

SPECTROSCOPY CONFIGURATIONS FOR **LIFE SCIENCES APPLICATIONS**



SOLUTIONS FOR LIFE SCIENCES

Avantes instruments and accessories have been used successfully in a multitude of life science applications. Spectrometers and photonics sensors have been used for years in applications such as blood gas analysis and oximetry but they are now being deployed into a variety of new applications thanks to the developments in the fields of biophotonics and proteomics. Fiber based spectrometers offer a variety of advantages over traditional instruments including:

Size/portability – These configurations are optimized for size and with portability/transportability in mind.

Value – these instrument often have a superior price/performance ratio.

Micro-sampling for small sources or spot measurements by using fiber optics

Speed – Micro spectrometers can support sampling at KHz rates and higher

Non-invasive/non-contact sampling

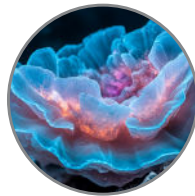
This brochure provides information on common configurations used in life science applications. Avantes offers many possible configurations for life sciences, this brochure only lists a few common configurations so we advise you to speak with one of our knowledgeable sales team members to learn more about the right configuration for your application. Avantes is not a manufacturer of integrated turnkey solutions, rather a component supplier for life science.

These configurations represent examples of Avantes capabilities, but certainly more unique configurations are possible based on each application. Please contact a sales engineer to discuss your requirements.

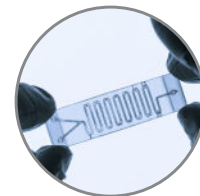
LIFE SCIENCE APPLICATIONS



Diffuse Reflection



Fluorescence



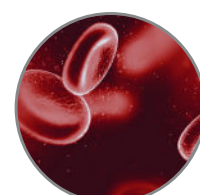
Microfluidics



Blood Gas Analysis



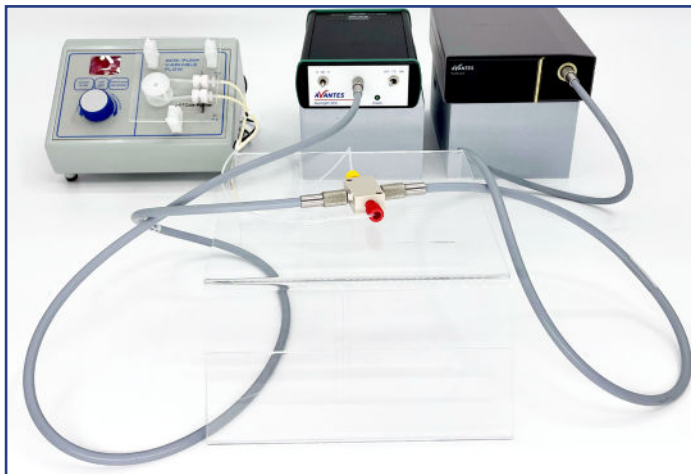
Endoscopy



Blood Perfusion

MICROFLUIDICS CONFIGURATION FOR FLUORESCENCE

For protein and similar biological medium measurements sample volumes are often constrained requiring the use of microfluidics for measurements. Avantes offers a variety of micro-fluidic and probe options to facilitate such measurements. The figures below show a typical set up for microfluidics measurements.



● Spectrometer

[AvaSpec-VARIUS™](#)

190-1100 nm range, with replaceable slit options.

● Light Source

[AvaLight-XE](#)

Pulsed xenon light source.

● Fiber Optic

[FC-UVIR600-1-MS](#)

600 micron core broad band fiber optic cable

● Flowcell-FL-Uitem

Microfluidic Fluorescence flow cell with SMA connectors. Fluid coupling for 1/8" or 1/16" tubing.

*Peristaltic Pump Sold Separately for Setup

MICROFLUIDICS CONFIGURATION FOR ABSORBANCE



● Light Source

[AvaLight-XE-Mini](#)

Miniature OEM pulsed xenon light source.

● Spectrometer

[AvaSpec-NEXOS™](#)

Miniature UV/VIS spectrometer 190-1100 nm

● Fiber Optic

[FC-UVIR600-1-MS](#)

600 micron core broad band fiber optic cable

● Flowcell-Z-10-PEEK

Microfluidic absorbance/transmission flow cell with SMA connectors fluid coupling for 1/8" or 1/16" tubing. Available in various pathlengths from 0.5-10 mm

*Peristaltic Pump Sold Separately for Setup

ADDITIONAL CUSTOMIZATION OPTIONS

Beyond the diffuse reflectance configurations shown above, AvaSpec instrument lines include higher performance spectrometers for measurements of lower limits of detection with a higher signal-to-noise performance.

The [AvaSpec-ULS2048X64-EVO](#) and [AvaSpec-1024X58-HSC-EVO](#) from our SensLine product family provide superior performance for more demanding applications. As an alternative to the flow cell configurations, Avantes offers microfluidic dip probes for similar applications.

Fluorescence measurements may also be performed with probe configurations such as the [FCR-UVIR200/600-2-IND](#) probe.

Such probe-based fluorescence may require the use of band pass and long pass filters, which allow for the separation of excitation from emission wavelengths. Avantes direct attached ([FH-DA](#)) and in-line filter holders ([FH-INL](#)), or an LED excitation source.

ADDITIONAL PROBE TIP OPTIONS



Microfluidic Dip Probe

1.5 mm OD tip. Various pathlengths available



Fluorescence Probe:

FCR-UVIR200/600-2-IND

More probe options?

Click [here](#) to discover all our fiber optic probes and cables.

DIFFUSE REFLECTANCE CONFIGURATION

Diffuse reflection is the technique of choice for surface and sub-surface dermal measurements. This technique allows for the measurement of reflection and absorption in the visible and near-infrared for the characterization of color and identification of abnormalities, such as lesions or masses.

Diffuse reflection can be performed ex-vivo on skin lesions or in-vivo during a biopsy or endoscopy and yields rich information about the tissues being analyzed. Combined with a near-infrared detector, the technique can provide a deeper penetration to 1 cm below the surface.

Avantes solutions for diffuse reflection typically consist of a spectrometer, either a reflection probe or an integrating sphere, and a light source.

INSTRUMENT DETAILS

Diffuse reflectance configuration with NEXOS™ and Avasphere-50-LS-HAL, shown with tissue phantom sample over integrating sphere port.



Spectrometer

[AvaSpec-NEXOS™](#)

Miniature UV/VIS OEM spectrometer
190-1100 nm range (adjustable).

Fiber Optic

[FC-UVIR600-1-MS](#)

600 micron core broad band fiber optic cable

Light Source

[AvaSphere-50-LS-HAL](#)

Integrated light source. 50 mm integrating sphere.

Reflection/Transmission Stage

TR-Stage-US: Transmission Stage (shown) and/or reflection stage configurations with vertical orientation

DIFFUSE REFLECTANCE PROBE BASED CONFIGURATION

Probe configurations for diffuse reflection are available with various options, including small tip diameters, side-firing configurations, right angle tips, or 45-degree angle tips with integrated windows such as our FCR-7UVIR200-2-45-ME. All probe configurations prevent the need for external light sources, and our AvaLight line can cover your needs. We also offer a variety of custom fiber optic probes with configurations to meet every application requirements you should have. Systems for in situ fluorescence measurement can also be configured with similar probe configurations and the additional bandpass filters to control excitation/emission



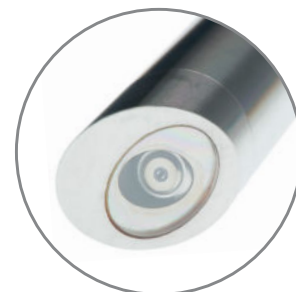
- **Spectrometer**
[AvaSpec-VARIUS™](#)
190-1100 nm range, with replaceable slit options.
- **Fiber Optic**
[FC-UVIR600-1-MS](#)
600 micron core broad band fiber optic cable

- **Light Source**
[AvaLight-HAL-S-Mini](#)
Compact, stabilized halogen light source with adjustable focusing of the fiber connection
- **Reflection/Transmission Stage**
TR-Stage-US: Transmission Stage (shown) and/or reflection stage configurations with vertical orientation

ADDITIONAL PROBE TIP OPTIONS



FCR-7UVIR400-2-ME
Standard fiber optic probe. 0.7mm outside diameter

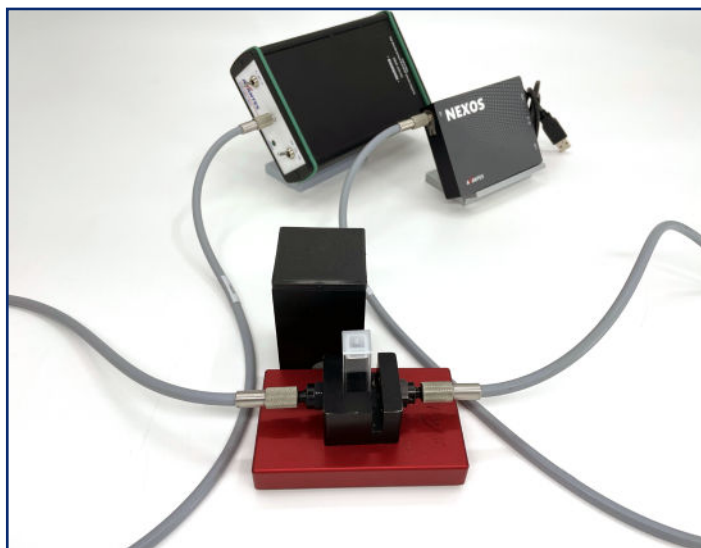


FCR-7UVIR200-2-45-BX
Side firing reflection probe with 45 degree window

ABSORBANCE CONFIGURATIONS

CUVETTE CELL MEASUREMENT SYSTEM WITH 1 MM CUVETTE CELL

Most life science applications begin their measurement at an experimental level. Here is where a cuvette cell comes in. We offer a variety of configurations to support researchers performing cuvette measurements of biological samples. Cuvette measurements provide a stable, well-controlled means of measuring samples while controlling variables such as path length, sample geometry, referencing, and temperature.



- **Spectrometer**
[AvaSpec-NEXOS™](#)
Miniature UV/VIS OEM spectrometer
190-1100 nm range (adjustable).
- **Light Source**
[AvaLight-DHc](#)
Deuterium halogen compact source
- **Fiber Optic**
[FC-UVIR600-1-MS](#)
600 micron core broad band fiber optic cable
- **Accessory**
[CUV-UV/VIS](#)
Cuvette cell holder

TEMPERATURE CONTROLLED CUVETTE CELL MEASUREMENT SYSTEM: 1 CM

For biological samples, temperature control can be of critical importance. For this reason, we offer a temperature control cuvette cell holder capable of operating from -30° to 105° C. Probe-based absorbance measurements featuring so-called dip probes are also facilitated within our instrument platform.



- **Spectrometer**
[Avaspec-ULS2048x64-EVO](#)
190-1100 nm range (adjustable), with
replaceable slit options.
- **Light Source**
[AvaLight-DHc](#)
Deuterium halogen compact source
- **Fiber Optic**
[FC-UVIR600-1-MS](#)
600 micron core broad band fiber optic cable
- **Accessory**
[CUV-UV/VIS-TC](#)
Cuvette cell holder; temperature controlled

ADDITIONAL INFORMATION ON PROBES

Probe configurations for diffuse reflection are also possible and include a variety of options including micro-tip probes (as low as 0.7 mm OD), 45 degree angle tipped probes, side firing probes and more.

IRRADIANCE CONFIGURATION

Many life science applications require radiometric characterization of light sources directly or probes attached to light sources to assess the dosing of light being emitted with each test. Avantes spectrometers can be configured into spectroradiometer systems that can quantitatively measure light sources such as on-chip LEDs, probe tips, etc. The image below demonstrates a configuration with an AvaSpec spectrometer and 100mm integrating sphere.



INSTRUMENT DETAILS

Radiometry configuration with spectrometer and integrating sphere.

- **Spectrometer**
[AvaSpec-VARIUS™](#)
190-1100 nm range (adjustable), with replaceable slit options.

- **Fiber Optic**
[FC-UVIR600-1-MS](#)
600 micron core broad band fiber optic cable

- **Light Source**
[AvaSphere-IRRAD-100](#)
Large Integrating Sphere; 100 mm

- **Irradiance Calibration**
[IRRAD-CAL-UV/VIS](#)
NIST traceable irradiance calibration; 200-100nm

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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