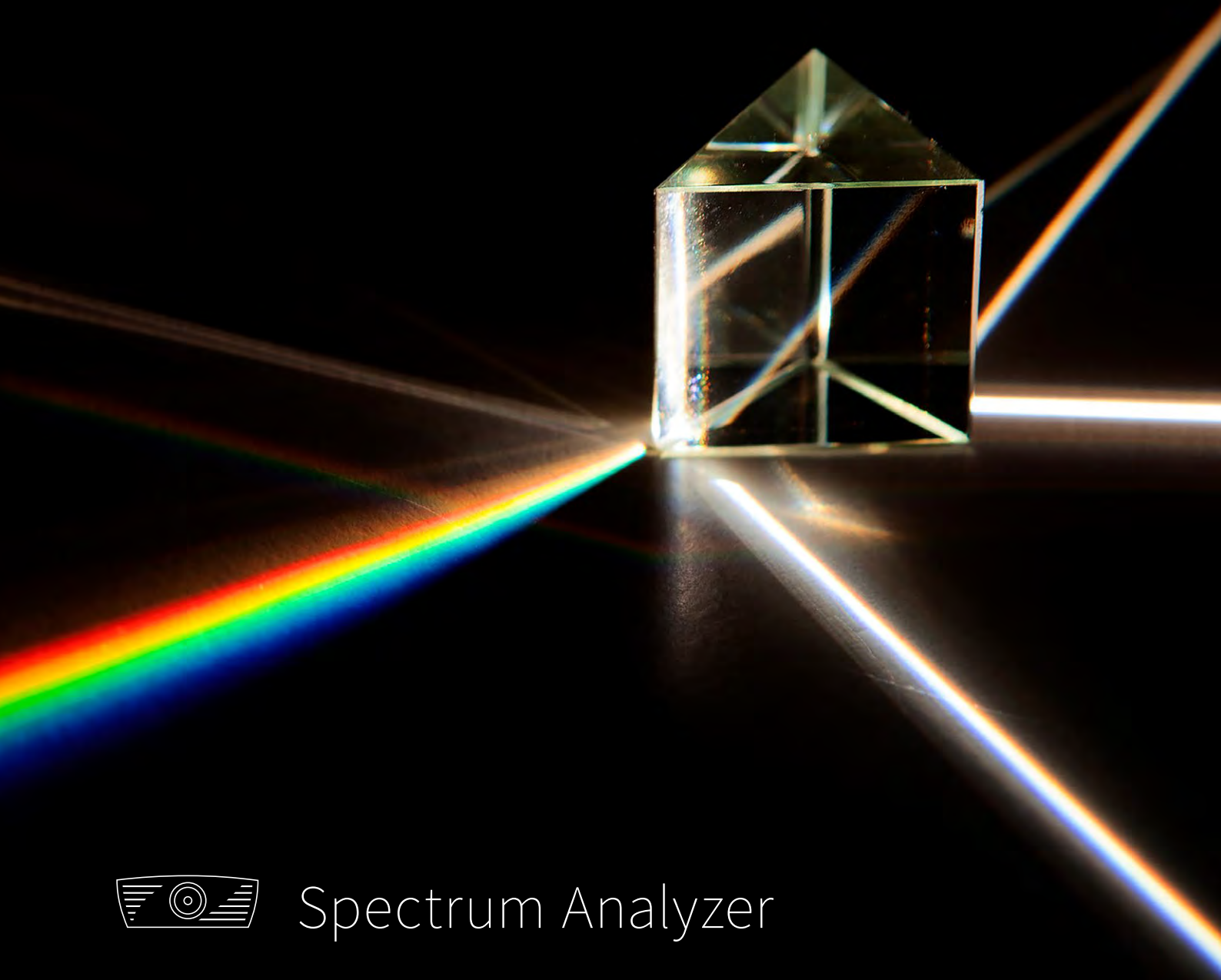
HighFinesse
The Standard of Accuracy

Ångstrom



Spectrum Analyzer

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

The grating based HighFinesse/Ångstrom Laser Spectrum Analyzers offer the capability for a very accurate simultaneous measurement of both the wavelength and the linewidth with a compact and robust instrument. The product series covers the range from 192 nm to 2250 nm.

Utilizing the principle of non-moving parts just like the well-known HighFinesse WS-series wavemeters, the LSA offers the time-tested robustness and ability to measure both pulsed and cw lasers.

The grating based technology allows the analysis of laser sources over a large linewidth range. The laser light can be easily guided to the LSA using optical fibers.

These feature make the LSA instruments versatile and reliable instruments for both academic research and industrial applications such that they will become indispensable tools for your laser diagnostics and development. The LSA instruments can be customized for your application such that wavelength and linewidth range will fulfill your requirements.

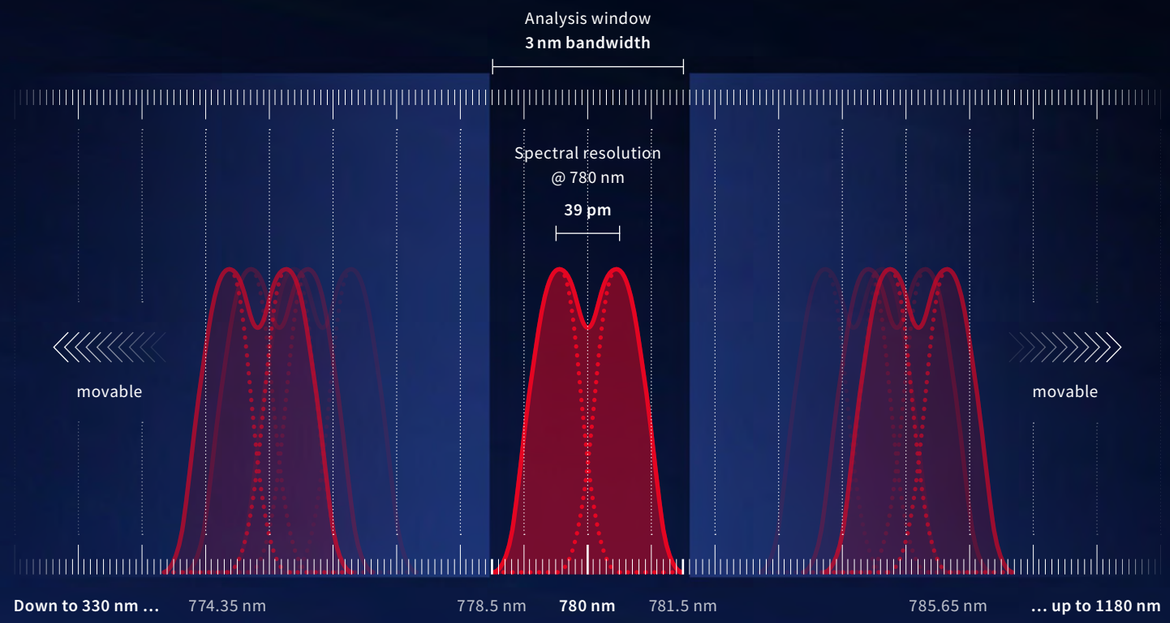
Our spectrum analyzers are connected to the PC via USB. After a simple software installation the instrument is ready for use. All optical and electronical components of the instrument are safely packed in a thermally insulating housing.

Measurement range and explanation of the spectral bandwidth

The basic version of the LSA has a very broad measurement range. Our standard range covers 330 – 1180 nm. Other ranges between 192 to 2250 nm are available (see table on next pages).

Any valid laser light source can be measured within this range. By using a second echelle grating, the de facto free spectral range of the instrument is 5.4 THz. This defines the spectral band that is visible at one given time. Please mind that the value is fixed in the frequency domain and changes in the wavelength (nm) domain accordingly.

To have enough room for analysis of the signal, please use laser sources that have a spectral width of no more than 1.5 THz FWHM.

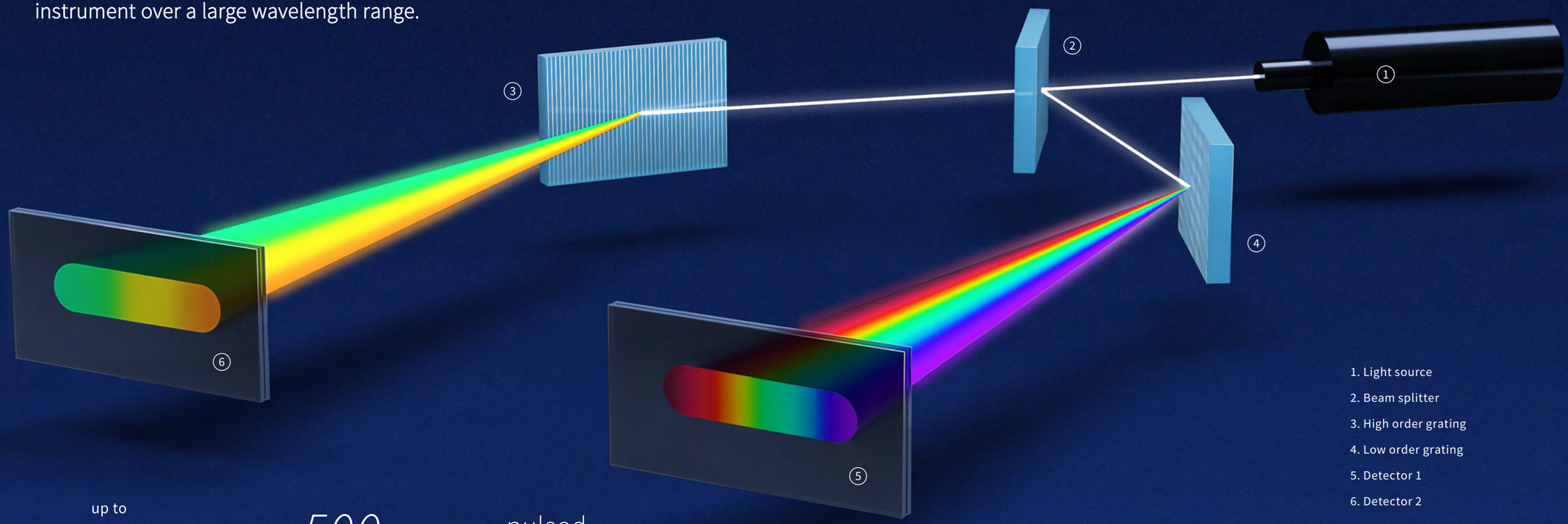


At any given time, the measured signal has to be not wider than 1.5 THz (FWHM), here at 780 nm this means ~3 nm. The analysis window will automatically be selected for each measurement shot inside the measurement range of the instrument.

HighFinesse/Ångstrom Laser Spectrum Analyzer (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 indeterminacy of the echelle grating.

The combination of both beam paths yields a high resolution instrument over a large wavelength range.



1. Light source
2. Beam splitter
3. High order grating
4. Low order grating
5. Detector 1
6. Detector 2

up to
40000
λ/Δλ
Resolving Power

up to 500
Hz
Measurement Speed

pulsed
cw
For Pulsed and Continuous Lasers

The LSA can analyze any laser light source ① regardless if it is cw or pulsed laser and a free beam laser using the included fiber collimators or a fiber laser.

The LSA utilizes an echelle grating ③ and a low order grating ④ in two separate beam paths. The echelle grating provides the LSA with high resolving power, enabling high accuracy measurements. The low order grating makes it possible to overcome the wavelength indeterminacy of the echelle grating.

The detectors ⑤ and ⑥ allow for a high measurement rate with data acquisition up to 500 Hz and a sensitivity down to 0,1 nJ. The LSA comes with a user-friendly and powerful software with a convenient GUI and an API for control of the instrument via your own software.

Typical Applications

A very common application of our LSA instruments is monitoring the lineshape of lasers during their optical adjustment. With their unmatched measurement speed, our instruments are uniquely suited for this task. In the same way, these instruments can also be used for production certification of laser linewidths and lineshapes.

Technical Data

LSA 2R/Standard/UV & LSA VIS/IR-I

			Unit	
Measurement Range	LSA 2R	LSA 2R VIS (330 – 1180 nm)		■
	LSA	Standard (330 – 1180 nm)		■
		UV-I (248 – 1180 nm)		■
		UV-II (192 – 800 nm)		■
		UV-II / VIS (192 – 1180 nm)		■
		VIS / IR-I (330 – 1750 nm)		■
Absolute Accuracy [1]	LSA 2R	330 – 420 nm	pm	2
		420 – 1180 nm	GHz	3
	LSA Standard/UV	192 – 330 nm [2]	pm	6
		330 – 390 nm		3
		390 – 1180 nm	GHz	6
	LSA VIS/IR-I	VIS: 330 – 420 nm	pm	6
		VIS: 420 – 1060 nm	GHz	6
		IR-I: 1060 – 1750 nm		25
Quick Coupling Accuracy	LSA Standard/UV	(with multi mode fiber)	GHz	20 [3]
Wavelength Deviation Sensitivity/Measurement Resolution	LSA 2R	330 – 420 nm	pm	1
		420 – 1180 nm	GHz	1.5
	LSA Standard/UV	192 – 330 nm [2]	pm	5
		330 – 420 nm		3
		420 – 1180 nm	GHz	3
	LSA VIS/IR-I	VIS: 330 – 420 nm	pm	3
		VIS: 420 – 1060 nm	GHz	6
		IR-I: 1060 – 1750 nm		12
Resolving Power (λ/Δλ) [4]	LSA 2R		Singlemode | Multimode fiber [9]	40000 | 20000
	LSA Standard/UV			20000 | 10000
	LSA VIS/IR-I	VIS: 330 –1060 nm		20000 | 10000
		IR-I: 1060 – 1750 nm		4000 | 2000
Linewidth Estimation Accuracy [5]	LSA 2R		GHz	4
	LSA Standard/UV			7
	LSA VIS/IR-I	VIS: 330 – 420 nm	pm	3
		VIS: 420 – 1060 nm	GHz	7
		IR-I: 1060 – 1750 nm		40
Minimum required Input Energy and Power [6]		Standard, LSA 2R VIS	µJ (or µW)	0.0001 – 0.04
		UV-I, UV-II		0.0001 – 0.1
		IR-I		0.02 – 2
Measurement Speed [7]	Data Acquisition		Hz	500
	Wavelength and spectrum calculation			300
	Wavelength and spectrum calculation with live display			100
Maximal Linewidth	LSA 2R VIS		THz	0.6
	LSA Standard, UV, VIS / IR-I			1.5
Diffraction Grating, FSR	LSA 2R VIS			2.3
	LSA Standard, UV, VIS / IR-I			~5.4
Coupling Fiber Diameter			Single mode fiber set, 50 µm MM fiber, use of single mode fiber recommended	
Calibration			Built-in calibration [8]	
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	

Technical Data

LSA IR-II

	Unit	
Measurement Range	nm	IR: 1000 – 2250 + VIS: 500 – 1000
Absolute Accuracy [2]	GHz	IR-II: 25, VIS: 60
Wavelength Deviation Sensitivity/ Measurement Resolution		IR-II: 12, VIS:30
Resolving Power (λ/Δλ) [4]	Singlemode	IR-II: 2800, VIS: 2000
	Multimode fiber [9]	IR-II: 2000, VIS: 1000
Linewidth Measurement Accuracy [7]	GHz	IR-II: 60, VIS: 70
Minimum required Input Energy and Power	µJ	0.02 – 2
Calibration		SLR-1532
Calibration Period		≤ 15 days
Power Supply		External power supply included
Technical data Measurement Speed, Maximal Linewidth, Diffraction Grating, Coupling Fiber Diameter, Warm-up Time, Dimensions, Weight, Interface: **see technical data of LSA Standard/UV & LSA VIS/IR-I (identical)**		

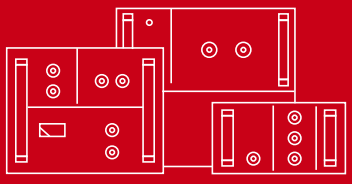
1) According to 3σ criterion.
2) With multi mode fiber.
3) Use of multi mode fibers. For LSA Standard.
4) Spectral resolution Δλ = λ / R; R = resolving power. Assuming that two features are resolved if they are separated by more than the FWHM of the instrument response function.
5) With the use of sinle mode fibers. Not better than 15 % of the linewidth. The algorithm assumes that the laser lineshape is given by a Lorentzian.
6) The required cw power P can be calculated based on the exposure time t (1-10000 ms) and the pulse energy E using the quation P=E/t.
7) Depending on PC hardware and settings. Without autocalibration usage. Data acquisition and wavelength and spectrum calculation LSA 2R VIS: 60 Hz.
8) IR-II: external calibration sources required, e.g. SLR-1532.
9) Please use 50 µm MM fibers. Please do not use fibers > 50 µm.

HighFinesse

The Standard of Accuracy

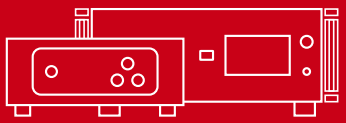
Wavelength Meter

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 physics 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 user 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 instruments 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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