

Radiometric Calibration

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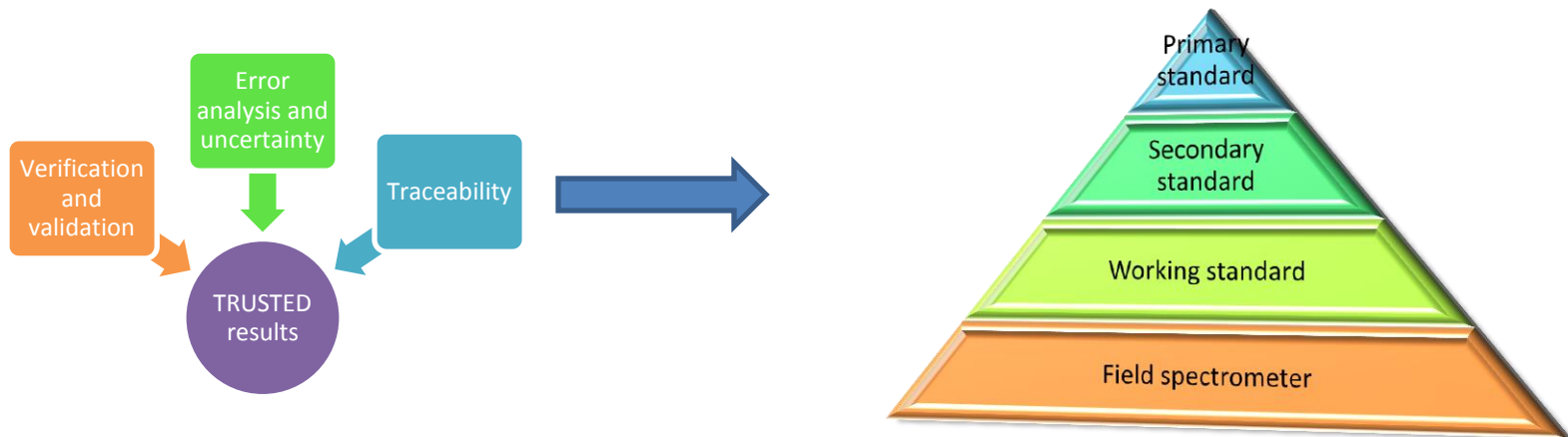
Overview

- DEFINITION
- TESTS TO BE DONE
- REQUIREMENTS AND TESTS SET-UPS
- SOME TESTS EXAMPLES
- POTENTIAL SOURCE OF ERRORS AND UNCERTAINTY EVALUATION



Definitions

The radiometric calibration consists in the determination of the spectral coefficients needed to convert the digital counts recorded by the spectrometer in physical units (e.g. radiance $W \cdot m^{-2} \cdot sr^{-1} \cdot nm^{-1}$).



Laboratory radiometric calibrations



Temp.
variation



Radiance calibration



Irradiance calibration




Wavelength calibration

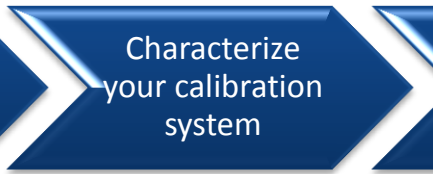


Evaluation in time


Calibration plan



Identify possible sources of error



Characterize your calibration system



Select the best calibration standards



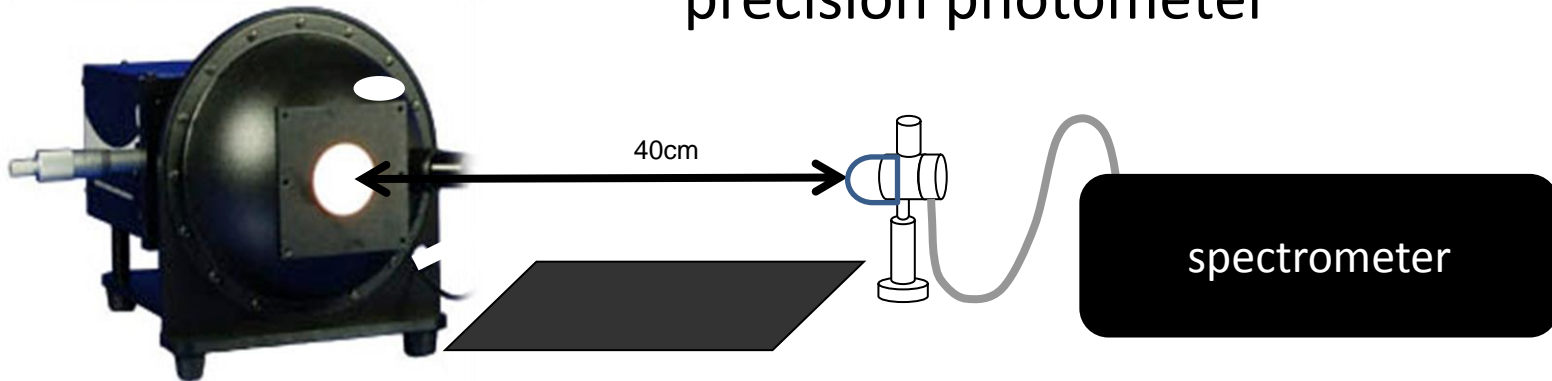
Carrying out measurements



Uncertainty report

Radiance Calibration

- *Requirements:* dark room, constant room temperature 22° C, spherical integrating source radiance standard traceable to an international recognized metrology laboratory, spectral radiance calibration file, precision photometer



Laboratory radiometric calibrations



Temp.
variation



Radiance calibration



Irradiance calibration




Wavelength calibration

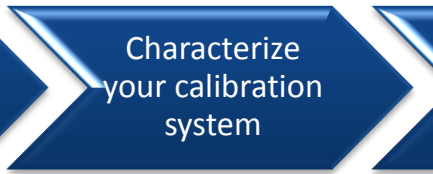


Evaluation in time


Calibration plan



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Select the best calibration standards



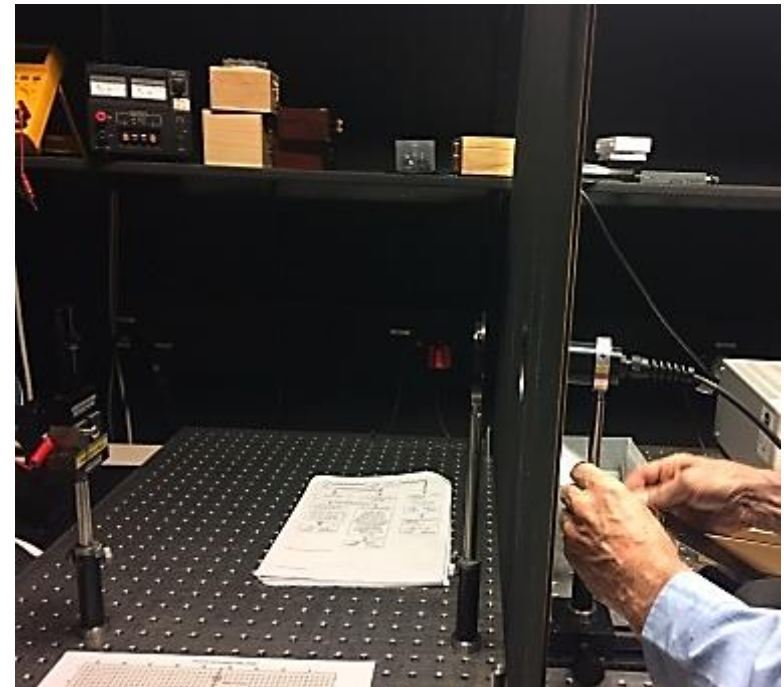
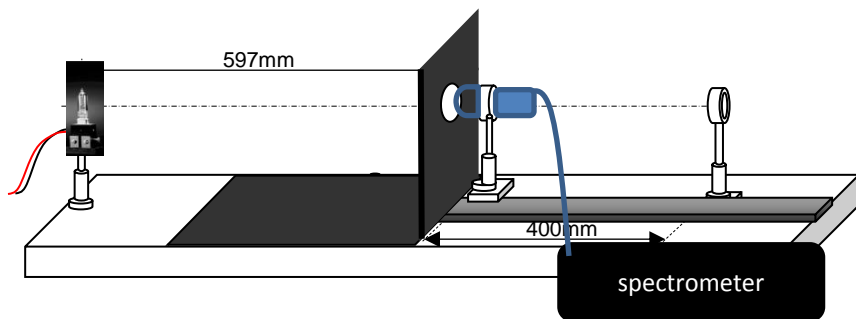
Carrying out measurements



Uncertainty report

Irradiance calibration

- Requirements:* dark room, constant room temperature 22^o C, FEL Lamp 1000W or tungsten/ halogen standard lamp traceable to an international recognized metrology laboratory, spectral irradiance calibration file



Laboratory radiometric calibrations



Temp.
variation



Radiance calibration



Irradiance calibration




Wavelength calibration

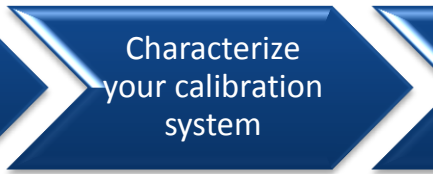


Evaluation in time


Calibration plan



Identify possible sources of error



Characterize your calibration system



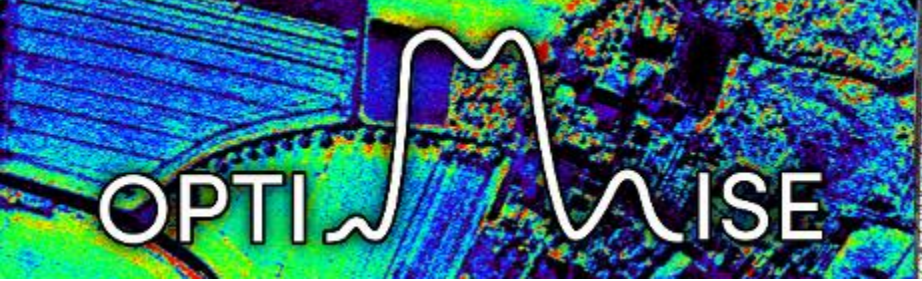
Select the best calibration standards



Carrying out measurements



Uncertainty report



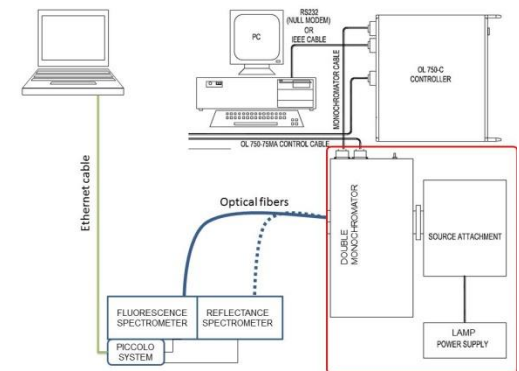
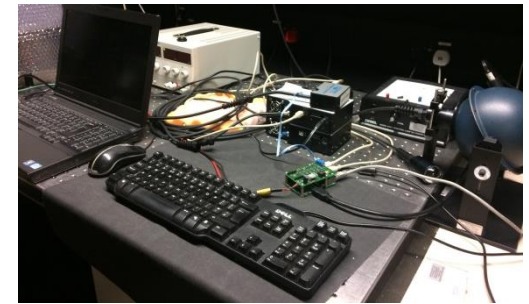
Innovative Optical Tools For Proximal Sensing
Of Ecophysiological Processes

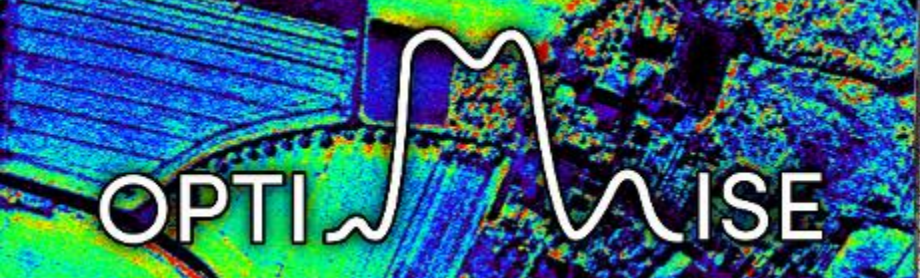
Wavelength calibration

- discharge lamps atomic line
- lasers lines
- gas cells absorption lines

or

- double monochromator system

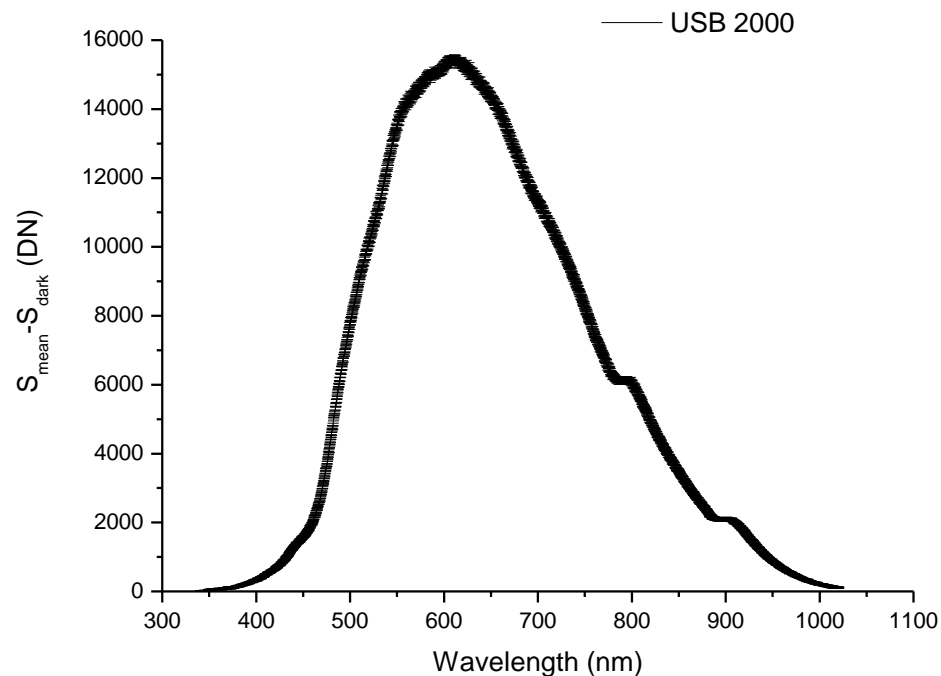
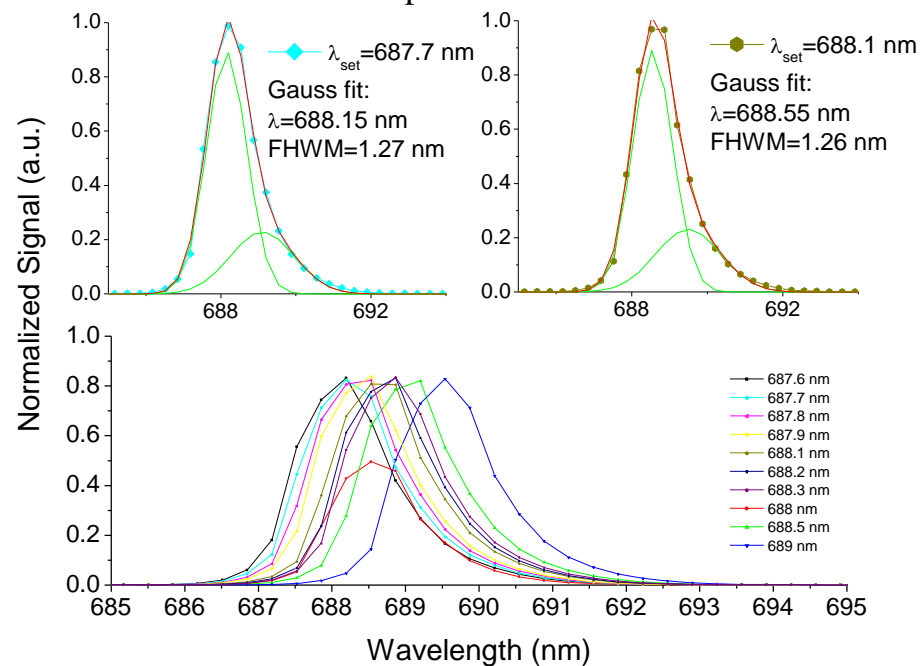


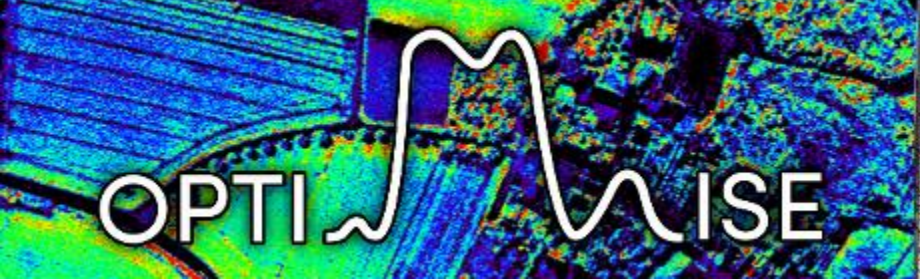


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Results examples

OL750 absorption lines with USB+

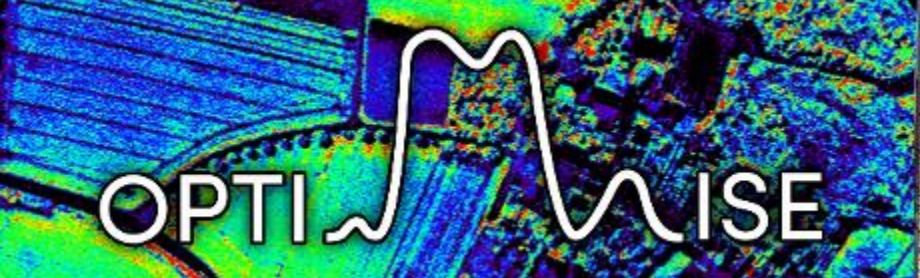




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UNCERTAINTY ANALYSIS

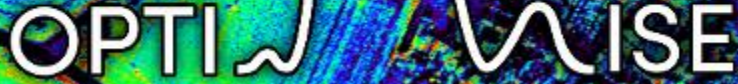
- Type A: based on statistical analysis from series of obs.:
 - Possible sources: noise to signal ratio, response nonlinearity,
- Type B: other than statistical: variation with T, wavelength shift, standard response changes, etc.



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POTENTIAL SOURCE OF ERRORS AND UNCERTAINTY EVALUATION

	Radiance	Irradiance	Wavelength
Standard uncertainty	x	x	x
Signal Noise Ratio	x	x	x
Stability in time	x	x	x
Dark current	x	x	x
Nonlinearity	x (diff. radiance levels)	x (different currents)	
Spectral scattering		x	x
Central Wavelength shift			x
Temperature responsivity	x		x
Fore optics position		x	x
Standards aging	x	x	x
Grating misalignment			x



OPTIWISE



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Thank you
for your attention

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