Light Sources

INTRODUCTION

For applications such as transmission, absorption and reflection, illumination sources are needed. Avantes offers a wide range of different light sources, to suit your specific needs. An overview of the different options can be found on this page.

Tungsten Halogen light sources are mostly used to do measurements in the visible and NIR range. AvaLight Halogen sources provide a very stable output combined with long bulb lifetime. The high-stability enables their use in reflection and transmission configurations or as an irradiance calibration light source. Most importantly, the Halogen light's spectral output is a smooth black body curve which provides for maximized dynamic range.

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Avantes Deuterium light sources are known for their stable output and are used for UV absorption or reflection measurements. These can also be used as irradiance calibration sources due to their high-stability. The standard AvaLight-DH-S mixes the Halogen light with the Deuterium light, thus producing a wide spectral range light source. The output spectrum of Deuterium light sources exhibits several peaks, with a prominent peak at 656 nm. The AvaLight-DH-S-BAL incorporates a dichroic beam splitter installed to minimize these peaks, providing a smooth spectrum from 200-2500 nm.

Our pulsed Xenon light source is used in applications where a long lifetime and high output power is needed, such as in fluorescence measurements. This is an affordable UV source, but the spectral output is not as smooth and continuous as the AvaLight Halogen and Deuterium light sources. LED light sources provide high power at a precise wavelength. A typical application for AvaLight-LED sources is fluorescence. They provide long lifetime, short warm-up time and high-stability.

For wavelength calibration Avantes offers a variety of sources including Argon, Mercury-Argon, Neon, Zinc and Cadmium. All Avantes spectrometers are factory wavelength calibrated and do not require recalibration as they have fixed slits and optics. For those customers who wish to do their own calibrations, the AvaLight-CAL light sources can be used for recalibration purposes. For auto-calibration AvaSoft-Full provides a calibration procedure to make this easy.

New to the Avalight illumination sources family is the AvaLight-LDXE, a very high brightness light source. It has an extremely long lamp life, a spectral range from 200 nm to 1100 nm and a high-stability.

Table 8 Overview light sources

|	Wavelength Range	Type	Principle	Product
Color / VIS / NIR	360-2500 nm	Tungsten Halogen	Continuous	AvaLight-HAL(-S)
DUV	190-400 nm	Deuterium	Continuous	AvaLight-D-S-DUV
UV	215-400 nm	Deuterium	Continuous	AvaLight-D-S
UV/VIS/NIR refl./abs.	215-2500 nm	Deuterium/Halogen	Continuous	AvaLight-DH-S-(BAL)
UV/VIS/NIR absorption	200-2500 nm	Deuterium/Halogen	Continuous	AvaLight-DHc
UV/VIS	200-1000 nm	Xenon	Pulsed	AvaLight-XE
UV/VIS high-brightness	200-1100 nm	Laser-driven Xenon	Continuous	AvaLight-LDXE
	Multiple possible	LED	Continuous	AvaLight-LED
Fluorescence	200-1100 nm	Laser-driven Xenon+ band-pass filter	Continuous	AvaLight-LDXE
Wavelength Calibration	253-1704 nm	Mercury-Argon Neon / Argon	Continuous	AvaLight-CAL
	200-700 nm	Zinc/Cadmium	Continuous	AvaLight-CAL-CAD/Zinc
Irradiance Calibration	360-2500 nm	Tungsten Halogen	Continuous	AvaLight-HAL-CAL
	200-1100 nm	Deuterium/Halogen	Continuous	AvaLight-DH-(BAL)-CAL
Radiance Calibration	360-2500 nm	Tungsten Halogen	Continuous	AvaSphere-50-LS-HAL-CAL
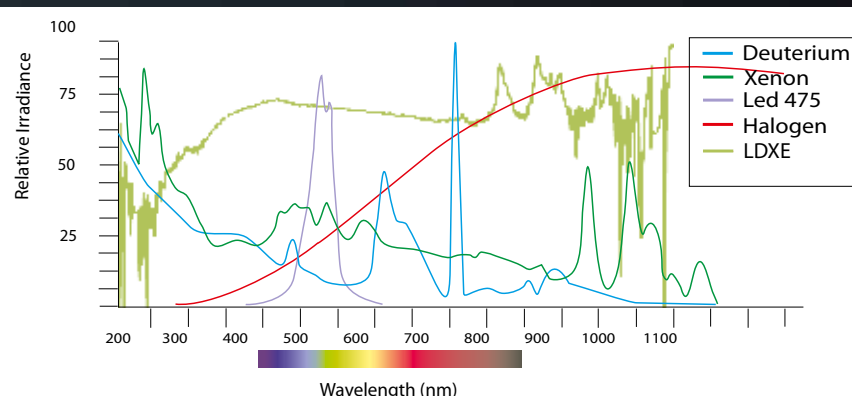
Figure 7 spectral distribution of different Light Sources

AvaLight-DHc
Full-range Compact Light Source

AvaLight-DHc

Get the best out of two worlds with the AvaLight-DHc. It has both a deuterium light source and a halogen light source, providing you with adequate light between 200 and 2500 nm for nearly all absorbance chemistry applications. Deuterium emits light between 200 and 550 nm, where the halogen takes over up to 2500 nm. Coupling to the rest of your spectroscopy system is easy with the SMA connector.

This light source is recommended in settings with large fiber cables or direct-attachment to a cuvette holder such as the CUV-DA, due to its relatively low output energy. The integrated TTL-shutter makes saving a dark measurement very simple in combination with AvaSoft (extra IC-DB26-2 needed).

Optionally the AvaLight-DHc is available in a rack-mountable version, to be used in the 19" rack or the 9.5" desktop system.

* Combined Deuterium-Halogen
* Low cost
* Integrated TTL-shutter

A direct-attach cuvette holder CUV-DA (see section accessories) is available for fluorescence or absorbance measurements.
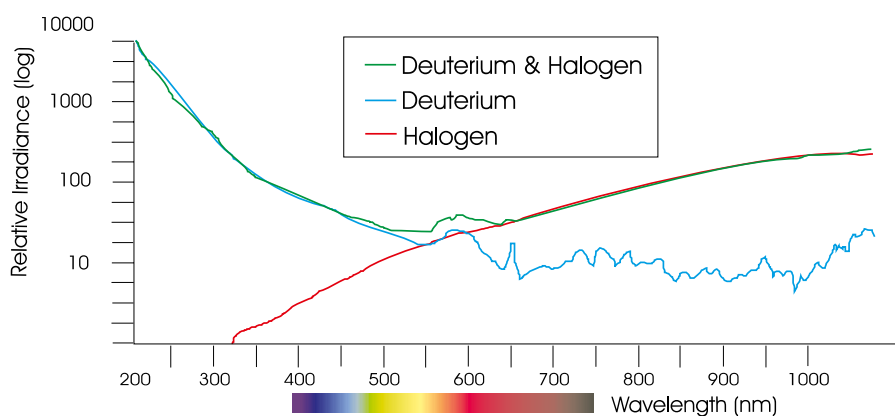

Figure 8 Spectral output of AvaLight-DHc

Technical Data

	Deuterium Light Source	Halogen Light Source
Wavelength Range	200 - 400 nm	400 - 2500 nm
Stability	< 1 mAU	< 1 mAU
Warm-up time	8 min	1 min
Drift	< 0.25% / h	< 0.25% / h
Optical Power in 600 µm fiber	0.2 µWatt	7 µWatt
Lamp Lifetime	1000 hours	2000 hours
Temp. Range	5ºC - 35ºC	
Power Supply	12VDC / 450 mA	
Dimensions	175 x 110 x 44 mm	

Light Sources

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Ordering information

AvaLight-DHc	• Compact Deuterium Halogen Light Source with TTL Shutter
IC-DB26-2	• Interface cable AvaSpec-USB2 platform to AvaLight-DHc-TTL-shutter
AvaLight-DHc-RM	• Rackmount Compact Deuterium Halogen Light Source with TTL Shutter
AvaLight-DHc-B	• Compact Deuterium Halogen Replacement Bulb
CUV-DA	• Direct-attach cuvette holder for AvaLight-DHc/XE/LED
PS-12V/1.0A	• Power supply 100-240VAC/12VDC, 1.0A for AvaLight-DHc

Three years
limited warranty on all
Avantes spectrometers,
light sources and accessories

![AVANTES solutions in spectroscopy]

AvaLight-HAL Tungsten Halogen Light Source

AvaLight-HAL

From visible light to near infrared, that's where the AvaLight-HAL works best. It's a compact, stabilized halogen light source, with adjustable focusing of the fiber connection, maximizing output power at the desired wavelength. The light source also has adjustable output power to provide extra power or longer bulb life.

A filter-slot mounted on the front of the AvaLight-HAL accepts 1" round or 2" x 2" square filters, to block specific ranges of wavelengths or instantly lower the intensity. A direct-attached cuvette holder, CUV-DA-HAL, useful for fluorescence or absorbance measurements, replaces the filter holder and enables a fiberless illumination of cuvette cells.

The adjustable focus on the AvaLight-HAL helps you getting the most out of your light source: it makes sure all possible power is transmitted through your optical fiber. Bulb replacement is easy and can be done in a matter of minutes.

Optionally the ATT-DA-HAL can be ordered to attenuate the output from the AvaLight-HAL(-S), a combined direct-attach cuvette holder and attenuator is available as well (CUV-ATT-DA-HAL).

The optical output can be controlled through an internal jumper. At low setting the lamp has a color temperature of 2700K but provides over 4000 hours of lifetime. The standard or medium setting changes the color temperature to 2850K and provides 50% more power with a bulb lifetime of 2000 hours. The high power setting gives a color temperature of 3000K, doubles power compared to the long-life setting and gives you up to 1000 hours of lifetime.

The AvaLight-HAL-S features an internal TTL-shutter, controllable from your AvaSpec spectrometer. This gives you the ability to use the auto-save dark option in AvaSoft spectroscopy software.

For more demanding environments we developed the AvaLight-HAL-S-IND, that comes with a heavy-duty industrial power connector and 24V power adapter included. This connector is also available as an upgrade to your existing AvaLight-HAL-S.

* VIS-NIR output (360-2500 nm)
* Controllable power
* Internal TTL-shutter
* Filter-slot standard

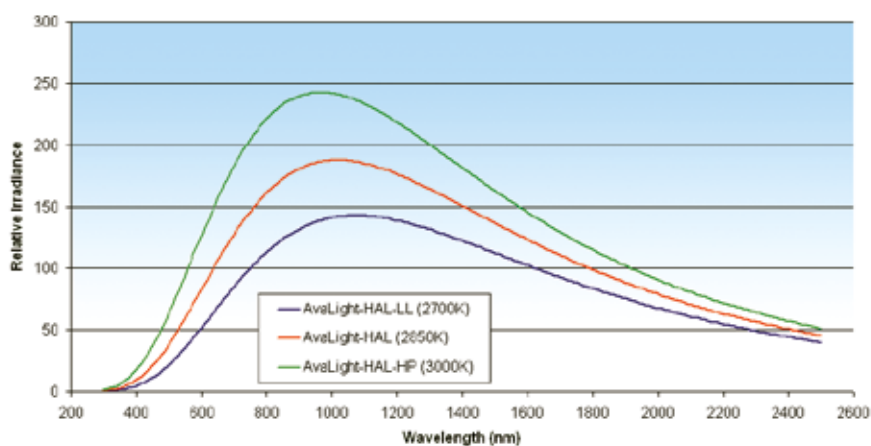Figure 9 Spectral output of AvaLight-HAL

Light Sources

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Technical Data

	AvaLight-HAL (standard)	AvaLight-HAL (long life)	AvaLight-HAL (high power)
Wavelength Range	360-2500 nm		
Stability	± 0.1%		
Time to stabilize	Ca. 15 min.		
Output to bulb	12.0 VDC/ 0.83A	11.3 VDC/ 0.8A	14.1 VDC/ 1.0A
Bulb Life	2000 hrs	> 4000 hrs	< 1000 hrs
Optical power* 200 µm fiber	0.5 mWatt	0.35 mWatt	0.7 mWatt
Optical power* 600 µm fiber	4.5 mWatt	3.2 mWatt	6 mWatt
Optical power* 1000 µm fiber	10 mWatt	7 mWatt	14 mWatt
Bulb Color Temperature	2,850 K	2,700 K	3,000 K
Power requirement	24 VDC / 1.25A		
Temperature range	0-65 ºC		
Dimensions, weight	132 x 110 x 44 mm, 490 grams		

* Optical power measured from 350-1100 nm

Separate 50x50 mm filters to install in AvaLight-HAL-(S)

GL-WG305-3	Separate 50 x 50 x 3 mm long-pass filter > 305 nm
GL-KG3-3	Separate 50 x 50 x 3 mm band-pass filter, transparent > 325 nm and < 700 nm
GL-BG28-3	Separate 50 x 50 x 3 mm band-pass filter, transparent > 360 nm and < 500 nm
GL-GG385-3	Separate 50 x 50 x 3 mm long-pass filter > 385 nm
GL-GG475-3	Separate 50 x 50 x 3 mm long-pass filter > 475 nm
GL-OG515-3	Separate 50 x 50 x 3 mm long-pass filter > 515 nm
GL-OG550-3	Separate 50 x 50 x 3 mm long-pass filter > 550 nm
GL-OG590-3	Separate 50 x 50 x 3 mm long-pass filter > 590 nm
GL-NG9-1	Separate 50 x 50 x 1 mm Neutral Density filter (transmission 10%, 400-1100 nm)
GL-NG9-2	Separate 50 x 50 x 2 mm Neutral Density filter (transmission 1%, 400-1100 nm)
GL-NG9-3	Separate 50 x 50 x 3 mm Neutral Density filter (transmission 0.1%, 400-1100 nm)

More filter types available, please contact us for ordering information

Ordering Information

AvaLight-HAL	• 10W Tungsten Halogen Lamp, fan-cooled, needs extra PS-24V/1.25A power supply
AvaLight-HAL-S	• As AvaLight-HAL, incl. TTL shutter, needs extra PS-24V/1.25A power supply
AvaLight-HAL-S-IND	• As AvaLight-HAL-S, including industrial connector and PS-24V/1.25A power supply
AvaLight-HAL-S-RM	• Rack-mounted version of AvaLight-HAL-S
IC-DB26-2	• Interface cable AvaSpec-USB2 platform to AvaLight-HAL-S
AvaLight-HAL-B	• 10W Tungsten Halogen Replacement bulb for AvaLight-HAL(-S)
HAL-S-IND-UPGRADE	• Upgrade from HAL-S to HAL-S-IND, incl. industrial connector. Please return with PS-24V/1.25A
CUV-DA-HAL	• Direct-attach cuvette holder for AvaLight-HAL(-S)
ATT-DA-HAL	• Direct-attach attenuator for AvaLight-HAL(-S)
CUV-ATT-DA-HAL	• Direct-attach cuvette holder and attenuator for AvaLight-HAL(-S)
PS-24V/1.25A	• Power supply 100-240VAC/24VDC, 1.25A, necessary for AvaLight-HAL

AvaLight-DH-S Deuterium-Halogen Light Source

AvaLight-DH-S

In need of more power than the AvaLight-DHc? The AvaLight-DH-S is Avantes' most powerful deuterium halogen source. Like the DHc it is also a combined deuterium and halogen light source, capable of transmitting light in the UV/VIS/NIR-range, but has 35 times more halogen output and up to 300 times more deuterium power. The source has a prominent 656 nm deuterium peak which can limit dynamic range (see Avalight-DH-S-BAL as an alternative). It includes a focusing lens assembly, to fully utilize the possibilities and size of your fiber.

The AvaLight-D-S is a deuterium light source only, making it a great option for measurements in the UV range, 215-400 nm. The AvaLight-D-S-DUV version starts even lower at 190 nm, for your deep-UV experiments.

The output of the AvaLight-DH-S is optimized for fibers or bundles up to 600 micrometers. For larger fibers the focal point is manually adjustable to optimize the light coupling into your fiber.

To protect the fibers from solarizing, standard AvaLight-D(H)S light sources have a special UV long-pass filter (>220 nm) implemented. Should you require a spectral output below 220 nm, then please order the Deep-UV-version (DUV), which is available in three versions (see table on the next page).

The AvaLight-D(H)-S features an integrated TTL-shutter and filter holder for filters of up to 50x50x5.0 mm.

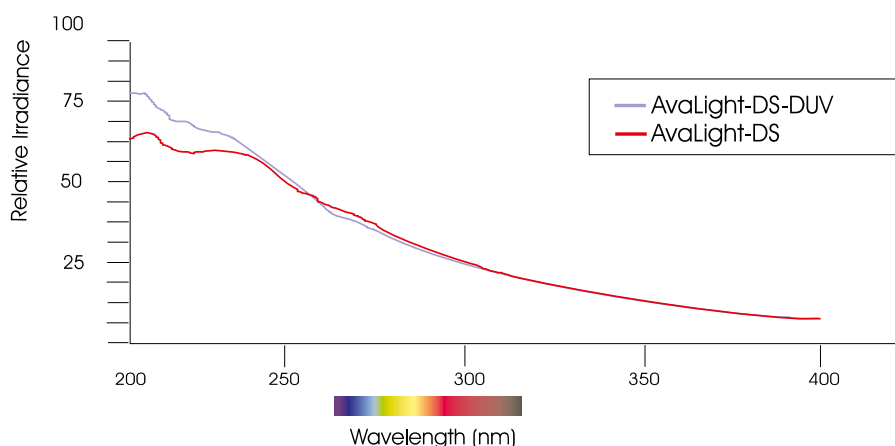* Combined Deuterium-Halogen
* UV-VIS-NIR
* Deep-UV optional
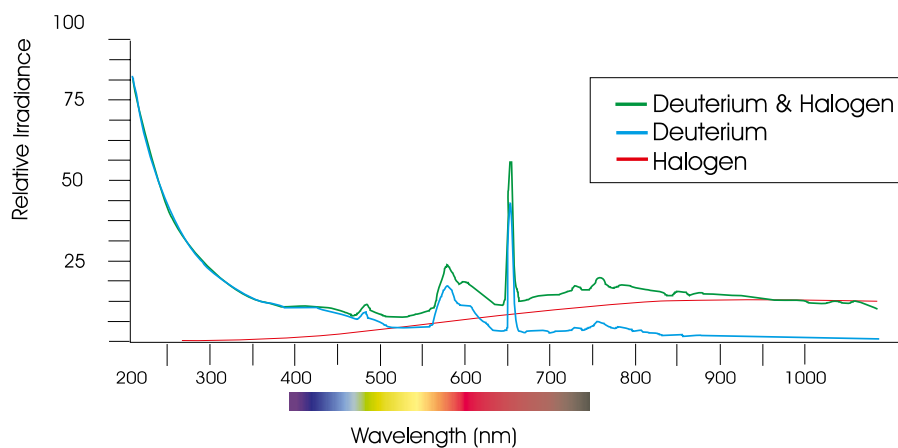* Powerful

Figure 10 Spectral output AvaLight-D-S

Figure 11 Spectral output AvaLight-DH-S

Technical Data

|	Deuterium (Deep-UV)	Deuterium (Standard)	Deuterium (long-life DUV)	Halogen
Wavelength Range	190-400 nm	215-400 nm	185-400 nm	360-2500 nm
Warm-up Time	30 min.	30 min.	30 min.	20 min.
Lamp Power	78W / 0.75A	78W / 0.75A	78W / 0.75A	5W /0.5A
Lamp Lifetime	1000 h	1000 h	2000 h	1000 h
Noise (AU)	$2x\ 10^{-4}$	$2x\ 10^{-4}$	$2x\ 10^{-5}$	10^{-4}
Max. drift	± 0.5%/h	± 0.5%/h	± 0.5%/h	±0.1%/h
Color Temperature	-	-	-	3000 K
Optical Power* in 200µm fiber	11 µW	7 µW	11 µW	43 µW
Optical Power* in 600µm fiber	72 µW	61 µW	72 µW	239 µW
Optical Power* in 1000µm fiber	206 µW	166 µW	206 µW	354 µW
Power consumption	90 Watt (190Watt for heating D-Lamp 4-5 sec.)			
Power Requirements	100-240VAC 50/60 Hz			
Dimensions / Weight	315 x 165 x 140 mm / ca 5 kg.			

* total power for the specified wavelength range

For a table of separate 50x50 mm filters to install in AvaLight-D(H)-S see AvaLight-HAL.

AvaLight-LDXE:
high-brightness laser-driven
Xenon light source

AvaLight-DH-S-BAL
Balanced Power

AvaLight-DH-S-BAL
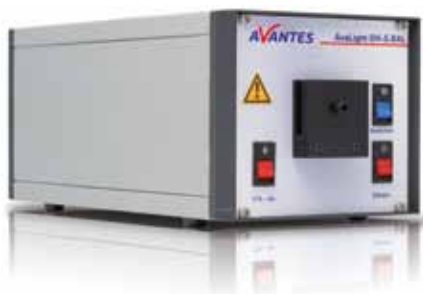
The AvaLight-DH-S is a powerful deuterium halogen source, but like any unbalanced deuterium halogen source it does have a very dominant alpha peak at 656 nm. This is why Avantes developed the DH-S-BAL, in which this peak is drastically reduced by a dichroic filter. This means less power, but an increase in the dynamic range of a factor 20. A comparison spectrum as taken with a standard AvaSpec-2048 is shown on the next page. Existing AvaLight-DH-S light sources can be upgraded.

The light source delivers a continuous spectrum with high efficiency. The highest stability is in the ultraviolet, visible and near infrared range, from 200 to 2500 nm. An integrated TTL-shutter and filter holder for filters of up to 50x50x5.0 mm are included. The TTL-shutter can be controlled from any AvaSpec spectrometer, which means the auto-save dark-option in AvaSoft software can be used (please note: IC-DB26-2 cable

needed).

Connection to the fiber is done through an SMA-905 connector, which features an adjustable focusing lens assembly. This ensures you getting the maximum possible power into your fiber. For all deuterium light sources solarization resistant fibers (-SR) are recommended (see the fiber-optic section of this catalog). The output of the AvaLight-DH-S-BAL is optimized for fibers or bundles up to 1500 µm.

* Balanced light source
* Wide spectrum: 200-2500 nm
* Integrated TTL shutter
* High efficiency
* Increased dynamic range

The filter holder can be easily replaced by a direct-attach cuvette holder CUV-DA-DHS (see section accessories) useful for fluorescence or absorbance measurements.

Technical Data

	DUV Deuterium	Deuterium Long-life DUV	Balanced Deuterium (Standard)	Balanced Halogen Lamp
Wavelength Range	190-400 nm	185-400 nm	215-500 nm	500-2500 nm
Warm-up Time	30 min.	30 min.	30 min.	20 min.
Lamp Power	78 W / 0.75 A	78 W / 0.75 A	78 W / 0.75 A	5 W / 0.5 A
Lamp Lifetime	1000 hrs	2000 hrs	1000 hrs	1000 hrs
Noise (AU)	$2x\ 10^{-4}$	$2x\ 10^{-5}$	$2x\ 10^{-4}$	10^{-4}
Max. drift	± 0.5%/hr	± 0.5%/hr	± 0.5%/hr	±0.1%/hr
Color Temperature	-	-	-	3000 K
Optical Power in 200 µm fiber	6 µW	6 µW	4 µW	17 µW
Optical Power in 600 µm fiber	33 µW	33 µW	28 µW	160 µW
Optical Power in 1000 µm fiber	90 µW	90 µW	72 µW	448 µW
Power consumption	90 Watt (190 Watt for heating D-Lamp 4-5 sec.)			
Power Requirements	100-240 VAC 50/60 Hz			
Dimensions / Weight	315 x 165 x 140 mm / ca 5 kg.			

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AvaLight-DHS vs AvaLight-DH-S-BAL
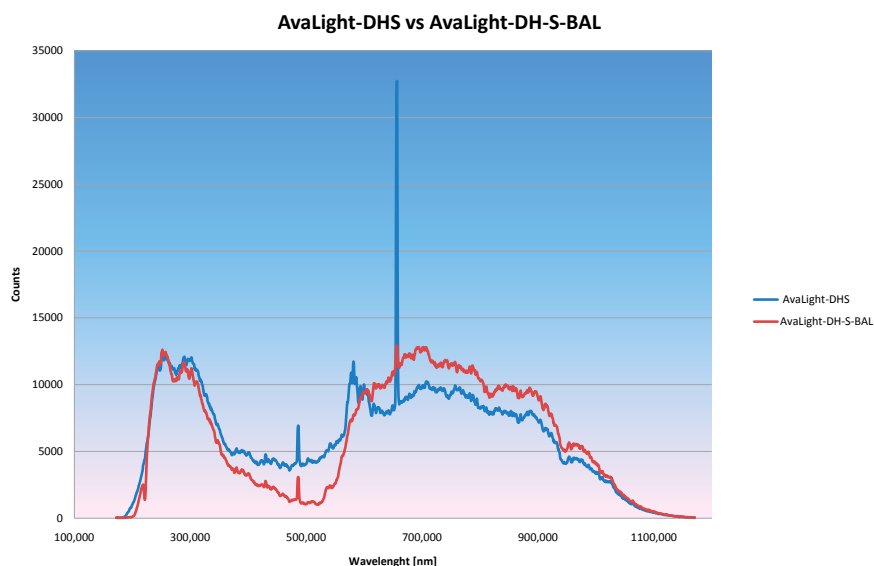
Figure 12 Spectral output AvaLight-DH-S-BAL (red) vs. AvaLight-DH-S (blue)

Ordering Information

AvaLight-D-S-BAL	• Balanced Deuterium light source, 200-400 nm, incl. TTL shutter, -SR fibers needed
AvaLight-DH-S-BAL	• Balanced Deuterium-Halogen light source, 200-2500 nm, incl. TTL shutter, -SR fibers needed
DH-S-BAL upgrade	• Upgrade existing AvaLight-DH-S to an AvaLight-DH-S-BAL Balanced Deuterium-Halogen light source, 200-2500 nm
AvaLight-DH-S-BAL-DUV	• Deep-UV 190-2500 nm version of the AvaLight-DH-S-BAL, -SR fibers needed!
AvaLight-DH-S-BAL-DUV-LL	• long-life 2000 hrs version of the AvaLight-DH-S-BAL-DUV
IC-DB26-2	• Interface cable AvaSpec-USB2 platform to AvaLight-D(H)S-BAL
AvaLight-D-B	• Replacement deuterium bulb for AvaLight-D/AvaLight DH-BAL light source
AvaLight-D-B-DUV	• Replacement deep-UV deuterium bulb for AvaLight-D/AvaLight DH-BAL light source
AvaLight-D-B-DUV-LL	• Long-life 2000 hrs. Replacement deep-UV deuterium bulb for AvaLight-D/AvaLight DH-BAL light source
AvaLight-DH-B	• Replacement halogen bulb for AvaLight-DH-BAL light source
CUV-DA-DHS	• Direct-attach cuvette holder for AvaLight-D(H)S-BAL

Add flexibility
to your spectrometer with
the Replaceable Slit (-RS) option

AvaLight-XE Pulsed Xenon

AvaLight-XE

Perfect for ultraviolet applications like fluorescence, the AvaLight-XE is a pulsed xenon light source. When connected to your AvaSpec spectrometer through the IC-DB26-2 cable (sold separately), the flashes are synchronized with the data collected by the spectrometer. In AvaSoft the number of flashes per scan can be selected.

With a special DUV bulb the AvaLight-XE can be used for deep ultraviolet application (below 200 nm). A special direct-attach cuvette holder is available for your fluorescence applications. For transmission measurements, the Avalight-XE can be used in conjunction with the CUV-ATT-DA which has an iris attenuator to limit the light output and to avoid saturation.

* Pulsed light source
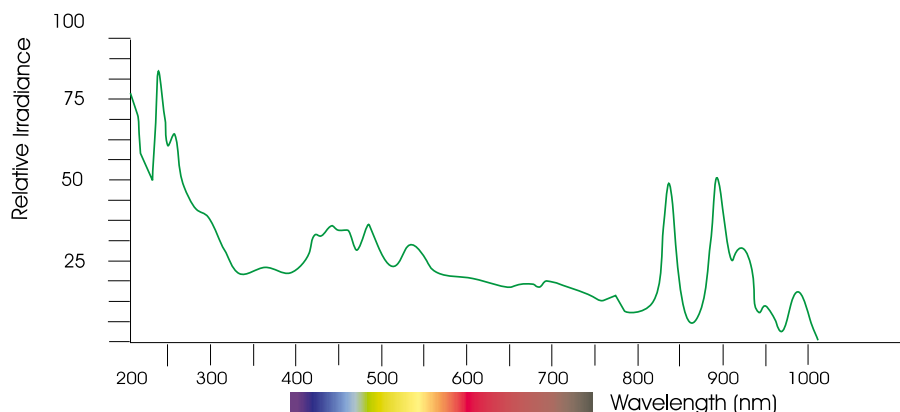* Perfect for fluorescence
* Cuvette holder available
* Long lifetime

Figure 13 Spectral output of the AvaLight-XE

For more brightness,
take a look at
the AvaLight-LDXE

Technical Data

Spectral Output	200 nm to 1000 nm
Total Optical Power output	39 µJ per pulse (average 66 mW)
Optical Power in 200 µm fiber	0.66 µJ per pulse (average 20 µW)
Optical Power in 600 µm fiber	3.2 µJ per pulse (average 320 µW)
Optical Power in 1000 µm fiber	7.4 µJ per pulse (average 744 µW)
Synchronization Input	15 pin sub-D connector, TTL level
Pulse Duration	5 µs (at 1/3 height)
Pulse delay	6 µs
Pulse rate (max.)	100 Hz
Bulb Life	min. 10^9 pulses
Connector	SMA-905 connector
Power requirement	12 VDC/550 mA
Dimensions, weight	175 x 110 x 44 mm, 540 grams

Ordering Information

AvaLight-XE	• Xenon Light Source (200-1000 nm), needs interface cable and power supply
AvaLight-XE-DUV	• DUV (160-1000 nm) version of the AvaLight-XE, needs interface cable and power supply
AvaLight-XE-B	• Spare bulb for the AvaLight-XE (200-1000 nm)
AvaLight-XE-B-DUV	• Spare bulb for the AvaLight-XE-DUV (160-1000 nm)
IC-DB26-2	• Interface cable AvaSpec-USB2 platform to AvaLight-XE
CUV-DA	• Direct-attach cuvette holder for AvaLight-DHc/XE/LED
ATT-DA	• Direct-attach attenuator for AvaLight-DHc/XE/LED
CUV-ATT-DA	• Direct-attach cuvette holder and attenuator for AvaLight-DHc/XE/LED
PS-12V/1.0A	• Power supply 100-240VAC/12VDC, 1.0A for AvaLight-XE

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AvaLight-HAL-CAL and AvaLight-DH-CAL Calibrated Light Sources

AvaLight-HAL-CAL

Calibrating your spectrometer has never been easier: the AvaLight-HAL-CAL and Avalight-DH-CAL are NIST traceable calibrated light sources to measure absolute spectral intensity.

The AvaLight-HAL-CAL is a compact, affordable light source. It is calibrated for the visible range (350-1095 nm). Optionally, an extended calibration for the near-infrared spectral range (1100-2500 nm) can be ordered. It has a built-in diffuser, a cosine corrector with SMA adapter and a CD-ROM containing the calibration file in ASCII

format. To calibrate your spectrometer for intensity and turn it into a spectroradiometer, use the AvaSoft-IRRAD software module.

The AvaLight-HAL-CAL-ISPxx is a special version of the Avalight-HAL-CAL, which enables coupling any of Avantes' AvaSphere-xx-IRRAD integrating spheres to the light-source (xx=30, 50 or 80) for calibration. This source is supplied with a special bottom plate to stabilize the AvaSphere. The Avalight-HAL-CAL and Avalight-HAL-CAL-ISP include a power supply.

* Low cost calibration
* Visible and optional NIR range
* Built-in diffuser
* Versatile

AvaSphere-50-LS-HAL-CAL

For radiance calibration in the visible spectral range (360-1100 nm), Avantes offers the AvaSphere-50-LS-HAL-CAL. This radiance calibration sphere is normally used to calibrate a spectrometer and a bare fiber with an SMA connector. This uniform source ensures that the fiber is homogeneously illuminated during calibration.

The AvaSphere-LS-HAL-CAL is supplied with a power supply and a CD-ROM with the calibration file in ASCII-format.

* Radiance calibration
* Visible range
* For homogeneous illuminated areas

AvaLight-DH-CAL

For calibrations in the ultraviolet and visible range (200-1099 nm), the AvaLight-DH-CAL is the best solution. This source can be used with all AvaSpec spectrometers to calibrate for absolute spectral intensity. It is supplied with a built-in diffuser, a cosine corrector (CC-VIS/NIR) with SMA adapter and a CD-ROM containing the calibration files in ASCII format.

Two calibration files are included: one for irradiance calibration over the full range (200-1099 nm) and one over the visible and near infrared range (350-1099 nm). For the first file, both the deuterium and the halogen bulb should be used during calibration. The second file is to be used with only the halogen light. The halogen only spectrum

provides a smoother black body calibration spectrum for the longer wavelengths.

For a more balanced spectrum accross the 200-1100 nm range, Avantes offers the AvaLight-DH-BAL-CAL. For ultraviolet range calibration only (200-400 nm), the AvaLight-D-CAL is the right choice.

The calibration files can be imported in the AvaSoft-IRRAD application software, for intensity calibration which turns your spectrometer into a spectroradiometer.

The AvaLight-DH-CAL-ISPxx is a special version of these calibrated light sources, meant to facilitate coupling of the AvaSphere-xx-IRRAD integrating spheres

to the light source. (xx is 30, 50 or 80). The AvaLight-DH-CAL, AvaLight-DH-BAL-CAL and AvaLight-D-BAL-CAL all include a power supply.

* Flexible calibration
* Ultraviolet and visible range
* Built-in diffuser and cosine corrector

Technical Data

	AvaLight-HAL-CAL	AvaSphere-50-LS-HAL-CAL	AvaLight-DH-(BAL)-CAL
Calibration use	Irradiance µW cm^{-2} nm^{-1}	Radiance µW sr^{-1} cm^{-2} nm^{-1}	Irradiance µW cm^{-2} nm^{-1}
Calibrated surface	CC-VIS/NIR or AvaSphere	Bare fiber	CC-UV/VIS or AvaSphere
Wavelength Range	350-1095 nm / 1100-2500 nm*	350-1095 nm / 1100-2500 nm*	200-1099 nm
Calibration Repeatability	± 0.5 %	± 0.5 %	± 1.0%
Calibration Relative Uncertainty to NIST standard	±9.5% (350-1100 nm) ±6.5% (1100-1950 nm) ±9.5% (1950-2500 nm)	±9.5% (350-1100 nm)	±10% (200-240 nm) ±9% (240-350 nm) ±10% (350-400 nm) ±9.5% (400-1100 nm)
Calibration valid for	60 hrs	60 hrs	60 hrs
Warm-up Time	Ca. 15 min.	Ca. 15 min.	Ca. 30 min.
Bulb Output	170µW cm^{-2} nm^{-1} (@800 nm)	100 µW sr^{-1} cm^{-2} nm^{-1} (@800 nm)	80 µW cm^{-2} nm^{-1} (@215 nm) 5 µW cm^{-2} nm^{-1} (@800 nm)
Power requirement	24 VDC / 1.2 A	24 VDC / 0.3 A	100-240 VAC
Dimensions	132 x 110 x 44 mm	70 round x 75 mm height	315 x 165 x 140 mm

* optional extended range NIR calibration

Ordering Information

AvaLight-HAL-CAL	• NIST traceable Halogen Lamp with CC- VIS/NIR diffuser, incl. PS-24V/1.25A
AvaLight-HAL-CAL-ISP30	• NIST traceable Halogen Lamp for use with AvaSphere-30-IRRAD, incl. PS-24V/1.25A and special sphere holder bottom plate
AvaLight-HAL-CAL-ISP50	• As AvaLight-HAL-CAL-ISP30 for use with AvaSphere-50-IRRAD
AvaLight-HAL-CAL-ISP80	• As AvaLight-HAL-CAL-ISP30 for use with AvaSphere-80-IRRAD
AvaSphere-50-LS-HAL-CAL	• NIST traceable radiance calibration source, 10 mm and SMA adapter calibrated, incl PS-24V/1.25A
HL-Recal	• AvaLight-HAL-CAL recalibration service 350-1095 nm
HL-Recal-NIR	• AvaLight-HAL-CAL extended or recalibration service 1100-2500 nm
AvaLight-D-CAL	• NIST traceable UV Deuterium Lamp with CC-UV/VIS diffuser, -SR fibers recommended
AvaLight-DH-CAL	• NIST traceable UV/VIS Deuterium/Halogen Lamp with CC-UV/VIS diffuser, -SR fibers recommended
AvaLight-DH-BAL-CAL	• As AvaLight-DH-CAL, but balanced UV/VIS Deuterium/Halogen
AvaLight-DH-CAL-ISP30	• NIST traceable UV/VIS Deuterium/Halogen Lamp for use with AvaSphere-30-IRRAD, incl. special sphere holder bottom plate, -SR fibers recommended
AvaLight-DH-CAL-ISP50	• As AvaLight-DH-CAL-ISP30 for use with AvaSphere-50-IRRAD
AvaLight-DH-CAL-ISP80	• As AvaLight-DH-CAL-ISP30 for use with AvaSphere-80-IRRAD
DH-Recal	• AvaLight-DH-CAL recalibration service 200-1099 nm
AvaSoft-IRRAD	• Irradiance add-on software, to be ordered with AvaSoft-Full

Light Sources

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AvaLight-CAL Spectral Calibration Source

The AvaLight-CAL is a spectral calibration lamp. It's available in Mercury-Argon (253.6-922.5 nm), Neon (337-1084.5 nm), Argon (696.5-1704 nm) Zinc (202.5-636.2 nm) and Cadmium (214.4-643.8 nm) versions. The major lines including their relative intensity and structures are shown on the bottom surface.

The standard SMA-905 connector supplies an easy connection between the lamp and optical fibers, making the AvaLight-CAL a low cost wavelength calibration system for any fiber-optic spectrometer. AvaSoft-Full

spectroscopy software includes an automatic recalibration procedure.

The AvaLight-CAL can also be delivered in rack-mountable version, to be integrated in Avantes 19" Rack-mount or the 9.5" desktop housing. The PS-12V/1.0A power supply should be ordered separately.

* Calibration light source
* Low cost
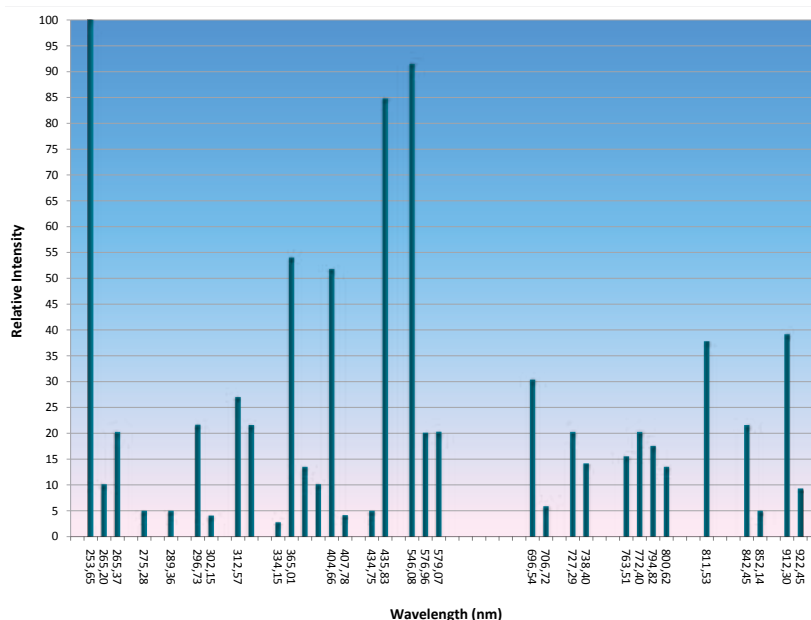* Available in a variety of wavelength ranges (UV to NIR)

AvaLight-CAL

Figure 14 Spectral lines - AvaLight-CAL

AvaLight-LDXE:
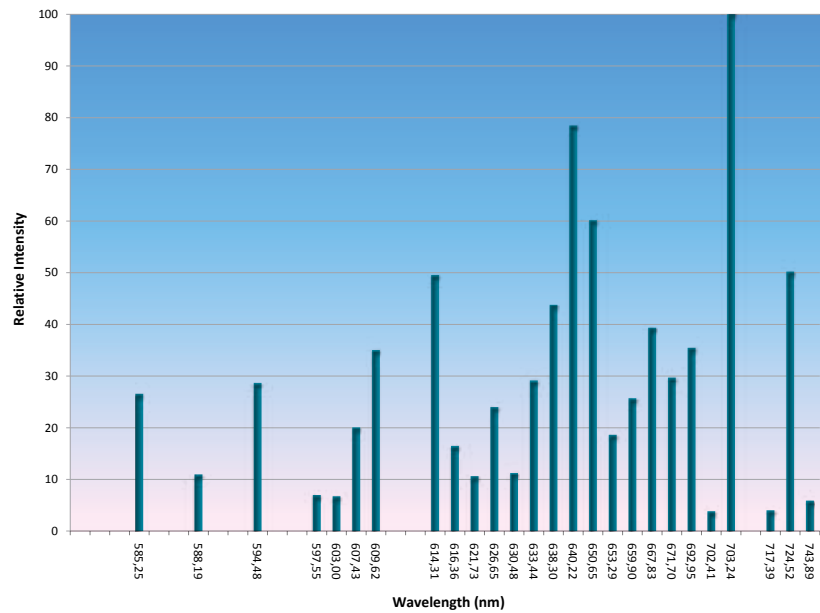high-brightness laser-driven
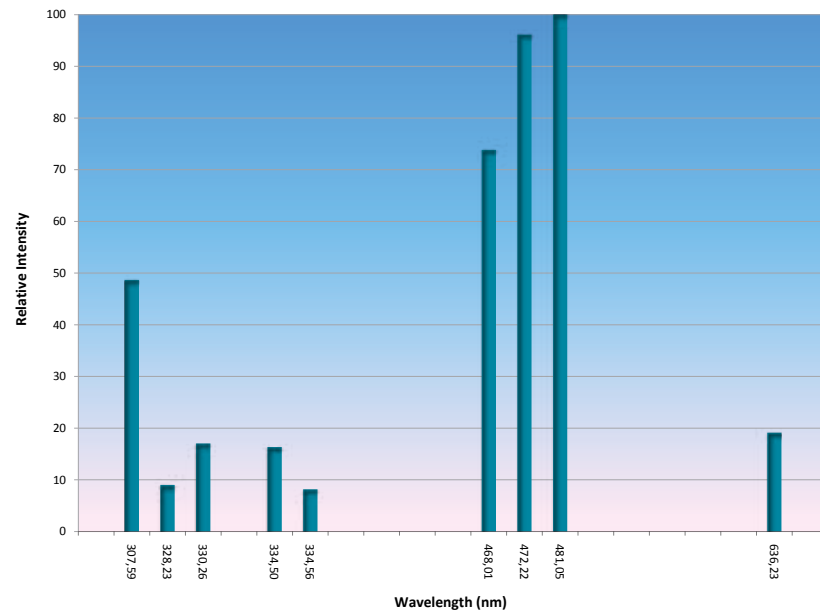Xenon light source

Figure 15 Spectral lines AvaLight-CAL-Neon

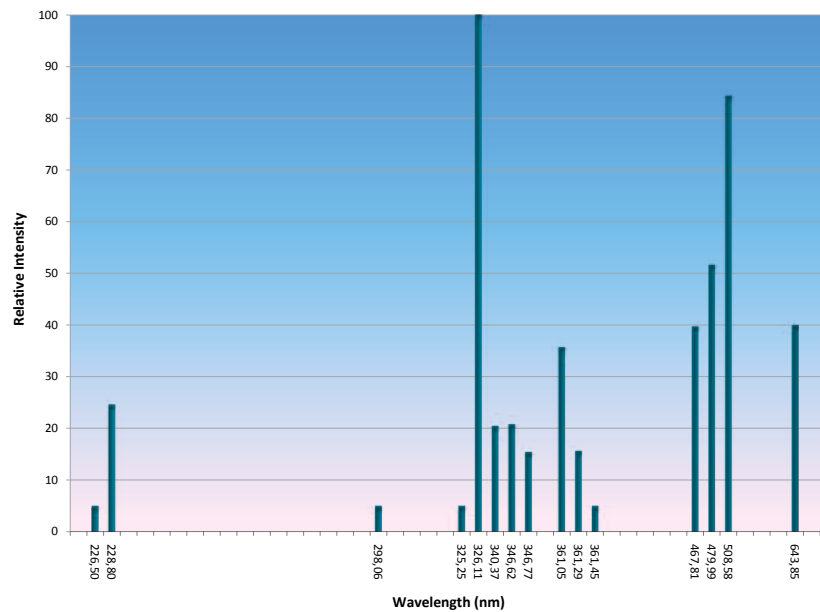*Figure 16 Spectral lines AvaLight-CAL-Zinc*
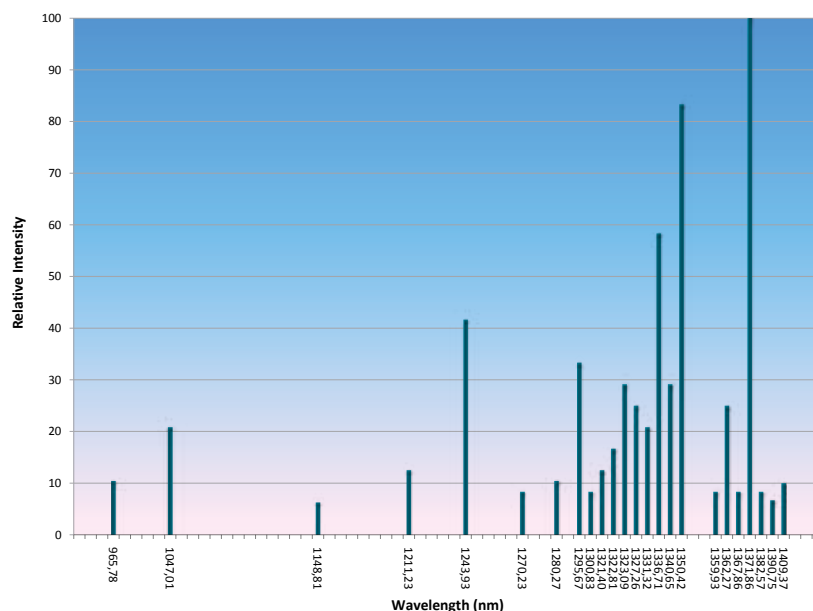

Figure 17 Spectral lines Avalight-CAL-CAD

Figure 18 Spectral lines AvaLight-CAL-AR

Technical Data

Lamp	HgAr	Neon	Ar	Zinc	Cadmium
Output	253.6–922.5 nm	337-1084.4 nm	696.5-1704 nm	202.5-636.2 nm	214.4-643.8 nm
Optical power in 600 µm fiber	1.6 mW				
Connector	SMA-905 connector				
Internal Voltage	1200 Volts AC at 30 kHz, 10 mA			1500 Volts AC at 27 kHz, 47.5 mA	
Warm up	1 minute for vapor stabilization			< 10 min.	
Lamp lifetime	5000 hrs.			1000 hrs.	
Power requirement	12VDC supply, 240 mA			85-240 VAC, 1.0A	
Dimensions, weight	175 x 110 x 44 mm, 480 grams			Lamp unit : 175 x 110 x 44 mm, 480 grams Power supply unit : 102 x 167 x 58 mm, 450 grams	

Ordering Information

AvaLight-CAL	• Mercury Argon Calibration source needs extra PS-12V/1.0A power supply, SMA
AvaLight-CAL-NEON	• Neon Calibration source needs extra PS-12V/1.0A power supply, SMA
AvaLight-CAL-AR	• Argon Calibration source needs extra PS-12V/1.0A power supply, SMA
AvaLight-CAL-RM	• Rack-mounted version of AvaLight-CAL
AvaLight-CAL-B	• Replacement bulb, Mercury-Argon
AvaLight-CAL-NEON-B	• Replacement bulb, Neon
AvaLight-CAL-AR-B	• Replacement bulb, Argon
AvaLight-CAL-ZINC	• Zinc Calibration Light source, including power supply
AvaLight-CAL-CAD	• Cadmium Calibration Light source, including power supply
AvaLight-CAL-ZINC-B	• Zinc replacement bulb
AvaLight-CAL-CAD-B	• Cadmium replacement bulb
PS-12V/1.0A	• Power supply 100-240 VAC/12 VDC, 1.0 A for AvaLight-CAL series

AvaLight-LED Light Source for fluorescence applications

AvaLight-LED

The Avalight-LED is a compact, low-cost light source meant for fluorescence applications. It produces continuous or pulsed spectral output at different wavelengths. Some standard excitation wavelengths are shown in the table on this page, but other wavelengths are available upon request. The sources have an SMA-905 connector to couple to fiber-optics. Please note that the power supply (PS-12V/1.0A) should be ordered separately.

The AvaLight-LED can be used as a DC source or pulsed with a programmable Pulse Width Modulation (PWM), supplied by an AvaSpec-USB2 spectrometer (IC-DB26-2 cable needed).

The CUV-DA is a cuvette cell holder that has an integrated LED for direct illumination of the cell. This provide greater excitation energy for fluorophores with low quantum efficiency.

Other accessories include the CUV-FL and CUV-ALL cuvette holders and the FCR-UV fluorescence probes. They can be found in the accessories and fiber-optics chapters of this catalog. At the end of the catalog, an example fluorescence setup can be found.

* Low cost fluorescence excitation
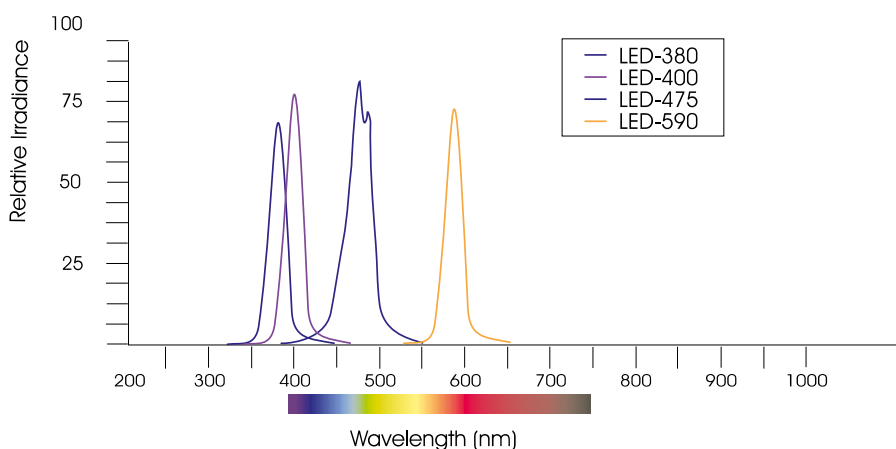* Compact
* Flexible excitation wavelength

Figure 19 Spectral output different AvaLight-LED´s

Technical Data

	AvaLight-LED 355/380	AvaLight-LED 400/410/430	AvaLight-LED 450/470/490	AvaLight-LED 530/590/780
Spectral Range*	355/380 nm	400/410/430 nm	450/470/490 nm	530/590/780 nm
FWHM (nm)	15 nm	11 nm	30 nm	30 nm
Optical power 600 µm fiber	10 µWatt	25 µWatt	25 µWatt	25 µWatt
Connector	SMA-905			
Power supply	12 VDC, 40 mA			
Dimensions, weigth	175 x 110 x 44 mm, 480 grams			

* other wavelengths available on request

Ordering Information

AvaLight-LED-XXX	• Light Emitting Diode Lightsource, specify wavelength XXX
AvaLight-LED-XXX-RM	• Rackmount version of the Light Emitting Diode Lightsource, specify wavelength XXX
AvaLight-LED-CON	• LED lightsource control unit with electrical connector to LED, needs extra PS-12V/1.0A and interface cable.
CUV-LED-XXX	• LED holder for Cuvette, specify LED wavelength XXX.
CUV-DA	• Direct-attach cuvette holder for AvaLight-DHc/XE/LED
IC-DB26-2	• Interface cable AvaSpec-USB2 platform to AvaLight-LED for PWM
PS-12V/1.0A	• Power supply 100-240 VAC/12VDC, 1.0 A for AvaLight-LED

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AvaLight-LDXE: Very High Brightness

For maximum brightness in the 170-1100 nm range, the AvaLight-LDXE is the ideal light source solution. It works by focusing a 1000 nm laser through a Xenon bulb, creating a high-intensity plasma. This gives maximum output power over a broad spectral range.

The AvaLight-LDXE has a unique robust design which enables long life without the lamp degradation and drift associated with many sources.

For Deep-UV operation, purging is optional. No auxiliary cooling is necessary.

* Ideal for fluorescence excitation in combination with a band-pass filter
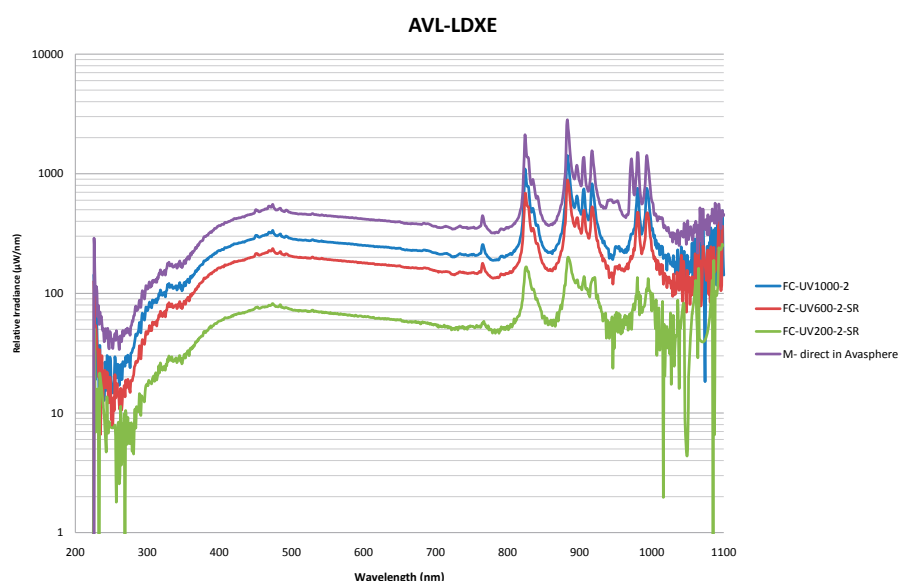* Very high brightness
* Very long bulb lifetime
* 170-1100 nm

Figure 20 Spectral Output AvaLight-LDXE

Technical Data

Wavelength Range	170-1100 nm
Stability	0.018% std. dev (measured @ 254 nm over 25 s)
Time to stabilize	20 min (when purged: 10 min purging time)
Total Optical Power output	385 mW
Optical Power in 200 µm fiber	52 mW
Optical Power in 600 µm fiber	153 mW
Bulb Life	10,000 hours typical
Connector	SMA-905 connector
Power consumption	140 W (22.5 W standby)
Power requirement	100-240VAC 50/60HZ
Operating Temperature Range	15-35 ºC
Dimensions(LxHxW), weight	351x361x144 mm, 8.5 kg

Ordering Information

AvaLight-LDXE	• High power Laser-driven Xenon Light Source (170-1100 nm)