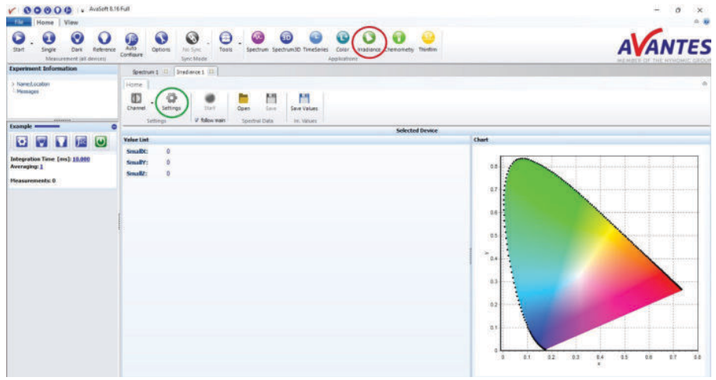
AVANTES
MEMBER OF THE NYNOMIC GROUP

SPECTRAL TIPS AND TECHNIQUES:

RADIOMETRY: USING THE IRRADIANCE MODULE IN AVASOFT 8

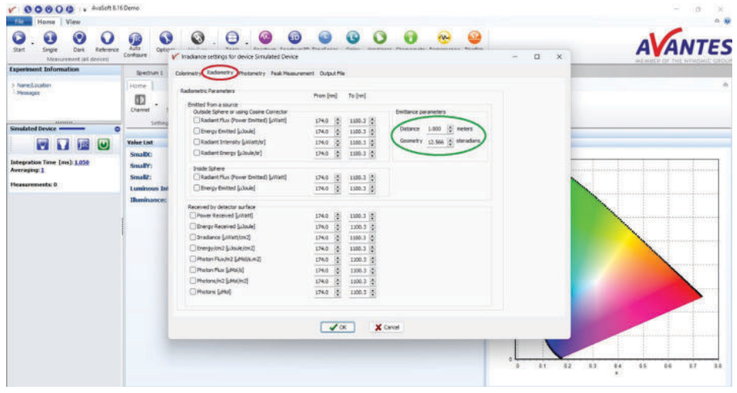
INTRODUCTION AND STEPS

Many users of AvaSoft 8 and our spectrometers work in the broad field of irradiance measurements. Our spectrometers can be calibrated to measure quantitative values for irradiance intensity in terms of µW/cm2/nm or photon counts as µMol/s/m2/nm. Beyond this, our software can measure and record a multitude of colorimetric, photometric, and radiometric values in our Irradiance module. These quantities can be essential in industries such as LED manufacturing. Below is a short guide covering the measurable radiometry parameters available in the Irradiance module in AvaSoft 8. Future guides will cover additional measurement parameters available within this module.



The Irradiance module is accessed by clicking the Irradiance button at the top of the window (circled in red below). This will open a new tab labeled “Irradiance 1”. By default, the irradiance values x and y (listed as SmallX and SmallY) will populate the value list in the middle section of the window. On the right side of the window, a chromaticity graph with respect to x and y is displayed based on the CIE 1931 color space. To access the irradiance settings to add values to the Value List, click the Settings button (circled in green below). This will open a smaller settings window.

The irradiance settings will open on the Colorimetry tab by default. To access the radiometric parameters available in AvaSoft, click the Radiometry tab (circled in red below). The parameters are organized into three broad categories, the first being radiometric values emitted from a source and measured outside of an integrating sphere or with a cosine corrector. The radiant flux parameter quantifies the total optical power emitted from a light source in all directions, hence the “power emitted” label in parentheses. While the best way to measure this parameter is inside an integrating sphere, it can also be calculated outside an integrating sphere or with a cosine corrector at a distance of at least five times the largest dimension of the light source, as this approximates a point source. This distance is defined in the Emittance parameters box to the right (circled in green below). The energy emitted parameter is simply calculated by taking the radiant flux value and multiplying by the integration time, since Watts is Joules/s. The radiant intensity and radiant energy parameters are simply the radiant flux and energy emitted parameters, respectively, but over a solid angle instead of emission in all directions. The solid angle is defined by the Geometry value of steradians (also circled in green below). The steradian and distance values create a conical shape that is the solid angle.

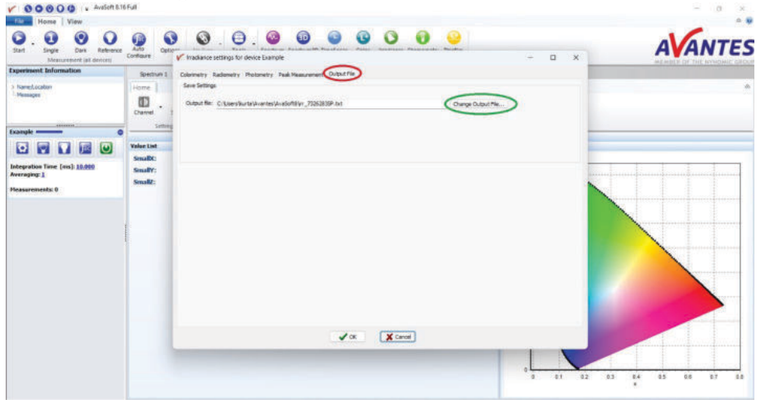


The next category is radiometric values emitted from a source measured inside a sphere. The measurable parameters here are simply radiant flux and energy emitted. Radiant intensity and radiant energy cannot be measured inside an integrating sphere since a solid angle cannot be defined. As stated previously, this is the preferred method to quantify radiant flux, as placing the light inside an integrating sphere ensures that light is measured from all directions of the source. An example of this would be placing an LED inside a sphere.

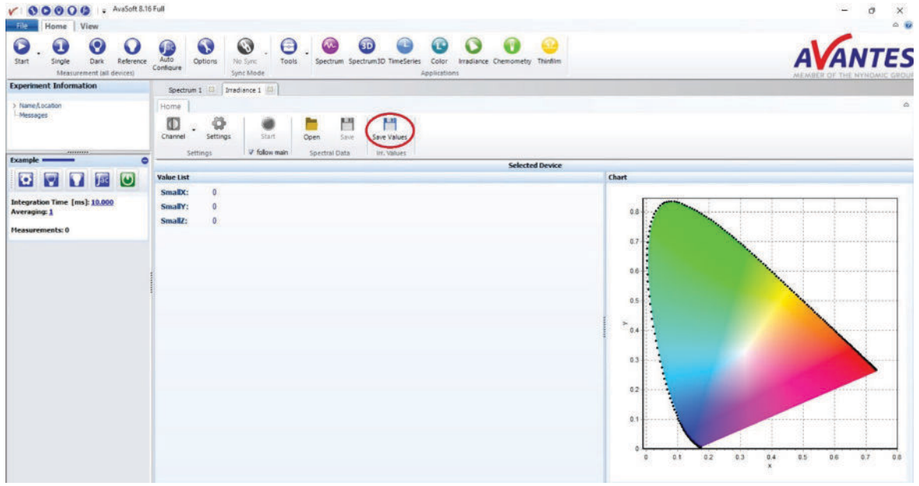
The last category is parameters measured by the detector surface. These include similar power and energy measurements, but are instead values of what is measured by the detector surface as opposed to what is produced by the light source. The irradiance and energy/cm2 parameters take these respective values and divide them by the detector area. For example, our standard cosine corrector has a diameter of 3.9 cm, so the divided area would be approximately 11.946 cm2. The last four parameters in this category relate to measuring photons measured by the detector surface. Because the number of photons measured per nanometer is very large even with low light intensity, Avogadro’s number is used to express the number of photons in Mol, or specifically µMol. The photon count distribution [µMol/(s*m2*nm)] is converted from power distribution [µWatt/(cm2*nm)]. Details on this calculation are available in the AvaSoft manual. The photon flux/m2 parameter is the photon count distribution over the defined wavelength range. The other photon parameters are derived from this value, including photon flux, which is photon flux/m2 multiplied by the diffuser surface, photons/m2, which is the number of photons received per square meter during one integration cycle, and photons, which is the number of photons received by the diffuser surface during one integration cycle.

It should be noted that all of these radiometric values are defined over a wavelength range set by the user. The default range will be the range of the spectrometer, though this can be adjusted as needed. For instance, a measurement may only pertain the visible range, so the wavelength range may be set from 380 nm to 780 nm.

Similar to the colorimetry values, the selected radiometry values can be measured in real time and saved to a text file. To name the text file and set the save location, click the Output File tab in the irradiance settings (circled in red below). The name and location can be set either in the text box or by clicking “Change Output File…” (circled in green below).



Once the file name and location are set, a data set can be saved while measurements are taken by clicking the “Save Values” button (circled in red below). This will save the data set at the time the button is clicked and notate the data set with a time stamp in the text file.



With these steps complete, the Irradiance module in AvaSoft can be utilized to measure and record a wide variety of radiometry values. Please reach out to our support team at support@avantes.com for further explanation or troubleshooting options.

SUPPORT & ADVICE

Providing high-quality equipment is only part of what we do. The other equally important factor is the high level of service we deliver. Our organization includes various services to provide you with the best support and advice:

Feasibility studies
Our sales engineers perform free feasibility studies to find your most ideal measurement setup.

Support team
Our support team never sleeps and provides you with the best possible service.

Demo program
Our demo program allows you to try our products for free to ensure that you find the perfect solution.

MyAvantes
Personal platform including AvaSoft software and other helpful material for you to download.

Online support
Helpful documents and tutorial videos on demand regarding to your products.

EXPLORE OUR SPECTROMETER LINES

SensLine

High-sensitivity
Demanding applications
Low noise
Ultra-high resolution
200-1160 nm
Stray light rejection
High stability
Thermo cooled

NIRLine

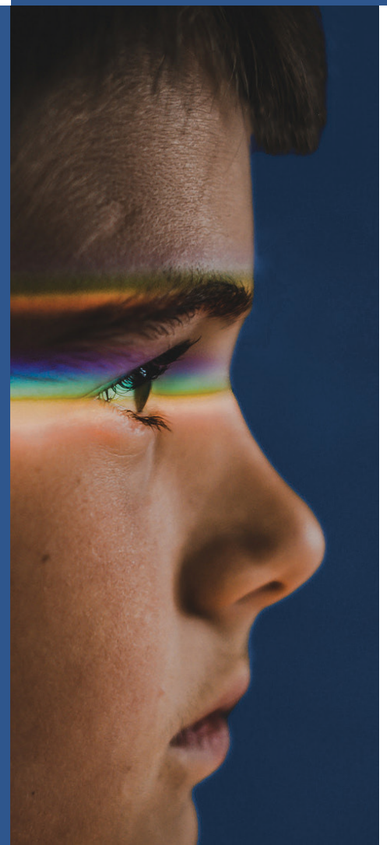
High-performance
Cooled & uncooled
Cooling to -25 °C
For harsh environments
900-1750 nm
Enhanced stability
Low noise
Compact option available

StarLine

High-performance
General applications
Stray light rejection
2048 or 4096 detec-
tor
200-1100 nm
High resolution
Improved sensitivity
USB powered

CompactLine

Compact
Easy integration
CMOS detector
2048 or 4096 detec-
tor
200-1100 nm
NIR-version available
900-1750 nm
USB powered



ABOUT AVANTES

We are Avantes, a leading player in the compact spectrometer industry. We operate in various industries, including (bio)medical, agriculture, semiconductor, and consumer electronics. Our instruments are found in world-class research laboratories, embedded in devices, or playing a crucial role in quality control during production.

With a long history of consulting with clients across various industries, Avantes is an **experienced partner** equipped to guide customers who want a solution tailored to their application and research needs.

Through our headquarters in the Netherlands and offices in the USA and China, our sales engineers work closely with our customers to find the most ideal measurement solution. In addition to our direct offices, Avantes has a **worldwide network** of distributors in over 35 countries ready to assist you. All of our products are made in our own production facility in the Netherlands.

Let our solutions empower your application
Scan the QR-code and discover how our solutions will empower your application. We are happy to help!

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CONTACT

WE'RE HAPPY TO HELP

Curious how spectroscopy can help you reveal answers by measuring all kind of materials, in-line, at your production facility, in a lab or even in the field? Please visit our website or contact one of our technical experts, we're happy to help you.

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