

# HIGH-RESOLUTION WAVELENGTH METER

## SHR

SHR is an ideal low-cost high-precision spectrometer for measuring laser wavelength in a large field of laser applications, as well as in the process of alignment and testing of solid-state lasers, diode lasers, dye lasers and OPOs.



### FEATURES

- High accuracy  $\pm 3$  pm and wide spectral range 190-1200 nm.
- FWHM and spectral line monitor and analysis.
- Ideal for wavelength measurement of pulsed and CW lasers.
- Compact design; no movable components.
- Fiber input; Diffuse attenuator.

The SHR is an ideal low-cost high-precision spectrometer for measuring laser wavelength in a large field of laser applications, as well as in the process of alignment and testing of solid-state lasers, diode lasers, dye lasers and OPOs.

The SHR optical scheme is based on an Echelle diffraction grating operating in high spectrum orders and a linear image sensor used as a detector. The SHR does not contain any moving elements; powering and control are performed from a computer via the Full-Speed USB interface. The SHR can be triggered from your laser source via standard TTL-level signals.

The SHR allows quick and easy measuring of absolute wavelength value of both CW and pulsed lasers with outstanding precision of  $\pm 3$  pm within a widest spectral range of 190-1100 nm, as well as detecting FWHM of the analysed line.

Apart from wavelength measuring the SHR provides demonstration of analysed spectra with resolution of 30000 ( $\lambda/\Delta\lambda < \text{FWHM}$ ) which constitutes from 6pm for the UV spectrum range to 40pm for the NIR. The SHR also ensures on-line monitoring of the above values and spectra in the process of tuning the analysed wavelength.

The software for the SHR, WLMeter, features a possibility to check the accuracy and correct it, if necessary, with any known wavelength guided to the SHR: the laser with known wavelength (for example, any He-Ne laser with wavelength of 632.816 nm) or any spectral line with certain constant wavelength value).

WLMeter features another useful function "Lines Array" for monitoring and saving the central wavelength value during time.

In respect of wavelength resolution and accuracy the SHR is an alternative to a long-focus monochromator (focal length of more than 1000mm), equipped with an appropriate CCD. But unlike the monochromator, the SHR has no moving parts and provides real-time measurements without scanning of diffraction grating. The SHR is rigid, stable and accurate, ensures absolute reliability and has more reasonable price.

The SHR wavelength meter is not directly intended for analysis of plasma emission and other populated spectra (refer to the SPECIFICATIONS, line "Source linewidth requirement"). However, the SHR can be applied in analysis of narrow spectral intervals within the spectral width of the Echelle order – from 0.5 nm in the UV spectrum range (190 nm) to 18nm in the IR (1200 nm), preliminarily separated with a filter or a monochromator.

Laser beam is steered to the SHR entrance slit either via a multimode optical fiber fitted with a diffuse attenuator (both are included in the delivery set) or directly, without any fibers.

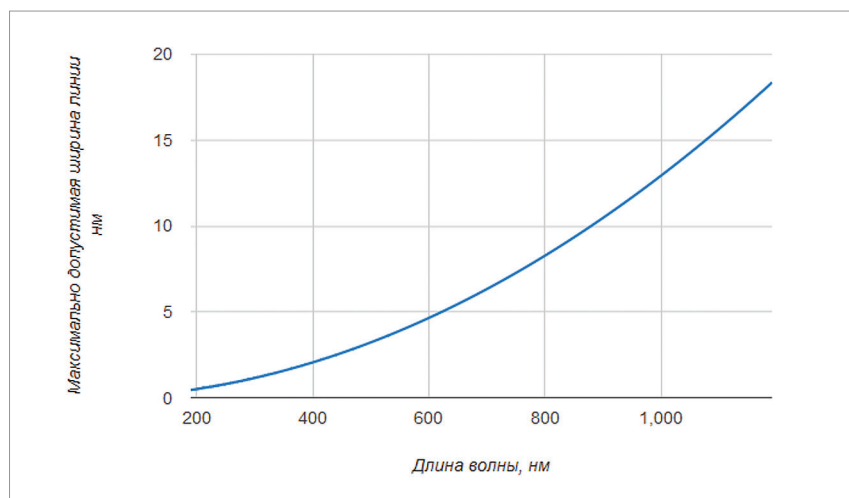


Diffuse attenuator FA-3 Contains two diffuse quartz glasses and SMA-905 connector. Axial adjustment of the fiber end relative to diffusive elements.

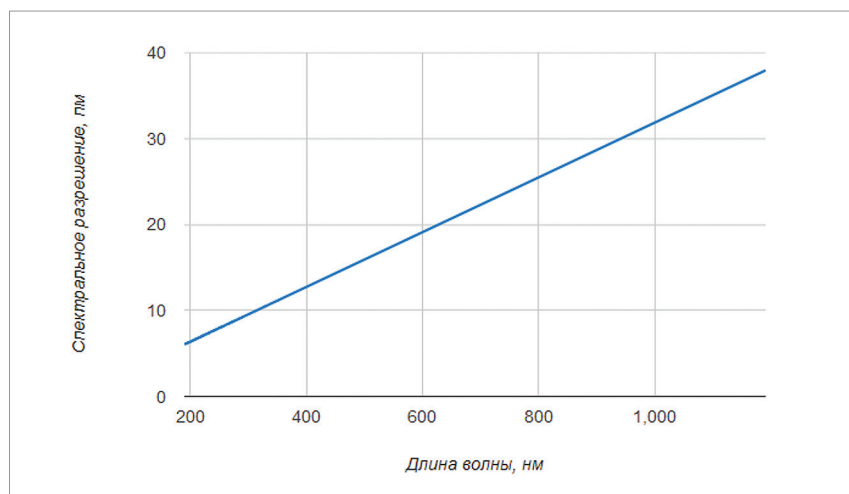
## SHR SPECIFICATIONS

Operating modes	CW & Pulsed
Focal length, mm	150
Aperture ratio	1:12
Spectral range, nm	190-1160
Wavelength detection accuracy, pm	$\pm 3$ at 190-1160 nm
Spectral resolution ( $\lambda/\Delta\lambda$ FWHM)	30000 (6 pm for $\lambda=193$ nm to 40 pm for $\lambda=1200$ nm – see pictures below)
Source linewidth requirements, not above	$125\text{ cm}^{-1}$ (0.5 nm for $\lambda=193$ nm to 18 nm for $\lambda=1200$ nm – see pictures below)
Mechanical moving parts	No
Line profile monitoring	Yes
Sensitivity	less than $0.5\ \mu\text{W}$ @632.8 nm for min. exposure time of 7.3 ms
Calibration necessity	No (only calibration correction)
Min exposure time, ms	7.3
Optical interface	- Optical fiber 400 $\mu\text{m}$ diameter, 1m length, SMA-905 connector - Diffuse attenuator FA-3 equipped with SMA-905
Interface	Full Speed USB
Requirements to external trigger pulse (for pulsed lasers)	BNC-58 connector, positive polarity, 3-15 VDC amplitude, 5-20 $\mu\text{s}$ pulse duration FWHM
Dimensions, mm	113 x 190 x 72.5
Weight, kg	2.5

## RESOLUTION &amp; SOURCE LINEWIDTH REQUIREMENT



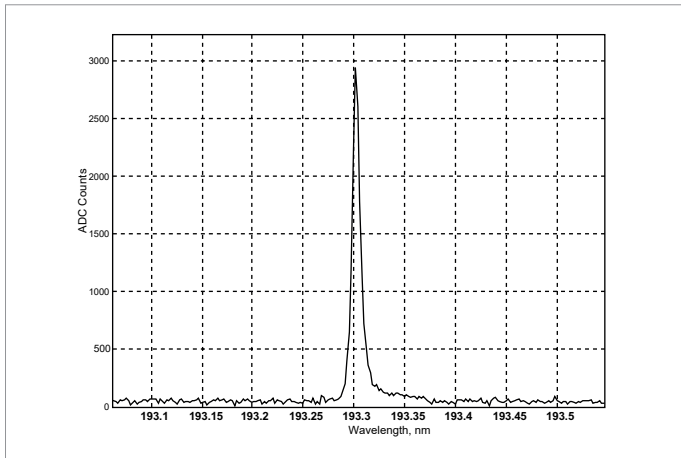
Spectral resolution vs wavelength.



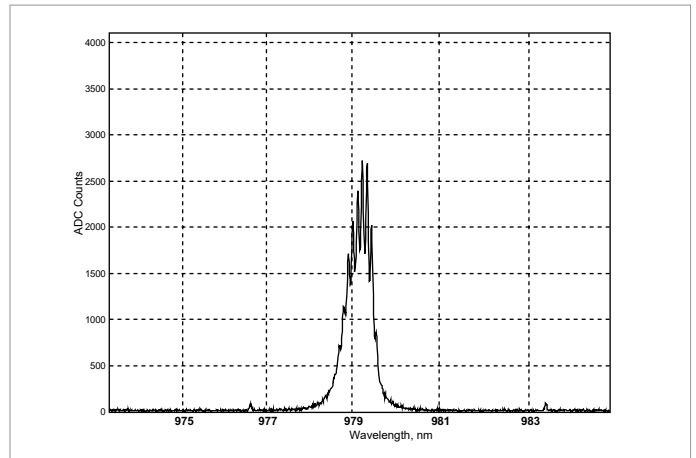
Source linewidth requirement, not above.

## SPECTRA OF LASER SOURCES ACQUIRED WITH SHR

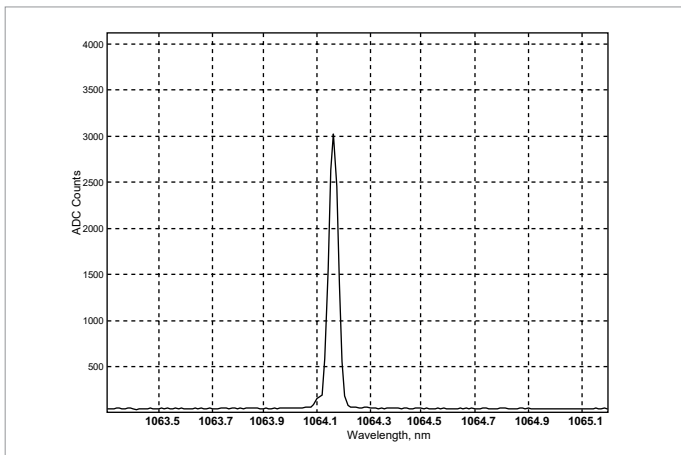
SHR ensures high quality of measured spectral lines.



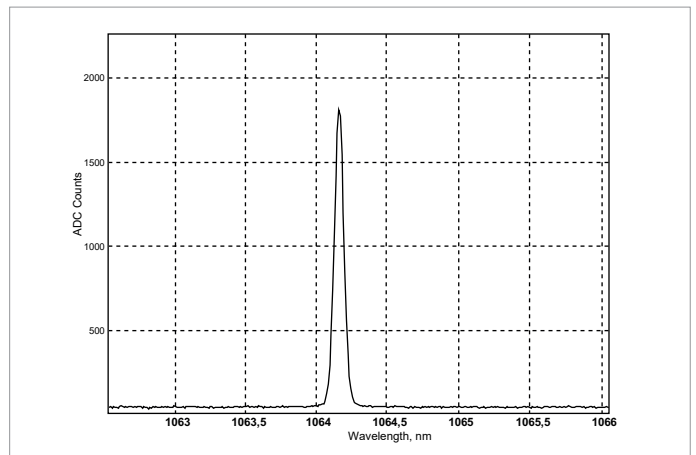
ArF las,  $\lambda = 193.3 \text{ nm}$  can be measured either with MM optical fiber or without fiber.



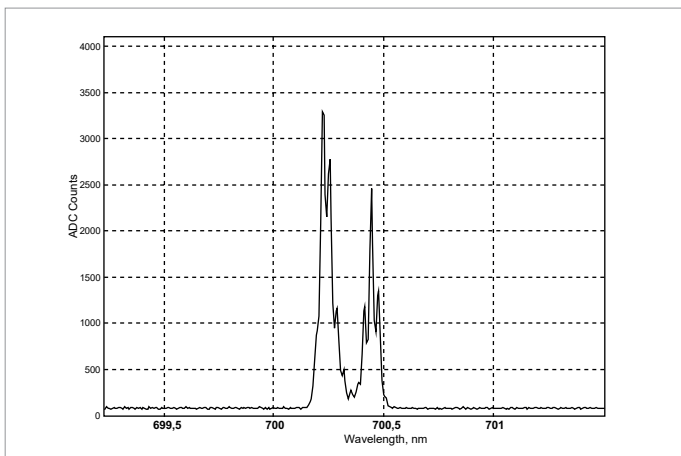
OPO spectrum  $\lambda = 979.169 \text{ nm}$ ,  $\text{FWHM} = 0.605 \text{ nm}$ . Each small peak can be measured separately.



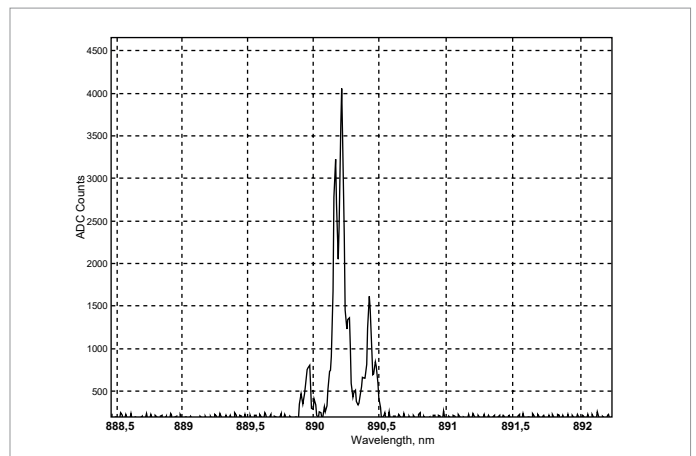
Nd:YAG laser, free running mode,  $\lambda = 1064.159 \text{ nm}$ ,  $\text{FWHM} < 0.04 \text{ nm}$ .



Nd:YAG laser, Q-switched mode,  $\lambda = 1064.161 \text{ nm}$ ,  $\text{FWHM} = 0.077 \text{ nm}$ .



Ti:Sapphire tunable laser 700 nm.



Ti:Sapphire tunable laser 890 nm.