HighFinesse
Laser and Electronic Systems

Ångstrom

Spectrum Analyzer

Compact and robust spectrometers with fully customizable range and resolution parameters, able to measure pulsed and continous lasers.

One of the most common usages of our LSA and HDSA devices is monitoring the line-shape of lasers during their optical adjusting. With their unmatched measurement speed, our devices are uniquely suited for this task. In the same way, these devices can also be used in production certification of laser linewidths and shapes.

The echelle grating based HighFinesse/Ångstrom High Definition Spectrum Analyzer offers unrivaled capability for simultaneously measuring large wave-length ranges with an unmatched measurement speed. Nowhere else can you find a device that records its whole spectral range up to 60 times a second.

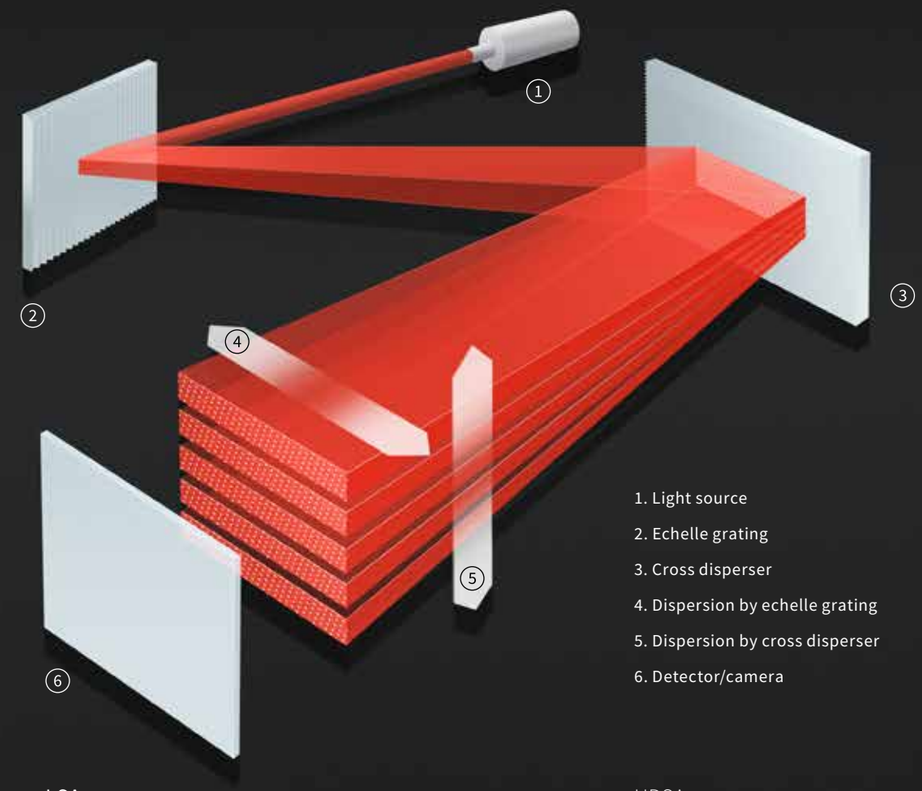
Utilizing the principle of non-moving parts just like the well known HighFinesse WS-series wavemeters, the HDSA offers the time-tested robustness and ability to measure both pulsed and cw lasers! Most importantly, a multitude of possibilities are open for tailoring the resolving power and spectral bandwidth of the device according to our customers' needs.

Our spectrum analyzers are connected to the PC by either a USB or an Ethernet cable. After a simple software installation the device is ready for use. All optical and electronical components of the device are safely packed in a compact, thermally insulating housing.

Attention to detail!

The design of our spectrum analyzers is based on different combinations and configurations of low order and echelle diffraction gratings. The spectra are read out by CCD arrays, resulting in exceptionally high measurement speeds.

Since these devices incorporate no moving parts, you can expect the usual high accuracy and stability of our devices, as well as the capability to measure pulsed lasers in addition to CW.



1. Light source
2. Echelle grating
3. Cross disperser
4. Dispersion by echelle grating
5. Dispersion by cross disperser
6. Detector/camera

LSA:

The LSA utilizes an echelle grating and a low order grating in two separate beam paths. The echelle grating provides the LSA with high resolving power, enabling high accuracy measurements. The first order grating makes it possible to overcome the wavelength indeterminancy of the echelle grating.

The auto-calibration function of the LSA ensures that you never have to worry about routine maintenance.

HDSA:

Using gratings in a cross-dispersion configuration means that you do not have to sacrifice the measurement range for accuracy. The HDSA delivers high accuracy and resolution for its whole range at once. Combined with measurement rates of up to 60 Hz in some ranges, this instrument can easi-ly satisfy most spectroscopic needs.

LSA

Technical Data		Unit	LSA
Measurement Range	Standard (330 – 1180 nm)		■
	UV-I (248 – 1180 nm)		■
	UV-II (192 – 800 nm)		■
	UV-II-VIS (192 – 1180 nm)		■
	VIS / IR (330 – 1750 nm)		■
	IR-I (630 – 1750 nm)		■
	IR-II (1000 – 2250 nm)		■
	IR-III (1400 – 11000 nm)		■ [1]
Absolute Accuracy [2]	192 – 330 nm [3]	pm	6
	330 – 420 nm	pm	3
	420 – 1100 nm	GHz	6
	IR-I		12
	IR-II		25
	IR-III	nm	1 – 5 [1]
Quick Coupling Accuracy (with multi mode fiber)		GHz	20 [4]
Wavelength Deviation Sensitivity/ Measurement Resolution	192 – 330 nm [3]	pm	5
	330 – 420 nm	pm	2
	420 – 1100 nm	GHz	3
	IR-I		6
	IR-II		12
	IR-III	nm	1
Resolving Power (λ/Δλ) [5]	Standard / UV	Singlemode | Multimode fiber	20000 | 10000
	IR-I		4000 | 2000
	IR-II		2800 | 2000
	IR-III		15 – 30 nm [1]
Linewidth Measurement Accuracy [6]	Standard / UV	GHz	7
	IR-I		40
	IR-II		60
	IR-III		15 % (≥ 200 GHz)
Maximal Linewidth		THz	1.5
Measurement Speed [7]	Data Acquisition	Hz	500
	Wavelength Calculation		60
	Spectrum Calculation		15
Required Input Energy and Power [8]	Standard	µJ (or µW)	0.0001 – 0.04
	UV-I, UV-II		0.0001 – 0.1
	IR-I, IR-II		0.02 – 2
	IR-III	mW	1 [1]
Diffraction Grating	FSR	THz	~5.4
Coupling Fiber Diameter			50 µm or single mode fiber set
Calibration			Built-in calibration [9]
Calibration Period			≤ 1 month
Warm-up Time			No warm-up time under constant ambient conditions. Otherwise until thermal and air pressure equilibrium is reached
Dimensions L × W × H		mm	325 × 180 × 77
Weight		kg	2.8
Interface			High-speed USB 2.0 connection
Power Supply			Power consumption < 2.3 W, supply directly via USB cable; IR-II & IR-III: external power supply included

1) For further information on IR-III devices see upper table on following page 2) According to 3σ criterion 3) With multi mode fiber
4) Only for standard range 5) Spectral resolution Δλ = λ / R; R = resolving power. According to Rayleigh criterion. 6) But not better than 5% of the linewidth
7) Depending on PC hardware and settings. Without autocalibration usage

LSA IR-III

Technical Data		Unit	LSA IR-III TYPE 2 – 3	LSA IR-III TYPE 2 – 6	LSA IR-III TYPE 2 – 11
Measurement Range		nm	1400 – 3000	1400 – 6000	1400 – 11000
Absolute Accuracy [2]		nm	1	2	5
Relative Accuracy			1.25×10^{-4}	3×10^{-4}	5×10^{-4}
Wavelength Deviation Sensitivity/Measurement Resolution			0.7×10^{-4}	1.5×10^{-4}	2.5×10^{-4}
Spectral Resolution (Δλ)		nm	15	20	30
Linewidth Measurement Accuracy [6]			15%		
Maximal Linewidth		THz	1		
Measurement Speed [7]	Data Acquisition	Hz	100		
	Wavelength Calculation		100		
	Spectrum Calculation		15		
Required Input Energy and Power [8]	Pulsed	µJ	10		
	cw	mW	0.2		
Diffraction Grating	FSR	THz	~ 2.7		
Coupling Fiber			PIR-550/600 or CIR-550/600		
Calibration			SLR-1532 or 3.39 µm HeNe calibration laser (not included)		
Calibration Period			≤ 15 days		
Warm-up Time			No warm-up time under constant ambient conditions. Otherwise until thermal and air pressure equilibrium is reached		
Dimensions L x W x H		mm	325 × 180 × 77		
Weight		kg	3.0		
Interface			High-speed USB 2.0 connection		
Power Supply			External power supply included		

HDSA

Technical Data		Unit	HDSA Standard
Measurement Range		nm	450 – 1000
Absolute Accuracy [2]		GHz	5
Wavelength Deviation Sensitivity/ Measurement Resolution		GHz	2
Resolving Power (λ/Δλ) [5]			30000 @ 633 nm
Measurement Speed [7]	Data Acquisition	Hz	7.5
	Wavelength Calculation		7.5
	Spectrum Calculation		7.5
Required Input Energy and Power [8]		nJ	0.01 @ 633 nm
Calibration			External calibration source (incl. in delivery)
Calibration Period			≤ 7 days
Warm-up Time			No warm-up time under constant ambient conditions. Otherwise until thermal and air pressure equilibrium is reached
Dimensions L × W × H		mm	360 × 210 × 120
Weight		kg	~4.5
Interface			USB 3
Power supply			Directly via USB-cable

HDSA Customized

Various modifications available: other spectral ranges, resolution, accuracy.

For example:

HDSA UV: Down to 192 nm
HDSA IR: Up to 1700 nm
HDSA Custom: With enhanced resolution over a smaller range.

Please contact us for further details!

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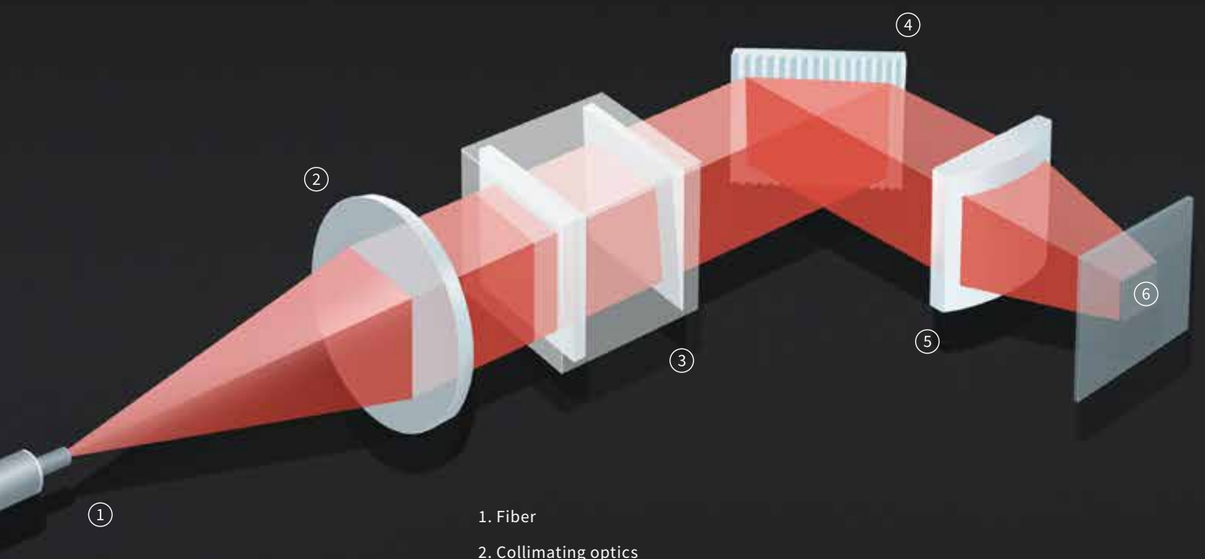
8) The cw power interpretation in [µW] compares to an exposure of 1s (generally the energy needs to be divided by the exposure time to obtain the required power)
9) IR-III: external calibration sources required, e.g. SLR-1532 10) Broad line versions. For further information please contact: info@highfinesse.com
11) Various modifications available: other spectral range, resolution, accuracy and measurement speed. Please contact us for further details!

Spectrum measurement solutions for all wavelength ranges

New Product
HRSA

Our new HRSA offers even greater resolution than our previous devices. We achieve this improvement by combining the Fizeau interferometer technology with the grating-based configuration of the LSA. The result is a device with an unprecedented spectral resolution.

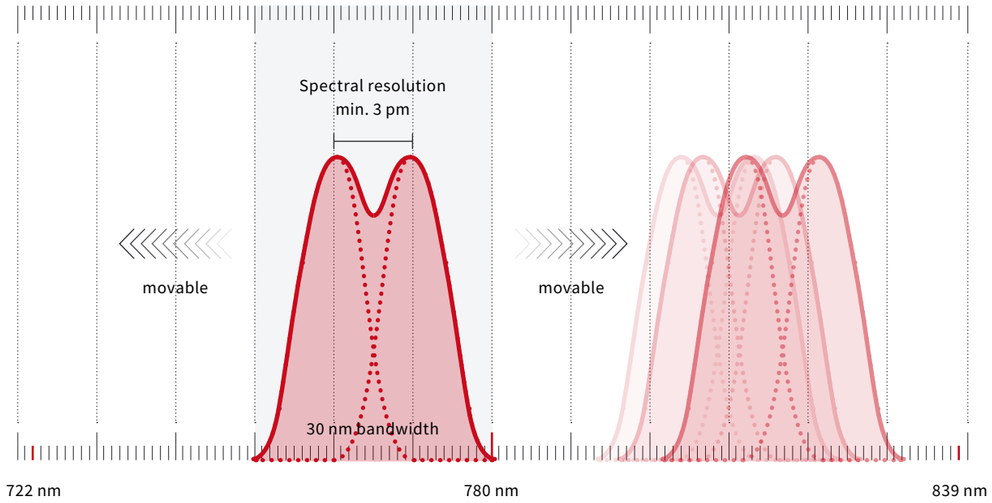


1. Fiber
2. Collimating optics
3. Fizeau interferometer
4. Echelle grating
5. Imaging optics
6. 2D detector

Measurement range

The basic version of the HRSA has a 15 % measurement range around the design wavelength. This design wavelength is freely chosen by the customer to suit their specific needs. By limiting the spectral bandwidth, the resolving power can be expanded to the hundred thousands or in extreme cases up to 2,000,000. The maximum measurement range remains at 15% around central wavelength.

An explanation of the spectral bandwidth



At any time, the measured signal has to be not wider than 30 nm, but this 30 nm window can be freely selected for each measurement shot inside the 15% measurement range (117 nm if centered around 780 nm).

A few examples of the variable window sizes and the reachable resolutions

A large number of different custom configurations can be worked out, allowing each device to be hand-tailored to the customers' needs. The examples provided on this page are just a few of the many possibilities. Do not hesitate to contact us for your own unique spectrometer!

Center Wavelength	Bandwidth	Resolving Power	Maximum Spectral Width
530 nm	80 nm	More than 2,000,000	94.5 pm
630 nm	90 nm	250,000	30 nm
1000 nm	100 nm	410,000	20 nm
1550 nm	100 nm	35,000	100 nm

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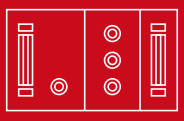
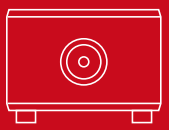
Wavelength Meter

HighFinesse/Ångstrom offers sensitive and compact wavelength meters with a large spectral range for high speed measurement of lasers. The optical unit consists of temperature-controlled Fizeau-based interferometers that are read out by photodiode arrays. The high absolute accuracy is achieved by use of solid state, non-moving optics. The optical unit and associated electronics are housed in a compact, thermal casing. The connection to a computer or notebook is realized via a highspeed USB 2.0 port, which allows a high data read-out rate. The analyzing software displays all the interferometer information.



Precision Current Sources

HighFinesse Precision Current Sources have been developed for experiments and quantum technologies in the areas of cold-atom and solid state physics. The linearly regulated BCS (Bipolar Current Source) and UCS (Unipolar Current Source) series deliver highly stable, low noise source currents for high precision magnetic field control. The current output is floating or is on a used defined potential. Ultrafast response to control signals and trigger functions, clear grounding, connection and signal isolation schemes make the integration of the current sources into complex experimental systems easy.



Linewidth Analyzer

HighFinesse Linewidth Analyzers (LWA) are specialized high-end devices for measuring and analyzing the spectral shape of various laser sources. Through the use of two measurement modes, the LWA can analyze both very narrow laser lines down to 100kHz as well as broader spectra up to 1GHz. They feature an extremely high resolution and accuracy in determining the linewidth of the respective laser source and its spectral lineshape. The LWAs are ideal for optimizing the stability of laser setups.

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