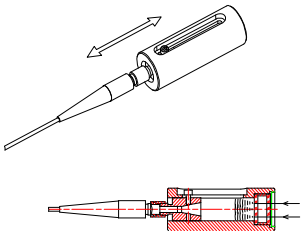
SHR - High-Precision Wide-Range Wavelength Meter

- **high accuracy and wide spectral range**
- **capabilities of spectrum analysis**
- **for pulsed and CW lasers**
- **compact design; no movable components**
- **optical fiber input coupled with an attenuator**
- **sophisticated user-friendly software**

Our SHR is an ideal low-cost high-precision instrument for measuring laser wavelength in a large field of laser applications, as well as in the process of adjustment 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 instrument does not contain any movable elements; powering and control are performed from a computer via Full-Speed USB interface. Analyzed light hits the SHR's input slit through an optical fiber fitted with an attenuator.

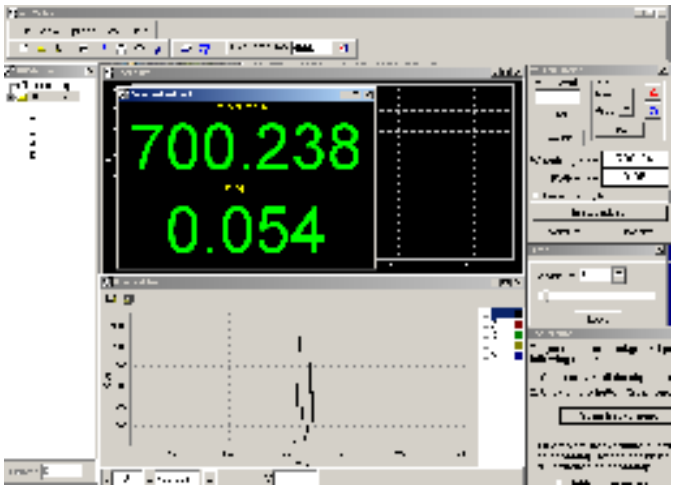


Diffuse attenuator FA-3
Contains two diffuse quartz glasses and SMA-905 connector. Axial adjustment of the fiber end relative to diffusive elements.

The SHR allows quick and easy measuring of absolute wavelength value of both CW and pulsed lasers with outstanding **precision of ± 3 pm** within a widest **spectral range of 190-1100 nm**, as well as detecting FWHM of the analyzed line with **resolution of 30 000** ($\lambda/\Delta\lambda_{<FWHM}$) which constitutes from 6 pm for the UV spectrum range to 40 pm for the IR. The SHR also ensures on-line monitoring of the above values in the process of tuning the analyzed wavelength.

The SHR spectrometer is not directly used for analysis of plasma and other populated spectra; however, it 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 18 nm in the IR (1200 nm), preliminarily separated with a filter or any other spectral device.

Operation modes	CW and pulsed (externally triggered)
Spectral range	190 - 1100 nm
Absolute accuracy	± 3 pm
Spectral resolution (instrument function, $\lambda/\Delta\lambda_{FWHM}$)	30 000 (from 6pm at 193nm to 40pm at 1200nm, refer to Fig.1)
Source linewidth requirement	≤125 $см^{-1}$ (from 0.5nm at 193nm to 18nm at 1200nm, refer to Fig.2)
Sensitivity	less than 0.5 μW at 632.8nm for min exposure time of 7msec
Optical interface	- optical fiber 400 um dia., 1000mm length, connector SMA-905 - diffuse attenuator FA-3 equipped with SMA-905
Computer interface	Full Speed USB
Software	WLMeter
Dimensions and weight	165 x 215 x 90 mm; 2.6 kg



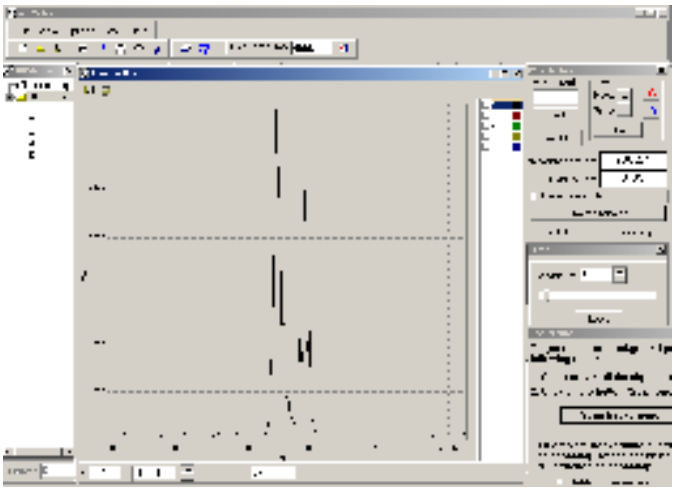
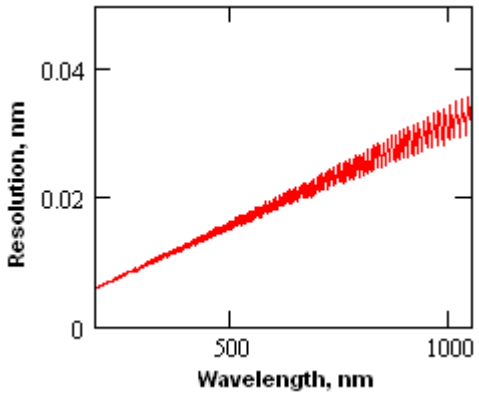
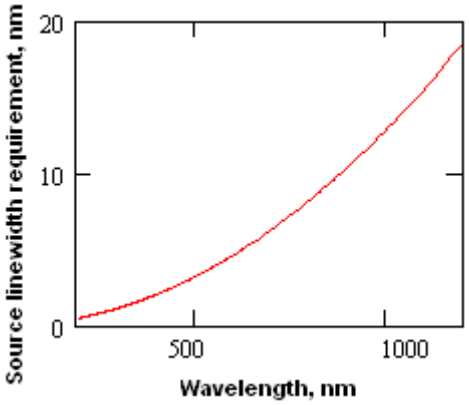


Fig.1. SHR spectral resolution dependent on WL

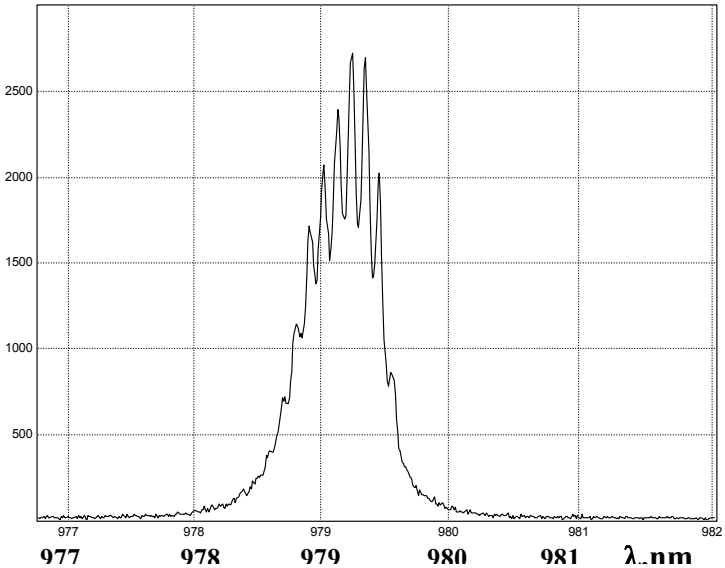
Fig.2. Max width of analysed spectrum dependent on WL



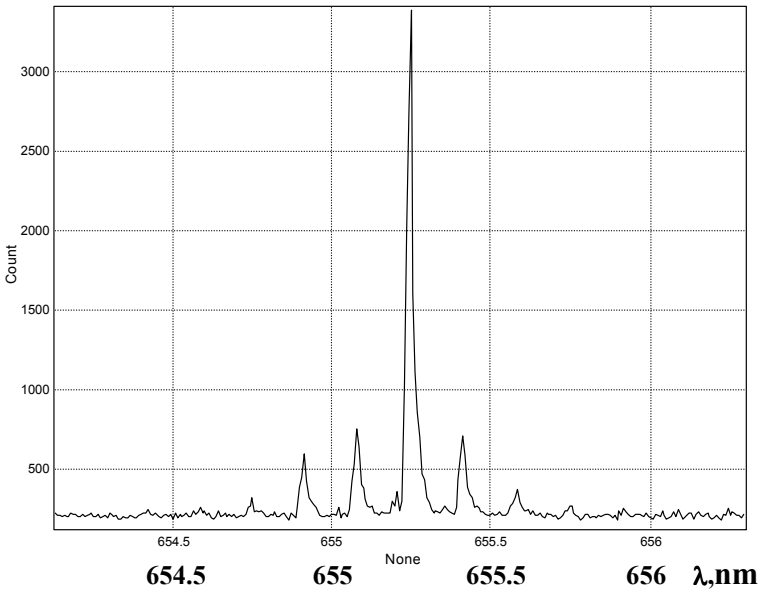


Measurement example with our High-Precision Wavelength Meter SHR

OPO spectrum λs=979.169nm, FWHM=0.605nm
Each small peak can be measured separately.



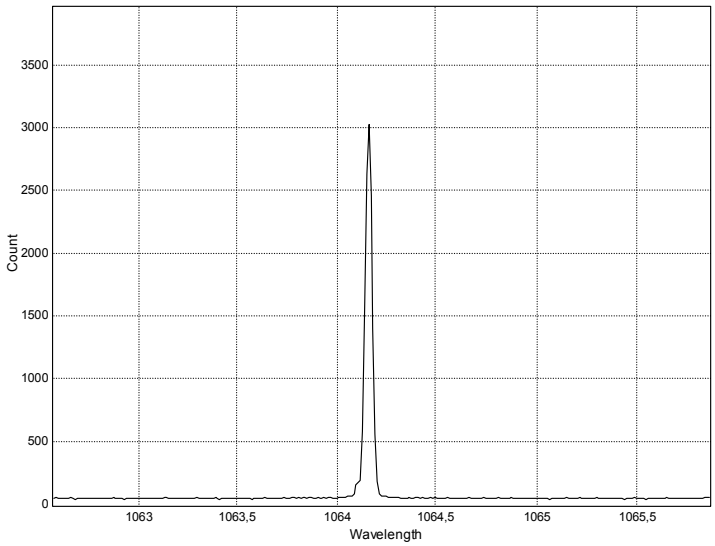
Diode laser λcenter=655.25nm, FWHM<0.022nm.
Distance between single modes is 170pm



654.5 655 655.5 656 λ,nm

You can fully trust the results of FWHM measurement because the SHR will tell you if FWHM of analyzed line is less than the instrument function.
Take for example Nd:YAG laser in two operation modes: free running mode and Q-switched mode.
In the free running mode width of 1064nm line is less than 40pm, and the SHR tells it cannot resolve its FWHM (refer to the picture below). In the Q-switched mode the line is wide and can be precisely measured with the SHR.

Nd:YAG laser, free running mode, λ = 1064.159 nm, FWHM<0.04nm



Nd:YAG laser. O-switched mode. λ = 1064.161 nm. FWHM=0.077nm