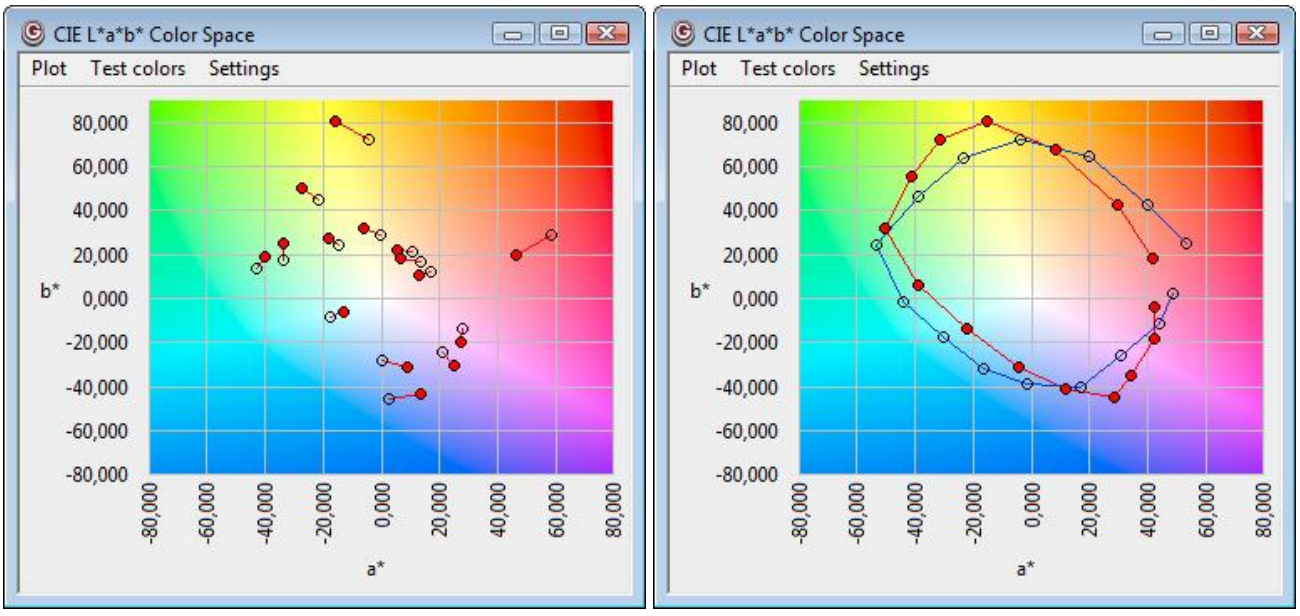


Figure 52: The Lab color space with the 15 test color samples of the CRI (left) and the CQS (right)

This color space is used to show the color rendering of predefined test colors. The empty dots show the a-b-coordinates of the test colors, illuminated by a reference light. The red-filled dots show the coordinates of the same color illuminated by the test light.

- Plot->Save: a file save dialog opens where you can export the plot to a jpg file.
- In the menu “Test colors”, you can switch between the test color samples for CRI and CQS.
- Settings->Linetype defines the way the different points are connected. You can choose between no connection, “pair” where the coherent dots are connected and “loci” which connects the points iterative.
- Settings->Colors defines the Color of the Grid and the Background

16.5 Graphic Displays: CRI Bar Plot

In these Plots, the values shown in the CRI/CQS-Data-Display are visualized in a Bar Plot. In the menu, you can change between CRI and CQS values to be displayed.

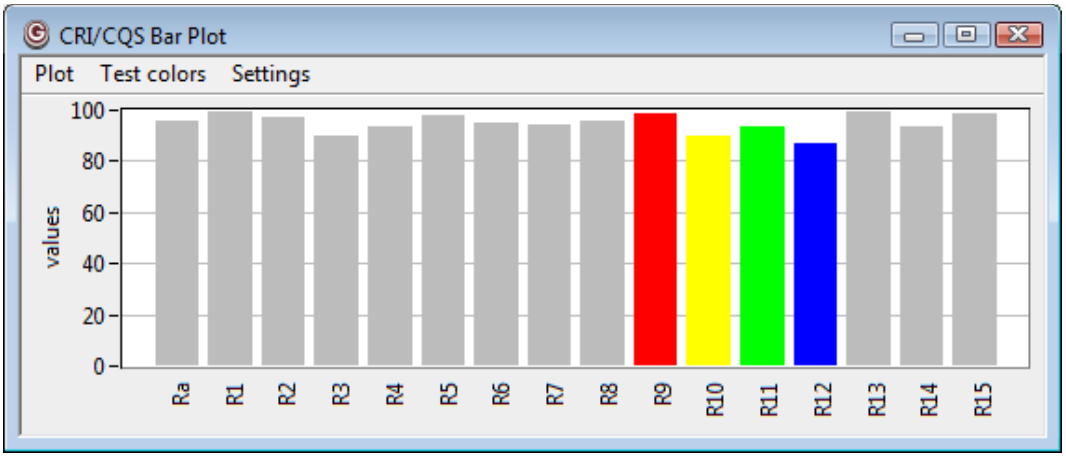


Figure 53: This bar plot shows the CRI values as defined by the NIST.

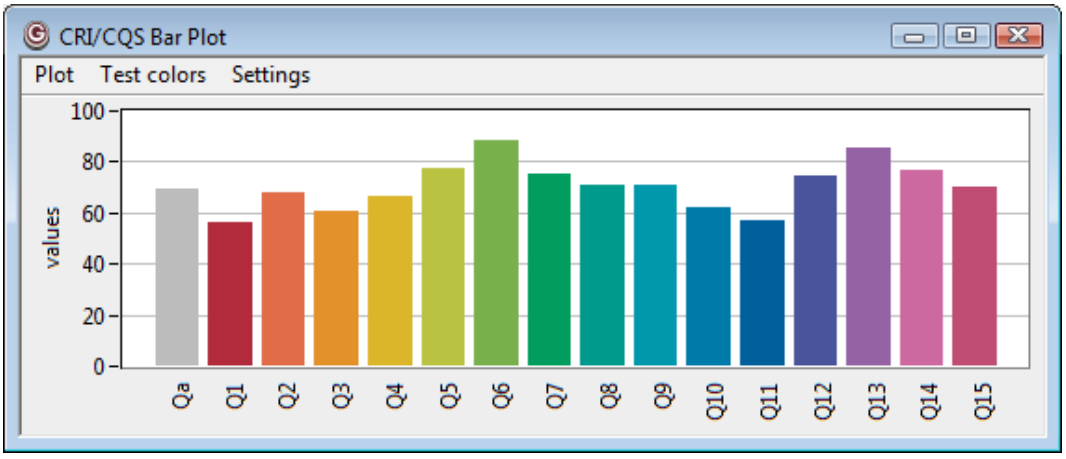


Figure 54: This bar plot shows the Test Color Samples for the CQS

16.6 Graphic Displays: Chromaticity Plot

This view gives an impression how the test colors could appear illuminated with the test light source and the reference light. Note that the image itself describes colors using sRGB, and colors outside

the sRGB gamut cannot be displayed properly. Depending on the color space and calibration of your display device, the sRGB colors may not be displayed properly either.

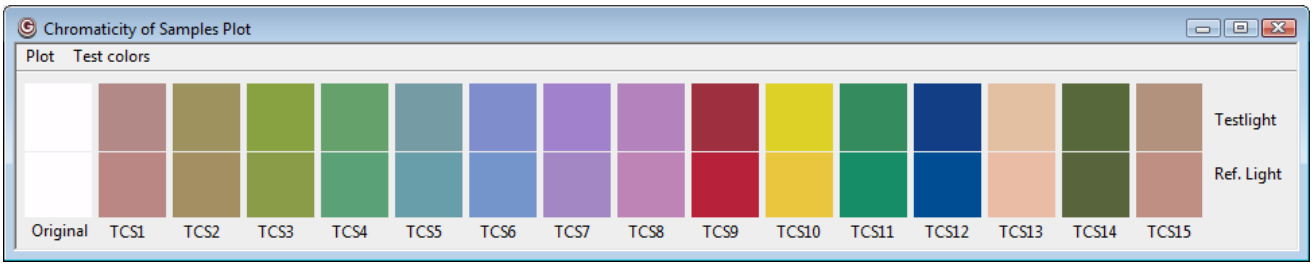


Figure 55: Chromaticity of Samples Plot for the CRI

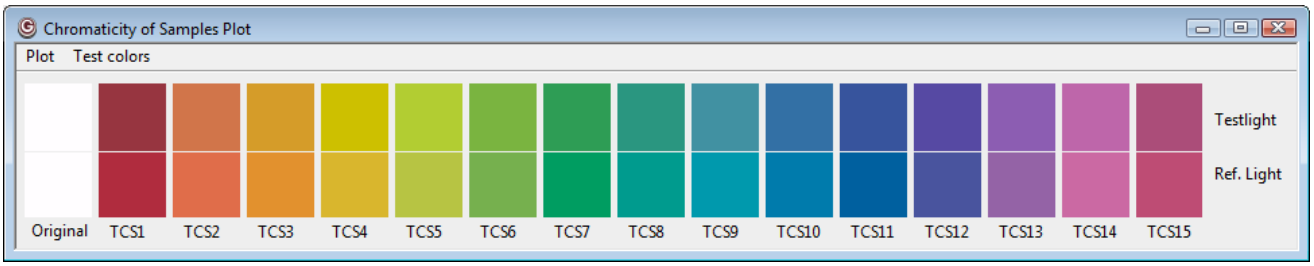


Figure 56: Chromaticity of Samples Plot for the CQS

16.7 TM-30-15 Rf-Rg Space

This view shows the IES TM-30-15 Values in a two dimensional space. The black lines define the region where the combined values are not achievable for white light sources.

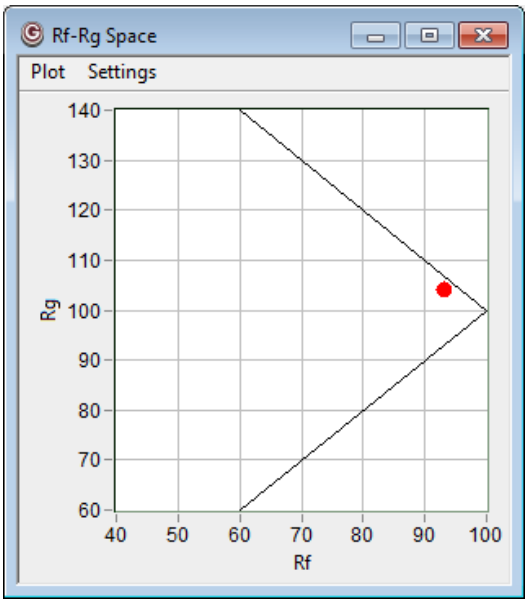


Figure 57: The TM-30-15 Rf-Rg-Space

- Plot->Save: a file save dialog opens where you can export the plot to a jpg file.
- Plot->Add: adds the actual data point to the plot for comparison with other points.
- Plot->Clear: Deletes all added data points
- Settings->Color: Change the appearance of the plot.

16.8 TM-30-15 Color Vector Graphic

The J'a'b Color Space (CIE CAM02-UCS) is used to display the color vectors calculated in TM-30-15. The white line represents the color rendition of the reference source your test source is compared to. The black line shows the color rendition of the test light source and the differences are displayed by vectors. Take account, that all coordinates are normed so that the reference source has the radius 1.

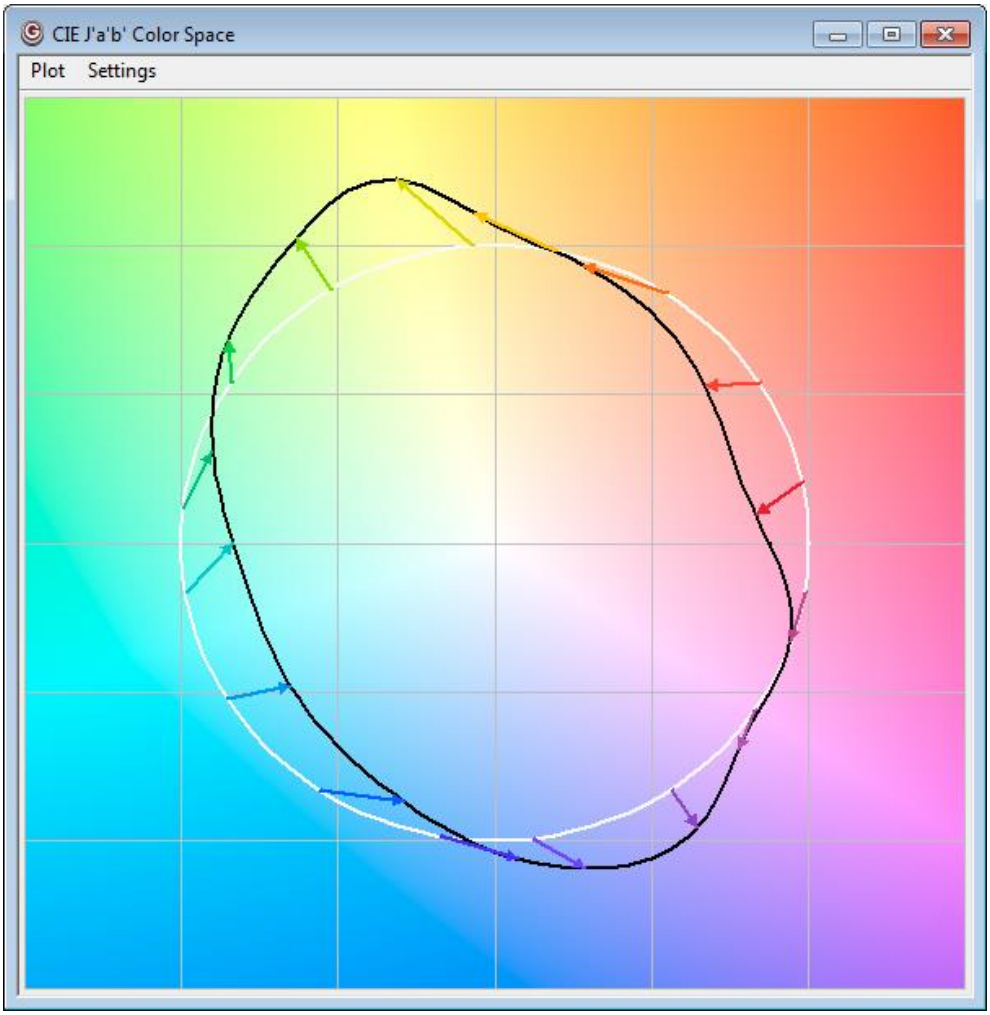


Figure 58: Color rendition of reference and test source in the J'a'b' Color Space

- Plot->Save: a file save dialog opens where you can export the plot to a jpg file.
- Settings->Vector: Define the appearance of the vectors
- Settings->Color: Change the color of the background and the grid.

16.9 TM-30-15 Bar Plot

The Rf Value Calculated in IES TM-30-15 can be The Bar Plot can be grouped in 16 bins by their hue. This view shows the Rf Values for the 16 different Hues. You can also display the average chromatic shift or the hue shift of the 16 bins.

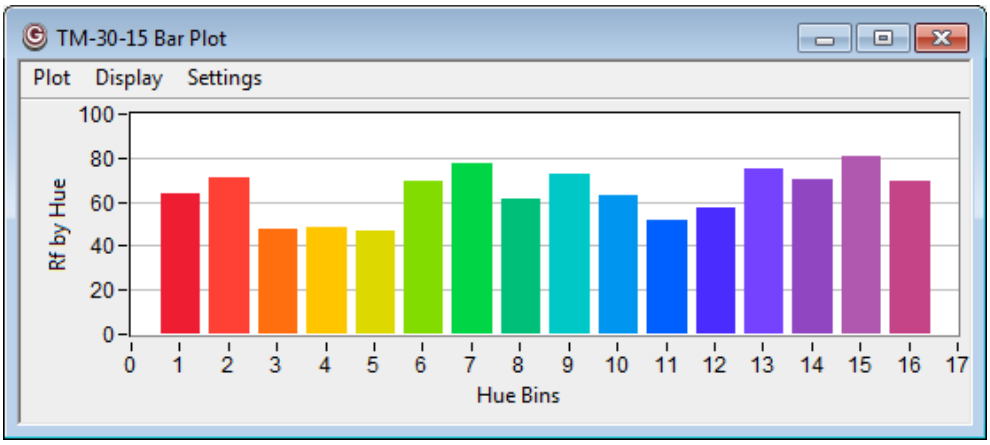


Figure 59: Rf(bin1) to Rf(bin16) shown in the TM-30-15 bar plot

- Plot->Save: a file save dialog opens where you can export the plot to a jpg file.
- Display->Change between the 16 Rf values, Chroma Shift and Hue Shift.
- Settings->Color: Change the color of the background and the grid.

16.10 Graphic Displays: Polar Plot 2D

This view shows all measurements of your goniometric measurement in a polar plot. If you have no goniometer connected this view is disabled in the menu.

First select the axis you wish to have a layer for and then select the angle of your layer.

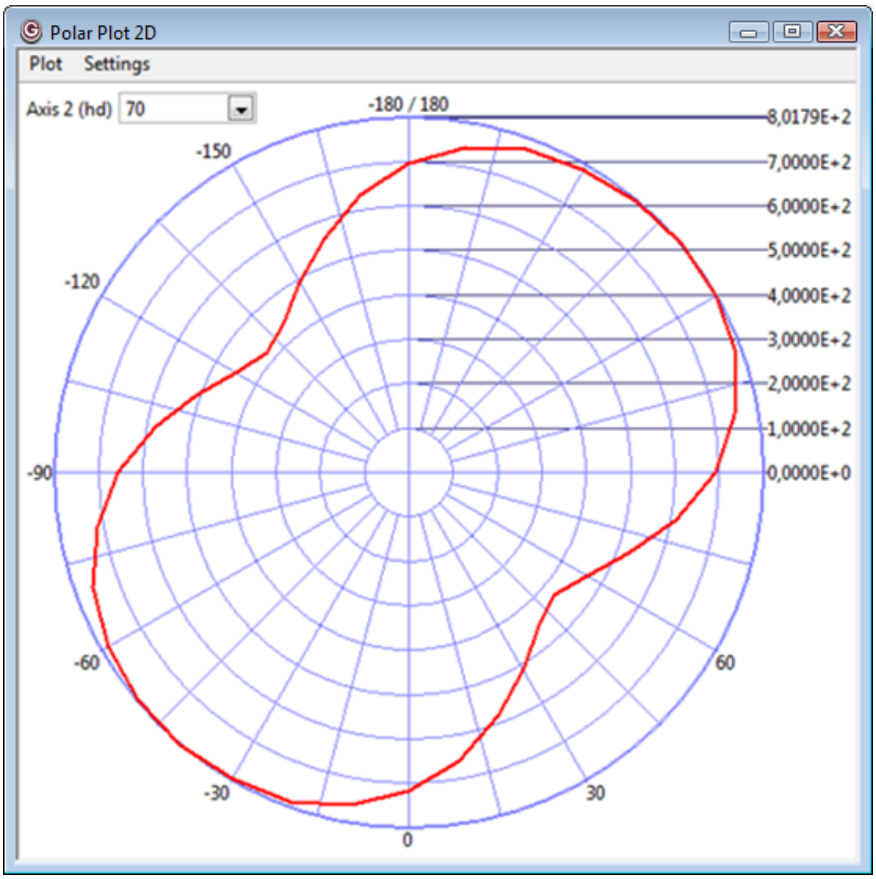
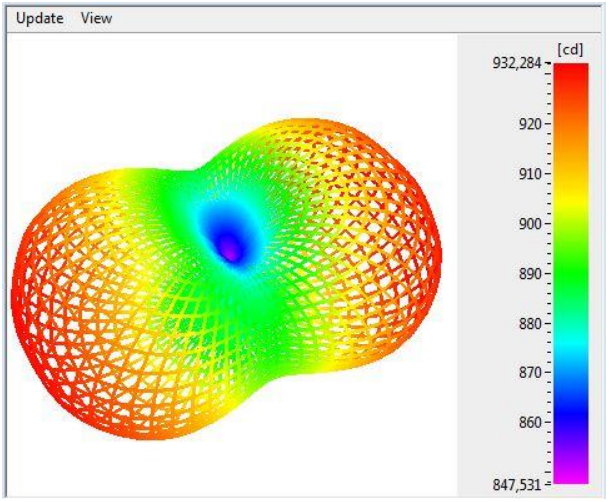


Figure 60: The polar plot 2D shows the light intensity for a defined axis

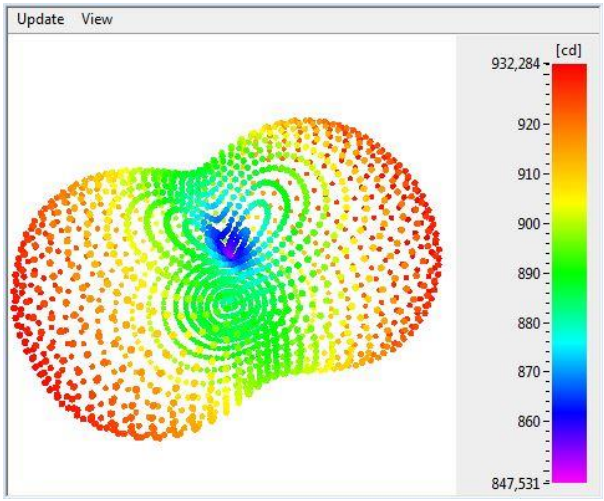
- Default axis is “Axis 1”. You can change the axis in Settings->View By->Axis 1 or Settings->View By->Axis 2
- Menu Plot->Save: Saves actual graphic to a file in jpg format
- Menu Settings->Colors->Plot: Plot color of active plot can be changed
- Menu Settings->Colors->Background: Background color can be changed
- Menu Settings->Colors->Grid: Grid Color can be changed

16.11 Graphic Displays: Polar Plot 3D

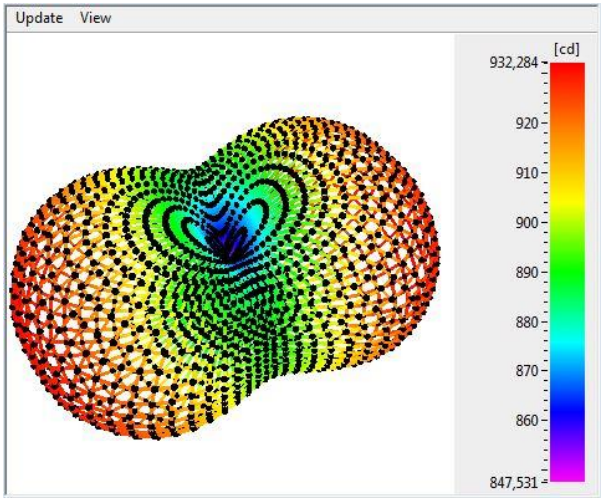
This view shows all measurements of your goniometric measurement in a 3D polar plot.



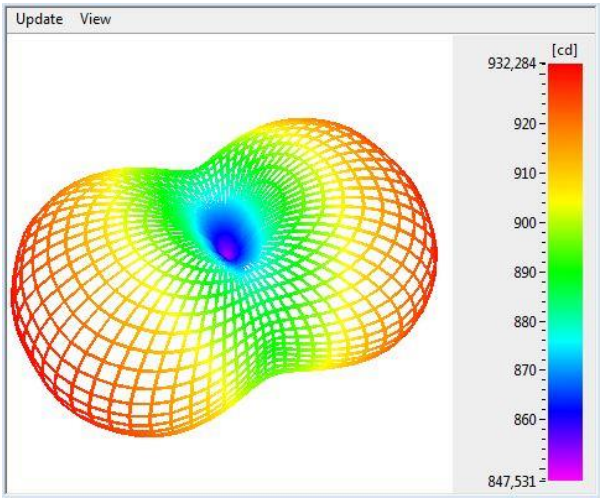
Line



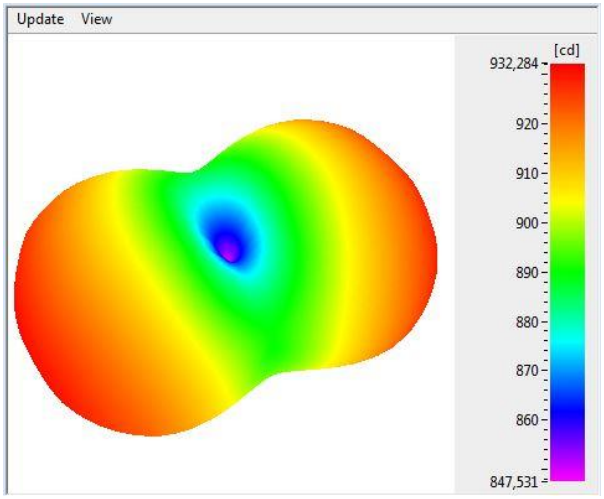
Point



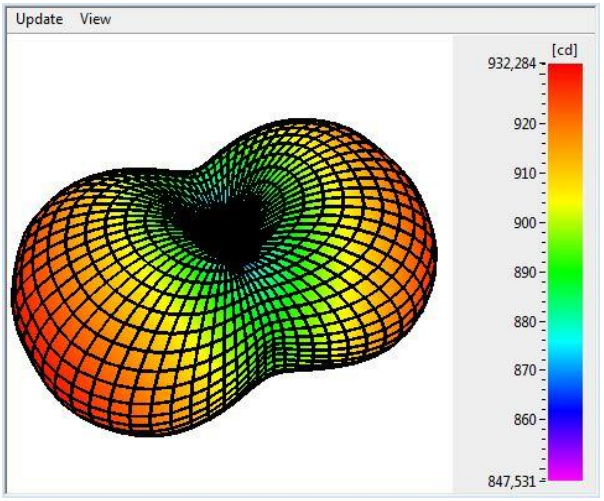
Line / Point



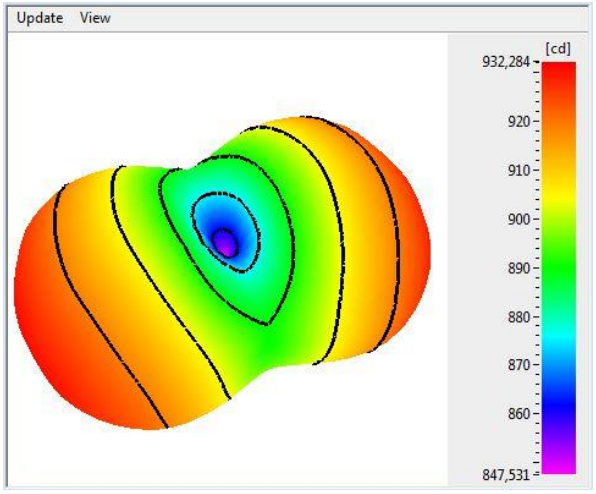
Hidden Line



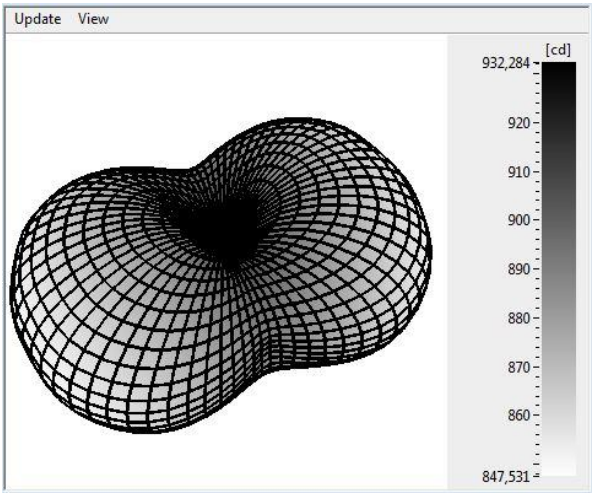
Surface



Surface / Line



Surface / Contour



Surface / Line (Black/White gradient)

There are 7 different plot styles. Every plot style can be shown with two different gradients options: black/white and colored. The following screenshots show all plot styles with colored gradient and one example for a plot style with b/w gradient.

The view doesn't update itself. Update must be done manually by clicking the "Update" menu option after measurement sequence has finished.

16.12 Qualification Test

This view shows if the selected Qualification Test is fulfilled. The Qualification Test can be set and edited in "Options->Generate Qualification Test".

If no Test is selected or no measurement is done the view shows a beige circle. Otherwise the circle is green (test passed) or red (test failed).

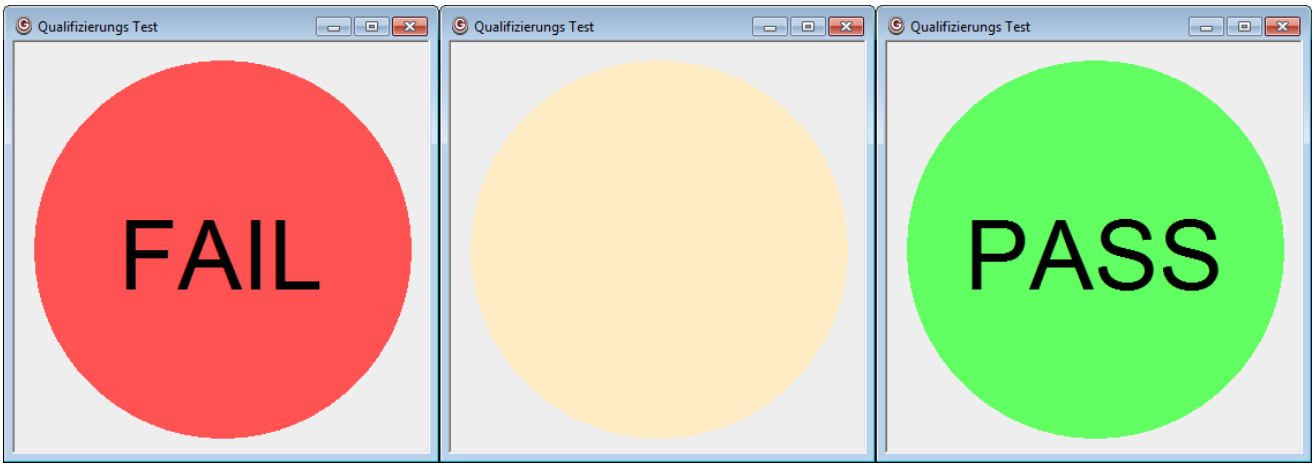


Figure 61: Graphic View - Qualification Test and its different states

17. Device Settings

Additionally to your BTS2048 measurement device, you can control power supplies and goniometer devices with this software. To open the Setup Screens of the different Devices, you can either press the Device Button in the Navigation Bar or you can click on Setup in the Application menu -> Devices. In the following the Setup Screens are described.

17.1 BTS2048 setup screen

The setup screen of your BTS2048 device lets you set and edit all necessary device settings.

In the Header the Dll Version and the Firmware Version of yous Device is displayed.

You can select between all Calibration Entry that are stored in the device

And you can load/save your actual settings from/to a custom file or you can set them to default, which will be loaded on each software start.

17.1.1 Spectral Tab

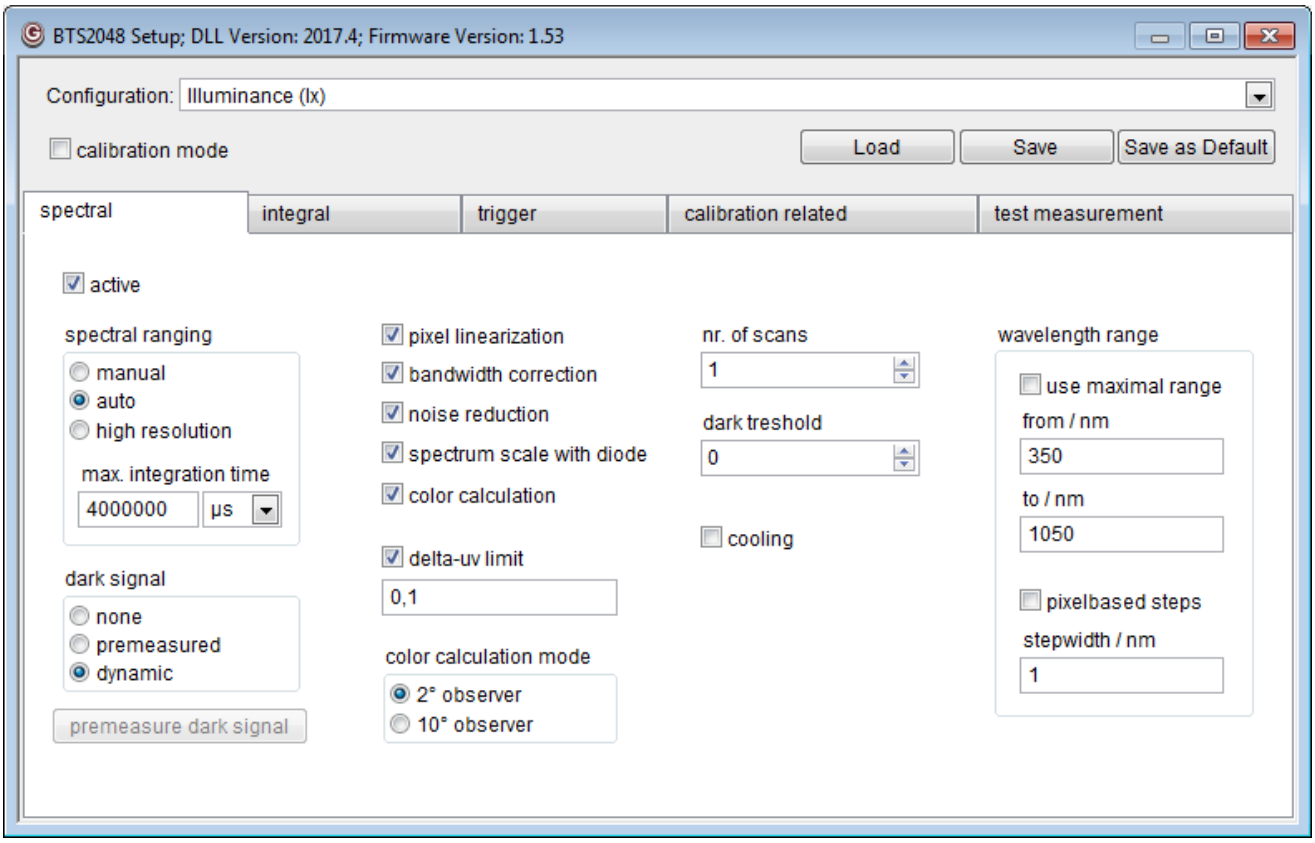


Figure 62: Tab for the spectral settings

- active: Here you can activate the spectral device. If deactivating you can save much time for measurement.
- spectral ranging: Here you can decide if you want the system to calculate optimum integration time. In auto mode, integration time will be calculated new for every measurement. The measurement device performs some pre-measurements to evaluate best value for the integration time. In high resolution mode multiple measurement with different integration times are performed an added to one spectral result. One measurement performance will take much longer in this mode. If you want static integration time then select “manual”.
- integration time: The minimum value is 2µs. Maximum value depends on your device type. For TEC-Devices it has a maximum of 60000000µs=60s for other devices it is 4000000µs = 4s. You can enter this time, if manual ranging is activated.

  The BTS2048-UV devices have some Calibrations which contain more than one measurement (e.g. Solar Measurements). For these Calibrations you can set the Measurement Time instead of the Integration Time. This Value sets the total time that is used for all the Measurements together.
- Dark signal: Here you can select desired dark signal mode. First mode means that no dark offset will be subtracted from measured signal. Static dark offset means, that you have to measure the offset once by clicking the “measure offset” button. After changing integration

time you must measure offset again. Online mode means, that an offset is measured additional to every regular measurement.

- Premeasure dark signal/measure static dark signal: With this button you can perform the measurement for a dark signal offset that will be used for further measurements.
- pixel linearization: This checkbox activates pixel linearization.
- bandwidth correction: This checkbox activates the bandwidth correction for your spectral signal.
- noise reduction: This checkbox activates the noise reduction for your spectral sensor.
- array scale with diode: Activating this means, that the spectral measurement will be scaled absolutely with help of the integral sensor result.
- color calculation: enable or disable color calculation (only available for BTS2048-VL-devices)
- delta-uv limit: this defines the limit of the delta-uv-value. It will be used to decide, if calculated color temperature is within valid range. Color temperature will not be calculated, if real uv values are out of defined limit.
- color calculation mode: change between 2° and 10° observer for color calculation.
- nr of scans: It defines the number of spectral measurements that are done for signal averaging.
- dark treshold: The minimum number of counts for each pixel to become used.
- OoR Staylight mode (only BTS2048-UV-S): Similar to the “static dark offset” you can premeasue the straylight factors when manual integration time is selected. When “dynamic-mode” is selected the straylight factors are measured each time. When “premeasured-mode” is selected you can measure the factors once by clicking “measure OoR SL”. These factors are used for all future measurements.
- wavelength range: Here you define the minimum and the maximum wavelength and the minimum stepwidth you will receive as output. The allowed values depend on your BTS2048 device, but the minimum wavelength must always smaller than the maximum wavelength. When you activate “use mavimal range”, the maximal available wavelength range is selected even if you change the calibration entry.
- cooling: this is only available for TEC-Devices. It activates the cooling.

17.1.2 Integral Tab

Within this tab you can see the configuration of your integral sensor.

- active: This checkbox has to be activated, if you want this sensor to be measured
- a* mode: Here you can define the spectral mismatch factor a* for specified sensor. If “no a*” is selected then no spectral mismatch factor will be used. “dynamic” means that a* is calculated with every array scan. “static” means that you can define your own spectral mismatch factor. The fourth mode is “automatic”. It calculates a* only if enough signal is available in the relevant range. Otherwise a* is 1. This mode is recommended.
- Static a* value: This field is visible, if the static a* mode is activated. Here you can enter your specific spectral mismatch factor that should be used for correction.

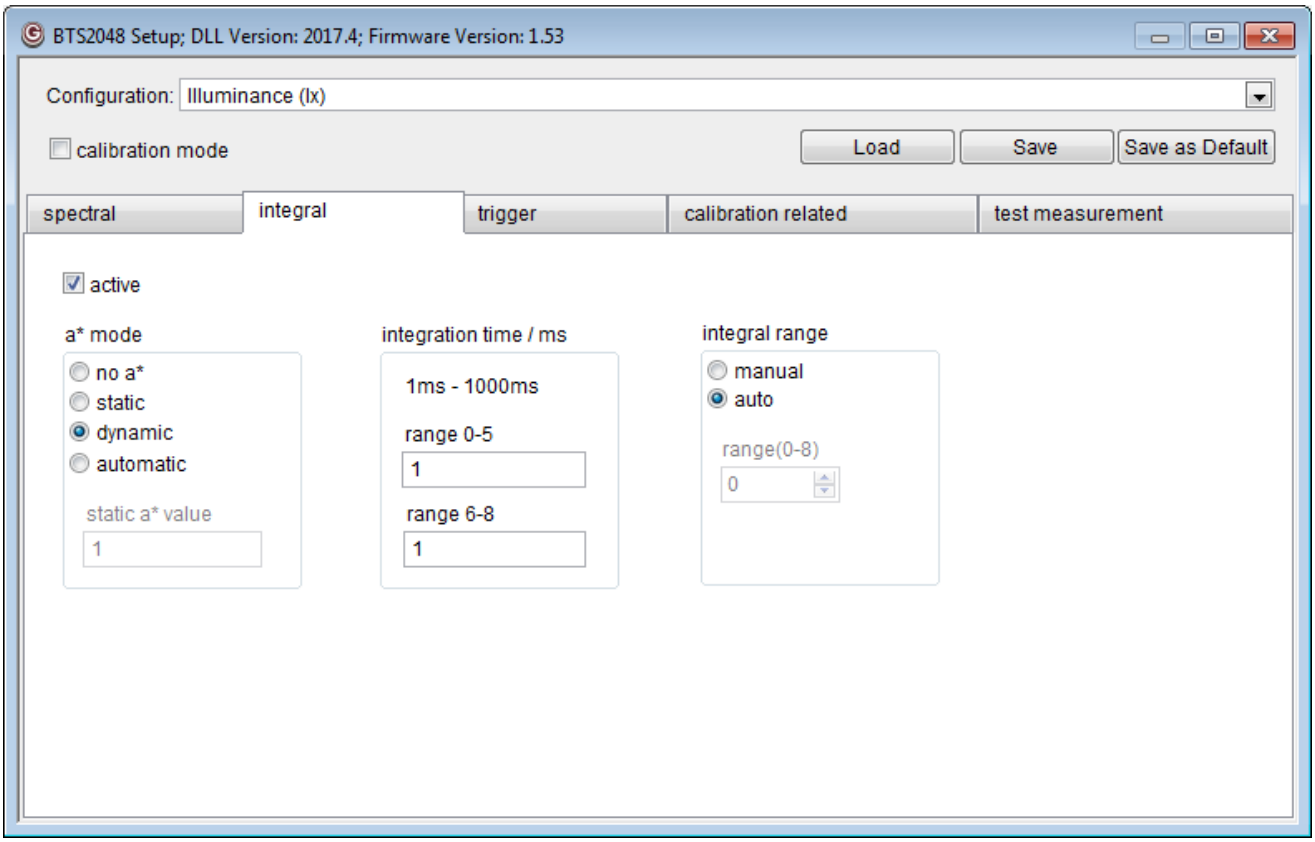


Figure 63: Tab for integral settings

- integration time: You can define a different integration time for ranges 0-5 and ranges 6-8.
- Integral range: Choose if you want to set the integral range automatic or manual. If you select manual you have to pay attention not to get an integral underload or overload

17.1.3 Trigger Tab

This Tab is used to activate and set the trigger of your device. The trigger is used to start the measurement when a defined event occurs.

- activate: This activates the trigger function.
- Trigger source: Choose if you want to set the trigger source to the external input or to the internal diode.
- max light level: If you have selected the internal trigger source you have to set a maximal light level which will be reached by your signal. This value defines the integral range that will be set for the measurement.
- trigger level (with external trigger source): choose if the trigger should start at low voltage(GND) or at high voltage (~5V).
- trigger level (with internal trigger source): Here you define the light level that is necessary to start your measurement. Choose the percentage of the selected maximal light level but it is not recommended to use values larger than 95% or smaller than 5%.
- Delay: time in ms between reaching the required trigger input and measurement start

- timeout: If no trigger event occurs in this time the measurement will be stopped and a warning “Trigger Timeout” will be displayed.

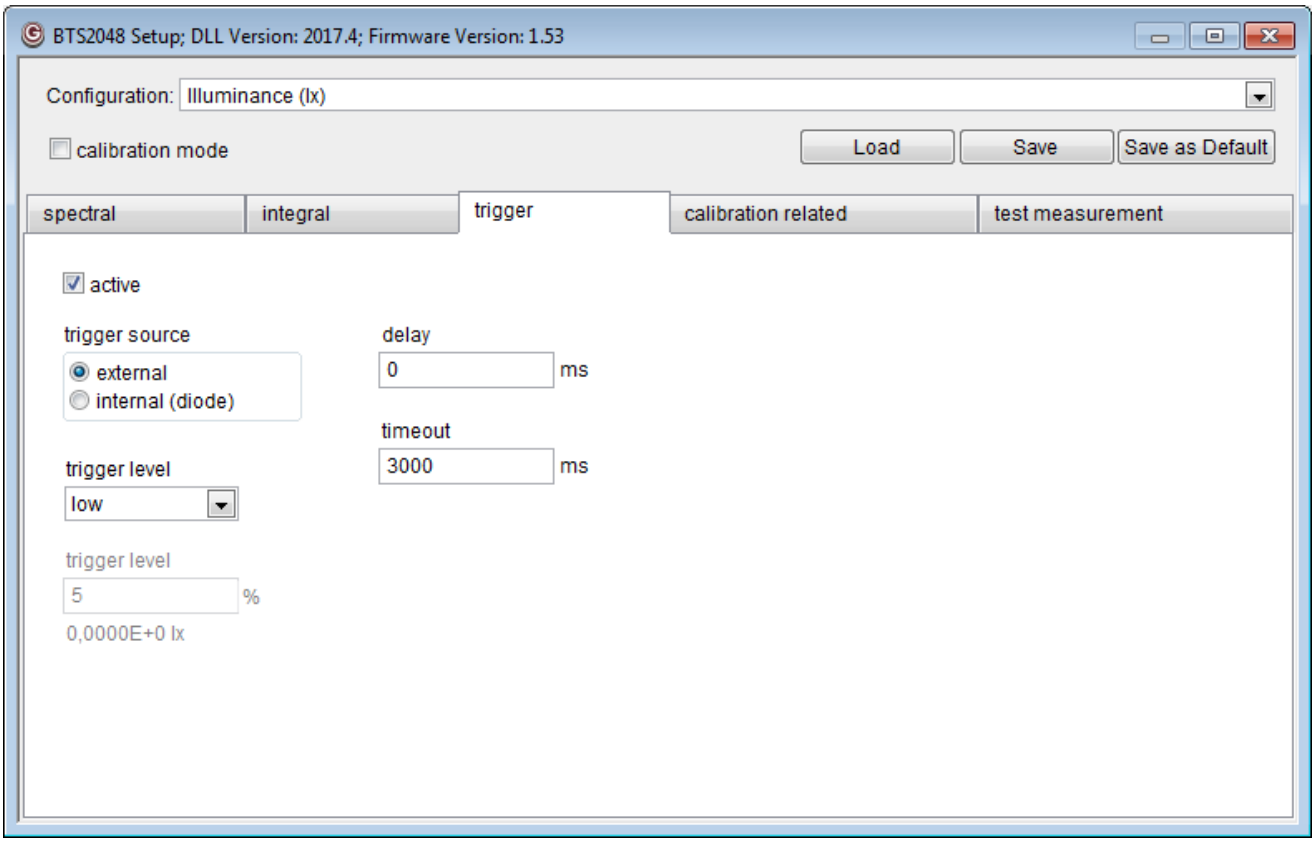


Figure 64: Tab for trigger settings

17.1.4 Self-Absorption Correction Tab

This is only available when using a calibration for an external sphere (quantity phi, “Luminous flux”)

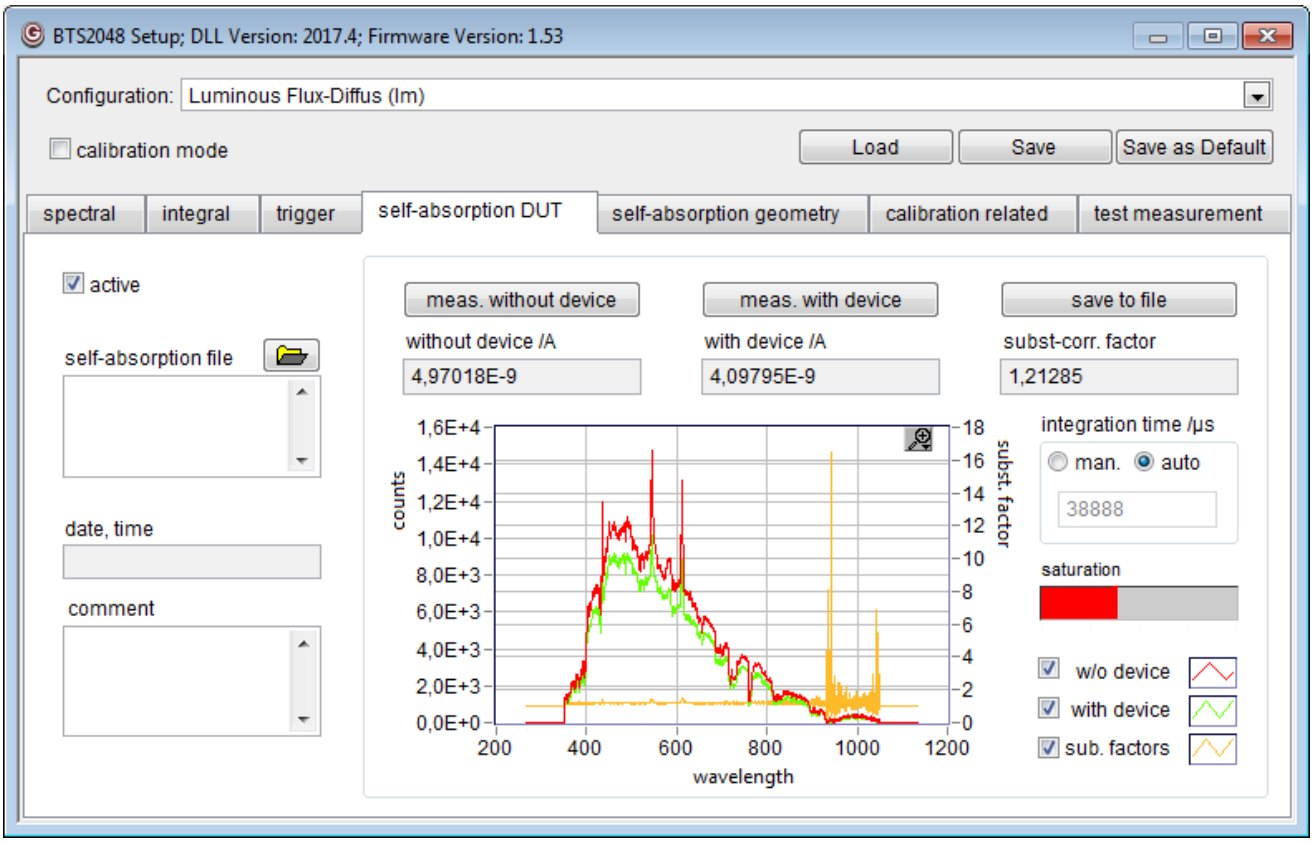


Figure 65: Tab for activating and calculating the self-absorption correction

- activate: This activates the self-absorption correction. The correction factors used are shown in the graph and in the panel. You can load the factors from a file or you can calculate them with the buttons in the box.
- self-absorption file: If a file is selected it will be displayed here. If the field is not empty the actual correction factors are the one saved to this file.
- date, time: The time the file was generated.
- comment: Here you can save individual comments for each file.

Calculation of the self-absorption correction

- First you have to choose if you want to set the integration time manually or if you want to autorange the integration time. Autorange is recommended for most users. Only if your signal with and without device differ a lot, you should set the integration time on your own.
- If you want to do a self-absorption correction for your external sphere then switch on auxiliary lamp first. Then measure your sphere both without the test device and with the device in the order you like. Have a look at the saturation, the bar should always be green.
- After your self-absorption correction was successful, you can save it to a file for later usage. After you saved it, the file will be displayed in the self-absorption file panel.

17.1.5 Calibration Related Tab

In this tab all settings are done that belong to the selected calibration.

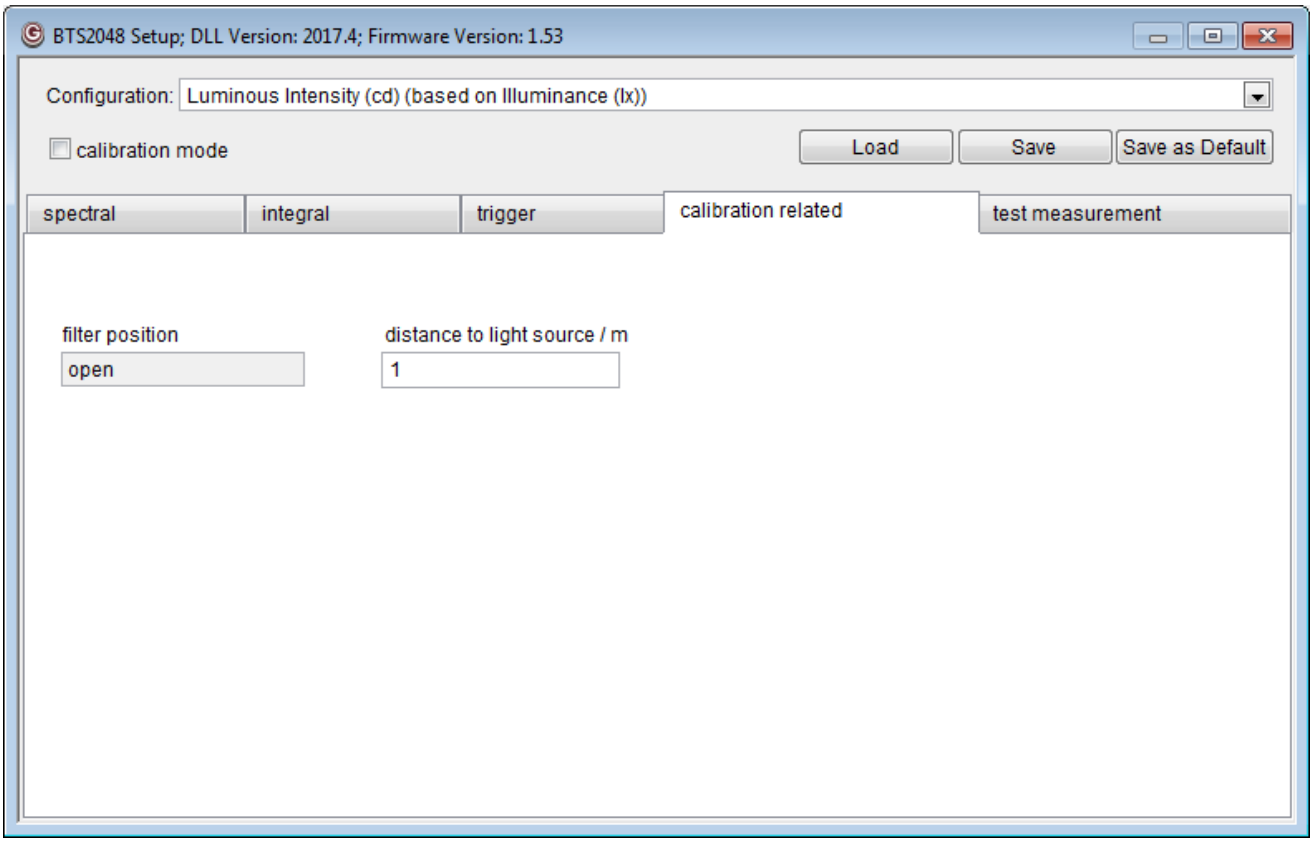


Figure 66: Tab for calibration related settings

- filter position: The internal filter that is active for actual selected calibration entry.

  For BTS2048-VL there are four different positions: dark, open, OD1, OD2

  BTS2048-UV-S has 8 positions: dark, open, OOR, BP1, BP2, BP3, BP4, BP5

- distance: If a configuration for “Luminous Intensity” is selected, then an additional field will be visible to enter the distance between your measurement device and your light source. This value must be defined for “Luminous Intensity” setup; otherwise result values won’t be correct.

17.1.6 Calibration Tab

Only advanced users should do a Recalibration of the device. This is the reason, a password necessary to activate the Calibration Tab.

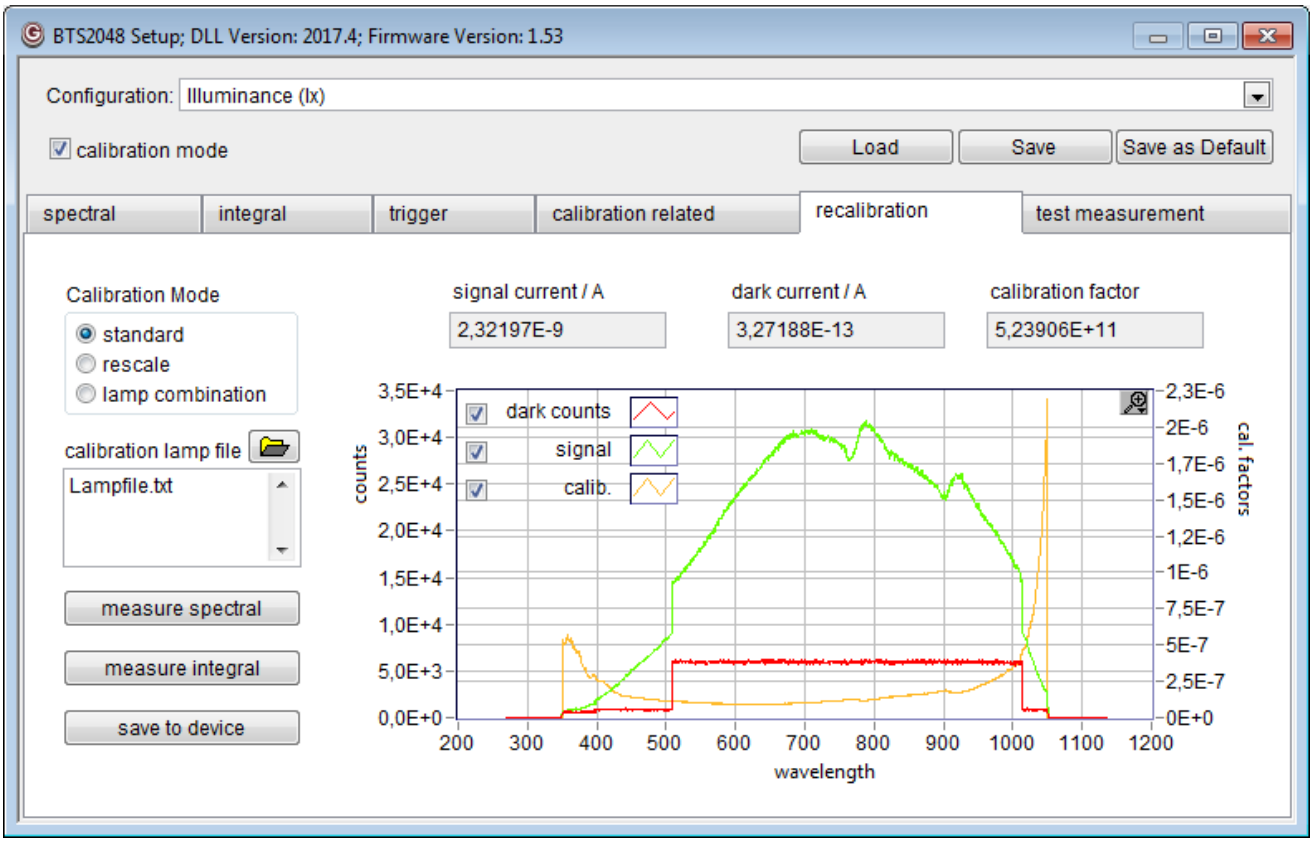


Figure 67: Tab for the recalibration

- calibration mode: There are three calibration modes:

  standard mode: complete recalibration of spectral and integral calibration factors with one calibration lamp.

  rescale mode: like standard mode but the spectral calibration factors are scaled, so that the radiometric value is conforming to the measured input.

  Lamp combination mode: like standard mode but with different calibration lamps. If you want to use more than one lamp for spectral calibration. (e.g. for recalibration of BTS2048-UV-S with halogen and deuterium lamp). Each lamp has to be loaded and spectral measured individually. And then spectral calibration factors have to be calculated.

- calibration lamp file: First select the file where your lamp data is stored. The file has to contain two columns, one for the wavelength and one for the intensity. Only the first row can have a comment. In this case it has to start with "//".

- Next step is to measure spectral (one) and integral (once) in the order you like. Look at the graph and the panels to verify your results. For calibration mode 2 you have to measure each lamp once and then press "spectral calculate" to get the total spectral calibration factors.

- After everything went right you can save the new calibration to the device. You have to choose if you want to overwrite the old calibration which can be a factory calibration, or if you want to save it to a user-calibration entry. Warning: If you choose the factory calibration, the old calibration will be overwritten and it cannot be restored.

17.1.7 Test Measurement Tab

To do a quick Test-Measurement of your settings and to evaluate your results you can use this tab. The graphic shows result of your array measurement.

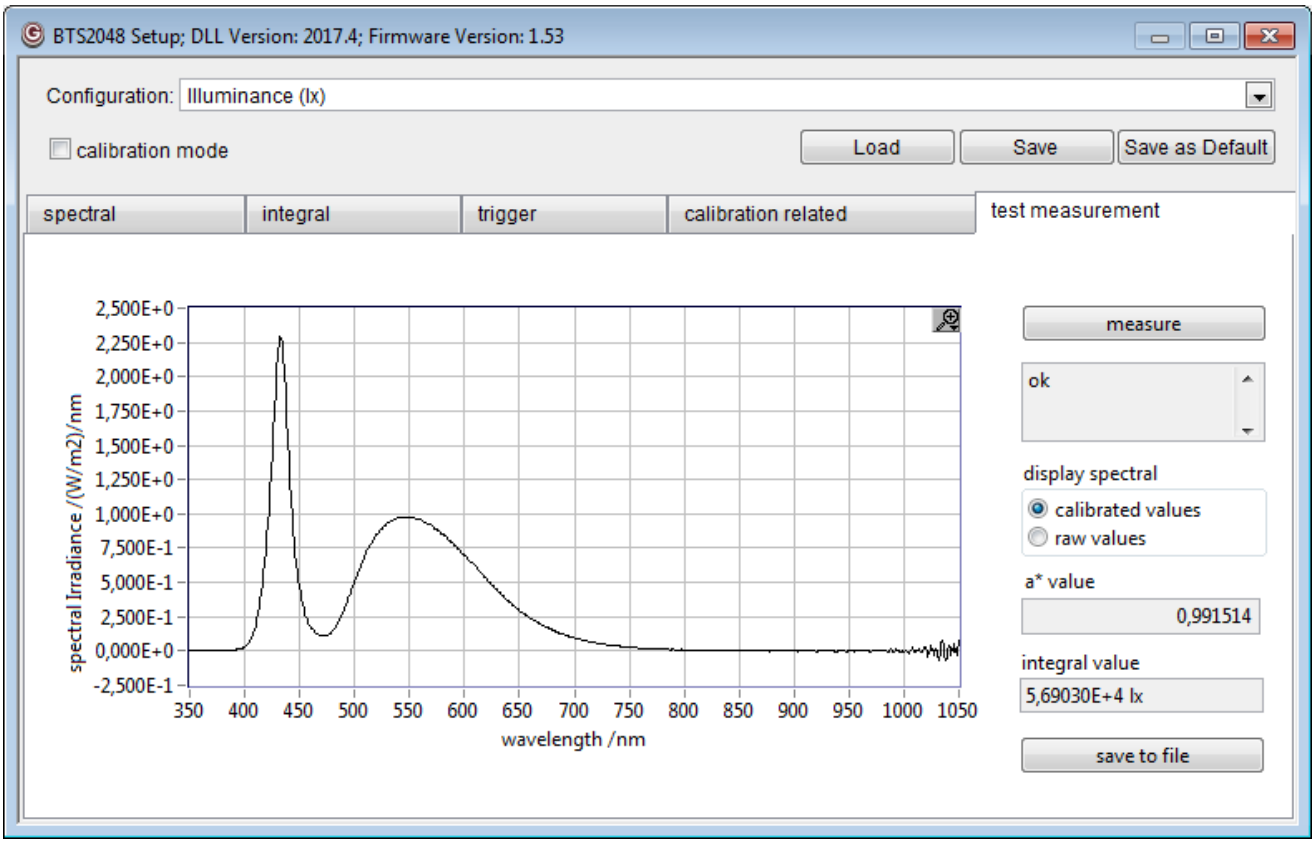


Figure 68: Tab for Testmeasurements

- measure: start the test measurement. If an error occurs it will be displayed in the panel below this button
- display spectral: Choose if you want to show the calibrated values based on wavelength or the raw pixel signal in the graph.
- a* value: Calculated or static a* value will be displayed. If no spectral mismatch factor is selected then value “1” is displayed.
- integral value: This shows the value that is detected by the integral sensor.
- save to file: export the measured data to a text-file.

17.2 Power Supply Setup Screen (if device is available)

17.2.1 Gigahertz Power Supply (LPSXXX)

The software supports different power supplies from Gigahertz-Optik. (LPS20, LPS25, LPS100). For the description of the setup screen, we have chosen the LPS20. The configuration of the other power supplies is very similar.

- on/off: Switches lamp on / off. When switching on / off the predefined ramp is driven. While ramp is driven, the border of the button is blinking and screen doesn't allow any inputs.
- Save/load: you can save and load your settings the same way described in the setup screen of your measurement device.
- current: Current value in mA, the power supply will drive, when switching on. If device is already switched on, changing this value will cause your power supply to drive with predefined ramp to new current value.

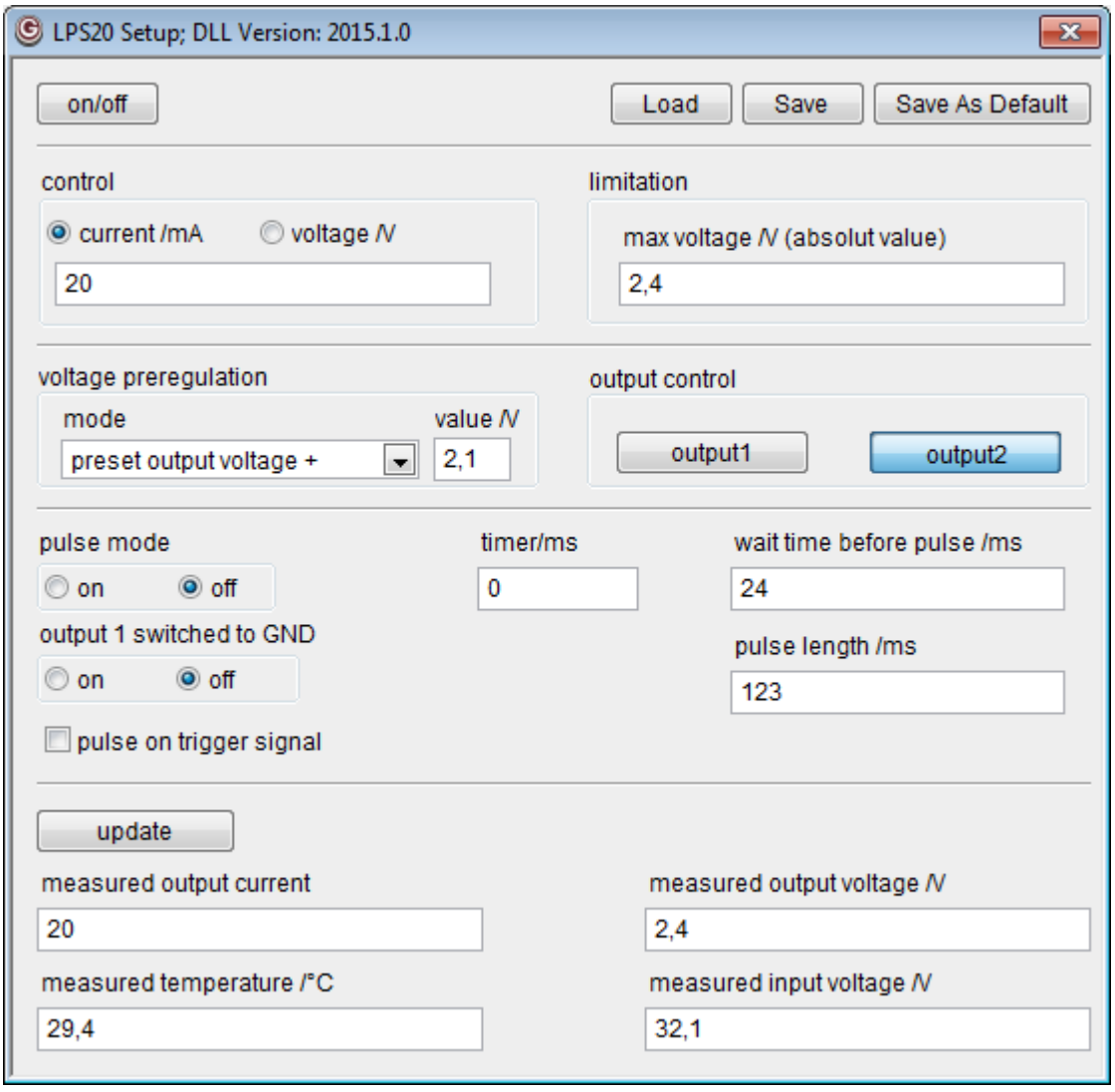


Figure 69: Setup Screen for the LPS20

- nominal current of lamp: This value defines the nominal current your lamp is defined for usage. Default value is 8500mA and should be adapted to real value of your lamp. This value is used for calculation of ramp slope. If this value is too big, minimum possible slope of your device can be reached. If this value is too small, maximum possible slope of your device can be reached. If calculated slope is out of allowed range, minimum resp. maximum slope is set and you will receive a message to change your ramp time.

- Ramp time: Gigahertz tells you the time you should drive your power supply to reach nominal current of your lamp. This should be a value of about 40 seconds. If choosing smaller ramp times, this could shorten life time of your lamp.
- update: This button updates all values of this config screen, even control values. This is necessary, if values are controlled by programming by means of a programming language. These values aren't updated automatically. Additionally useful status values are updated.

17.2.2 Keithley 24-Series (KE24XX)

At the moment the Kethley 24 Series is also supported by the software.

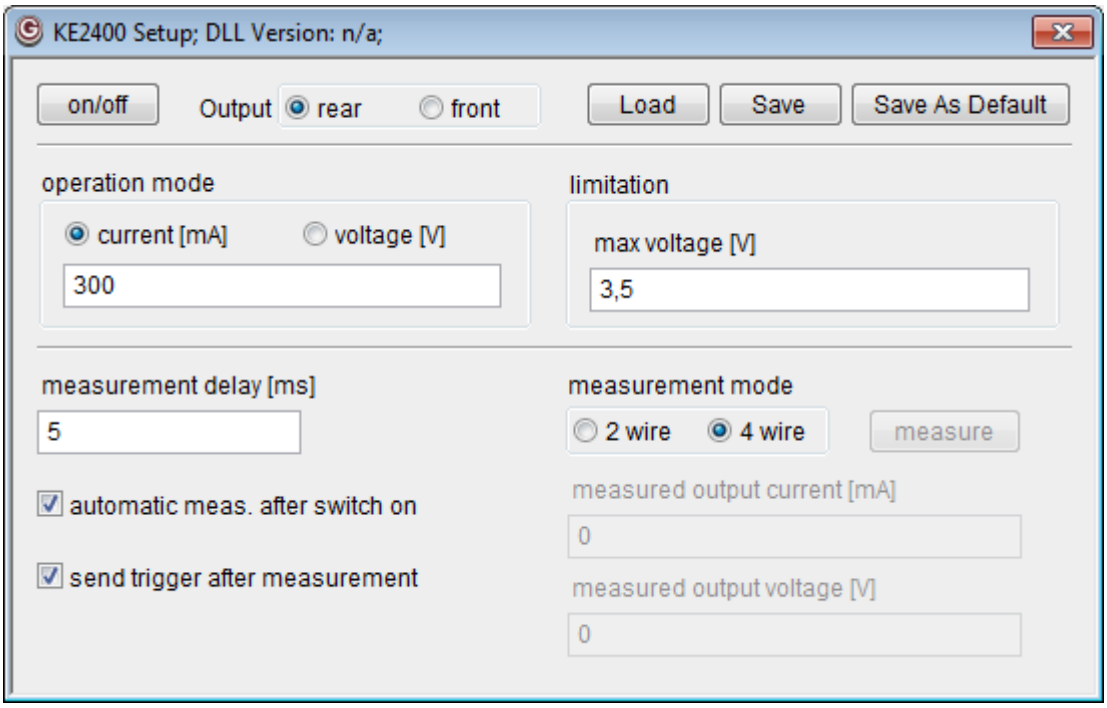


Figure 70: Setup Screen for Keithley 24XX

For the Keithley 24XX many settings are similar to the LPS100. The biggest difference to other power supplies, is that you have to actual perform a measurement to read the voltage and current of the device. Additional settings will be explained in this section:

- Output: Choose if you want to use the front or the rear Output of the device.
- automatic measurement after switch on: this checkbox defines if there should be an automatic measurement each time the output is switched on
- Measurement delay: sets the time between the switch on and the measurement.
- Send trigger after measurement: choose if you want to send a trigger (e.g. to the BTS2048) each time a current/voltage measurement is done.
- Measurement mode: choose if you want to use four wire or two wire measurement technique.

17.3 Goniometer setup screen (if device is available)

As goniometer is not initialized from application, speaking of searching the reference position, this has to be done manually each time after starting the application for each axis by clicking the goto reference position button.

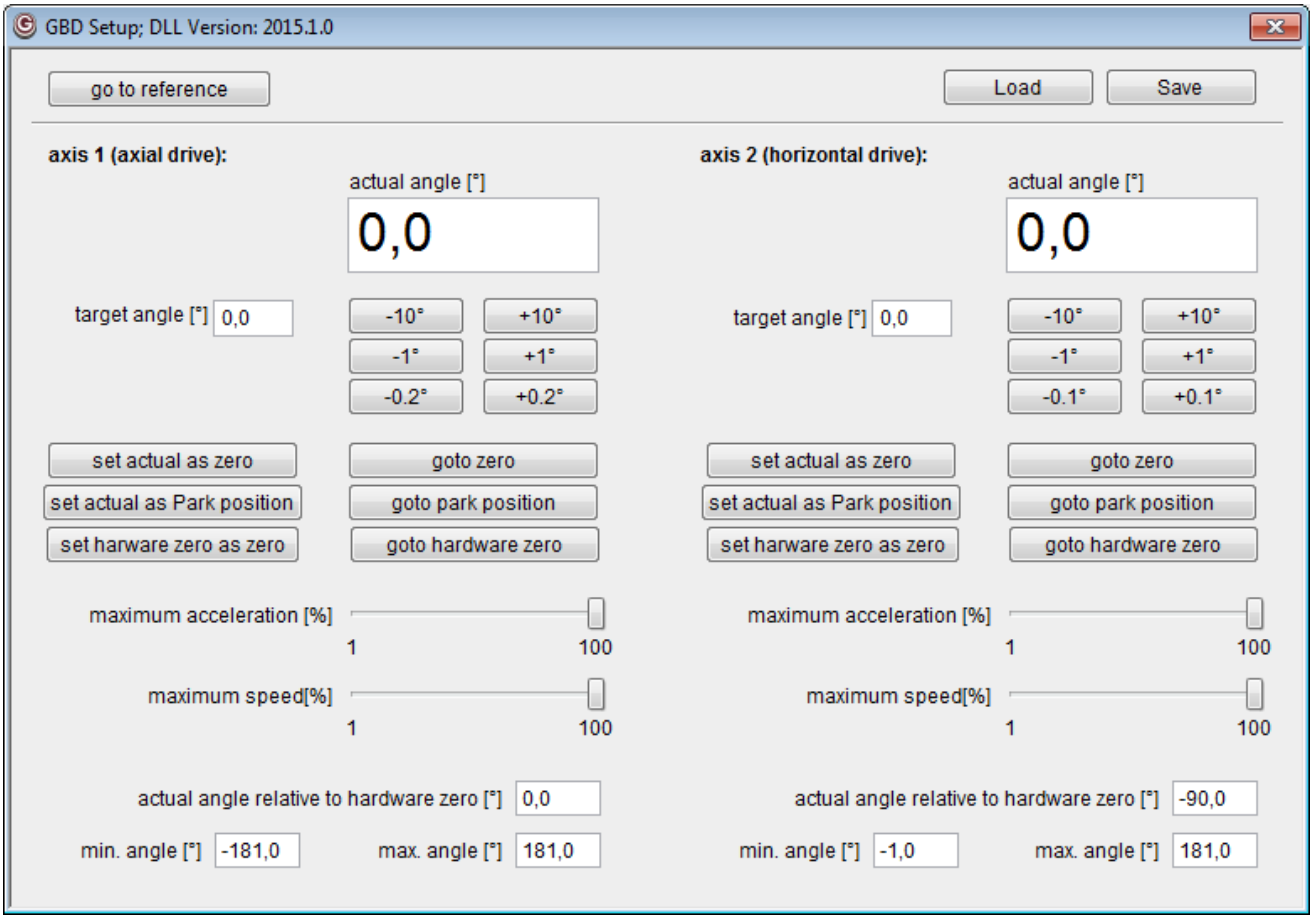


Figure 71: Settings for the Goniometer Device

Axis 1 represents Theta Axis (rotation, axial drive); Axis 2 represents Phi Axis (horizontal drive).

You can drive your goniometer device to your desired angle. You can drive to park position. If your hardware mechanics need lower speed and acceleration of the stepping motors, you can do this within this window.

17.4 Temperature Controller setup screen (if device is available)

With a temperature controller you can handle the temperature of e.g. the LED you are measuring. The software allows you to choose a target temperature and a delta temperature. With the update button you can check the actual temperature of your device and see if it is in range. If the "temperature in range" field is green that means that the device has reached the target temperature with a deviation defined in delta temperate. And that it is expected not to leave this range within the next 5 seconds.

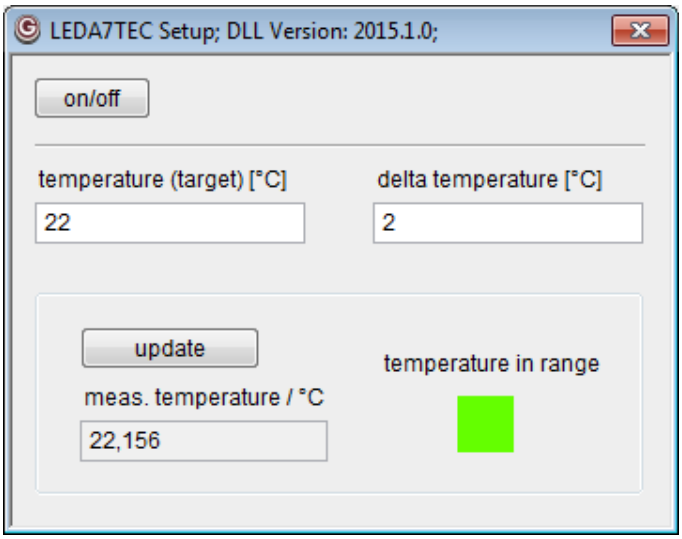


Figure 72: Settings for the LEDA-7-TEC

18. Tools

Tools can help you analyze your measurement data and create goniometer measurement routines. It depends on your system configuration which tools are available.

18.1 Analysis: Calculate Point of Value

This tool searches within your recorded measurement data at which time a defined target level in % is reached. Base for calculation is the 100% value that you have to define before calculation. The 100% value should be a value of your integral sensor. The unit depends on your selected calibration. The switch on time is the time of the measurement when target value is reached the first time.

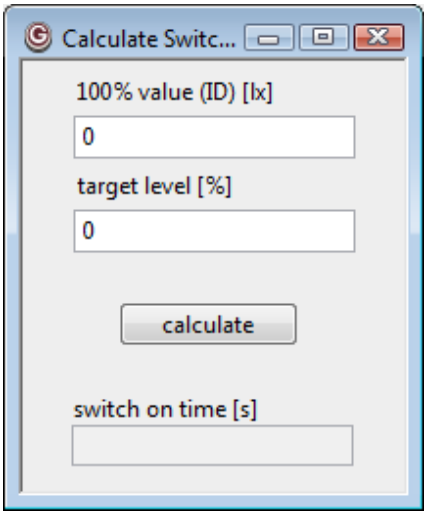


Figure 73: Tools to calculate the switch on time (point of value)

18.2 Analysis: Calculate Radiometric

This tool calculates the radiometric value of you measured spectrum. You have to set the wavelength borders for your desired range and press calculate

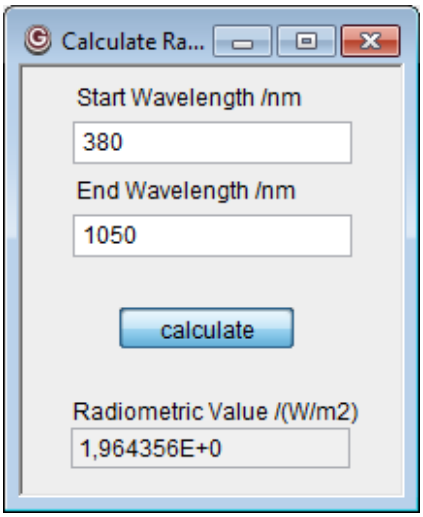


Figure 74: Tool to calculate the radiometric value

18.3 Analysis: Total Flux Calculation

This tool is only available, if you own a goniometer device.

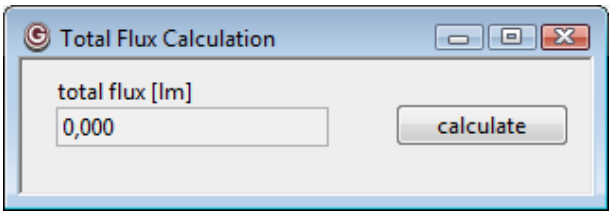


Figure 75: Tool to calculate the Total Luminous Flux

For correct calculation of total flux you have to generate a goniometer sequence with following preconditions:

- Axis 1 (column "A", technical number=0 in sequence file): Start 0°, End 180°
- Axis 2 (column "B", technical number=1 in sequence file): Start -90°, End 90°

The increment should be smaller than 10° to get a total flux with small tolerances.

The smaller you select the increment values the better your result will be.

First select the integral detector. Then click the calculate button and the total flux will be calculated.

18.4 Goniometer Routine: Course Generator

With this tool you can generate a goniometer sequence file, which you can use for goniometric measurement. The algorithm generates an excel file with all positions to be measured. The angles are equidistant. After you have specified start and end position for every axis, click the generate button and save your sequence.

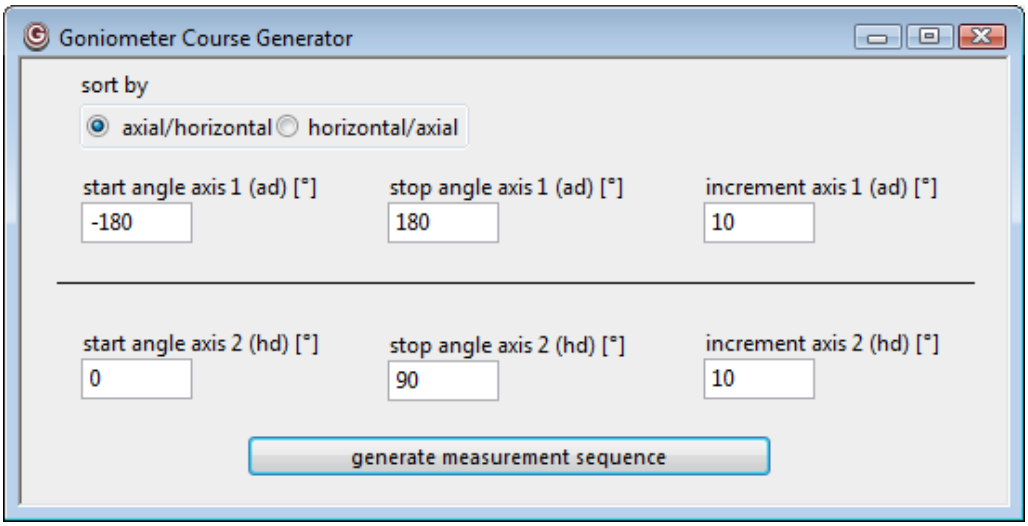


Figure 76: Tool to generate a goniometer course routine

A goniometer sequence file has following format:

There have to be two columns, one for each technical axes numbers. The first row is the header line where each axis is defined. . Number “0” or “A0” matches axis 1 (phi). Number “1” or “A1” matches axis 2 (theta).

The following lines contain the angle for each axis to be driven to for every measurement. There mustn’t be any empty line between single measurements because an empty line stands for the end of the measurement sequence.

18.5 IVL Routine -> Corse Generator

This tool generates an I-V-L Measurement Routine, for use with the I-V-L measurement mode.

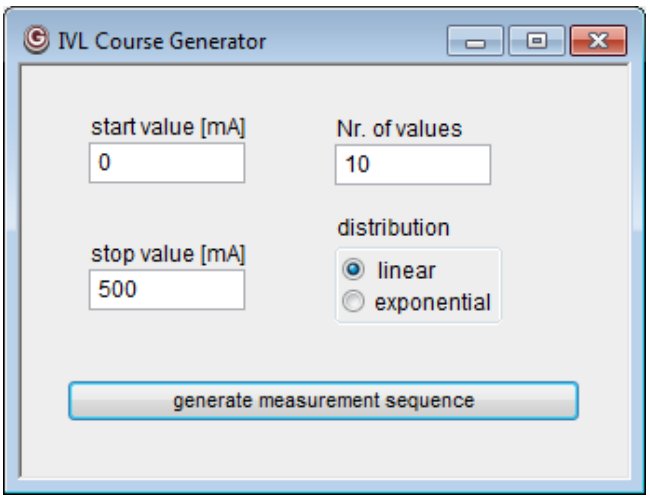


Figure 77: Tool to generate an IVL-Measurement Routine

IVL sequence file has following format:

An IVL measurement routine consists of just one column. The first row is the header and must contain only the letter “I”.

The following lines contain the current values for every measurement. There mustn't be any empty line between single measurements because an empty line stands for the end of the measurement sequence.

18.6 TEC Routine -> Corse Generator

This tool generates a TEC Measurement Routine, for use with the TEC measurement mode. It is very similar to the IVL Course Generator. Instead of current you define values for temperature and delta temperature.

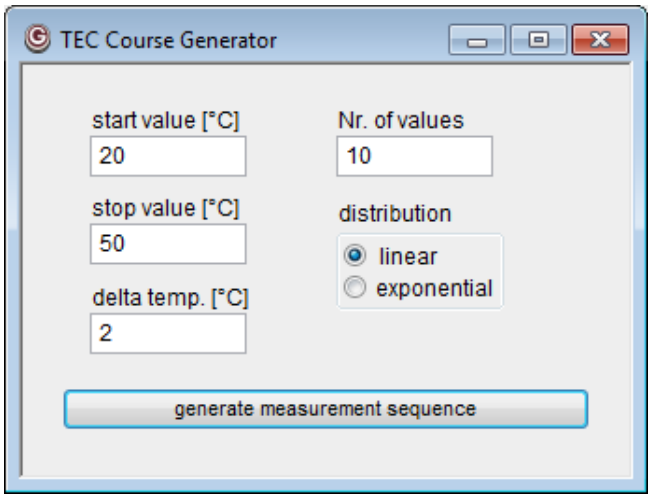


Figure 78: Tool to generate a TEC Measurement Routine

TEC sequence file has following format:

A TEC measurement routine consists of at least one column. The first row is the header and must contain only the letter "T". If you want to specify the temperature range you can add a second column with the header "TD".

The following lines contain the temperature values in the first column and the temperature delta in the second column. One row determines one measurement. There mustn't be any empty line between single measurements because an empty line stands for the end of the measurement sequence.

18.7 Course Spectral Activation Editor

This tool is only available, if you own a goniometer device.

You can open an already generated goniometer course file and edit the third column (spectral enabled). You can define if a spectral measurement should be performed at the specified angle. After you have done all modifications you must save your changes. You can save your changes to a file with the same name ("Save" button) or to file with a different file name ("Save As" button). At the end you can close the screen by clicking the "Close" button.

The spectral measurement at the specified angles will only be done, if you enable spectral measurement within your BTS256 setup screen. You can completely disable spectral measurement in your BTS256 setup screen, even if you defined spectral measurement in your goniometer course file.

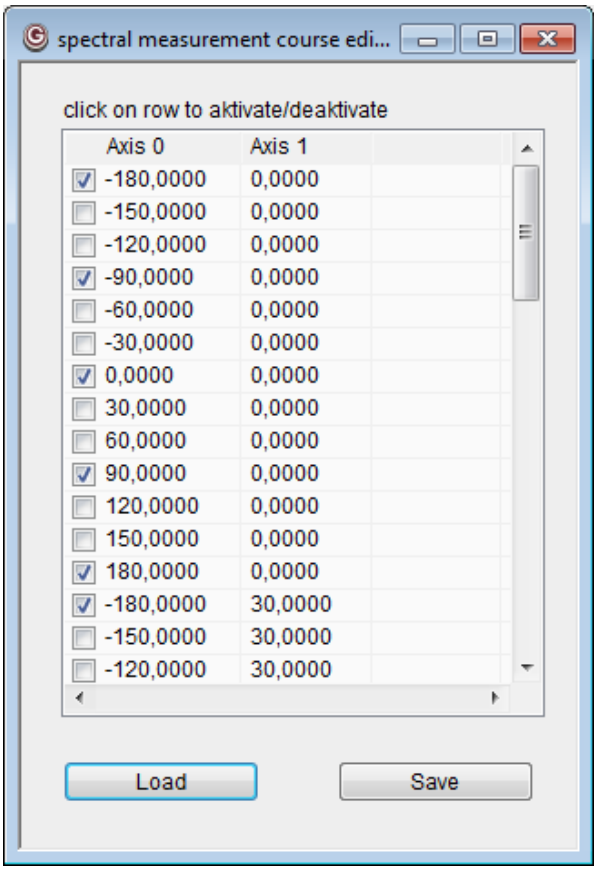


Figure 79: Tool to enable/disable the spectral measurement of your routine

18.8 Create Measurement Script

Only available with the “Measurement Control Tool”

With this tool you can create a file based measurement script. Attention: the creation and usage of a scriptfile is for advanced users only. With a measurement script you can automate your complete measurement cycle and set all software and hardware settings. You can also set the created script as standard routine for other users.

Common Settings

In this tab general settings can be defined.

alarm tone at end of measurement: same as in software settings

close door at the beginning: if you have connected a supported door mechanism to the software it can be controlled here. If this is enabled, the door has to be closed before the measurement can be stated. This is for your safety.

timing: time interval after that a measurement is started

add measurement to data container: enable this, if you want to save the measurement in your database afterwards.

lampfile: select a lampfile if you want lamp information to be added to you measurement.

Qualification test: select a QT file if you want to check you measurement data.

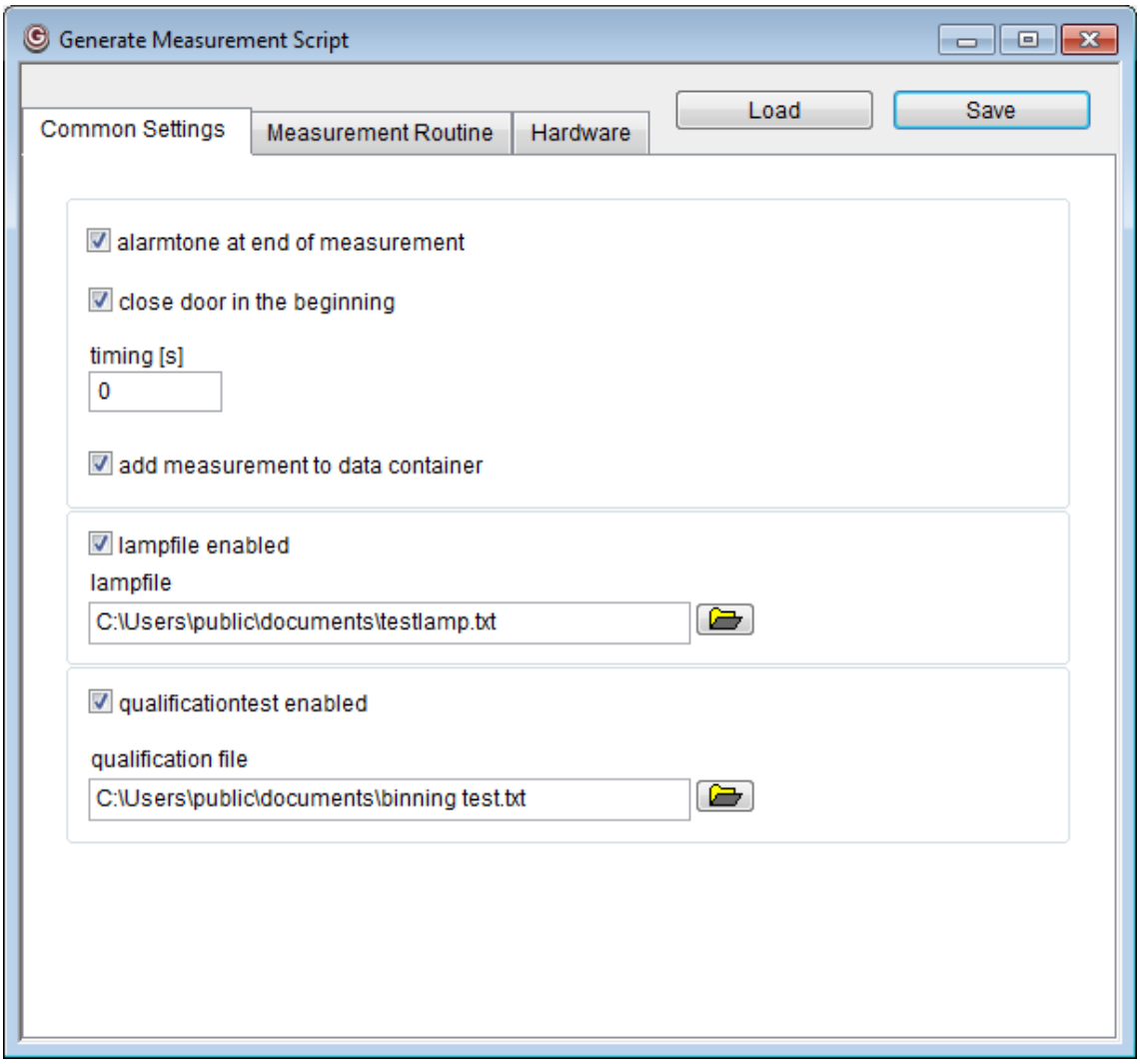


Figure 80: Generate Measurement Script - Common Settings Tab

Measurement Routine

Select if you want to start a single measurement a measurement sequence with additionally routine files or a simple datalogger measurement.

When you choose “measurement sequence” you can select up to two routine files. These files should have been created with the “Course Generator Tools” of this Software.

The primary routine file mustn’t be empty. If no secondary file is selected all file entries will be measured once.

The secondary file is optional. If a file is selected all entries will be measured once with every entry of the primary file. This means, the total amount of measurement will be the amount of measurements in the primary file multiplied with the amount of measurements in the secondary file.

Attention: If you selected a a routine file for a certain hardwaretype (e.g TEC) you have to activate this device type in the Hardware Tab.

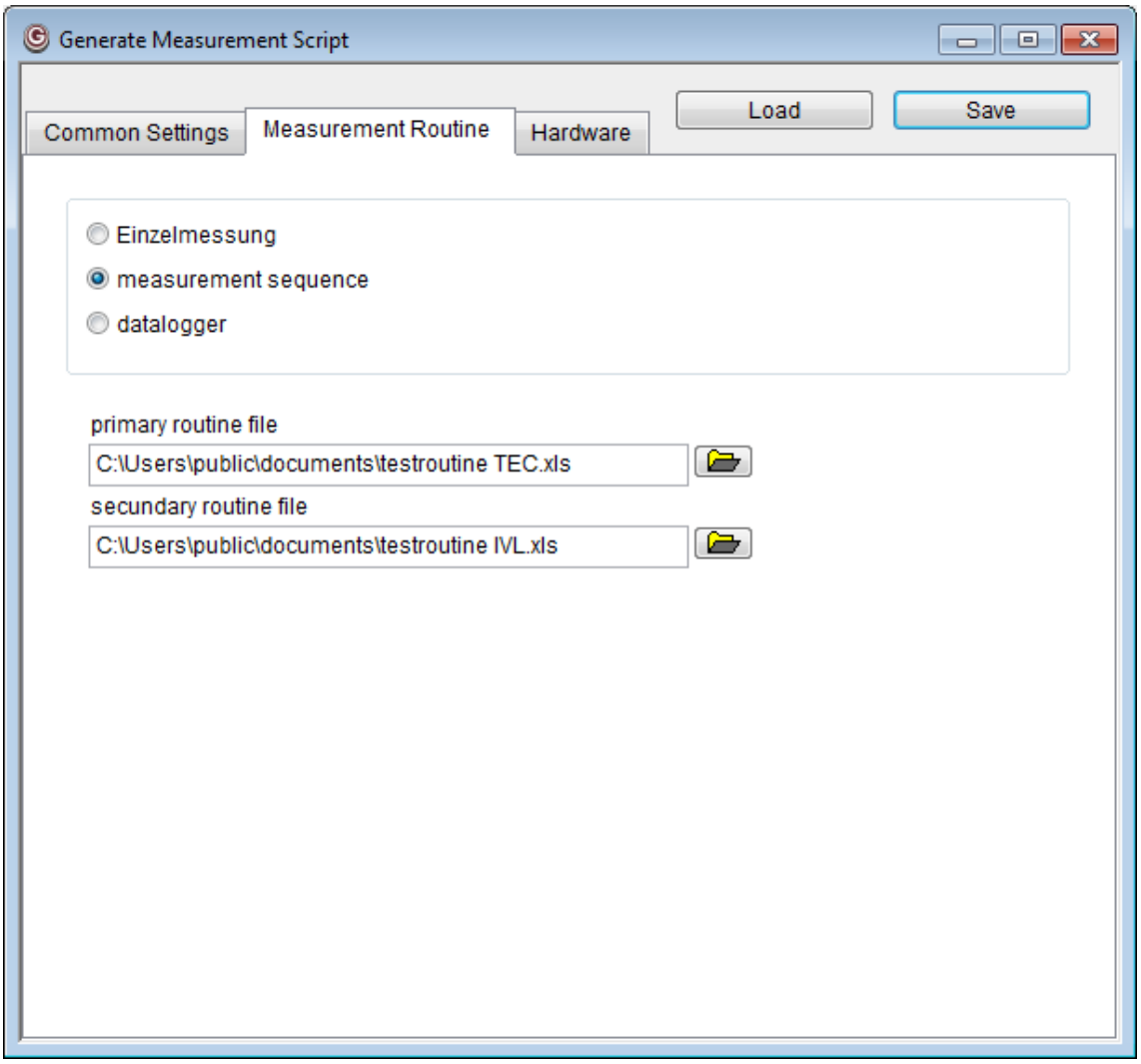


Figure 81: Generate Measurement Script - Measurement Routine Tab

Hardware

In this Tab you can specify the hardware settings of all available devices.

Enable all devices that should be integrated in the measurement. (You cannot disable the Measurement Device)

For each device you can select a Device Setup file. This file has to be generated in the device setup by pressing the “save as” button. If you select no device file, the default device settings will be used for the measurement.

For some devices you can choose a certain device type to be used and you can select a specific serial number. These fields are important if you have more than one devices of the same type otherwise you can leave them empty.

Attention: All of the enabled devices with their specifications have to be connected when the measurement is done otherwise the measurement script cannot be started.

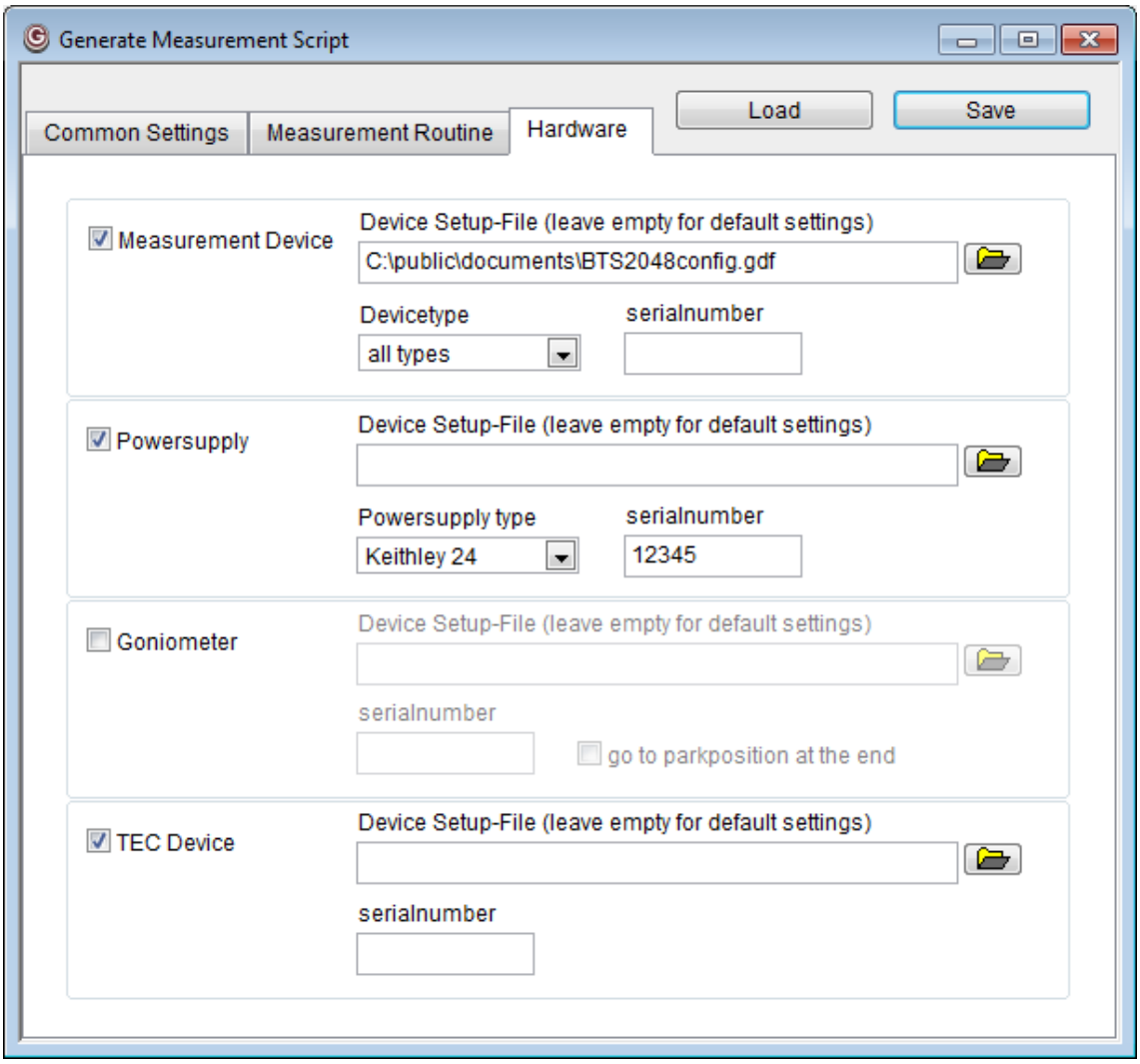


Figure 82: Generate Measurement Script – Hardware Tab

Example: Creating a measurement script for Measurement after DIN 5032-9

One Task could be to measure one specific LED with your BTS2048 in pulse mode under different circumstances. For temperature control you could use the Gigahertz-Optik LEDA-7-TEC-Device and as power supply you could use the Keithley 2420. Let's say you want to do four measurements with temperature set to 40°C and 80°C and power the LED with 200 mA, 400 mA and 600 mA at each temperature. The Keithley and the BTS2048 have to be connected via a trigger line to guarantee simultaneous measurements.

For a measurement script many files could be necessary. We recommend that you save all of them in one folder.

Measurement Routine for the TEC device: Go to "Tools->TEC Routine->TEC Course Generator". Set start value to 40°C, end value to 80°C and set number of values to 2. Choose linear distribution and press "create measurement sequence" and choose a new file to save it to.

Measurement Routine for the PS device: It is created with the Tool from "Tools->IVL Routine->IVL Course Generator". This time choose start value of 200 mA, end value of 600 mA and number of values is 3.

BTS2048 device settings: Open the settings for your BTS2048. For pulse mode it is important to activate the external trigger and you have to set the integral and the spectral range to manual and the dark signal to static. To choose the right range and integration time, do some test measurements with the highest signal you will expect. When you are done with setting up the device, save the settings to a file.

Keithley 2420 settings: Open the settings for your Keithley. To trigger your BTS2048 you have to select the options “automatic measurem. after switch on” and “send trigger after measurement”. The measurement delay sets the time between setting the output on until your measurements should be done. For LED measurements this is normally between five and ten milliseconds.

Create the script: Now it’s time to create the actual measurement script. General settings can be chosen as you want. Under the tab “Measurement Routine” choose “measurement sequence” and select you created TEC-routine as primary routine file and the IVL routine as secondary routine file. In the hardware settings you have to activate “Measurement Device”, “Power Supply” and “TEC Device” and load the Device Setup Files for BTS2048 and Keithley. If you have connected more than one device of the same category choose device type and serial number, to specify the device you want to use. At the End save the Script to a file.

Attention: All file paths are absolute. That means the location of all chosen files mustn’t be changed.

19. Perform your first measurement

Configure your measurement device
- select configuration entry
- select integration times
- ...
- save settings as default

Configure your power supply
- select current value
- select ramp time
- ...

switch on your power supply.
Open data displays
Open graphic displays
Perform measurement by clicking the measurement button (Play) in Navigation Bar
Add measurement to data container
Repeat last two steps some more times
Save your measurements

20. FAQ

The setup button in menu for my hardware device is not enabled.

This means that your hardware device is not recognized by S-BTS2048 application.

Possible reasons:

- Loose cable connection
- Drivers are not installed properly

- Device is not connected to power supply
- Device is switched off
- You connected a device with different serial number.

Check, if the structure of delivered configuration files in datauser folder, as described at the end of the documentation is the same as delivered files, because structure changed a bit since earlier versions of Gigahertz-Optik software.

Is it necessary to connect hardware?

No. Not at all. You can run the software without hardware connected. No measurement can be done in this case. But you can load saved measurements and step through and have a look at them.

Why are measurement values not plausible?

Please check, if you already loaded a detector head configuration file in measurement setup screen and selected the correct configuration entry for your measurement needs.

Why doesn't the goniometer move?

Go to setup of your goniometer and click the "goto reference position" for both axes. This has to be done after each program start. Otherwise the goniometer won't move. This is done because of security purposes.

I can't see a menu because a view of my application is in front of it?

It's a bug that sometimes views move over the main menu after program start.

Just click into the view and press Alt+F4 key. You can open the view again from the "Views"-menu.

My Loci do not appear in CIE Plot after Software Update

Loci are no longer defined in the "colorFields.goi"-File. A new file called "userLoci.goi" has to be created and the Loci have to be copied there manually. For more Information see the point "userLoci.goi" in the next Chapter.

21. Additionally files

devices.goi

In this file, all additionally hardware devices are specified. If you just use the BTS2048 device this file is not necessary.

Following example contents definition of one measurement device and two power supplies:

```
[power devices]
quantity=0

[power device 1]
type=LPS25
serial=4116

[power device 2]
type=LPS20
```

serial=8765

[goniometer devices]
quantity=1

[goniometer device 1]
type=GBD
serial=4025

userLoci.goi

Binning fields are defined in a configuration file, called “userLoci.goi”. This is an ASCII-file, which has to be created manually and can be modified with a text editor. These Loci will be displayed in the Menu “Loci->user Loci”.

Every binning field that should be visualized in the CIE 1931 diagram has to be defined in this file. It’s defined by a section called “locus” followed by a unique number e.g. [locus1] First locus number has to be ‘1’. Following loci must be consecutively numbered: ‘2’, ‘3’, ‘4’, ….

Following parameter can be set for a locus:

- name: This is the name of the locus which will be shown in the graphic to identify it. It will be placed right below the first vertex.
- type: If values are defined in xy value space then type = 0; if values are defined in u’v’ value space then type = 1.
- nrOfVertices: this is the number of vertices used to define the locus
- cyclic: ‘1’ if the last defined vertex should be connected with the first one to build a closed line; ‘0’ if the last defined vertex should not be connected with the first vertex
- vertex1, vertex2, vertex3, …: the ‘x’ and ‘y’ color values resp. u’ and v’ color values depended from previous defined type, that have to be separated by tab space. Values defined in xy color space will be converted to u’v’ color space if visualized in CIE 1976 and vice versa.

example for first locus definition:

[locus1]
name=0S
type=0 // -> vertices defined in xy color space
nrOfVertices=4
cyclic=1
vertex1=0,2870 0,3210
vertex2=0,2937 0,3312
vertex3=0,2962 0,3220
vertex4=0,2895 0,3135

When every locus is defined you can combine them to many sets. A locus can be used in more than one set. In the graphic you can switch on/off every set separately.

The locus sets must be numbered consecutively. Index of first locus set is ‘1’.

Following parameters can be set for a locus set:

- name: This is the name shown in the bottom part of the graphic for switching it on/off.
- loci: A set of locus indices separated by comma. A locus index can be used in more than one locus set.

Example for first locus set. It combines locus number 1, 2, 5 and 7 to be shown at once.

```
[locusSet1]
name=set number 1
loci=1,2,5,7
```

Last but not least a header section, called [general] has to be defined

- The first parameter nrOfLoci defines the number of loci defined in this configuration file.
- The second parameter nrOfLocusSets defines the number of locus sets defined in this configuration file.

Example for a complete “userLoci.goi” configuration file with 4 loci and 2 locus sets:

```
[general]
nrOfLoci=4
nrOfLocusSets=2

[locus1]
name=0S
type=1
nrOfVertices=4
cyclic=1
vertex1=0,2870   0,3210
vertex2=0,2937   0,3312
vertex3=0,2962   0,3220
vertex4=0,2895   0,3135

[locus2]
name=0B
type=1
nrOfVertices=4
cyclic=1
vertex1=0,2895   0,3135
vertex2=0,2962   0,3220
vertex3=0,2984   0,3133
vertex4=0,2920   0,3060

[locus3]
name=0A
type=1
nrOfVertices=4
cyclic=1
vertex1=0,2920   0,3060
vertex2=0,2984   0,3133
vertex3=0,3009   0,3042
vertex4=0,2950   0,2970

[locus4]
name=0R
type=1
```

```
nrOfVertices=4
cyclic=1
vertex1=0,2950   0,2970
vertex2=0,3009   0,3042
vertex3=0,3037   0,2937
vertex4=0,2980   0,2880

[locusSet1]
name=set number 1
loci=1,2,3,4

[locusSet2]
name=set number 2
loci=2,4
```

22. Release notes

V2014.1

Initial release

V2014.2

New: minimum wavelength step width 0.25nm (old: 1nm)
Bugfix: Communication instability
Bugfix: Memory leaks

V2014.3

New: All open views are shown in menu “view”
Bugfix: Number of scans in setup window could not be set

V2014.4

New: New data types in “any data screen”
New: Performance improvements
New: Flux calculation improvements (better results)
Bugfix: Desktops could not be reloaded under certain circumstances

V2015.1

New: Window management
New: Measurement/Status view; you can now set a comment for each measurement
New: CIE Lab color space
New: Color Quality Scale (CQS) added, including new required views
New: I-V-L Measurement mode and I-V-L Curve view
New: German Language added
New: support for the new internal trigger mode
Update: Ability to work with several power supplies and goniometer devices
Update: Added functions to the spectrum view and the datalogger view
Update: New functions in the Any Data Window
Update: IES Export adjusted to the standard
Update: The loci functionality was changed and some loci where added

Bugfix: Some error when saving exported files
Bugfix: Fixed some calculation errors

V2015.2

New: Invention of the Navigation Bar
New: Full Support for BTS2048-UV and UV-S
New: Support of Cooling for TEC Devices
New: Color-Binning for all Loci
New: Tool Calculate Radiometric
New: Calculation of relevant weighting functions
New: On first software start a default desktop is loaded
New: Restore unsaved data after SW-Crash
New: Info on how long a Datalogger Measurement will last.
Update: Substitution Correction more intuitive
Update: simplify Recalibration
Update: Combined some measurement routines for simpler usage
Update: Redefinition of the user specific Loci
Update: Implementation of all Setup Screens
Update: EULUMDAT and IES Export more user friendly
Update: Warning when Device is disconnected
Bugfix: Report shows all selected Plots

V2015.3

New: Application Menu with new structure
New: Software settings in its own window
New: Licence Management and activation of certain tools
New: Scriptbased Measurement Mode
New: User Management
New: Lamp Preferences
New: Qualification Test
New: Hardware Support for Keithley 24 Series
New: Hardware Support for temperature controller and temperature sensors
New: Hardware Support for Door Controller
New: Straylight Measurement Mode for BTS2048-UV
New: automatic a* mode
New: Substitution Calculation for Geometry
New: Rescaling of a calibration
New: Showing the filtername in the device setup
New: Export of the test measurement
Update: Hardware Reinitialization of all devices
Update: added a lot relevant device settings to measurment settings view and DB
Bugfix: Linearization with long integration times (TEC-devices)
Bugfix: Display of right integral and radiometric value
Bugfix: Combi Measurement with BTS2048-UV

V2016.1

New: spectral Plot has now logarithmic scaling
New: Recalibration and Rescaling can now be saved to user calibration entries.
Update: Qualification Test Criteria where added to the view, DB and export
Update: Lamp-Data was added to the report
Update: Rename of a(Z) and substitution correction
Bugfix: Measurement Time is now updated correctly
Bugfix: Warning after Integral and Spectral Overload
Bugfix: IVL and TEC Routine had an error when choosing one datapoint

V2016.2

New: Display of TM-30-15 (Data and Plots)
New: Support for LPS27
Update: Spectral Plot: Legend for added Plots and logarithmic display
Update: Additional common values to export
Bugfix: Progress Bar in Datalogger

V2016.3

New: Observer 10° (Color Calculation)
New: Advanced Noise Reduction
Update: Performance Optimization for TM-30-15
Update: Set max wavelength-range in config window
Bugfix: Blocked UI in config after measurement
Bugfix: Error handling for diode measurement
Bugfix: status update for cooling on bur not ok (TEC-devices)
Bugfix: integral calculation of distance
Bugfix: communication error with long integral integration time

V2016.4

New: Tool for Measurement Transmission
Update: Generate pixelbased Spectrum
Bugfix: Software doesn’t freeze during Measurement

V2016.5

New: dynamic Noisereduction for different Light-Sources
New: High Resolution Measurement
Update: Transmission added to Report
Update: Keithley now supports Pulsemode
Bugfix: some fixes for Combi-Measurement with UV-Devices

V2016.6

Bugfix: TEC temperature ranging

V2017.1

Update: Calibration now performs High Resolution Measurement
Bugfix: Export > 50 Datasets

V2017.2

New: Calibration Mode 2 for more than one calibration lamp
New: High Resolution Mode for UV-Devices
Bugfix: Radiometric Value Calculation
Bugfix: Standard Calibartion Mode

V2017.3

New: CIE 170 Color Plots and Displays
New: automatic “scale by diode”-mode
Update: solar-BP measurement for UV-Devices
Update: BTS2048 Device Setup
Bugfix: Self-Absorbtion Correction

V2018.1

New: Settings for data export
Bugfix: Unknown Integral Error Message
Bugfix: LAN Initialization

V2018.2

Update: Performance ppdate when using number of scans
Bugfix: Popup and Translation for Error Messages

V2018.3

Update: USB and LAN Communication optimization
Update: FWHM, Centre- and Centroid Wavelength for BTS2048-UV
Update: premeasured OOR Streylight Mode
Bugfix: a* differences in CW measurement mode