PHYWE
excellence in science

Spectrometer Pro LED

35620-00

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Fig. 1: 35620-00 Spectrometer Pro LED

Operating instructions

CE The unit complies with the corresponding EC guidelines.

TABLE OF CONTENTS

1 SAEFTY PRECAUTIONS

Caution!

- Carefully read these operating instructions before operating this instrument. This is necessary to avoid damage to it, as well as for user-safety.
- Do not start up this instrument in case of visible signs of damage to it.
- Only use the instrument for the purpose for which it was designed.

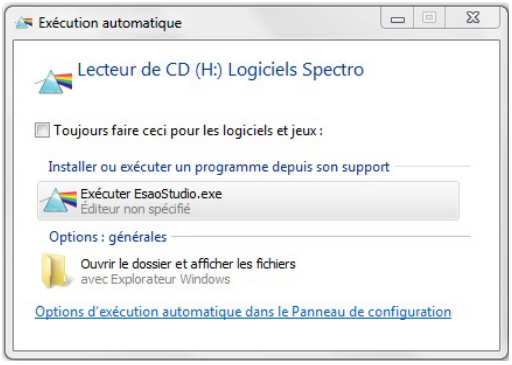
2 PURPOSE AND CHARACTERISTICS

The spectrometer Pro LED is a specially developed instrument for science education. It is easy to use and its intuitive integrated software provides a unique environment for visualizing, measuring, comparing and evaluating spectroscopic data. A glass fiber mount is available to keep your hands free during the experiments. The light to be examined is coupled via the optical fiber to the spectrometer, where it is directed to a fixed grid and thus spectrally decomposed. The spectrum is recorded by means of a CCD array, so that the complete spectrum is recorded in one go, which makes it possible to reliably detect even rapid changes in a spectrum. The integrated software in the device requires no installation and can be used immediately after connecting the spectrometer via USB interface with the PC. Power is supplied via a separate 12V power supply, which is included in the delivery.

3 FUNCTIONAL AND OPERATING ELEMENTS

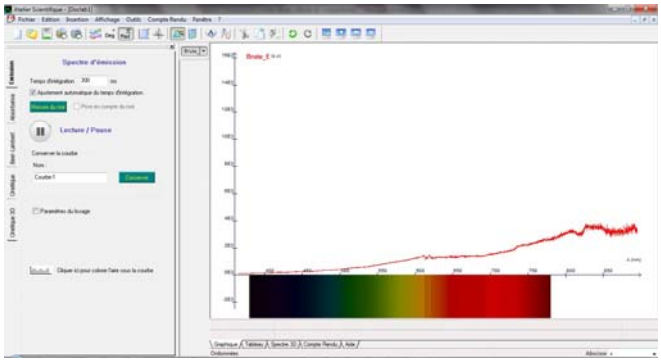
3.1 Installation

- Turn on your computer.
- Connect the device to the power supply..
- Connect the camera to the computer via USB.
- In the following window, click Run to start the software.



3.2 Commissioning

After starting the software, the user interface window appears and the spectrum is displayed.



Integration time

Allows you to adjust the intensity of the graphic. By default, the integration time is automatically adjusted. To disable this feature, simply uncheck the box and then set the integration time so that the spectrum occupies most of the window.

By increasing the integration time you increase the intensity, but you move the zero point, so it is advisable to adjust the integration time before performing the software calibration. Be careful when increasing the integration time, you also increase the intensity of the noise.

Dark measurement

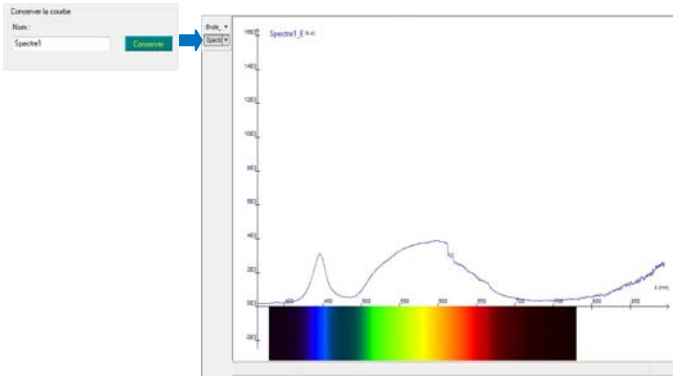
If you are not in perfect experimental conditions, you can subtract the parasitic spectrum from the ambient light by recording the dark spectrum.

Spectrum analysis

Click on  to freeze the curveAfter the recording has been interrupted, you can use all the evaluation functions of the software. To restart the spectrum acquisition, click on  .

Recording a curve

Name the curve and click Save. The name will appear in the upper left corner of the window. The curve "Brute_E" corresponds to the acquisition of the spectrum in real time (the characters "_E" mean that it is an emission spectrum).

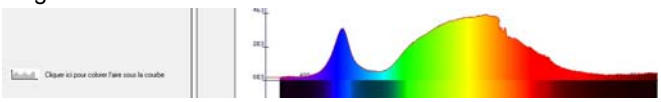


Show/Hide Spectrum

Click on the name of the spectrum you want to display, click again on its name to hide it again. It is also possible to display multiple stored curves at the same time.

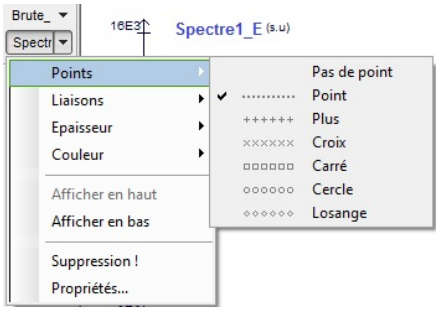
Coloring of the area under the curve

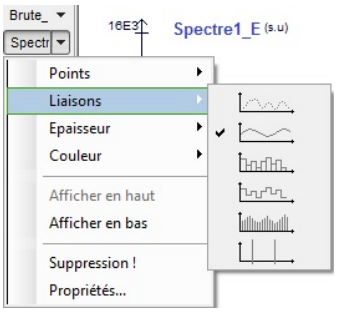
This coloring allows a simple visualization of the wavelengths.

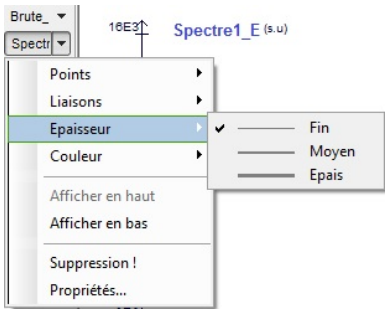


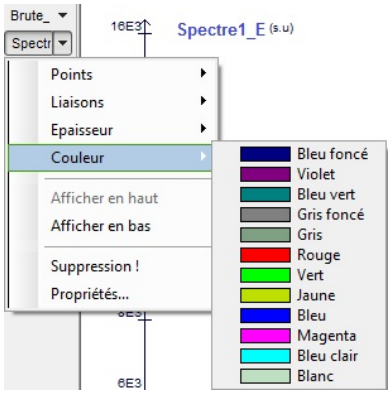
Curve display options

The curve display options are available when you right-click the curve name. It is then possible to change the style of the points, the connections (point mode, bound mode, histogram, staircase, vertical or vertical straight segments), the thickness of the line and its color.



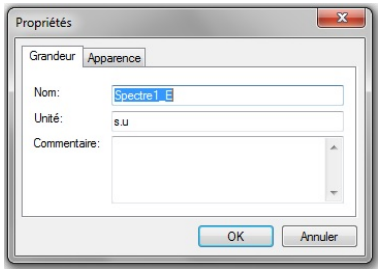


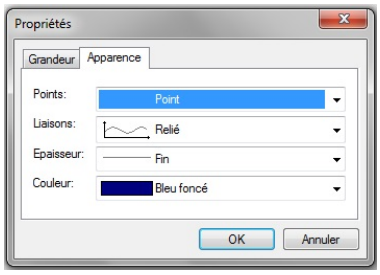




It is possible to delete the curve by selecting Delete!

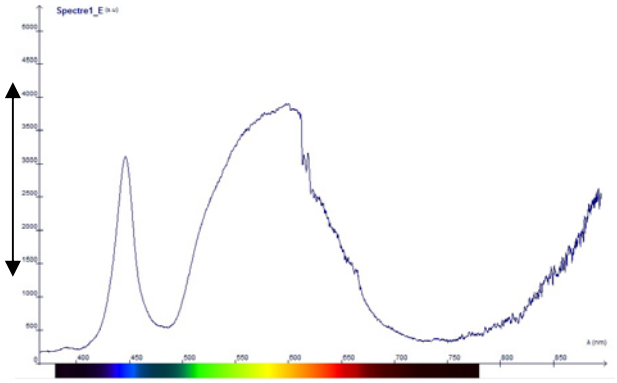
The Properties option summarizes all formatting options.

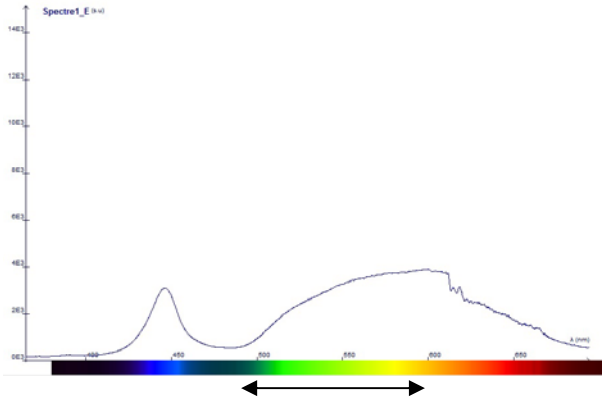




Extending the scale

Point to one of the scales with the mouse, click and drag to stretch or compress the
scales.



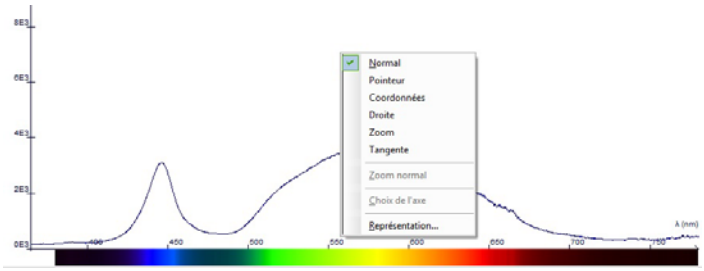


Translating the scale

Hold down the CTRL key while clicking and dragging on one of the axes to move the spectrum along that axis.

Normal mode

Allows you to navigate through the spectrum, stretch scales, and move scales.



Positioning a pointer

Position your mouse at the desired position on the spectrum to display the wavelength and intensity.

Display coordinates

Place your mouse on the spectrum at the desired position and tap "Enter" to confirm and set the position of your marker. This marker remains permanently in the spectrum. To delete it, repeat the process of displaying the marker at the same position as the one you want to delete.

Insert a row

Place your mouse at the desired position on the spectrum, drag it to the right and tap Enter to confirm and set the position of your rights.

Insert a tangent

Place your mouse on the spectrum at the desired position and tap "Enter" to confirm and set the position of your tangent.

Enlarge

Draw a rectangle that represents the part of the spectrum you want to zoom into.

Click Normal Zoom to return to the initial display.

Modeling options

Click the appropriate icon to display the Modeling Wizard.

Different types of mathematical modeling are available.

4 HANDLING

Emission mode

The emission mode allows the measurement of the emission spectrum of the light sources, this spectrum can be displayed raw or corrected in amplitude.

The device at your disposal has sensitivity correction, which allows it to transcribe a real spectrum and not a spectrum modulated by the sensitivity of the device at different wavelengths. The use of this function is very important for the visualization of continuous spectra: light bulb, solar spectrum.....

To do this, select the 'Send' tab.

Adjust the integration time so that the spectrum occupies most of the window without collapsing.

Absorption and transmission

Before each absorption or transmission measurement, you must perform a calibration of zero (also called "dark measurement") and reference spectrum.

The absorption mode allows you to measure the optical density and/or the transmission coefficient of a sample according to the wavelengths.

Select the 'Absorption' tab.

Adjust the integration time so that the spectrum occupies the largest part of the window without collapsing.

Then measure the reference sample. This determines the reference quantity of the light according to the respective wavelength.

Switch off the light source and measure the background. This determines the noise level to be subtracted from the curve during the measurement.

Insert the cuvette with the coloured solution. Name your solution and start the acquisition by clicking on "Measurement".

The graph shows the following curves: raw, white, black, black, black, solution name 'A (for absorption), solution name'T (for transmission).

Kinetic mode

The LED spectrometer can be used to determine the kinetics of slow reactions that cause a change in the color of the solution, such as the oxidation of iodide ions.

Select the 'Kinetics' tab. The following window will appear:

The instrument must be calibrated before recording. Insert a cell with your reference solution into the cell holder and click on 'Calibration'.

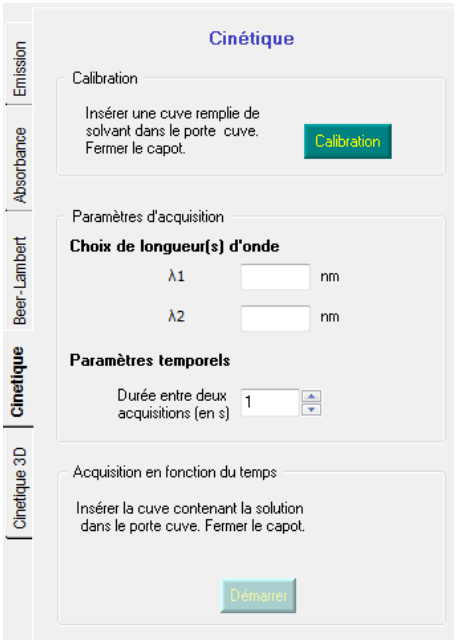
The instrument first performs the dark calibration and prompts you to switch off the lamp power supply via a dialog window.

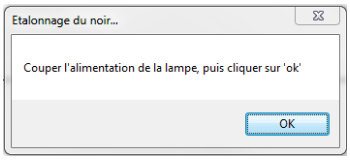
When the calibration phase is complete, you can restore power to the lamp (the software will tell you).

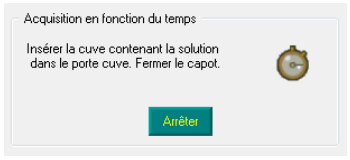
It is possible to study the kinetics at two different wavelengths. If you only want to examine one wavelength, set the same value for λ1 and λ2.

Select the time interval between two recordings and start the recording.

It is then possible to stop the recording by clicking "Stop".



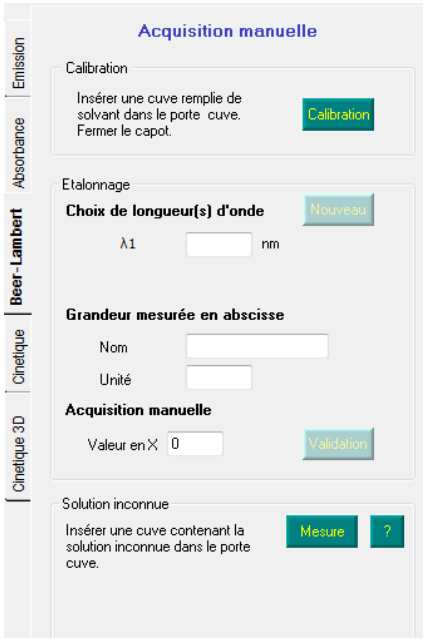




Beer-Lambert

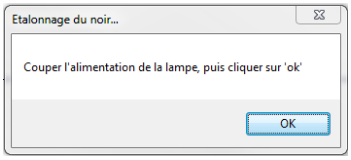
Das Gesetz von Beer-Lambert kann direkt an der Software überprüft werden, ohne eine externe Kalkulationstabelle durchlaufen zu müssen.

Wählen Sie dazu die Registerkarte 'Beer-Lambert'. Sie erhalten das folgende Fenster:



The instrument must be calibrated before recording. Insert a cell with your reference solution into the cell holder and then click 'Calibrate'..

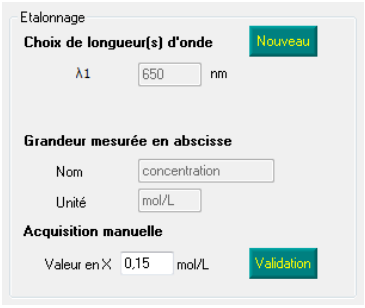
The device first performs the dark calibration and prompts you to switch off the lamp power supply via a dialog window.



Wenn die Kalibrierungsphase abgeschlossen ist, können Sie die Stromversorgung der Lampe wiederherstellen (die Software wird es Ihnen mitteilen).

Sie können nun eine Aufnahme starten:

- enter the wavelength at which you want to work
- indicate the characteristic size of v and its unit, generally the concentration of the solutions analysed,
- enter the value of the concentration of each sample and click on 'Validation'.



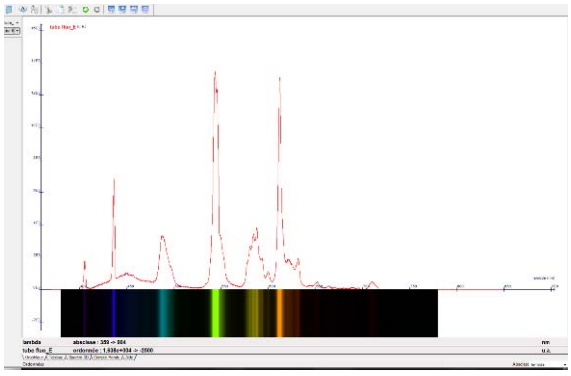
After the acquisition of each sample, a point is added to the curve representing the evolution of the absorption of solutions according to their concentration. This curve directly illustrates the Beer-Lambert law.

Everyday spectra

Fluorescent tube

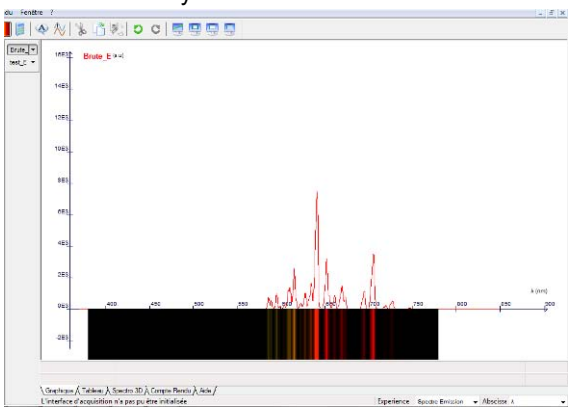
There are well marked emission lines and a continuous emission zone. All fluorescent lamps produce visible light through two simultaneous processes. On the one hand, the ionisation of a mixture of argon and mercury vapour at low pressure and under the influence of an electric current produces light in the ultraviolet range. This radiation is then converted into visible light on the surface of the tube by the fluorescent powder whose composition is specific to the light shadow.

The lines observed with the spectrometer are therefore the gas emission lines and the continuous spectrum is that of the fluorescent powder excited by the ultraviolet emission of the argon and mercury vapor mixture.



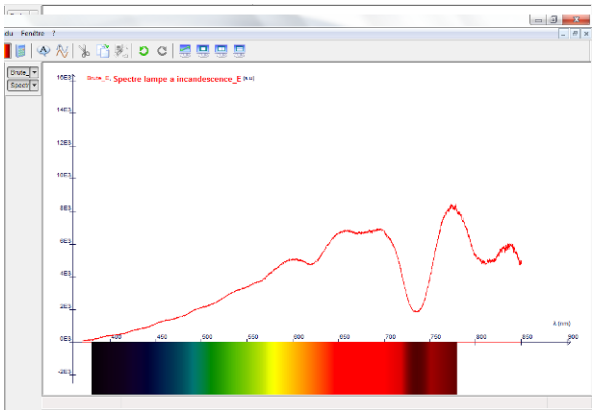
Neon light: inexpensive spectral lamp

Neon light is the most widely used and cheapest "pure" spectral source on the market. It is characterized by a large number of lines from yellow to infrared



Incandescent lamp: the continuous spectrum

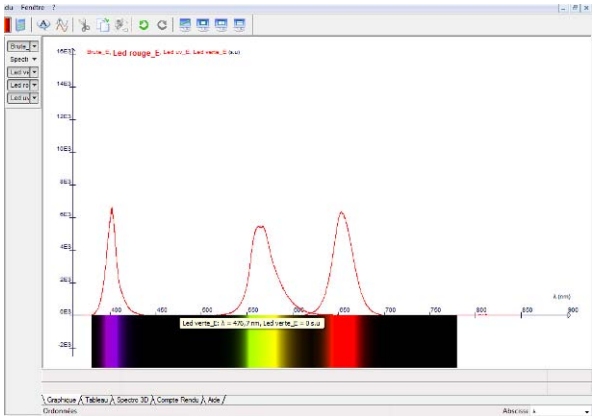
The incandescent lamp emits a continuous spectrum from near ultraviolet (very low) to infrared. Depending on the bulb used, there is a higher or lower infrared intensity (standard filament, tungsten, metal reflector bulb, dichroic...). Also the blue sky or the emission of the sun can be observed.



Violet, green and red LEDs

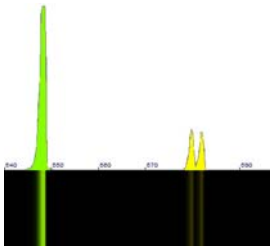
An LED is an electronic component that is able to emit light when an electric current flows through it.

Its radiation is spectrally well marked, even if it is far from monochromatic (the emission band is in the range of 50 to 100 nm).



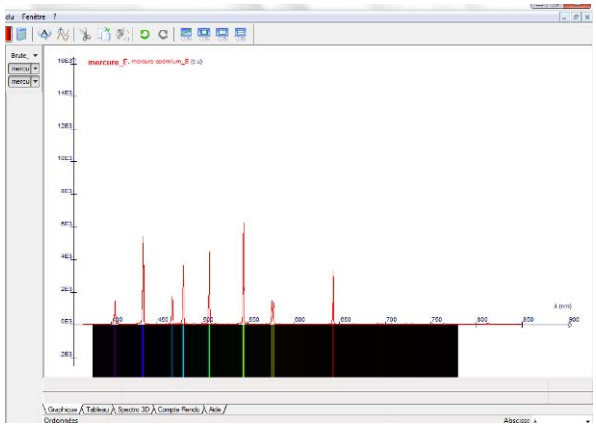
Source of mercury

A mercury lamp consists of a low pressure glass bulb filled with gas, through which an electric current is passed that leads to the production of phtons. The low-pressure mercury lamp has a line spectrum in the ultraviolet and visible range. The ultraviolet is largely blocked by the protective window. The lines at 404.7, 408, 435.8, 546.1, 577, 579.1 nm can be easily measured with the pointers available in the Tools tab.



Source Mercury-Cadmium

The source of mercury and cadmium overlaps the lines of the two sources. It is a very handy source if you want to identify or calibrate a device because the number of lines is so high and at regular intervals at comparable intensity.



Laser beams

You can not only identify lines, they can also be characterized.

For example, the analysis of the laser monochromy becomes more and more precise: It is possible to distinguish the width of the emission tip of a gas laser (e.g. helium neon) from that of a laser diode without the measurement actually corresponding to the resolution limits of the device.

5 TECHNICAL DATA

Spectrometer

- Dimensions (mm): 133 x 120 x 60
- Mass: 950 g
- Structure: Metal case
- Spectral range: 350 - 900 nm
- Resolution: 1 nm
- linear CCD with 3600 px
- Integration time: adjustable from 0,1 ms to 60 s
- Assembly type: Czerny Turner
- Grating: 600 Lines / mm
- Connection to computer: USB 2.0
- Optical fibre connection: SMA 905 - Fibre: 2 m + Fibre holder on post
- Software: embedded (no installation required)
- compatibility: Windows 2000 / XP / Vista / 7 / 8 / 10(32 and 64 bit)

Specification of sample container

- Dimensions (mm): 65 x 100 x 55
- Mass: 250 g
- Calibrated low voltage light source
- Power supply: 12 V
- cuvette size: 10 x 10 mm
- 2 slots for filters in size of 50 x 50 mm
- 1 slot for a chip D40 mm

6 WASTE DISPOSAL

The packaging consists predominately of environmentally compatible materials that can be passed on for disposal by the local recycling service.

Should you no longer require this product, do not dispose of it with the household refuse.
Please return it to the address below for proper waste disposal.

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