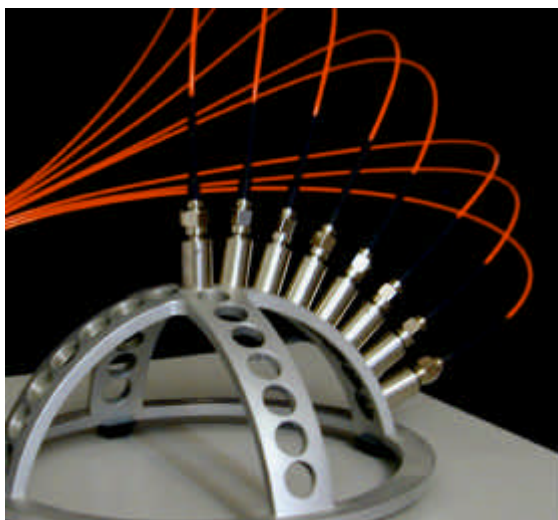
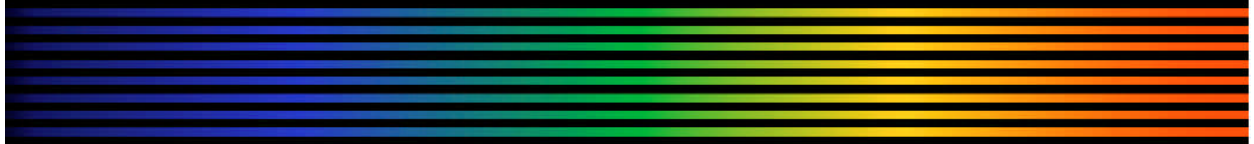




MultiSpect-8™

Multichannel Spectrometer

with simultaneous data-acquisition,
real-time evaluation and storage

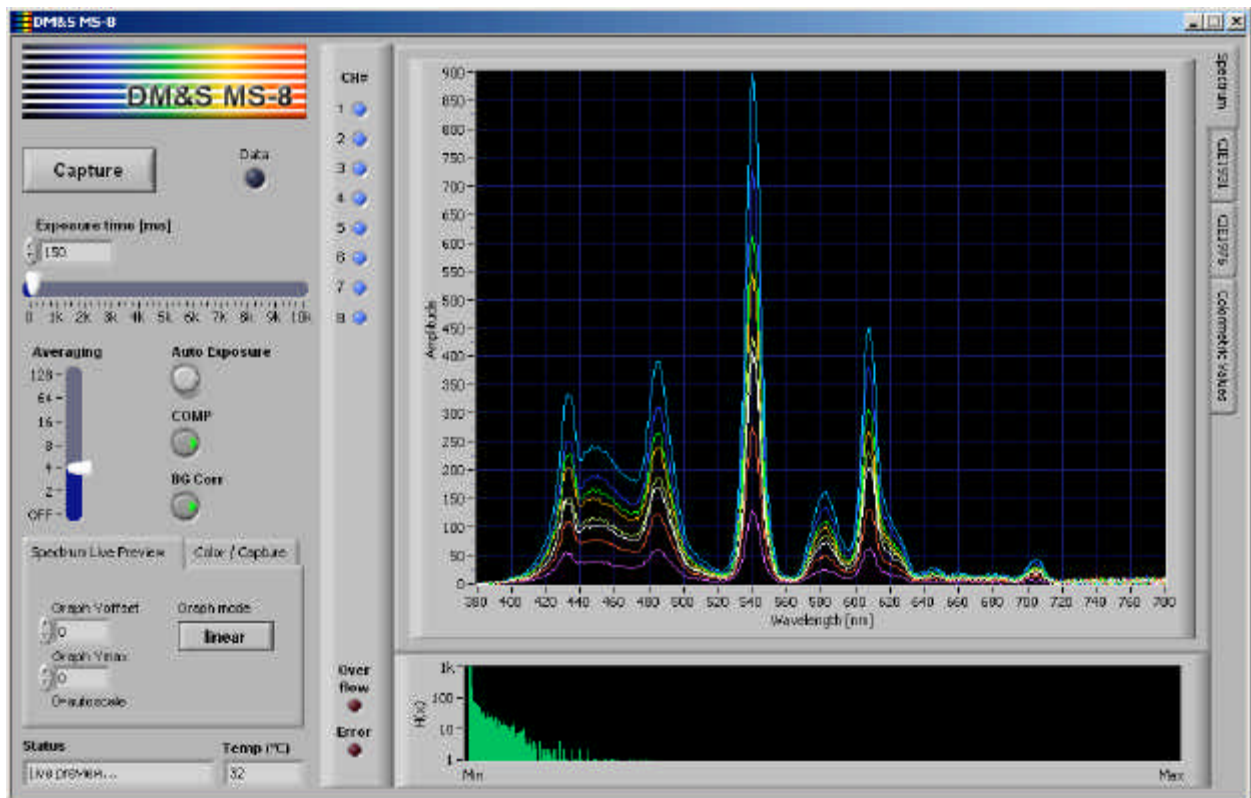


Display-Metrology & Systems
D-76135 Karlsruhe



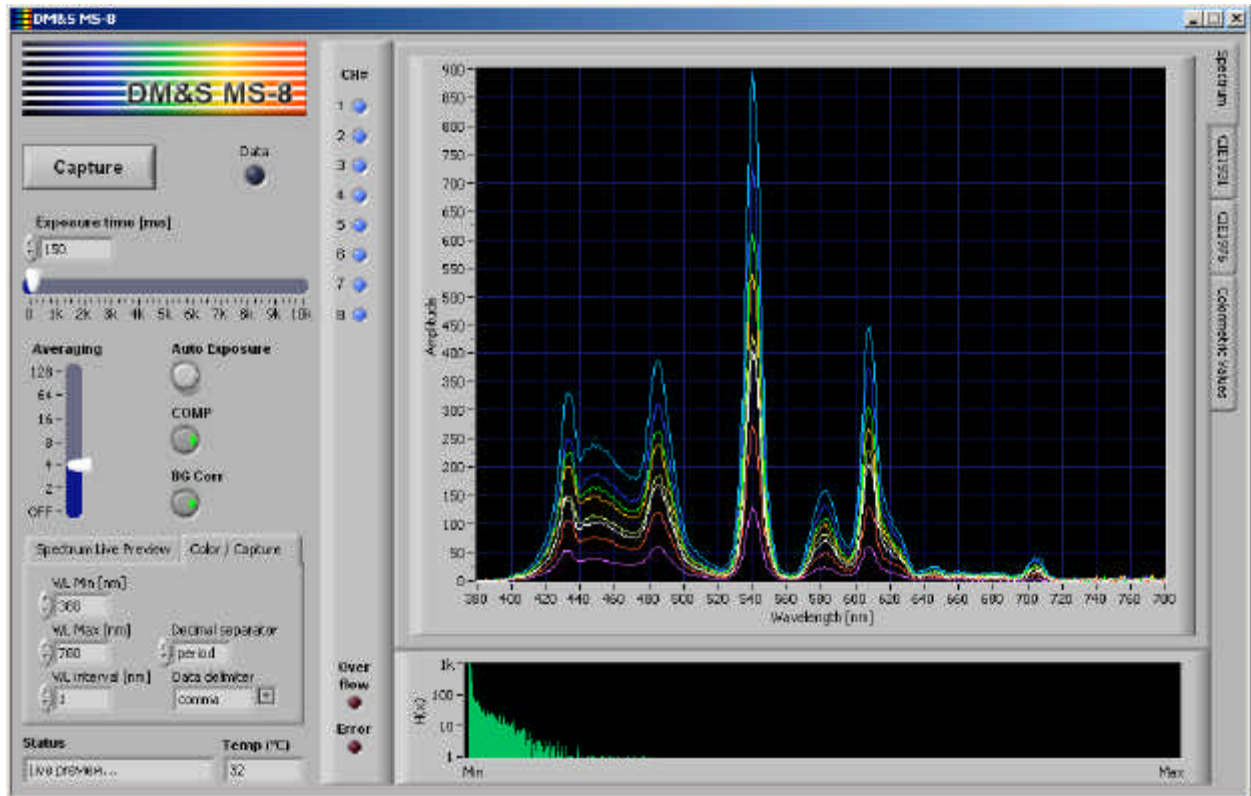
Version 06-05

MS-8 Control



The **MS-8 control** application comprises the main parameter settings for the **life-preview** mode as well as for the **capturing** of spectra (measurement). All parameters for capturing of spectra are adjusted in the **life-preview mode**.

- ◆ **Exposure Time [ms]** Setting of Exposure Time [1 ms to 10 s]
- ◆ **Auto Exposure** Automatic Adjustment of Exposure Time
- ◆ **BG Corr** Correction/subtraction of Background Signal (Dark Signal)
- ◆ **COMP** Compensation of Spectral Sensitivity of Spectrometer (without compensation, raw spectral data is displayed)
- ◆ **Averaging** Averaging of Number of Spectra (improves S/N ratio)
- ◆ **Life-Preview Diagram Modes** Scaling and Offset of Spectrum Diagram (lin, log)
- ◆ **Status Output**
 - Life Preview
 - Capturing (Measurement)
 - Temperature of CCD Array
- ◆ **Channel Selection** Turn-off channels from being displayed (default: all ON)
- ◆ **Capture Parameters** Wavelength-Range and Stepsize (WL Interval) (usable range depends on calibration procedure & settings)



Spectrum of an LCD-monitor (white) with Capture Parameters (Wavelength-Range and Stepsize) shown

Typical Adjustment and Measurement Procedure

Turn-on and align your object of measurement to ensure that light is entering into all fiber-optic input channels.

Select the appropriate **Exposure Time** (avoid overflow which corrupts the measurement for e.g. colorimetry) either manually (entry of a suitable numerical value or use of the slider) or by application of the **Auto Exposure** feature.

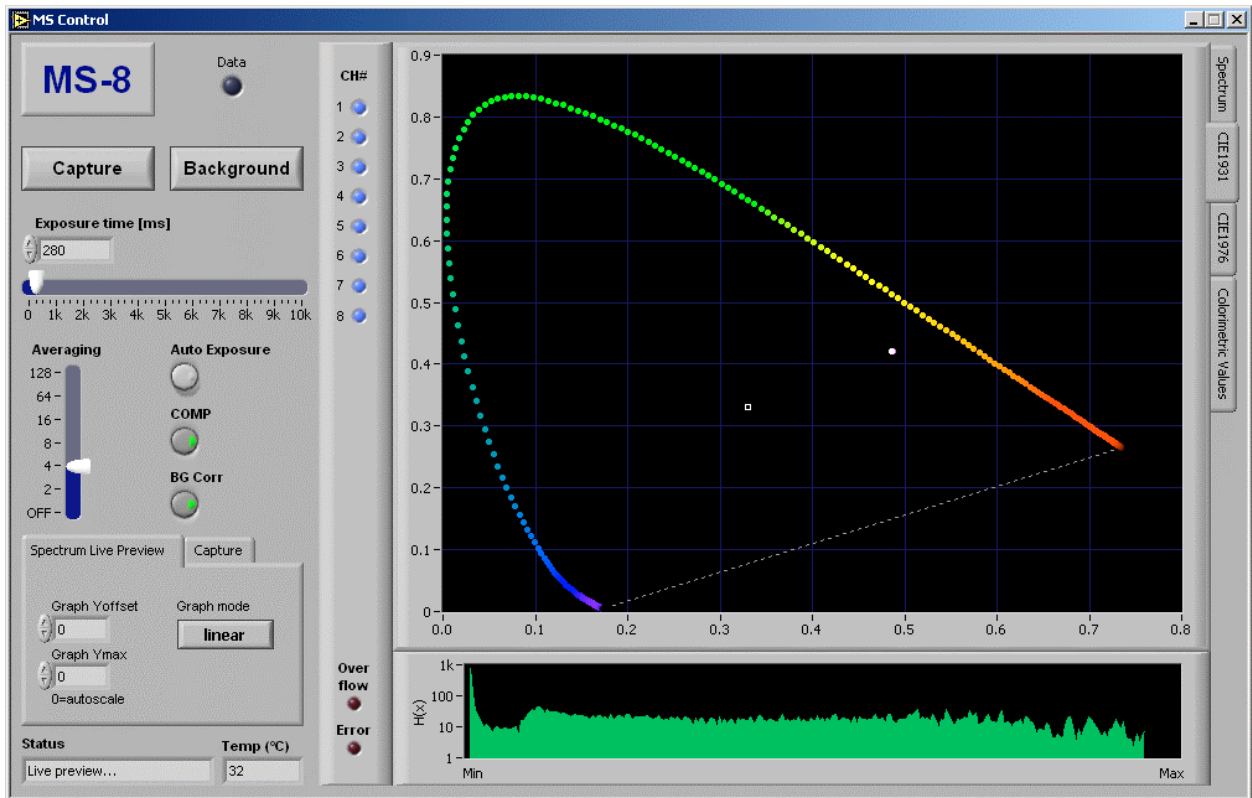
NOTE: the intensity of the spectra shown on the Y-axis of the spectrum diagram is normalized to an exposure time of 1 s.

When all parameters are suitably adjusted the **Background** (dark-signal) can be measured with the shutter of the spectrometer closed automatically.

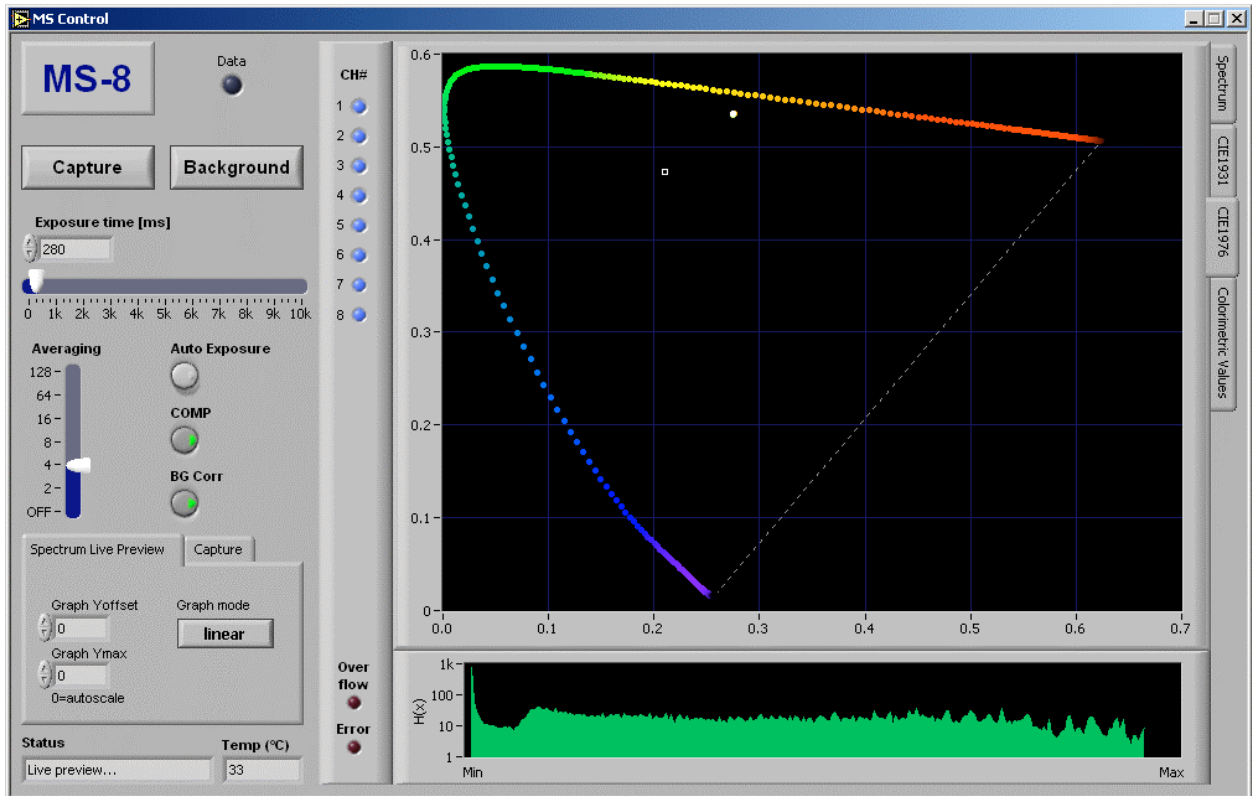
Emissive objects: Measurement of the spectrum of emission requires the system function to be known (see **Calibration**).

Transmissive and reflective objects: Usually, the source is measured first and the resulting spectra stored. Then the object as illuminated by the source is measured, generally (but not necessarily) with an updated exposure time, resulting in object*source-spectra. The spectrum of transmission or reflection of the object is obtained by division of the object*source-spectrum by the respective source spectrum (channel by channel).

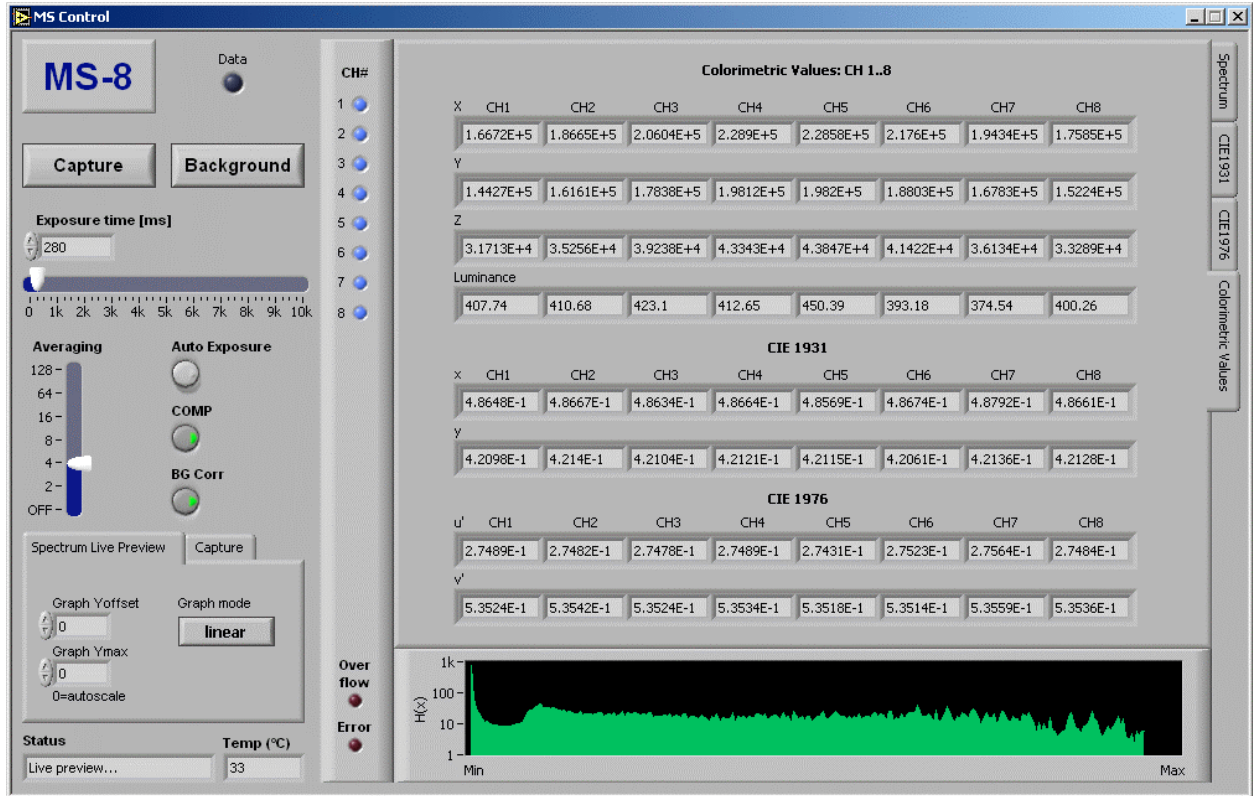
Colorimetric Evaluation & Representation



CIE 1931 Chromaticity Diagram



CIE 1976 UCS Chromaticity Diagram



Listing of Colorimetric Characteristics (including luminance in cd/m^2)

Calibration of Spectrometer

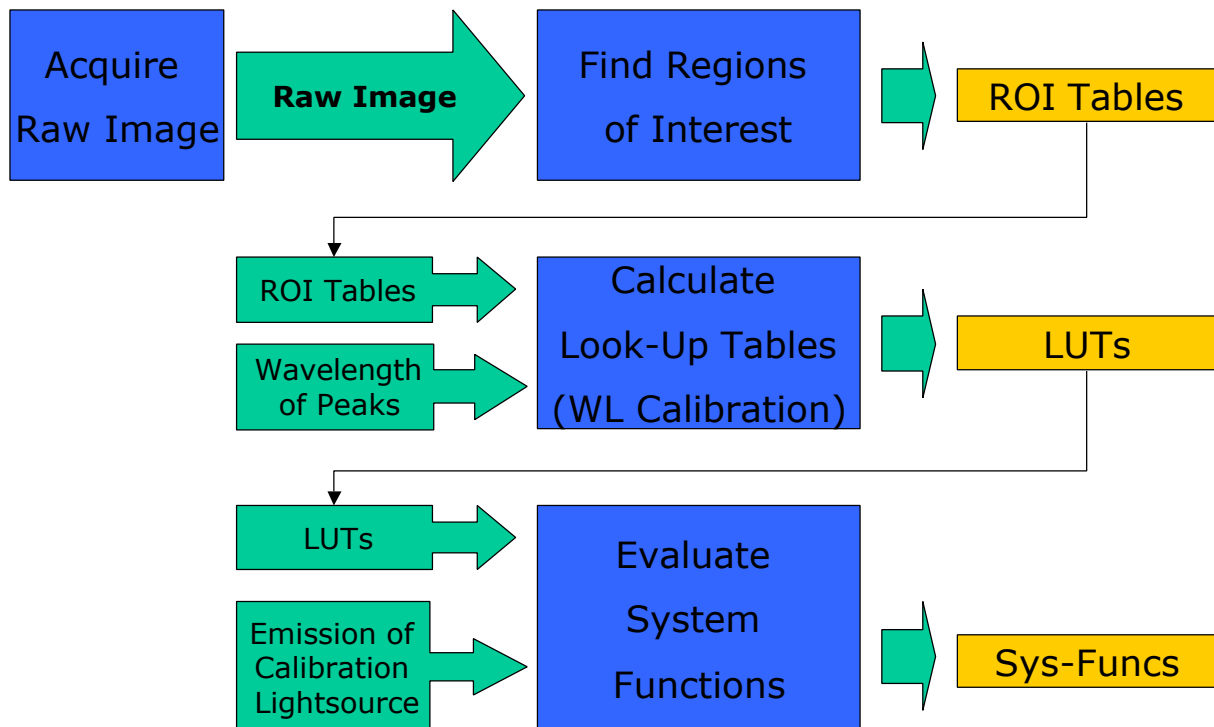
Due to several non-ideal properties of the spectrometer, the system comprising the optics, the diffracting element and the detector unit has to be calibrated in various aspects.

- **Regions of Interest** the location of the individual spectra has to be located on the detector array and stored (ROI Tables),
filename: *ROI.rdf*

- **Wavelength Calibration** a relation has to be established between the number of the pixels (e.g. their cartesian coordinates) and the corresponding wavelength of light. The result is stored in look-up tables (LUTs)
filename: *LUT.lsf*

- **System Sensitivity** since the response of the spectrometer system is varying with the wavelength of light, the overall sensitivity has to be evaluated for measurement and evaluation of emitted light. The result is stored as an inverse of the system sensitivity (System Functions)
filename: *SysFunc.sdf*

Each of these three steps is supported by a special MS-8 calibration module as described in detail below.



Flow-chart for evaluation of the three basic calibration data-sets.



MS-8 Technical Data

- ◆ Spectral range visible 380 nm - 780 nm
(300 nm to 800 nm possible with reduced sensitivities in the extreme wavelength ranges)
- ◆ Luminance range 0.1 cd/m² to 20 000 cd/m²
- ◆ Spectral resolution better than 5 nm (FW@HM) with 50 μm slit
better than 8 nm (FW@HM) with 100 μm slit
- Slit-widths 50 μm, 75 μm and 100 μm (order option)
- Numerical resolution 0.9 nm / pixel
- ◆ Wavelength accuracy ±0.4 nm
- ◆ Numerical aperture k = 4 with f = 42 mm
- ◆ Digitization 12 bit
- ◆ Luminance accuracy ±2% for illuminant A
- ◆ Chromatic accuracy ±0.002 x and ±0.002 y for illuminant A @ 200 cd/m²
- ◆ Measuring time approx. 3 s for L ≤ 0.5 cd/m² with 100 μm slit



MS-8

DM&S