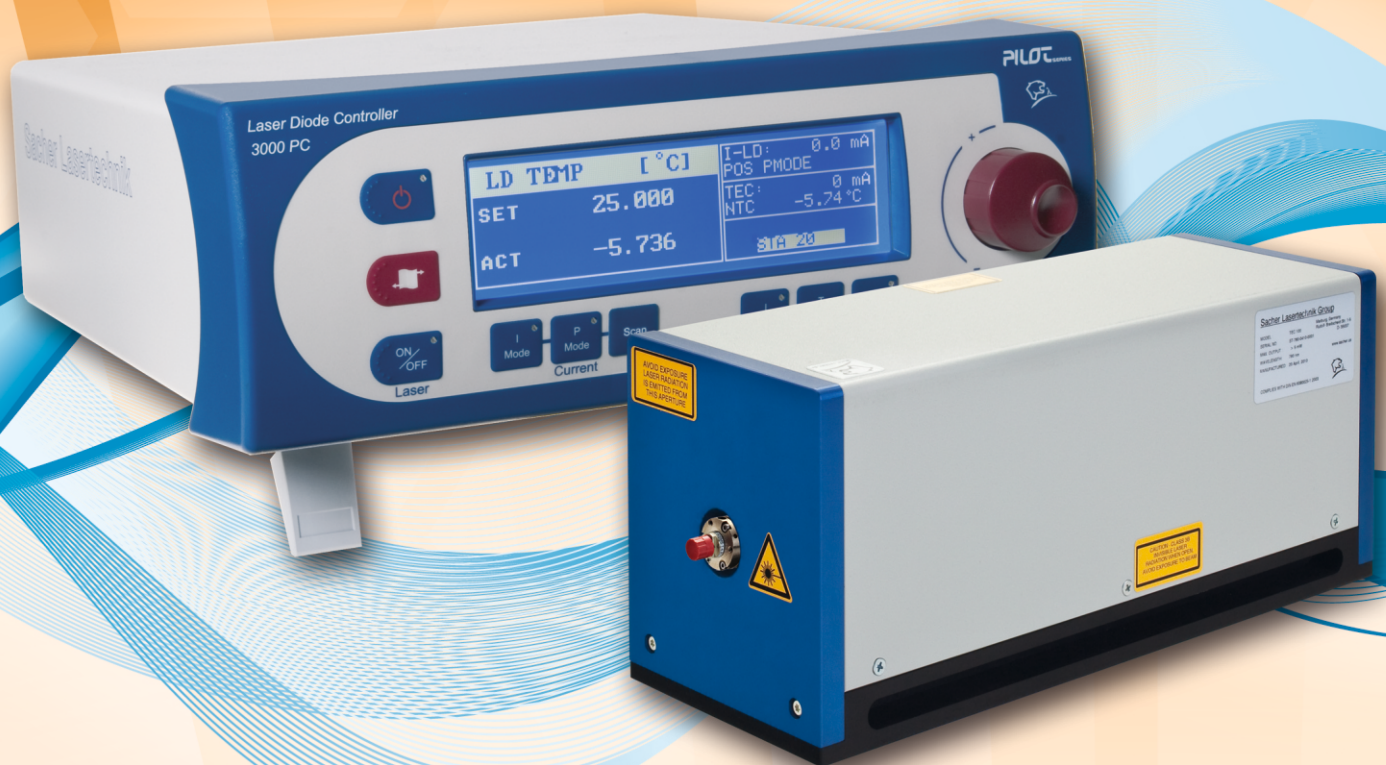


Lion

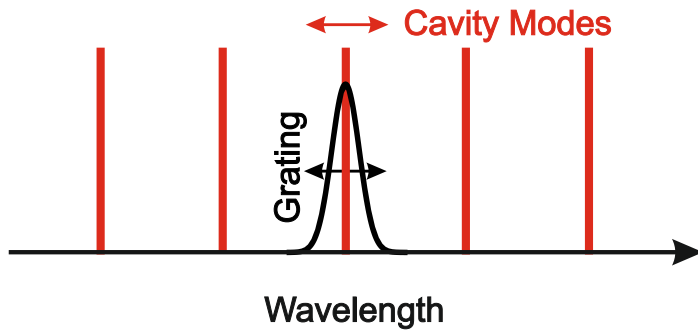
Tunable External Cavity Diode Laser Littman/Metcalf Configuration

Scientific Lasers

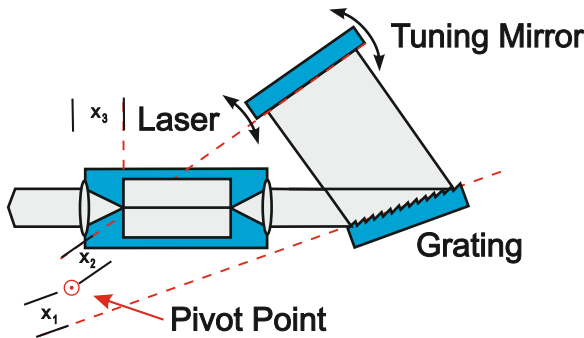
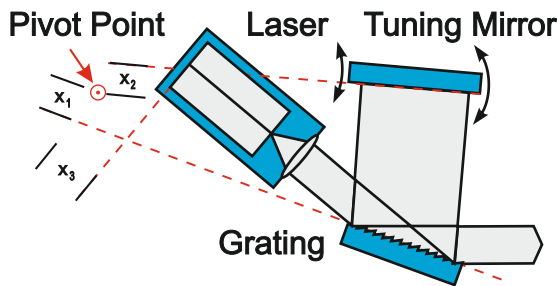




How does our Laser tune modehop-free ?



LION



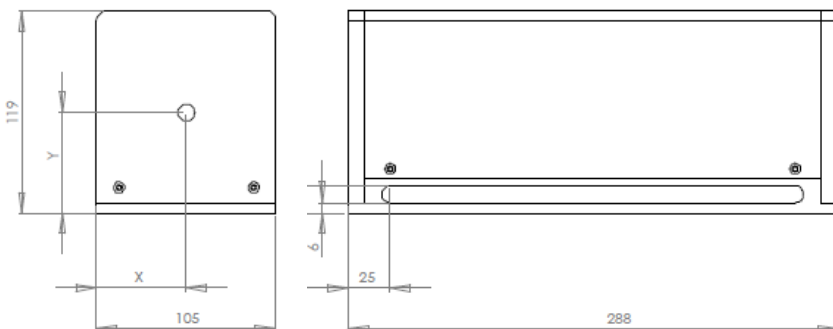
Physical Basics

The emission wavelength of a laser is defined by two features. The first condition is the cavity mode. The second condition is the amplification range of the gain medium. Since diode lasers have an extremely wide gain region, it is necessary to put a wavelength selective medium inside of the cavity like a grating. In order to tune such a laser modehop-free, it is required to synchronize the grating defined wavelength with the cavity defined wavelength [1].

Technical Solution

Sacher Lasertechnik has realized the synchronization between grating defined and cavity defined wavelength by only a simple rotation of the mirror. The adjustment of the pivot point is done during the wavelength scanning operation of our Littman/Metcalf laser system according to our patent no. 5,867,512. Due to this special method, we are able to ensure the best modehop free tuning behavior. An increase of the output power and the total performance of the Littman/Metcalf laser is achieved by using a high efficiency grating and outcoupling the light of the rear facet of the laser diode. With this approach, we are able to increase the output power to more than 100mW.

Dimensions



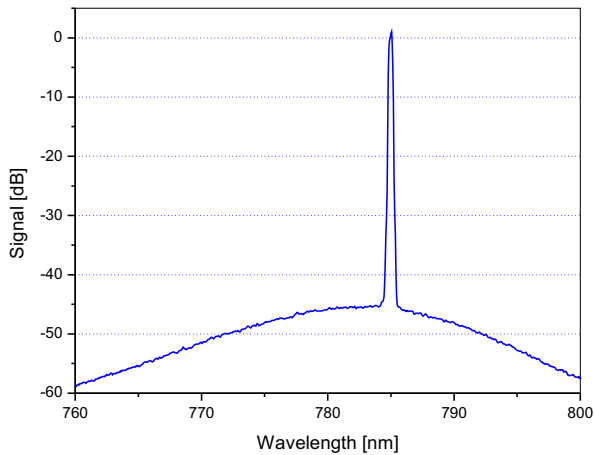
Technical Realization

The drawings on the left hand side show the technical realization and the dimensions of the TEC-500 and the TEC-520 external cavity diode laser systems. Due to using an alignment insensitive cavity design and a flex-mount concept, our Littman/Metcalf laser diode systems are excellent turn-key devices.

[1] M. G. Littman, H. J. Metcalf, Appl. Opt. 17, 2224, 1978

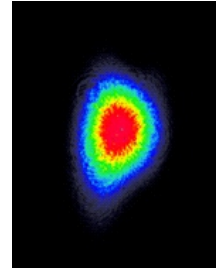
Key Features of our Littman/Metcalf Laser System

Side Mode Suppression



Example:
Power: > 100 mW at 780nm
 $M^2 < 1.3$ in both directions

Beam Quality



In-house manufacturing of AR-coatings, Patent 6,297,066

In house manufacturing of anti-reflection coatings for diode lasers guarantees the best performance for the complete laser system. for each type of application.

High passive stability

Realizing the pivot axis of the tuning grating and the cavity adjustment via flex-mounts ensures the highest passive stability of our Littrow laser system. As a result, we achieve a robust and highly stable external cavity diode laser system with excellent values for the long term laser linewidth.

Option: Single-mode fiber coupling

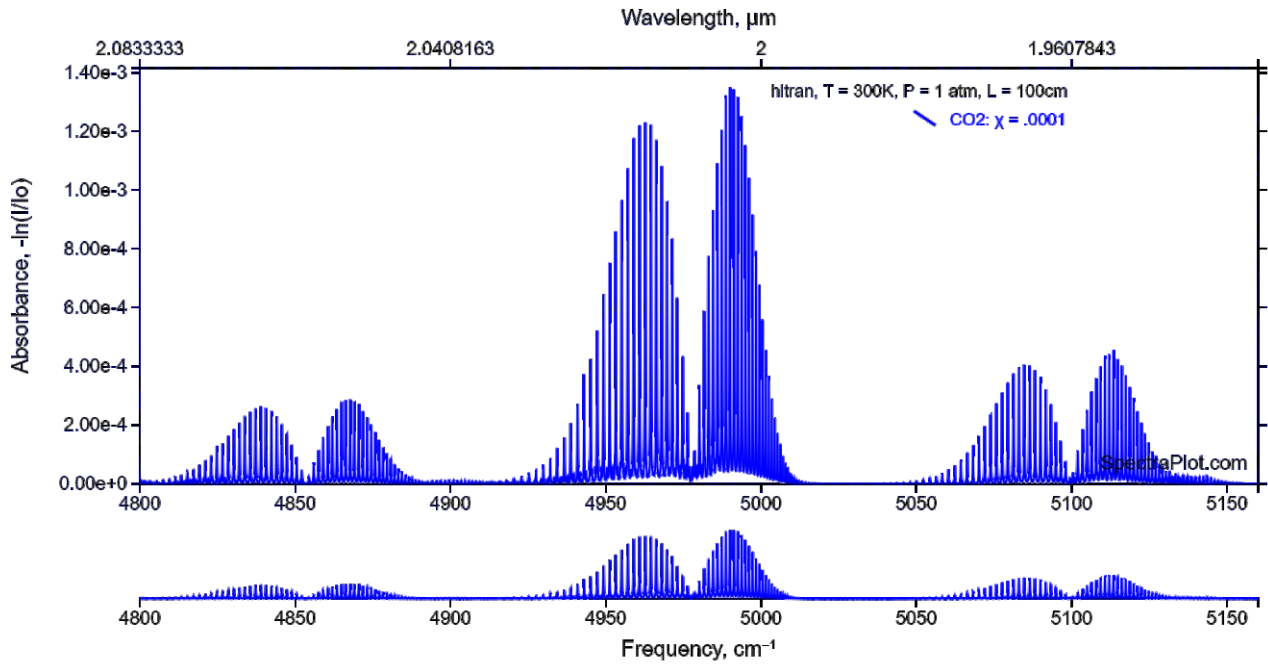
Due to the excellent mechanical stability of our Littrow laser system, we are able to perform high efficiency fiber coupling with coupling efficiencies between 60% and 85% into single-mode polarization maintaining optical fibers. Optical isolators and angled fiber connectors (FC/APC couplers) are available upon request.

Specification: Summary

Output Power	10 ... 150 mW (depending on wavelength)
Wavelength	635 nm ... 2450 nm with multiple laser heads
Wavelength Tuning	10 nm ... 250 nm (depends on wavelength)
Wavelength Tuning	10 nm ... 120 nm (depending on wavelength)
Piezo Tuning	30 GHz ... 120 GHz (depending on wavelength)
Linewidth	< 100 kHz @ 1ms (< 20 kHz @ 1ms typical)
Side Mode Suppression	> 50 dB
Beam Quality M^2	< 1.3
Further Specification	Please contact us for further specification

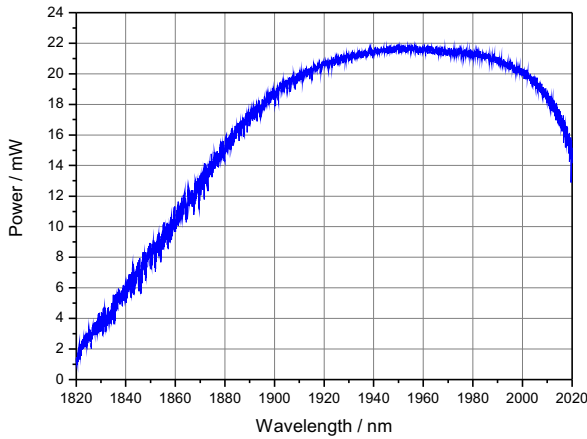
Application Example

Carbon Di-Oxide Spectroscopy

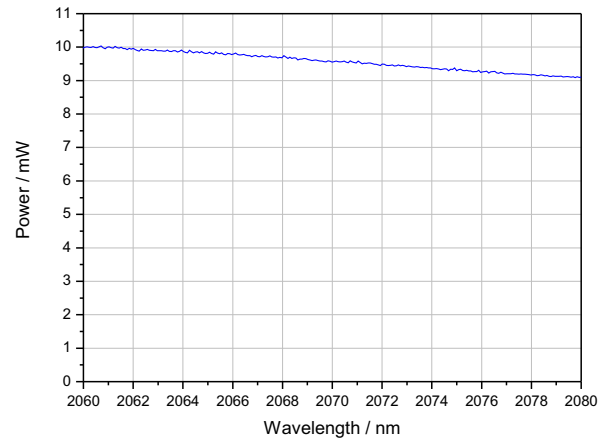
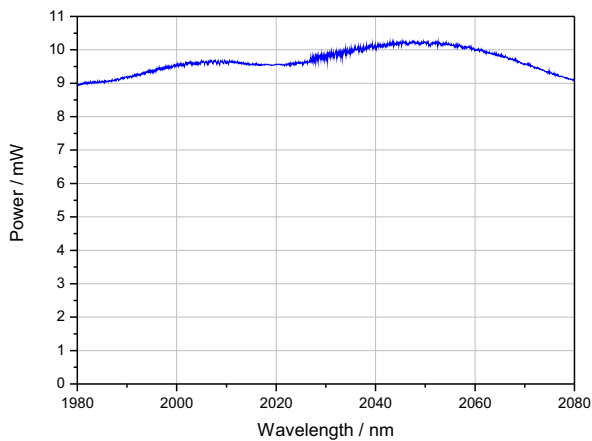
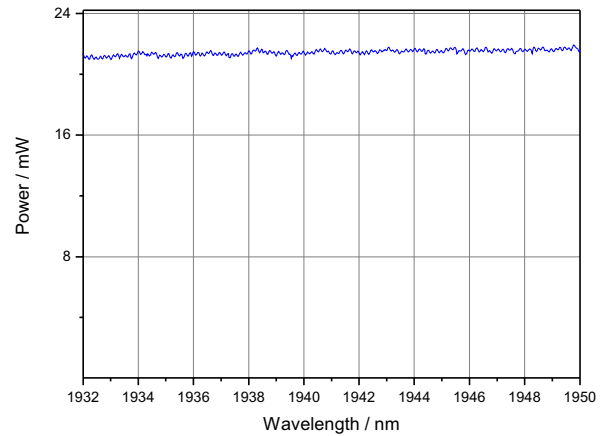


Matching Tunable Diode Laser (DC Motor Required)

Total Tuning Range



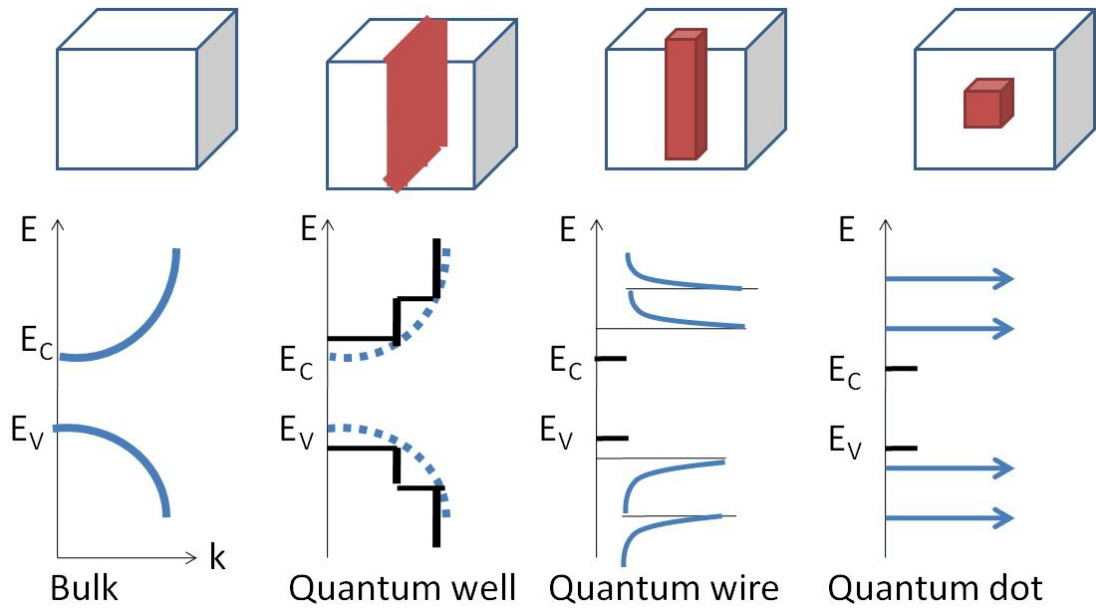
Smooth Mode-Hop Free Tuning



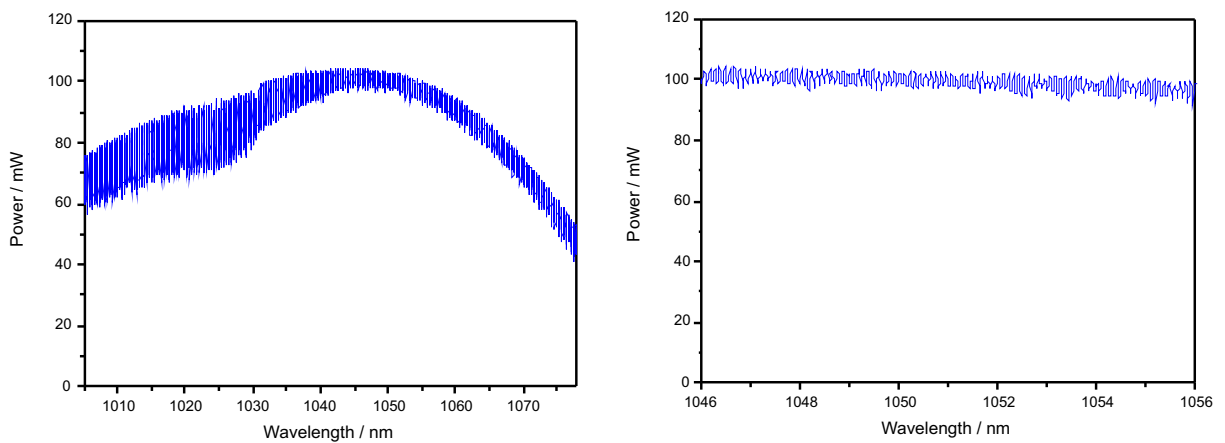
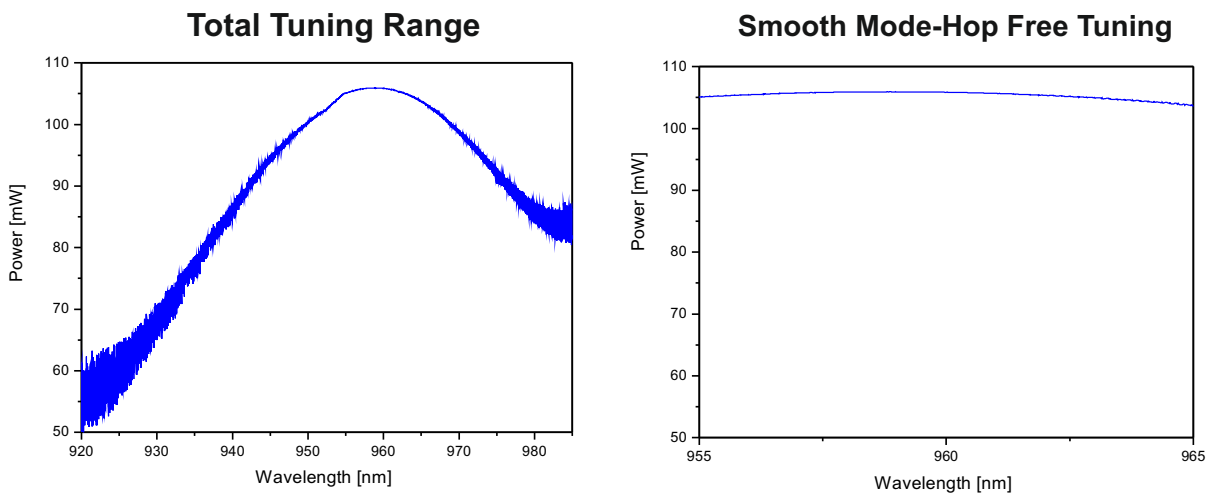
(tuning curves are recorded with motorized version of the Lion laser)

Application Example

Quantum Dot Spectroscopy



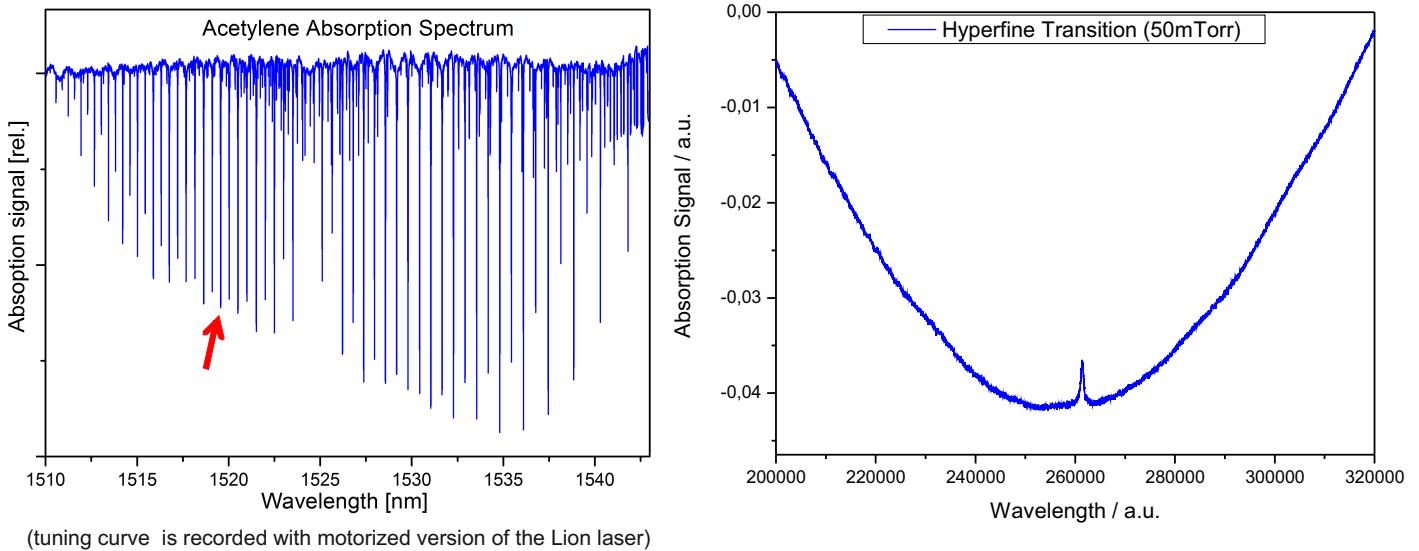
Matching Tunable Diode Laser (DC Motor Required)



(tuning curves are recorded with motorized version of the Lion laser)

Application Example

Acetylene Spectroscopy



High resolution spectroscopy requires laser features like narrow linewidth, high passive stability, exact adjustable wavelength as well as an excellent modehop free fine tuning ability. The figure summarizes experimental data which have been determined with our Littman/Metcalf laser system. The lines shows an absorption signal of the Rotational Absorption Band of Acetylene in the 1530nm wavelength regime. More demanding is the Doppler-free detection of the Lamb dips (Demtröder Laser Spectroscopy, Springer 1998). The enlargement shows the Doppler-free measurement of the Lamb dip of R11 state at a gas pressure of 50mTorr.

About Sacher Lasertechnik

Company Profile

Sacher Lasertechnik is leading manufacturer of tunable external cavity diode lasers (ECDLs) with more than 25 years of experience. The product range includes anti-reflection coated diode lasers, ECDLs in Littrow and in Littman/Metcalf configuration as well as driver electronics for the LD and sophisticated measuring electronics. Please contact us with your measurement requirements. We would be proud to support you with our competence.

Please contact us

Sacher Lasertechnik
GmbH
Rudolf-Breitscheid Str. 1-5
D-35037 Marburg/Lahn
Germany
Tel.: +49 6421 305 - 0
Fax: +49 6421 305299

Sacher Lasertechnik
LLC
5765 Equador Way
Buena Park, CA90620
U. S. A.
Tel.: 1-800-352-3639
Fax: 1-714-670-7662

Email: contact@sacher-laser.com
Web: <http://www.sacher-laser.com>



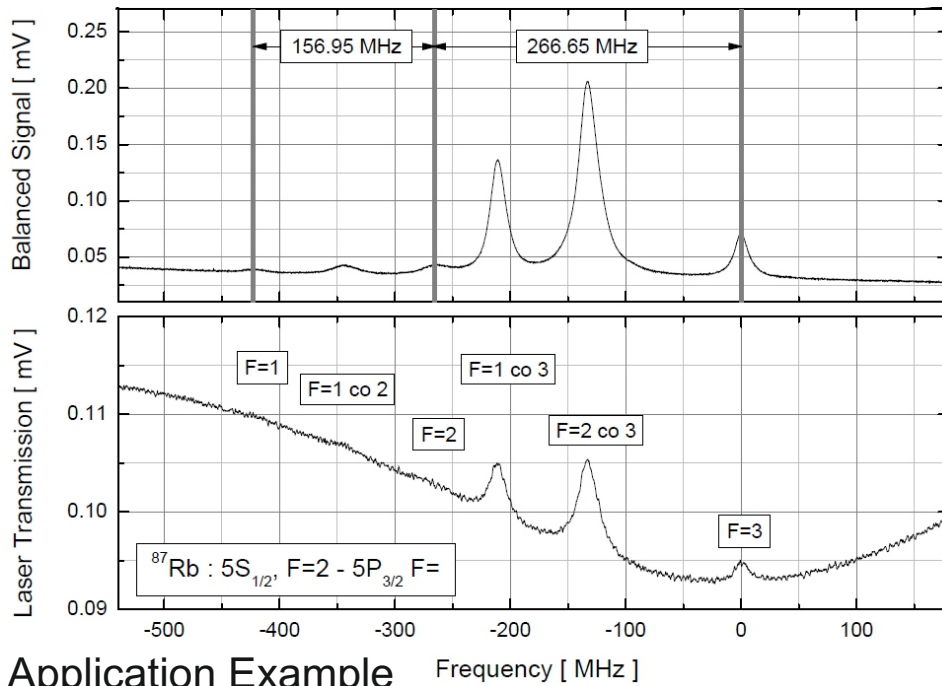
PilotPZ

External Cavity Diode Laser Controller
Low Current Noise, High Temperature Stability
Low Noise Piezo Amplifier, Ramp Generator

Electronic Systems & Devices



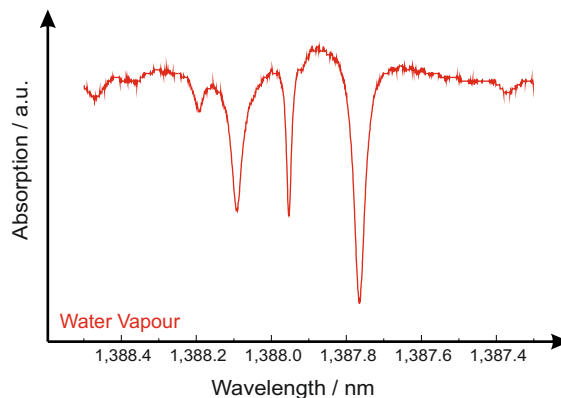
Automated Wavelength Scans via Remote Control



Application Example

Sub-Doppler Spectroscopy

High resolution spectroscopy requires laser features like narrow linewidth, high passive stability, exact adjustable wavelength as well as an excellent fine tuning ability. The figure summarizes experimental data which have been determined with our Littrow laser system. The blue trace shows an absorption trace of the D_2 -line of Rubidium. More demanding is the Doppler-free detection of the Lamb-dips (c/f W. Demtröder, Laser Spectroscopy, Springer 1998). The red trace shows the doppler-free measurement of the Lamb-dip of the D_2 -line of Rubidium.



Application Example

Water Vapor Spectroscopy

Water vapor show various absorption bands. Typical wavelength for spectroscopy of water vapor are 935nm or 1410nm. The figure summarizes experimental data which have been determined with our Littman/Metcalf laser system in the 1410nm wavelength range. The trace shows an absorption signal of an optical water vapor concentration measurement in ambient air. The total tuning range is 1nm with 1388nm as center wavelength of the scan.

Product Features

- Frontpanel graphic interface
- 500mA / 3000mA LD current source with forward voltage measurement
- Const current or const power mode
- 16 W / 32 W TEC control
- Various laser protection features
- - 13V .. +13V Piezo Voltage
- 0.1Hz .. 10kHz Piezo Scan Rate
- Current coupling for mode-hop free tuning
- GPIB, USB and RS232 remote interface
- Automated wavelength scans via remote control
- Signal monitoring for closed loop applications



Specifications

Laser Current Source

PC500 Drive Current Output

Output Current Range	0-500mA
Setpoint Resolution	0.1mA
Setpoint Accuracy	±0.1%
Noise (10Hz to 10MHz)	(See Note No. 20)
Compliance Voltage	0-7V adjustable

Temperature Control

TEC Output

Output Type	Bipolar Constant Current Source
Compliance Voltage	8V
Maximum Output Current	-3A to 3A
Maximum Power	32 Watt

PC4000 Drive Current Output

Output Current Range	0-4000mA
Setpoint Resolution	1.0mA
Setpoint Accuracy	±0.1%
Noise (10Hz to 10MHz)	(See Note No. 20)
Compliance Voltage	0-7V adjustable

Sensor

Temperature Sensor	Thermistor (10k NTC)
	IC Temp Sensor AD590
Temperature Control Range	-5°C to 30°C
Setpoint Resolution	1mK (-5°C to 30°C)

Photodiode Feedback

Photodiode Current Range	0-5000µA
Type	Diff. 100R

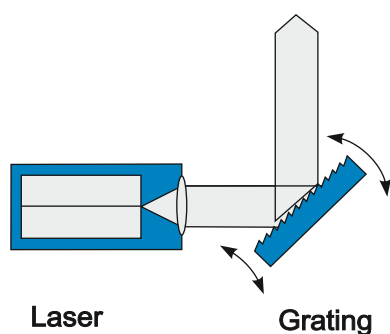
Common Data

Dimension (WxHxD)	270 x 110 x 320 mm
Weight	< 5kg
Line Voltage	110V / 115V / 230V +/- 10%
Line Frequency	50 .. 60Hz
Warm-up Time	10min
Storage Conditions	-25 .. 70°C
Operating Temperature	0 .. 40°C

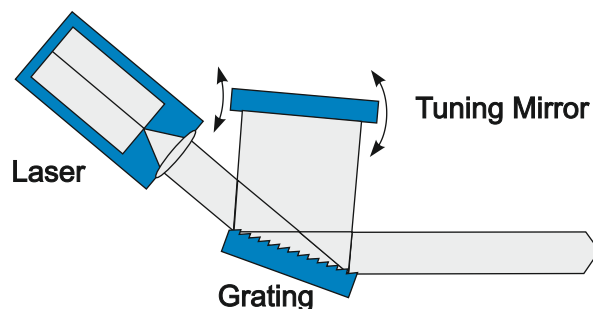
Piezo Amplifier

Voltage Range	-13V .. +13V
Setpoint Resolution	<1mV
Scan Rate	0.1 Hz .. 10kHz

Littrow - Configuration



Littman/Metcalf - Configuration



Application Example

External Cavity Diode Laser

The principle application of our PilotPZ laser controller are diode lasers with an external cavity. Typical laser configurations are Littrow- and Littman/Metcalf-cavity. We offer special plug-in modules for most measurement applications which are needed for state of the art measurements in spectroscopy such as trace gas analysis as well as for metrology. Please check our web-page for details.

About Sacher Lasertechnik

Company Profile

Sacher Lasertechnik is leading manufacturer of tunable external cavity diode lasers (ECDLs) with more than 15 years of experience. The product range includes anti-reflection coated diode lasers, ECDLs in Littrow and in Littman/Metcalf configuration as well as driver electronics for the LD and sophisticated measuring electronics. Please contact us with your measurement requirements. We would be proud to support you with our competence.

Please contact us

Sacher Lasertechnik
GmbH
R. Breitscheid Str. 1-5
D-35037 Marburg/Lahn
Germany
Tel.: +49 6421 305 - 0
Fax: +49 6421 305299

Sacher Lasertechnik
LLC
5765 Equador Way
Buena Park, CA90620
U. S. A.
Tel.: 1-800-352-3639
Fax: 1-714-670-7662

Email: contact@sacher.de
Web: <http://www.sacher.de>

