1. Getting started

1.1 Pairing a SPEKTRI 80 to a Display unit (Android device).

- Start SPEKTRI 80 by pressing the power button.
- Go to the Bluetooth (BT) settings of the Display unit and then “pair new device” (PIN 0000).
- From the list, select a device that has the Serial number (SN) of the SPEKTRI 80.
  (SN sticker can be found from the back side of the SPEKTRI 80)

1.2 Installing SPEKTRI 80 application.

- Uninstall any previous versions of the application.
- Installation file can be found from path: “Internal storage \ SSL Resource”

When installing the app to a newer Android phone, you may have to follow these additional steps:

- Delete folder “Spektri 80” completely, from path: “Internal storage \ Documents”.
  Remember to back up any saved measurement results before deleting the folder!
- Press and hold the installed Spektri app icon and press the appearing “App info” text.
- Select “Permissions” and allow permission for Nearby devices.

1.3 How to connect SPEKTRI 80 to the Display unit.

- Start SPEKTRI 80 by pressing the power button.
- Power button LED indicates power status. If the LED is not switched on when pushing the button, the battery of the SPEKTRI 80 needs to be charged.
- Confirm that the Display unit and SPEKTRI 80 are paired.
- Click BT connect-button in upper left corner of SPEKTRI App
- Select the SPEKTRI 80 device with the corresponding SN from the list.
- When the SPEKTRI 80 is connected to Display unit, ”Connected” status is visible.

2. How to measure the lighting parameters

- Before starting the measurements, SPEKTRI must be switched on and connected to the Display unit (See chapter 1.3).
- Point the white measuring head towards the light to be measured.
- Touch the ”MEASURE” button.
- SPEKTRI 80 integrates the light signal.
  - When the light signal is strong enough, the SPEKTRI 80 sends the measurement data over the BT to the Display unit.
  - Measurement time is longer for lower light levels, shorter for higher light levels.

3. Open/save results

3.1 Save measurement data

- Go to "**Conf**" tab
- Insert the filename into the Textbox.
- Touch  -button (Allow permissions for first time use).
  - Saved files can be found from path: "Internal storage \ Documents" of the Display unit.
  - Each measurement is stored in one row.

3.2 Loading and deleting measurement results

- Previous results of the session can be loaded by touching  -button in the left down corner.
- The prompt window is opened showing all the data in the memory.
- Name of the loaded result is shown between "**Load**" and "**delete**" buttons.
- You can delete all measurements of current session by holding the  -button.

3.3 Naming / commenting of measurement results

- Each measurement can be commented by pressing  -button.
- The prompt window will be opened where the result can be commented / named.
- The comment is saved in the first column in the measurement file and it is also shown in the comparison table and in the current test item field of Conf -tab.

4. Results

4.1 Spectral radiation (Spec)

Quantity	Unit	Description
Irradiance, $E_e(\lambda)$	mW/cm^2	Total optical power per area received by a surface. It is calculated as a sum of all wavelengths in WL range of 380-780nm.
Peak wavelength, λ_p	nm	The wavelength where the maximum irradiance is recorded.
Effective wavelength λ_{eff}	nm	Average wavelength $\lambda_{eff} = \frac{\int \lambda E_e(\lambda) d\lambda}{\int E_e(\lambda) d\lambda}$

4.2 Light and photometry

Quantity	Unit	Description

Ev, Illuminance	lx, lm/m^2	Illuminance is the optical power density coming to the surface as seen by human eye. It is calculated with the convolution of spectral irradiance and the V(λ) CIE 1924 spectral sensitivity function of a standard observer under daylight conditions: $$E_v = 683 \int V(\lambda) E_e(\lambda) d\lambda$$
CCT, Correlated color temperature	K	The temperature of the Planckian radiator (Such as incandescent lamp) whose perceived color is most closely resembled to that of the test source. The analysis is given in CIE1976 u'v' color diagram.
BLH	mW/m^2	Spectral irradiance weighted by blue light hazard action spectrum (EN 62471)
EML	lx	Melanopic illuminance for measure of nonvisual effects related to circadian lighting. It is calculated with the convolution of spectral irradiance and melanopic sensitivity function having a peak WL at 480nm.

4.3 Spectral radiation (Spec)

Quantity	**Unit**	**Description**
Color Rendering index, CRI		Special CRIs (Ri) and general CRI (Ra) is calculated according to CIE 15.2. Ra is average of special CRIs R1-8
x, y		Color coordinates in CIE 1931 color diagram
u', v'		Color coordinates in CIE 1976 color diagram
SDCM		Deviation of the color point of the test source from the target color according to the ANSI C78.377-2017. 1 SDCM = 0.001 color shift in u'v'.

4.4 Flicker

Quantity	Unit	Description
Percent Flicker / Modulation Index MI	%	Relative measure of the cyclic variation in the output of a light source (i.e. percent modulation). It is calculated as follows: Light modulation around the mean value: $\Delta = \frac{E_{v,max} - E_{v,min}}{2}$ Mean illuminance $E_{v,mean} = \frac{E_{v,max} + E_{v,min}}{2}$ $\text{MI} = \frac{\Delta}{E_{v,mean}} * 100\% = \frac{E_{v,max} - E_{v,min}}{E_{v,max} + E_{v,min}} * 100\%$
Flicker index, FI		Other measure of the cyclic variation in the output of various sources. This metric takes into account the shape of the temporal light signal. It is calculated as $\text{FI} = \frac{\text{Area1}}{\text{Area1} + \text{Area2}}$
Flicker frequency	Hz	The number of occurrences of temporal light signal per unit of time.