



iQ-LED

Software V3.3.1

User Manual

16. September 2020



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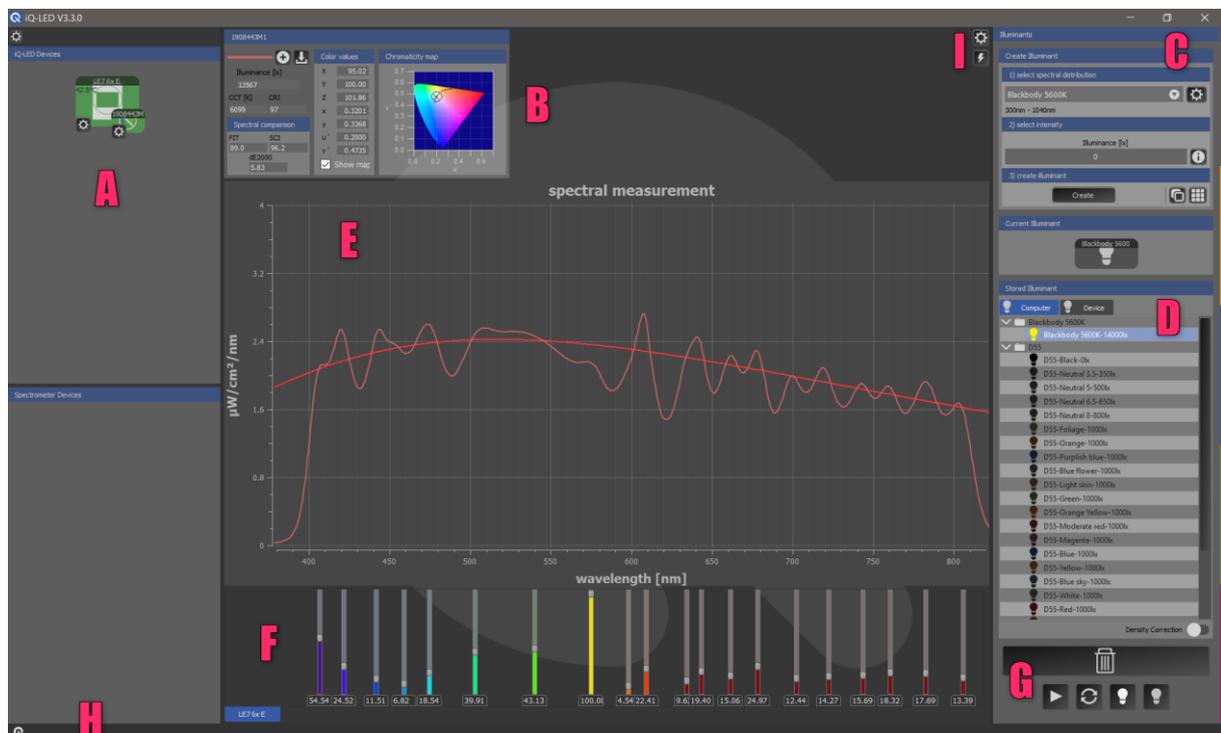
1 INSTALLATION

The iQ-LED control software is available in 64bit.

Start the installer 'setup_iqled_winXX_3.0.0.exe' and follow the instructions.

2 OVERVIEW / GLOBAL SETTINGS

The iQ-LED is a flexible light source based on an LED-array that is separated into 20 unique narrow-band LED channels. This module can be used as a single light source, or it can be part of an array consisting of multiple iQ-LED units acting as one larger light. With the ability to control each channel individually, standard illuminants can be reproduced with high accuracy. Custom illuminants with free configurable spectra can also be created. The iQ-LED control software provides the tools for an efficient workflow with the iQ-LED supported products.



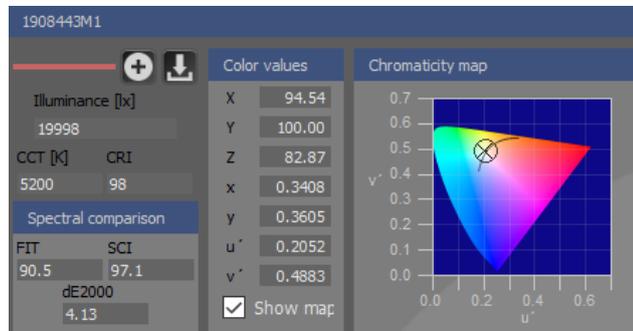
The interface of the iQ-LED control software is divided into multiple sections

- **Section A: Devices Section**
This section displays the connected devices (with temperature information). This section is where the devices can be activated and manipulated. An iQ-LED device always includes an illumination device and a spectrometer. If you want to use an iQ-LED device without a spectrometer, you have to remove the spectrometer in the device manager. Single spectrometer devices (such as the EX1 or EX2) are shown in the lower section. Click on the device to activate its functionality. An activated device will be highlighted with a green background.
- **Section B: Measurement results panel**



This panel shows the actual measurement values:

Illuminance in lux, Correlated Color Temperature (CCT), Color Rendering Index (CRI), the color values XYZ, x y, and $u' v'$. It also shows the spectral comparison values FIT, SCI, and dE2000 of the selected spectrometer (for more information about the values, see 4.6 Measurement results).



Measurement results panel

Press the  button to export the spectrum as a txt file. The color values will be stated in the header of the txt file. The  button will export the current measurement to the 'manage Spectra' area (see chapter 4.2). Right-clicking on the chromaticity map provides the option to switch between the x y and $u' v'$ plots. The Planckian locus can also be added to or removed from the plot. Remove the map by unchecking "Show map."

- **Section C/D: Illuminants Section**

Select spectral distribution and intensity to create and store different illuminants. With drag and drop control, you can store a current illuminant, where it will appear in the list (E). You can store up to 44 illuminants on the device. Delete an illuminant by dragging and dropping it into the wastebasket symbol or by marking several illuminants and then pressing the wastebasket symbol.

- **Section E: Spectral measurement Section**

The current measurement and the selected reference spectrum are displayed in this section. Zoom in and out using the click wheel. Click into the window to auto-scale the spectral measurement. It is also possible to set the "Measurement range" and the "Visual display range" here. Click on the gear wheel on the top right to change these settings (Section I).

- **Section F: LED control panel**

Control the intensity of each LED channel by sliding the 20 LED channels up and down.

- **Section G: Control Section**

Open the sequence tool, regenerate all stored illuminants, and turn all channels to the maximum or off.

- **Section H: Status Bar**

This bar displays warnings as well as the status of the last operation.

- **Section I: Global Settings**

Range setting, Fit calculation, Flashtester, Data folder



SECTION I, Global Settings:

Range Settings

Measurement range:

Set the best spectral range for all calculated values that are displayed in section B.

Visual display range:

Set the range for the displayed spectral measurement window shown in Section E.

Range settings

Measurement range

From 380 To 820 Set Default Default IR

Visual display range

From 380 To 820 Set Default Default IR

NOTE:

When you change the “Visual display range,” all 20 sliders may not be displayed!

Fit calculation

Change the algorithm of the fit calculation. It is recommended to use the ‘global fit’ calculation. To learn more about the fit calculation and the difference between ‘local’ and ‘global’ please contact the Image Engineering support.

FIT calculation algorithm

Local Global

Flashtester

You can measure the spectral characteristics of your flashlight. This measurement should be done in a dark environment. First, click on the gear wheel to configure the Flashtester and set the duration of the measurement in the “Main settings” tab. In the “Spectrometer settings” tab, you can set the integration, the binning, and the scans to the average. Be sure to set a higher integration time because a lower time won’t catch the flash and the spectrometer will never reach saturation. You will receive a warning message if your integration time is too low (we recommend an integration time between 50 and 100 ms, it is also possible to increase the distance from the spectrometer and the flashlight). Once the settings are established, close the menu and press the “flash button” to immediately begin the measurement. The measured spectrum can be exported (see B: measurement results panel).

Flashtester

Main settings

Duration 5 sec

Spectrometer settings

Integration Time [ms]: 1.1

Binning: 3

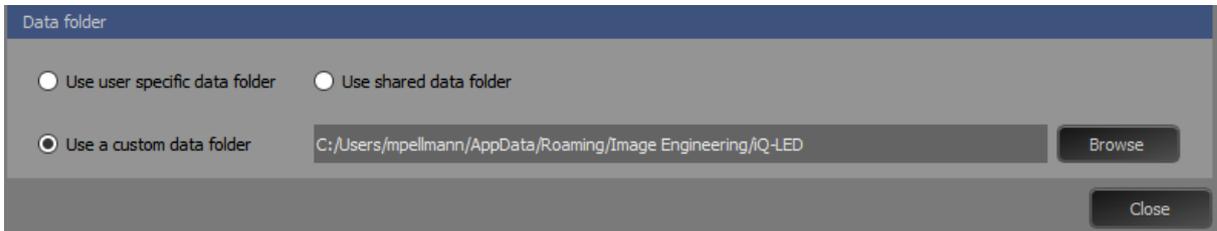
Scans To Average: 5

Configure the Flashtester



Data folder

You can set different data folders to share the generated database of devices, illuminants, or sequences.



Set the data folder

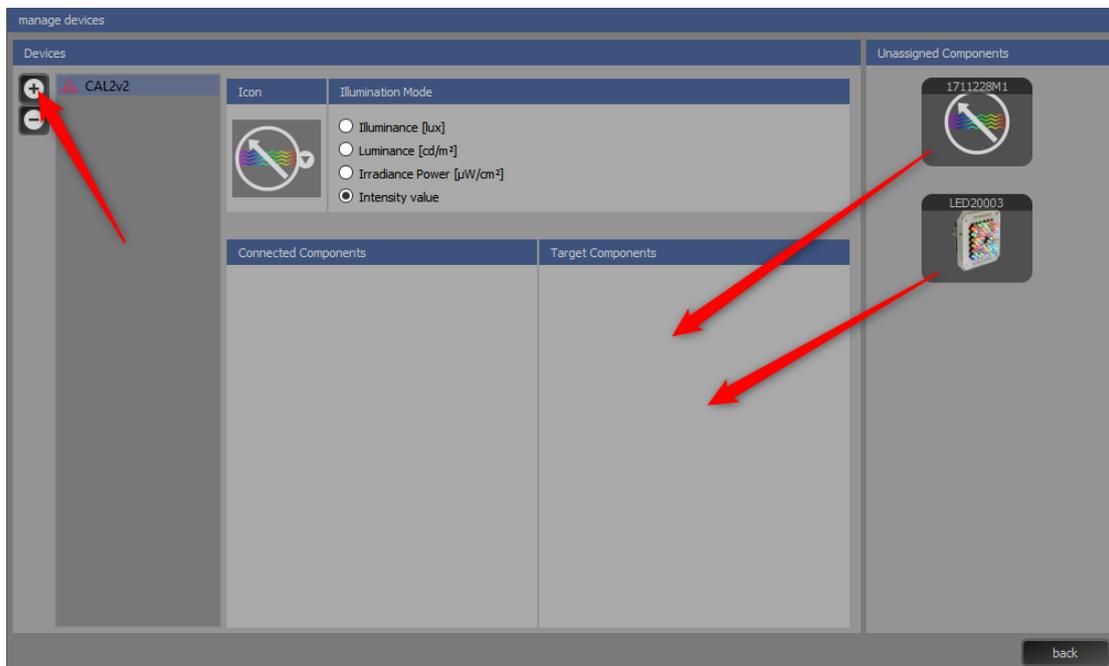
Multiple submenus can be accessed over the gearwheel symbols in the respective section.

3 INITIAL SETUP

NOTE:

Please read the following chapter carefully. The iQ-LED devices can only operate with high precision when setup and calibration are performed correctly.

Open the device manager by selecting the gearwheel symbol in the upper left corner of the device section. If you're using your device for the first time, the gear wheel will be marked red. Here you can manage your iQ-LED and spectrometer devices.



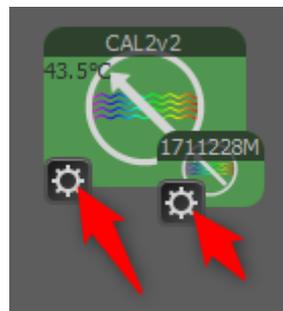
The device manager

The spectrometer and the iQ-LED of the supported devices are recognized by the system as single devices and are therefore interchangeable. Create a new device with the “+” button and rename it by



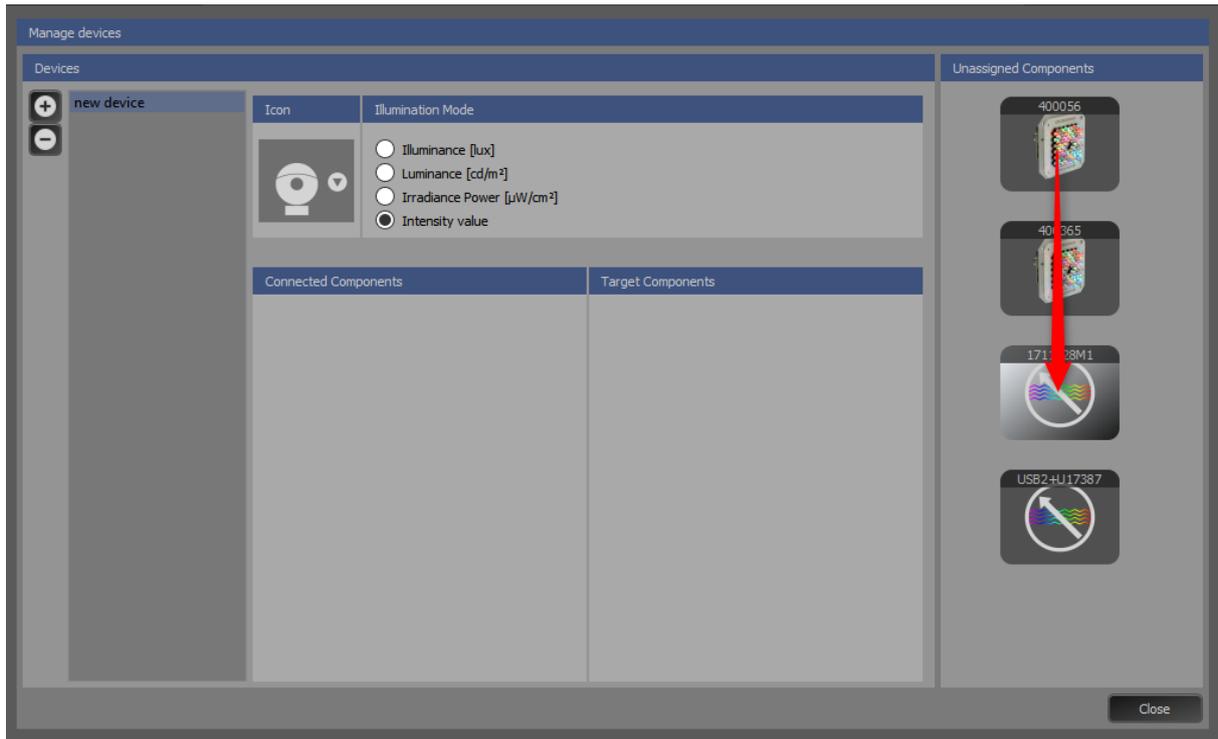
double-clicking the name. You can drag the desired components into the free field of the target components. If you are using a device with an internal spectrometer, declare the components as one device. Devices with external spectrometers can be created without a spectrometer, but the spectrometer must be assigned for generating a new spectrum or measuring a custom illuminant. If you use the device without a spectrometer, you also have to remove the spectrometer in the device manager by dragging it back to “unassigned components.” If you are only using a spectrometer (such as EX1 or EX2), then only add the spectrometer. The software will automatically allocate a symbol for the device, but this also can be changed by selecting the symbol menu. The intensity measurement mode can also be changed here. Please note: for a correct illuminance measurement you have to set a compensation factor. This can be done in the spectrometer settings. The selected Illumination mode will appear in the measurement results panel and illuminants section.

The created device will appear in the device section, after leaving the device manager. Each component has a separated settings menu. You can enter the menu by selecting the gearwheel symbol on the desired device. In the window of the new device, the temperature of the inbuilt iQ-LED array will be displayed.



Separated setting menu

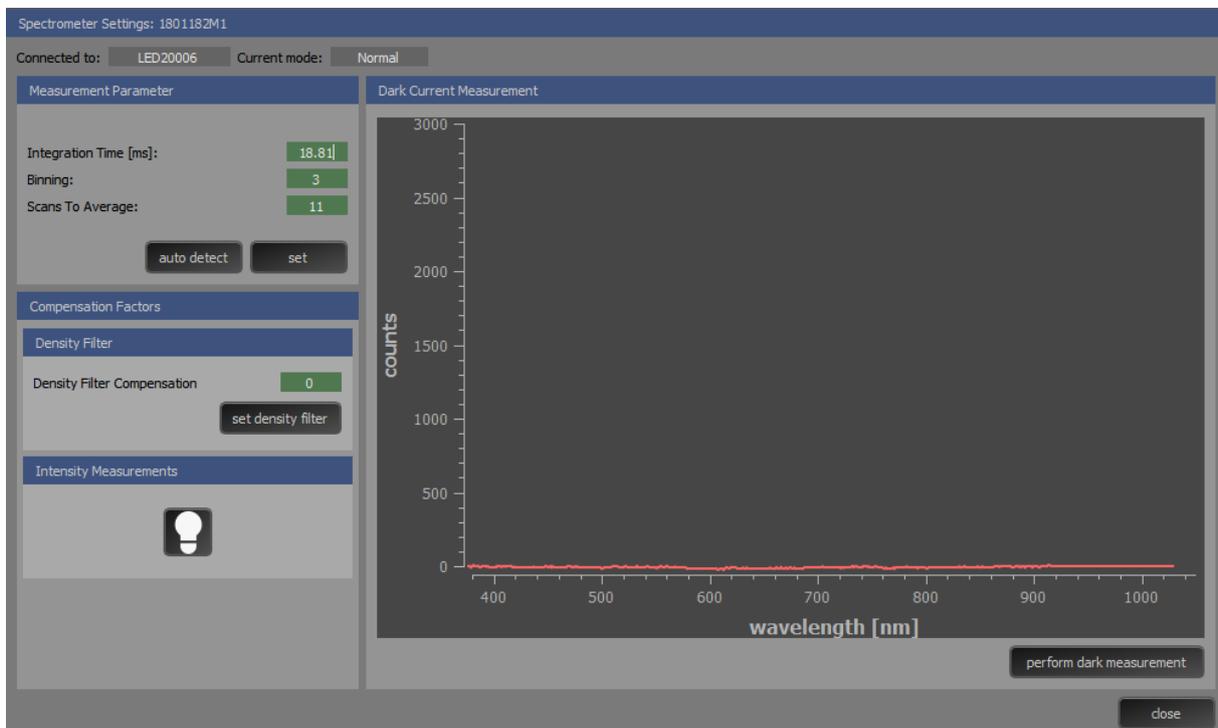
If you connect more than one spectrometer, you can check, while continuously pressing the left mouse button on the iQ-LED symbol, which spectrometer belongs to the iQ-LED. The spectrometer symbol turns into light gray. After that, you can create a new device.



Device manager

3.1 SPECTROMETER SETTINGS

Please set the spectrometer settings **before** calibrating the iQ-LED device.



Spectrometer settings menu



3.1.1 MEASUREMENT PARAMETERS

The iQ-LED software (see iQ-LED software manual) automatically generates the best spectrometer settings for your lighting condition after pressing the “auto detect” button. For special applications, it is also possible to set the spectrometer settings manually, you can store these settings by pressing the ‘set’ button. If you have further questions, please contact the Image Engineering support team.

If you don’t use the “auto detect button” please ensure to set the following measurement parameters before performing the dark current measurement. It is of particular importance that no ambient light can enter the device or the spectrometer during the calibration.

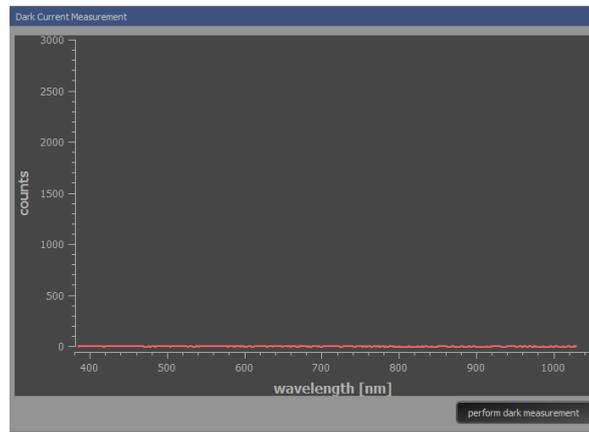
- **Integration Time:** Period for the measurement, comparable to the exposure time for photographic cameras. The higher the integration time, the longer the detector monitors the incoming photons. If your measured intensity is too low, increase this value. If the intensity is too high, decrease this value. You can enter values in milliseconds from 15 – 600 into the input field.
 - It is also possible to enter a manual integration time.
 - To save the integration time, press the “set” button.
- **Binning (Boxcar width):** number of pixels (supporting points) summarized for the measurement. Higher numbers will result in larger steps in wavelength.
 - It is also possible to enter a manual binning.
 - To save the binning, press the “set” button.
- **Scans for average:** Specifies the number of discrete spectral acquisitions the device driver accumulates before the software receives a spectrum. The more scans to average you use, the slower your system will measure.
 - While pressing the “auto detect” button, the scans for average will be calculated automatically for your lighting conditions.
 - It is also possible to enter a manual scan for average.
 - To save the scans for average, press the “set” button.

The choice of the right parameter depends on the device type you are using. Some guidance values are stated in the corresponding device manual.



3.1.2 DARK MEASUREMENT

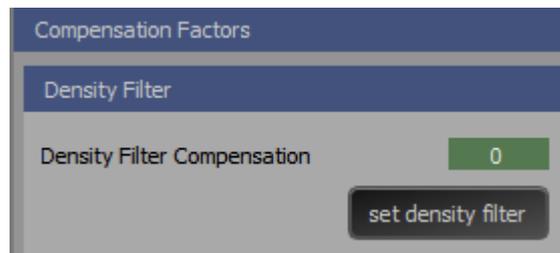
Please ensure to set the measurement parameters before performing the dark current measurement. The dark current will be subtracted from the results when performed correctly. We recommend to perform the dark measurement (as well as the usage of your device) without any ambient light. The dark curve could look different depending on the spectrometer. In any case, without ambient light you will see a flat line:



Dark measurement

3.1.3 COMPENSATION FACTORS

When you use a neutral density filter to reach low light conditions, you can set a neutral density compensation factor. We recommend to name your new generated illuminants with the abbreviation "ND" (for example: D50-2000_ND) that you can distinguish the illuminants.



Compensation factor density filter

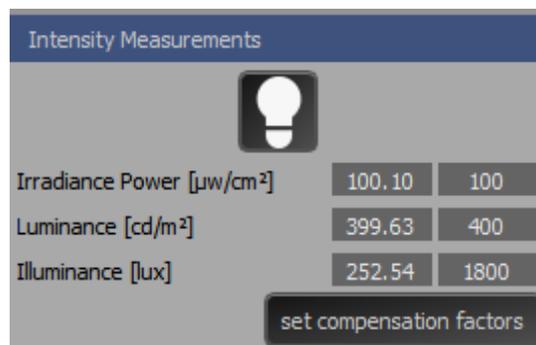


You can activate the density correction in the illuminant section E (see chapter 2 Overview). All currently shown values in the illuminance and measurement sections will change to the corresponding density correction factor.



Activate density correction

The iQ-LED device provides a relative measurement but it is possible to calibrate it with an external measurement device. In this case, activate the intensity measurements submenu by clicking on the lightbulb symbol. Measure the desired parameters with a suitable method (e.g., lux meter or luminance meter) on the corresponding place. Enter the results into the corresponding fields in the intensity measurements menu while measuring with the spectrometer. The compensation factors will be calculated automatically. Now you can generate illuminance spectra exactly with the desired intensity. Every iQ-LED illumination device is calibrated before delivery. The compensation factors are stated in the corresponding calibration protocol. We recommend to check the compensation factor before every spectral calibration. When you change the compensation factor, you have to do a new spectral calibration (see 4.2.2).



Compensation factors intensity measurement



3.2.2 SPECTRAL CALIBRATION

Light emitting diodes degrade over time. This process decelerates after the first 500 operating hours. As a result, the calibration of the light source needs to be performed regularly. In the first 600 hours, we recommend every 50 operating hours. After the first 600 hours, we recommend every 150 operating hours. It is of particular importance that no ambient light can enter the device or the spectrometer during the calibration. Select the “create new calibration” button and wait until the calibration process is finished. For further information, check the device manual. The ‘export’ button will export all LED channel measurements as txt files (txt files: 01 - N: single channels / 00: all channels maximum).

You can refresh , add new  or delete  calibrations. You can rename a calibration by double-clicking its name.

After recalibrating your system, you have to regenerate all your stored illuminants; this is done by pressing the circle arrow button in the control section.

Some devices may react with different intensities or spectral measurements when changing the hardware setup (e.g., different charts in the LE7). As a result, there can be different calibrations for one device. Please note that all stored illuminants correspond to the selected calibration. With a double-click on the calibration, you can rename it.

3.2.3 ADVANCED SETTINGS

In the advanced settings, you will see different data from your connected iQ-LED array.

With the PWM (pulse-width modulation) switch, you can change the PWM from the LEDs to 128 kHz. This change is necessary if you select short exposure values on your camera. However, this reduces the steps of the light intensity from 4000 steps to 1000 steps. As a result, generating illuminants with very low intensities will produce better results when using the 32 kHz mode. After switching the PWM, a spectral calibration and regenerate of all illuminants is needed.

Advanced settings

	Module Id: 1	Module Id: 2	Module Id: 3	Module Id: 4	Module Id: 5	Module Id: 6	Module Id: 7	Module Id: 8	Module Id: 9	Module Id: 10
T max	40.0°C	40.0°C	40.0°C	39.5°C	39.5°C	39.5°C	39.5°C	39.5°C	40.0°C	39.0°C
T mean	39.8°C	39.9°C	39.6°C	39.0°C	38.9°C	39.4°C	39.4°C	39.4°C	39.1°C	38.4°C
T sensor1	39.5°C	39.5°C	39.5°C	39.0°C	39.0°C	39.5°C	39.5°C	39.5°C	39.0°C	38.5°C
T sensor2	39.5°C	40.0°C	39.5°C	38.5°C	38.5°C	39.0°C	39.0°C	39.0°C	38.5°C	38.0°C
T sensor3	40.0°C	40.0°C	39.5°C	39.0°C	38.5°C	39.5°C	39.5°C	39.5°C	39.0°C	38.0°C
T sensor4	40.0°C	40.0°C	40.0°C	39.5°C	39.5°C	39.5°C	39.5°C	39.5°C	40.0°C	39.0°C
Timelap	80 min									
Timetotal	80 min									
Consumption	0,1	0,1	0,1	0,1	0,2	0,1	0,1	0,1	0,1	0,2
Power	1,5	0,9	0,9	0,9	2,9	0,9	0,9	0,9	0,9	2,9
Voltage	12,1	12,2	12,0	12,1	12,1	12,1	12,1	12,1	12,1	12,1
Heating	off	off	off	on	on	on	on	on	off	on
HeatOn at	39,0 °C									
HeatOff at	40,0 °C									
Fan	off									
FanOn at	44,0 °C									
FanOff at	43,0 °C									
PWM Clock	32 kHz									

PWM clock mode 32 kHz (4000 steps)

close



3.3 STANDALONE ILLUMINATION DEVICES

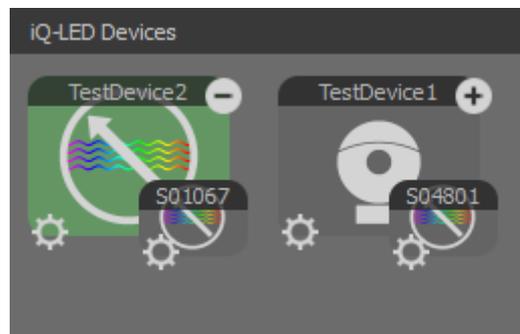
When using illumination devices with an external spectrometer (e.g., CAL2 or iQ-Flatlights), you have to assign the spectrometer to the device you want to measure. If you have multiple illumination devices, reassign the spectrometer in the device manager menu, corresponding to the measuring device.

For further information on standalone spectrometer options, please read chapter 6 External Measurement.

3.4 SELECT DEVICES / DEVICE GROUPS

Select a device by clicking on the symbol. A selected device will be marked with a green background. The spectrometer, which is connected to the device, is shown in the lower right corner of your device. It also can be activated by a click and will also be marked with a green background.

Depending on the use case, it can be convenient to combine multiple devices in one group.



Group devices

Select an illumination device and add other devices with the  - button. Use the  - button to remove a device from the group. All Illuminants, generated for the group, will also be available for each individual device. If you create a new illuminant, it will be generated for the whole group.

4 ILLUMINANTS

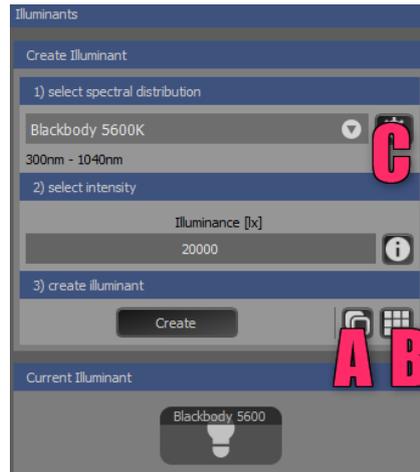
The iQ-LED control software provides you the possibility to recreate standard or customized illuminants. The following chapter explains how to use standard illuminants and how to create custom illuminants.

NOTE:

You need a spectrometer to generate an illuminant and to determine the maximum possible intensity (press “i” button) for the illuminant.

4.1 PREDEFINED ILLUMINANTS

On the right side of the main menu, you will find the illuminants section. All predefined or self-created illuminants are accessible from the drop-down menu.



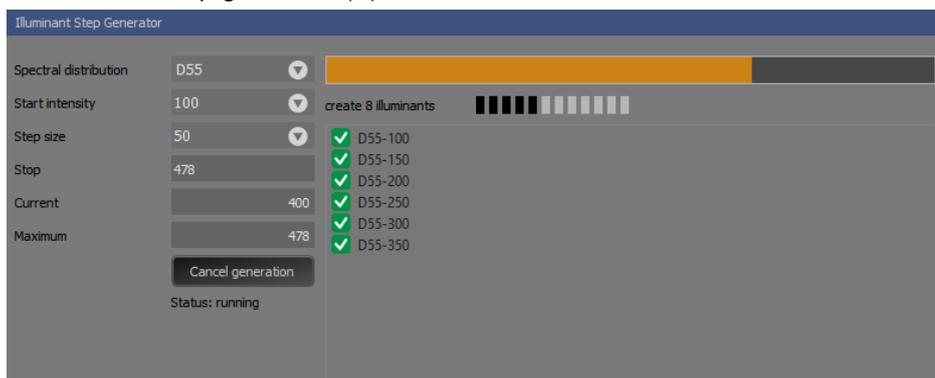
Illuminants section

- 1) Select a standard or predefined illuminant via the drop-down menu.
- 2) Choose the intensity. The “i” button provides information about the maximal possible intensity for the selected spectrum. You can scale the intensity by entering a number smaller than the one displayed.
- 3) By clicking the “create” button or pressing enter, the chosen illuminant will be created and shown as the current illuminant. If your spectrometer is activated, you will see the corresponding spectral measurement together with the illuminant reference curve in the spectral measurement window.
- 4) You can store the current illuminant by dragging and dropping it into the ‘stored illuminants’ list.

If you want to create more illuminants in defined steps, you can use the Illuminant step generator “A”.

You can generate 24 color patches with a given Illuminant using the color patch generator “B”.

Illuminant step generator (A):

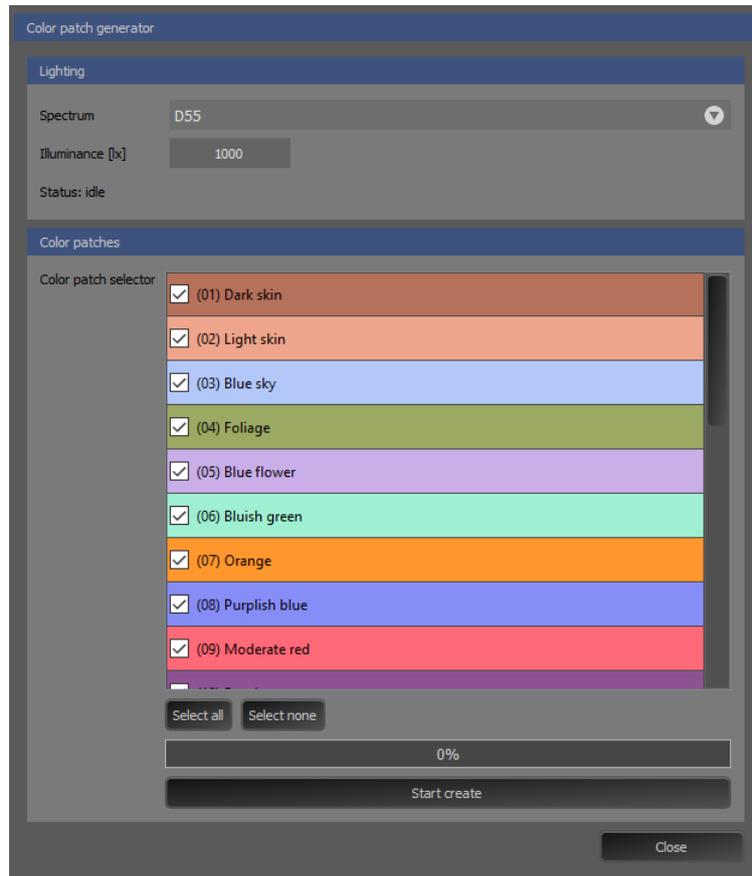


Illuminant Step Generator

- (1) select the spectral distribution (D65, D55, etc.)
- (2) select the start intensity value
- (3) select the step size
- (4) set the stop intensity value
- (5) shows what the current illuminant is creating
- (6) shows the maximum intensity value for the generated illuminant



Color patch generator (B):



Color patch generator

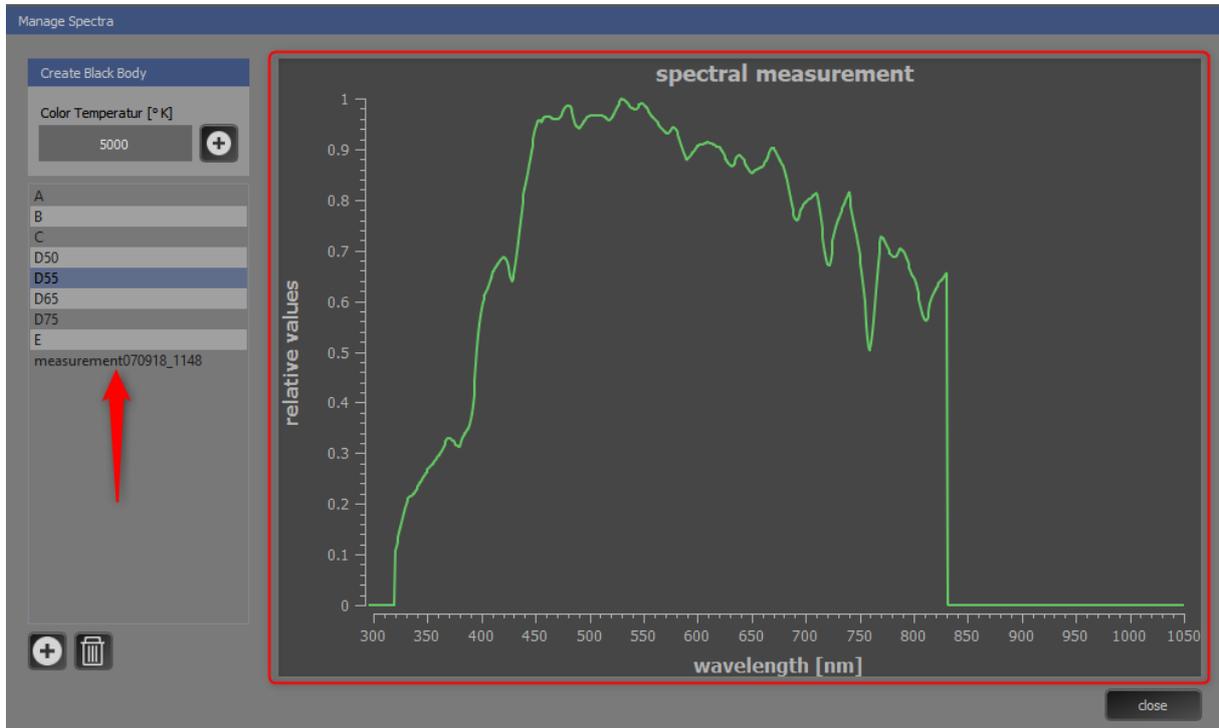
- (1) Choose the illuminant (standard is D55).
- (2) Choose the intensity, the maximum is defined by the corresponding maximum of the chosen light source (e.g., D55). For most patches, a lower intensity will give better results, especially with high green content (affected by the green gap of LEDs).
- (3) Press the 'Start create' button. If you generate all patches, the generation process will take a while.
- (4) You can select/deselect all patches with the corresponding buttons. You can select/deselect single patches with the check mark located in the list.

The generated color patches will automatically appear in the illuminant list and be allocated to the corresponding light source. It is important to note that some patches will have better results than others depending on the intensity and color channels that were used.

The spectral curves for the calculation of the reference curves are based on the templates in the CIE 15.2 document.



4.2 MANAGE SPECTRA



Manage spectra menu

Access the manage spectra menu over the gearwheel symbol in the illuminants section (C). You can preview, select, generate, and deselect spectra in this menu. Black body illuminants are generated by selecting the desired temperature and adding them to the list by clicking the “+” symbol located beside the temperature. All illuminants of this list can be shown as “additional reference” in the main measurement window by right-clicking the menu in the main measurement window.



Load existing spectra from hard drive (notation: txt file, tabs separated into wavelength and intensity).

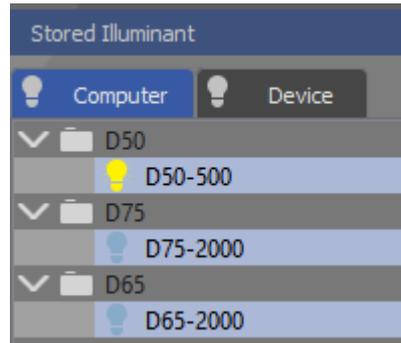


Delete spectrum from spectra manager list.

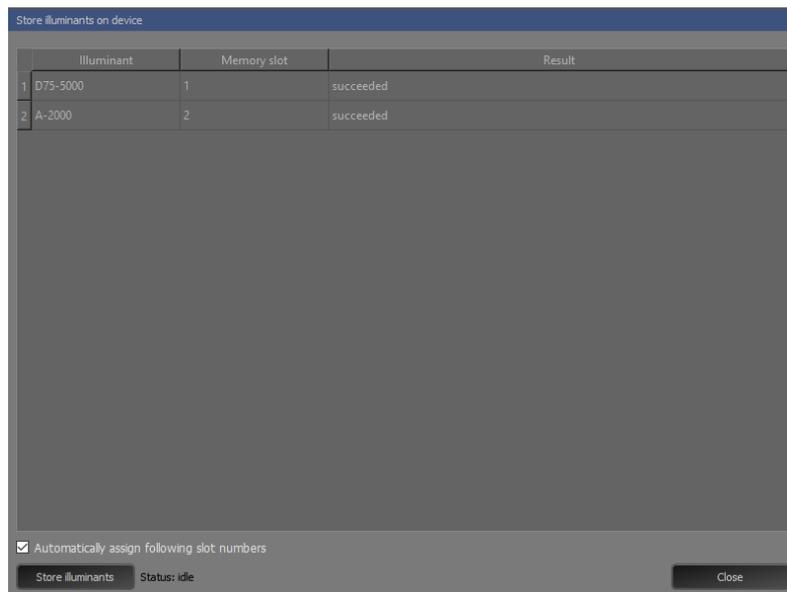
4.3 STORE ILLUMINANTS

For quick access, spectra with a defined intensity can be stored as illuminants on a computer or on the device. You can store up to 44 illuminants on the device. This option is useful when different intensities of the same spectrum are needed or are in preparation for a test sequence. In the computer tab, you can drag and drop the current illuminant into the “stored illuminants” section. When you have stored some illuminants on the computer, right-click on the illuminants to store them on the device. Use “Ctrl” to select more than one illuminant.

The memory slot numbers are automatically set by default, but you can also manually set the memory slot number, from 1-40, by deactivating the checkbox.



Select Illuminant



Store Illuminant

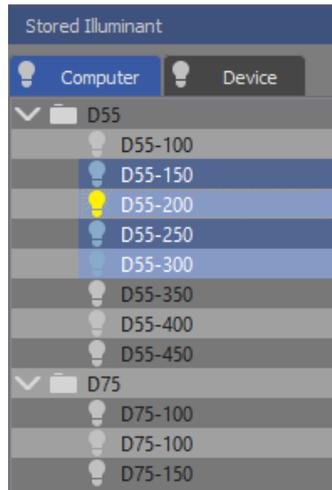
You can save a mixed light situation of two illuminants with different active modules (see chapter 4.5) by choosing the same memory slot for the corresponding illuminants. This option only works when there is no overlapping of active module numbers.

	Illuminant	Memory slot	Result
1	blue-left	1	
2	red-right	1	This illuminant can be merged with: blue-left

Merge illuminants with different active modules

4.4 EXPORT ILLUMINANTS

When right clicking on the illuminants, you can import/export them to the hard drive. The data will be saved in the “illuminants” folder. A second “calibration” folder includes the calibration data. You can use these illuminants for your iQ-LED product in another Image Engineering software (e.g., for the lightSTUDIO) or for backup.



Export Illuminants

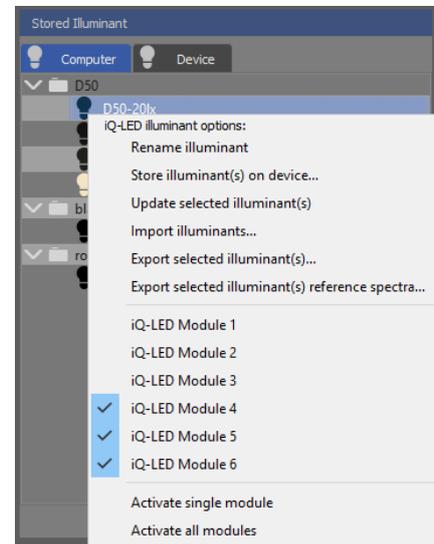
D55-150_Testgeräät_LED20006.iqillum	20.09.2018 10:49	IQILLUM-Datei	33 KB
D55-200_Testgeräät_LED20006.iqillum	20.09.2018 10:49	IQILLUM-Datei	33 KB
D55-250_Testgeräät_LED20006.iqillum	20.09.2018 10:49	IQILLUM-Datei	33 KB
D55-300_Testgeräät_LED20006.iqillum	20.09.2018 10:49	IQILLUM-Datei	33 KB

Exported illuminant data

4.5 ACTIVATE SINGLE MODULES / MIX ILLUMINANTS

You can activate or deactivate single iQ-LED modules if your device has more than one module. For example, you now can expand your low light range or illuminate a single section of your iQ-LED device. Right-click on the illuminant and deactivate/activate the modules of your choice via the checkmarks. When using this setting permanently, we recommend renaming the illuminant to the corresponding new intensity. You can rename the illuminants by clicking on them or via the right-click menu. The activated modules will be shown in the tooltip of the illuminants.

If you are storing illuminants with different module settings, then you can also generate mixed light situations with these illuminants. Activate the first illuminant (e.g., active modules: 4-6) then chose the second illuminant (e.g., active modules: 1-3) while pressing the Ctrl key. This option only works when there is no overlapping of active module numbers.



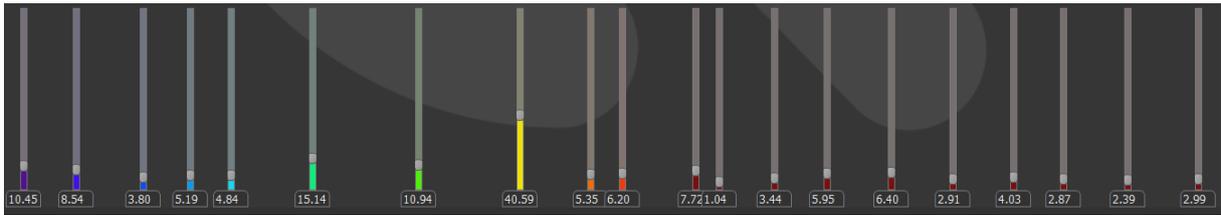
4.6 LED CONTROL PANEL

The 20 slider bars in the lower area of the main window section control the 20 color channels. They are positioned at the corresponding wavelengths in the graph. You can control the intensity (in percent) by dragging the slider up or down. You can set the percent values in the text fields below the sliders. You also have the option to use the scroll wheel of your mouse while hovering over the bar, the actual steps depend on the PVM mode.



NOTE:
When you use an additional UV extension module, a new slider will be displayed at 365 nm.
Please wear protect glasses!
This special channel won't flow into the calibration.

NOTE:
When you change the "Visual display range," all 20 sliders may not be displayed! The position of the sliders is below the peak wavelength.



20 LED channel control bars

You can check the effect to the spectrum in real-time in the measurement graph.

1711228M1	
intensity value	
259	
CCT [K]	CRI
5075	94
spectral comparison	
FIT	SCI
64.6	88.3
dE2000	
6.39	

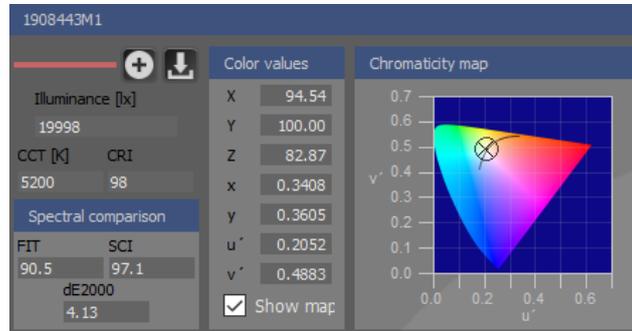
You can save the currently measured spectrum by selecting the "+" symbol in the measurement results panel. The spectrum manager will open automatically. Here you can rename the spectrum and use it as a new reference. You can also export the adjusted spectra as a text file from the save to file button in the measurement results panel.

NOTE:
The exported file contains only spectral intensity data and **not** the slider settings.



4.7 MEASUREMENT RESULTS

The measurement results panel provides calculated/measured values for the current spectrum. The intensity value corresponds to the allocated unity in the device manager.



Measurement results panel

Intensity:	Illuminance in lux / Luminance in cd/m ² / Linear Intensity
CCT:	<u>C</u> orrelated <u>C</u> olor <u>T</u> emperature in Kelvin
CRI:	<u>C</u> olor <u>R</u> endering <u>I</u> ndex
FIT:	Curve fit of the actual measured LED spectrum to the active reference in percent (RMS / nm)
dE2000:	Color difference DeltaE (2000) between the reference and the actual measured spectrum
SCI:	Spectral difference, weighted by averaged spectral sensitivity of still image cameras
Color values	XYZ* / xy / u'v' (u'v' and xy also in map) *Light source measurement, Y normalized to 100, 2-degree observer

4.8 SPECTRUM QUALITY

The measurement results panel offers different alternatives to measuring the quality of the generated spectrum.

The FIT value is an error estimation, which calculates the remaining difference between target and current actual spectral values.

Another approach is the measurement for the difference of the camera signal (using the measured light spectrum versus the reference light spectrum). This approach is the variance of the signal that can be calculated by the relative difference of the spectra, weighted with the typical spectral sensitivity of a digital camera. This measurement can be expressed as:

$$v = \frac{1}{N} \sum_{\lambda_{low}}^{\lambda_{high}} \left(\frac{I_m(\lambda) - I_{ref}(\lambda)}{I_{ref}(\lambda)} \right)^2 * (S_{RGB}(\lambda))^2$$



The SCI is determined as follows:

$$SCI = 100 - (\sqrt{v} * 100)$$

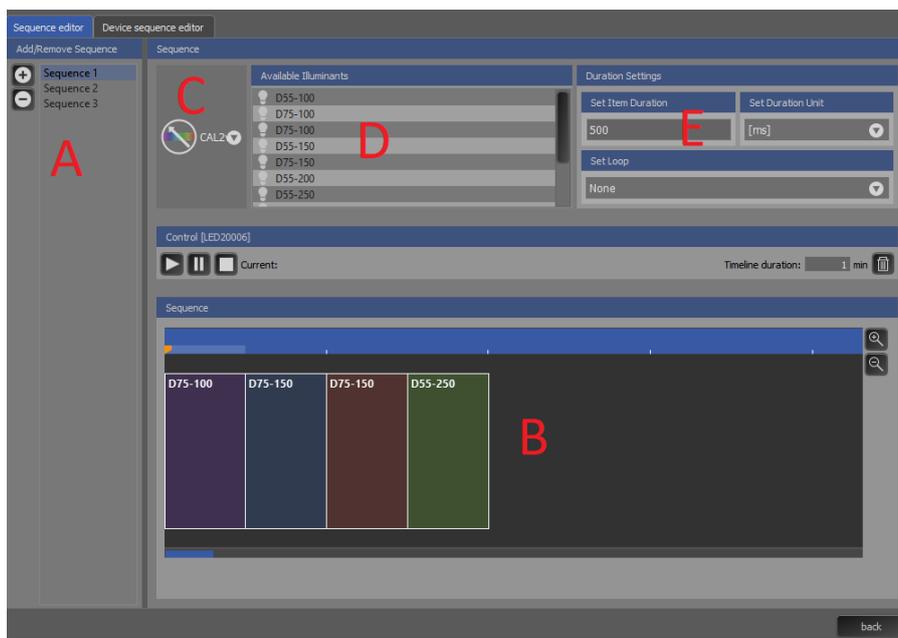
With:

- $I_m(\lambda)$ = measured spectrum intensity
- $I_r(\lambda)$ = reference spectrum intensity
- λ_{low} = lower measurement limit
- λ_{high} = upper measurement limit
- $S_{RGB}(\lambda)$ = spectral sensitivity of the camera R, G and B channels

5 CREATING SEQUENCES

5.1 SEQUENCE EDITOR

Multiple illuminants can be composed as a test sequence with customizable period times and a number of illuminants. Open the test sequence window via the play button in the control section.



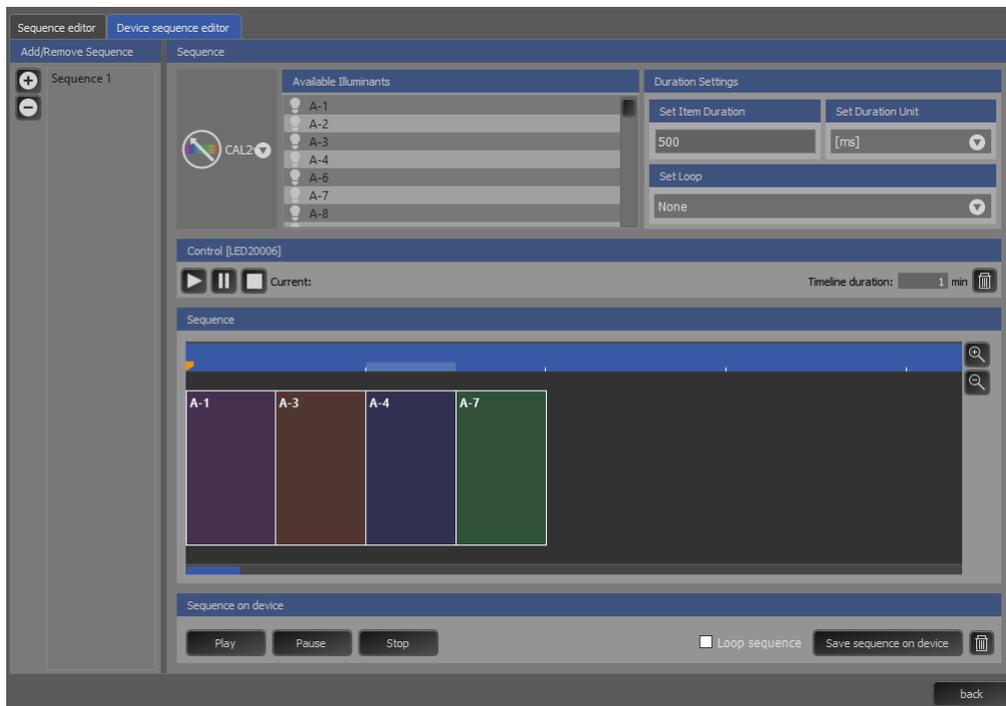
Sequence editor

Create a new sequence (A) and select the device (C). You can only use previously stored illuminants (D). Select the duration of each illuminant you need (E). Drag and drop available illuminants onto the sequence (B). The order can be rearranged simply by dragging the illuminants. Use the control panel to start, stop or pause your sequence.



5.2 DEVICE SEQUENCE EDITOR

You can create a sequence with illuminants according to the explanation in 6.1. With the play, pause, and stop buttons you can run the current generated sequence.



Device Sequence editor

Underneath the sequence editor, you can control the device remotely with the play, pause, and stop buttons.

Press the “Save sequence on device” button, to store the sequence on the device. You can store one sequence on the device.

NOTE:

When you delete an illuminant that is stored on the computer, it is possible that this illuminant is missing in an already generated sequence.

6 EXTERNAL MEASUREMENT

Only possible with the EX1/ EX2 or the external spectrometer of the CAL2. The external measurement is the right approach when reproduction of an already existing light source or spectrum is needed.

Choose your spectrometer in the device manager and create a new measurement device such as described in chapter 4. Set the spectrometer settings as described in chapter 3.1.1. and do a dark measurement (see chapter 3.1.2). Activate the spectrometer in the device section and point with the optical fiber on the desired light source or backlit translucent material. You will see the measured spectra in the spectral measurement section. Save the spectrum by selecting the “+” button on the measurement results panel.



7 LOW INTENSITY USE

When using your system with very low intensity, the measured values will start to fluctuate. The lower the intensity, the higher the fluctuation. The reason for this phenomenon is not an alleged instability of the generated light, but instead, is caused by the noise of the spectral measurement with the internal micro-spectrometer. As the influence of the noise gets higher, the light intensity becomes lower. If very low light intensities are required, please use a neutral density filter and activate the neutral density correction in the spectrometer settings menu by entering the density value of your filter. This way the light source will run at a higher intensity while having low intensity in the chart plane. The minimum possible intensity depends on your device, but here you can also use single iQ-LED modules for low light (See chapter 4.5 and the manual from your device). Please check the corresponding datasheet.

8 COPYRIGHTS AND TRADEMARKS

8.1 TRADEMARKS

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libusb (www.libusb.org) is an open source project, the code is licensed under the GNU Lesser General Public License version 2.1 or later (www.gnu.org/licenses/old-licenses/lgpl-2.1.html).

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