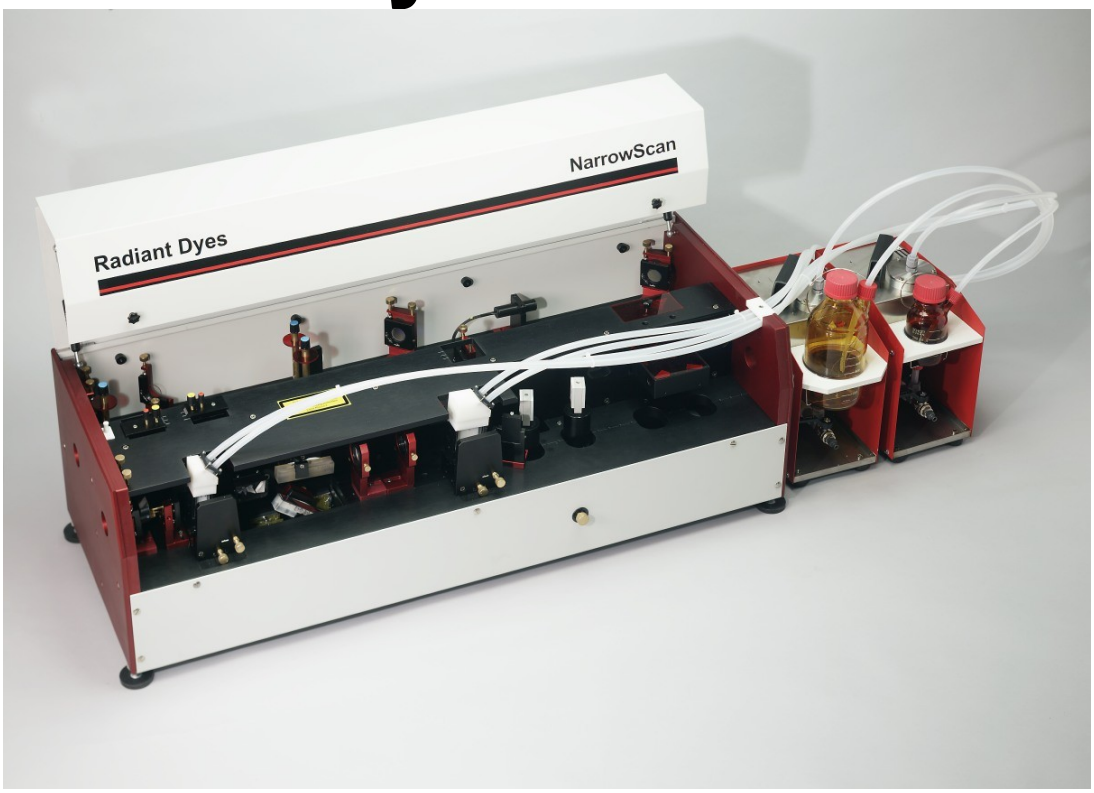
Radiant Dyes Laser Accessories GmbH

Dye Laser



New NarrowScan

New Resonator Design
4 analog / 4 digital inputs
Autotracking Frequency doubling, tripling and mixing
Wavelength Separation Unit
Frequency Stabilization
Temperature Stabilization
Wavelength Calibration
Online Bandwidth Control
Bethune Cell (up to 1 Joule pump energy)
Optional: Integrated Nd:YAG Laser

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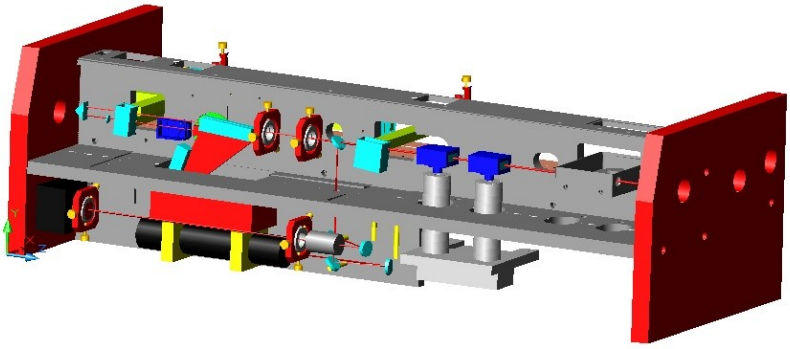
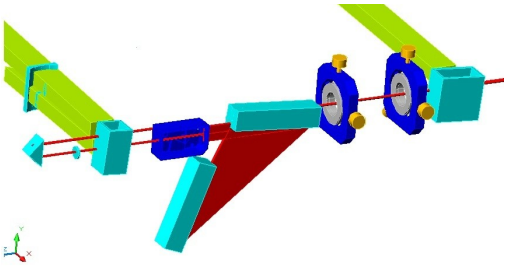
NarrowScan

The NarrowScan pulsed dye laser series is based on a new resonator-design with a very narrow linewidth (<0.04 cm^{-1}) that has been optimized in design and specifications by laser experts over many years and can now be used with pump laser pulses as short as 4 ns. The laser has very rigid and massive middle and side plates, ensuring a very high stability in the oscillator and pre-amplifier. The dimensions of the laser housing are much smaller than before, making the laser as compact as possible, while still allowing space for two frequency conversion units inside the laser.





Improved Resonator Design

- **vertical grazing incidence resonator**
- **larger tuning range**
- **lower bandwidth**
- **improved pulse to pulse energy stability**

New NarrowScan laser with the following options:

- Gratings: 1800, 2400, 3000, 3600 lines / mm
- Double-grating (bandwidth < 0.04 cm^{-1})
- Prismatic cell for high power output
- Frequency conversion units for doubling, trippling or mixing from 190nm up to 4.5µm
- "Look up" table and/or autotracking for both conversion units
- Wavelength separation with two or four Pellin-Broka-Prism
- Temperature stabilization of the crystal-housing
- Frequency stabilization
- Optogalvanic cell for laser calibration
- C++ or LabView software
- 4 digital and 4 analog inputs
- Online power monitoring of fundamental, doubled and tripled laser light
- Online bandwidth monitoring with CCD-camera
- Reversed laser design
- Integrated pump laser (dye and pump laser in a single housing)

Optical feedback

The new active feedback allows moreover a fully automatic wavelength calibration and an almost linear scanning. Active temperature contro, online energy control and wavelength stabilisation, as well as linewidth control are further advantages of the new optical feedback. Together with the new motor drive and a new software, we achieved a precision with reproducibility of the laser-line, linear scan and wavelength control, which is, to our knowledge, not reached by any other laser worldwide.

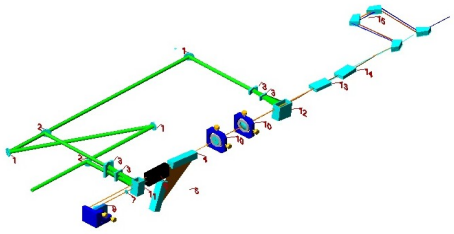
Additional options

When designing the new series of NarrowScan dye lasers we paid utmost attention to a flexible layout, meeting a variety of applications with a single dye laser. The following options can be easily integrated into the housing of the NarrowScan laser to guarantee a rigid and compact structure.

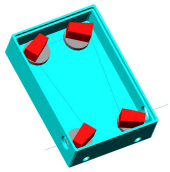
a) Frequency conversion

The excellent spectral and spatial quality of the NarrowScan-series predestinate this laser for the use in nonlinear processes. By means of our very precise positioning devices, all common crystals for frequency doubling, tripling and difference frequency mixing or mixing after doubling can be installed in the housing of the NarrowScan-laser. By installing the positioning stage directly inside the laser housing, a high stability and reproducibility is achieved. For difference frequency mixing (up to 4.5 µm) the dye laser wavelength is mixed with the fundamental of the Nd:YAG-laser. The necessary opto-mechanical components for the pump laser beam are also located inside the laser housing. All frequency units can be used independend, in LookUpTable or in autotracker mode.

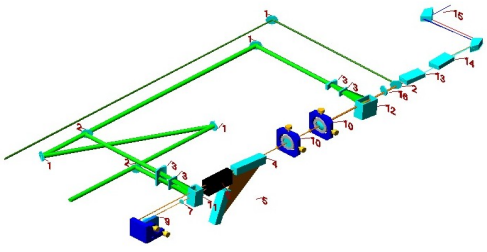
Frequency doubling



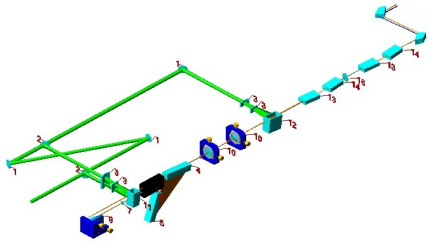
Doubling Unit & Pellin Broka Separation Box



Difference frequency mixing



Frequency tripling



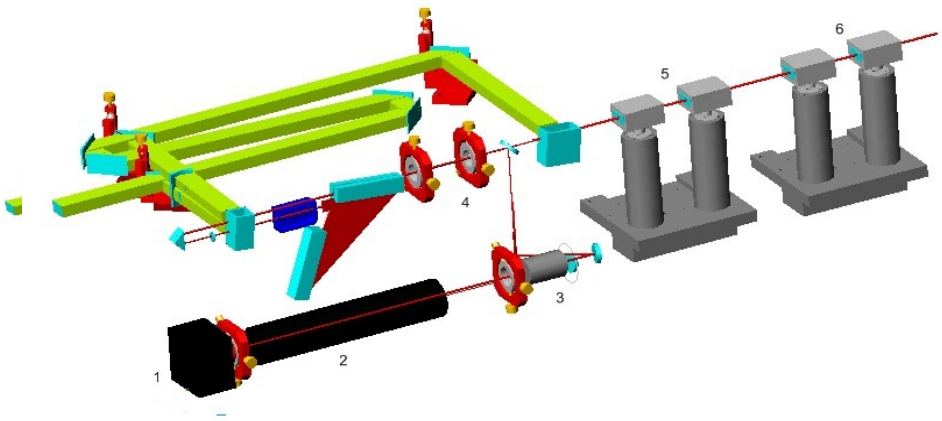
(13) compensators; (14) mixing-crystal; (15) separator (Pellin-Broka prism); (16) λ/2-plate

b) Temperature Stabilization

Our new NarrowScans are provided with an active temperature stabilization to prevent instabilities of the cavity because of changing environmental temperatures.

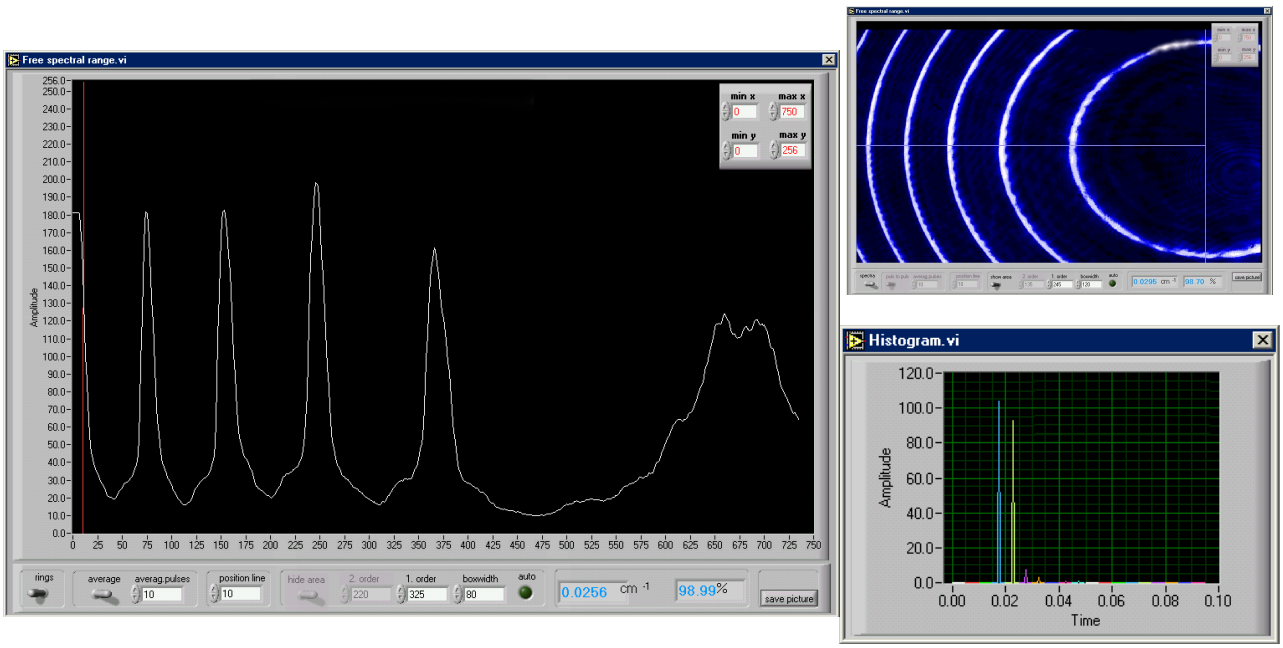
c) Opto-Galvanic Wavelength Calibration

A software controlled opto-galvanic (2) calibration device measures the absolute wavelength of atomic transitions, which are compared the actual grating position. The user can use the data to recalibrate his laser.



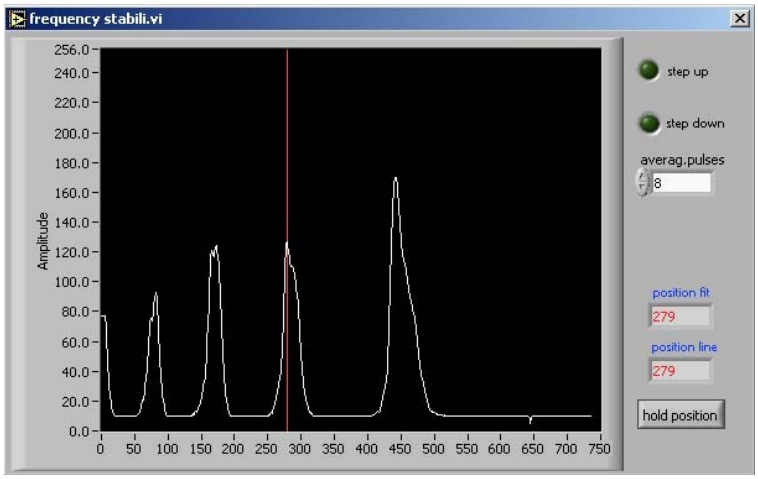
d) Bandwidth Monitor

An Etalon (3) is used to generate interference rings, which are monitored by a CCD-camera (1) and displayed on the PC. The software calculates the laser bandwidth by fitting the interference maxima, allowing an online control of the laser bandwidth during the measurements.



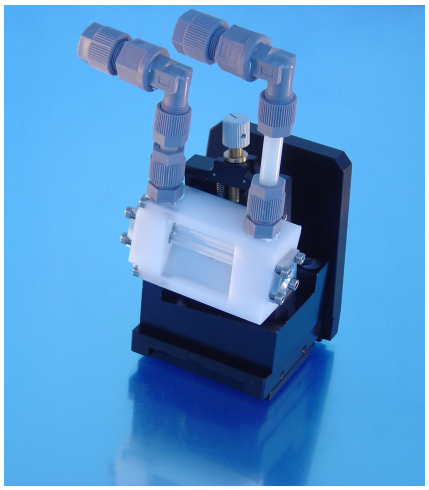
e) Wavelength / Frequency Stabilization

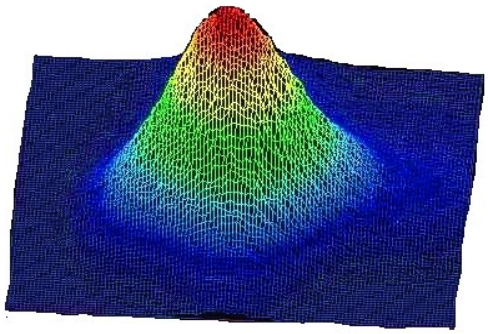
The active frequency stabilization uses the same Etalon as for the bandwidth measurement. In order to stabilize the laser frequency, one of the interference maxima is observed and kept at the same spatial position. Any frequency drift of the dye laser results in a spatial drift of the interference rings, which is compensated for slightly adjusting the resonator.



f) Prismatic cell for high power output and improved beam profile

Our new prismatic cell can be used with pump powers up to 1Joule and garantees a high power output with an excellent beam profile. The inner tube can be ordered from 1.6 up to 6mm diameter, depending on the power of the pumplaser.





Specifications for all NarrowScan Models:

Conversion efficiency: Nd:YAG pumped 532 nm	25 % DCM 28 % Rhodamine 6G
Conversion efficiency: Excimer pumped 308 nm	12 % Rhodamine 6G 15 % Coumarin 102
Wavelength reproducibility (580 nm)	< 0,0025 nm (typically < 0,0009 nm), temperature stabilized
Absolute accuracy of the wavelength (580 nm)	< 0,02 nm (typically < 0,01 nm), temperature stabilized
Wavelength stability	< 0,001 nm/°C
Divergence	0,5 mrad
Polarization	> 98 %
ASE-background	< 0.5 %
Dimensions	660 mm x 420 mm x 360 mm

Configurations:

Laser	Grazing Grating	Tuning Element	Tuning Range	Bandwidth [cm^{-1}]
NarrowScan Double Grating	3600 l/mm (90 mm)	3600 l/mm	330 nm – 480 nm	≤ 0,04 @ 460 nm
NarrowScan Double Grating	3000 l/mm (90 mm)	3000 l/mm	330 nm – 580 nm	≤ 0,03 @ 570 nm
NarrowScan Double Grating	2400 l/mm (90 mm)	2400 l/mm	330 nm – 710 nm	≤ 0,04 @ 580 nm
NarrowScan Double Grating	1800 l/mm (90 mm)	1800 l/mm	350 nm – 850 nm	≤ 0,05 @ 625 nm
NarrowScan Single Grating	3000 l/mm (90 mm)	Mirror	330 nm – 610 nm	≤ 0,05 @ 580 nm
NarrowScan Single Grating	2400 l/mm (90 mm)	Mirror	330 nm – 740 nm	≤ 0,06 @ 580 nm
NarrowScan Single Grating	1800 l/mm (90 mm)	Mirror	350 nm – 900 nm	≤ 0,07 @ 580 nm
NarrowScan Small Grating	2400 l/mm (60 mm)	Mirror	330 nm – 740 nm	≤ 0,08 @ 625 nm
NarrowScan Small Grating	1800 l/mm (60 mm)	Mirror	350 nm – 900 nm	≤ 0,1 @ 625 nm

Requirements:

Pump Laser Power	20mJ – 1000mJ (one main Amplifier)
Voltage	110V 6A/ 220V 3A, 50/60Hz, single phase
Computer (not included)	Windows, Linux or Mac, one free serial or USB Port for communication

All NarrowScan dye lasers are equipped with ready-to-use Radiant Dyes dye circulators (standard models for up to 50 Hz repetition rate of the pump laser). The pump optics can be chosen by the customer, according to the wavelength and the beam profile of the pump laser. The laser can either be controlled by a PC via the RS232 interface or an independend control box with a fully functional keyboard.