

Calibration of the integration sphere using USB5650 spectrometer

Version 10.3.2022

Devices:

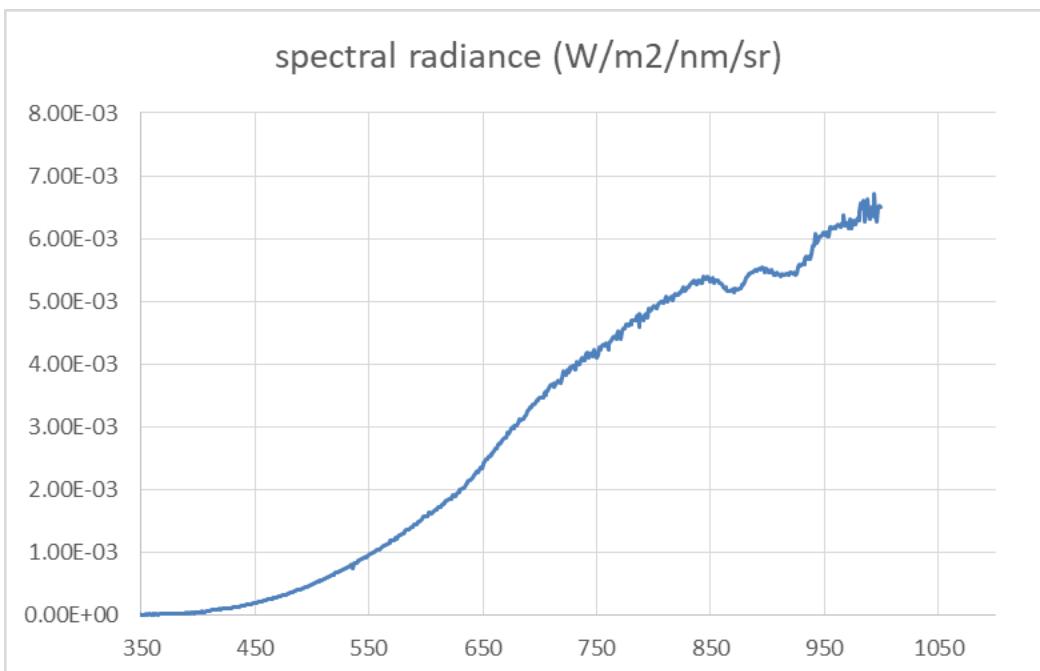
- USB650 with calibrated wavelength offset (see wavelength calibration), calibrated sensitivity (see radiometric calibration) and with marked „hot“ pixels

1. Measurement of the spectrum:

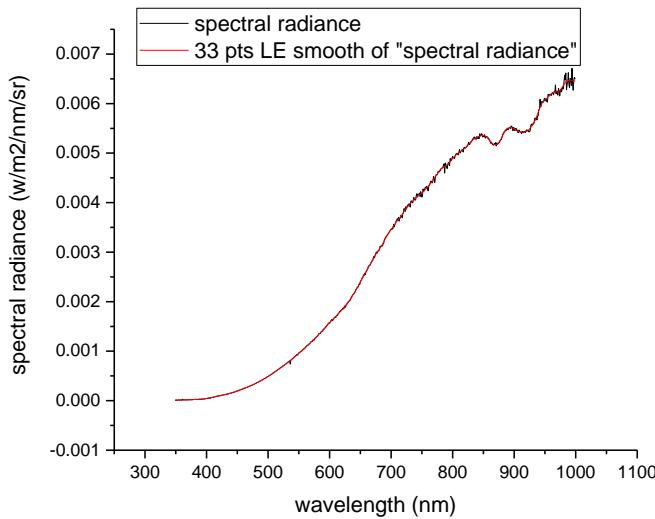
1. Use calibration.dat, offset.dat a hotpixels.dat files in GUI of the spectrometer
2. Set the exposure time of the USB650 spectrometer to 20s
3. Use Long time measurement (ca 10 minutes) of the sphere – insert the cosine corrector ca 5 cm into the sphere
4. Use Long time measurement (ca 10 minutes) of the background – cosine corrector is covered
5. Eventually measure the illuminance at the output port using a luxmeter: (305 lux for example)
6. Eventually measure the spectrum of the sphere by the Pollution spectrometer if the Pollution spectrometer will be calibrated during this session. Typical exposure time is 2s (maximum signal about 35000 ADU – ca 1/2 of the maximum range of 65535 ADU).

2. Processing the spectrum:

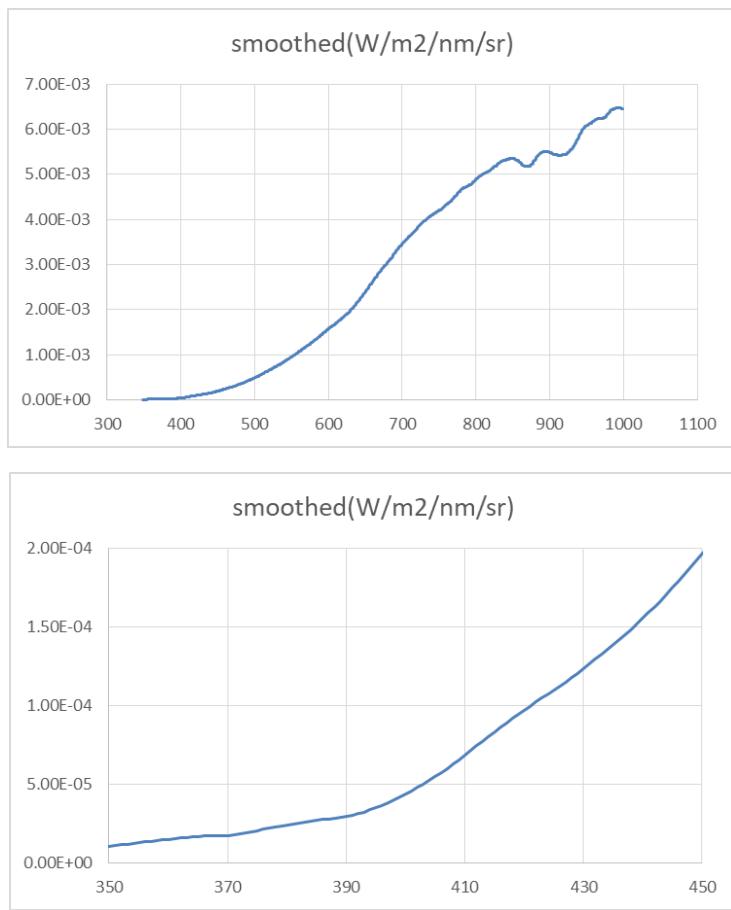
1. Subtract the background from the signal in Excel (spektrum_sfera_kalibrovane.xlsx)
2. Recalculate signal to $\mu\text{W}/\text{cm}^2/\text{nm}$ using the ratio of the exposure times of the radiometrically calibrated source and integration sphere in Excel (divide by this ratio)
3. Recalculate result to $\text{W}/\text{m}^2/\text{nm}$ in Excel (divide by 100)
4. Recalculate result to $\text{W}/\text{m}^2/\text{nm}/\text{sr}$ (divide by PI):



5. Smooth the curve in Origin Lab software – Analysis/Signal processing/Smooth: Loess, Span=0.05



6. Insert smoothed curve into Excel, check the curve at short wavelengths for noise:



7. Recalculate nanometres to Angstroms and export the text-file (calibrated spectrum of the sphere) – integration_sphere_final.dat – for later use.