

US-Patent 5,867,512  
US-Patent 6,297,066



*to meet the requirements  
of your special experiment*

## **LION**

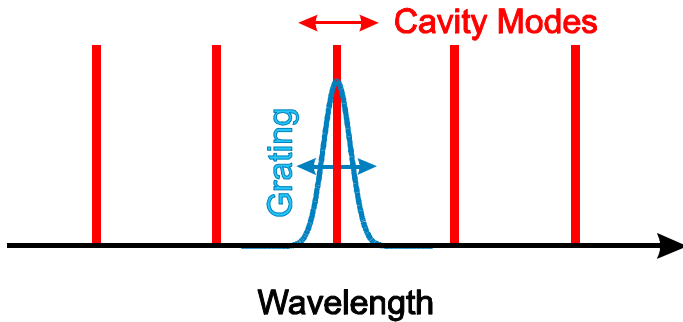
Tunable Littman / Metcalf  
External Cavity Diode Laser



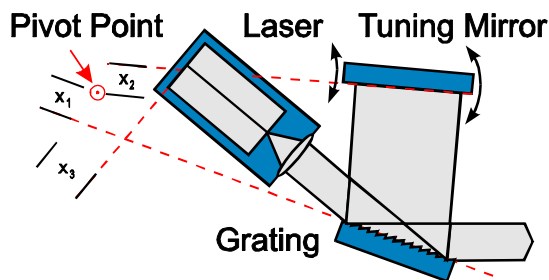
**Power and  
Tunability**



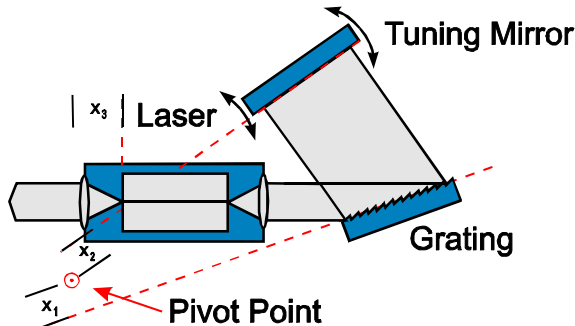
# How does our Laser tune modehop-free ?



**LION**  
TEC-500

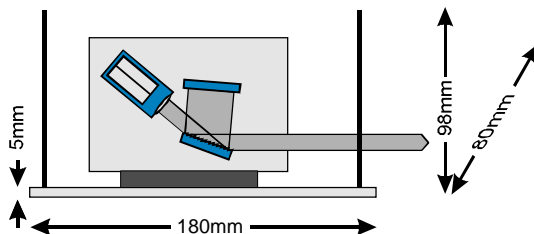


**LION**  
TEC-520

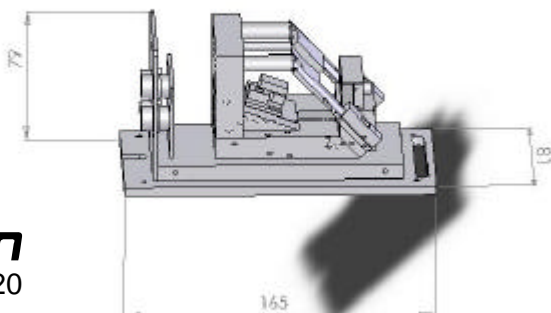


## Dimensions

**LION**  
TEC-500



**LION**  
TEC-520



## 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.

## Technical Realization

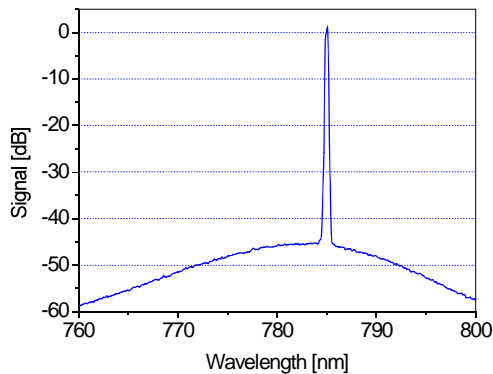
The drawings on the left hand side show the technical realization and the dimensions of the TEC-500 and the TEC-520 external cavity diode laser systems. Due to using an alignment insensitive cavity design and a flex-mount concept, our Littman/Metcalf laser diode systems are excellent turn-key devices.

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



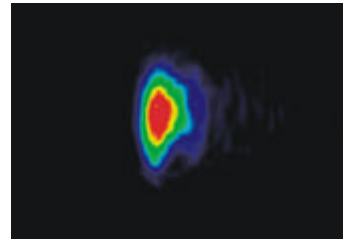
# Key Features of our Littman/Metcalf Laser System

## Side Mode Supression



Example:  
Power: > 150 mW at 780nm  
 $M^2 = 1.5$  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, Patent 5,867,512

Realizing a alignment insensitive cavity concept and the pivot axis of the tuning mirror via flex-mounts ensures the highest passive stability of our Littman/Metcalf 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.

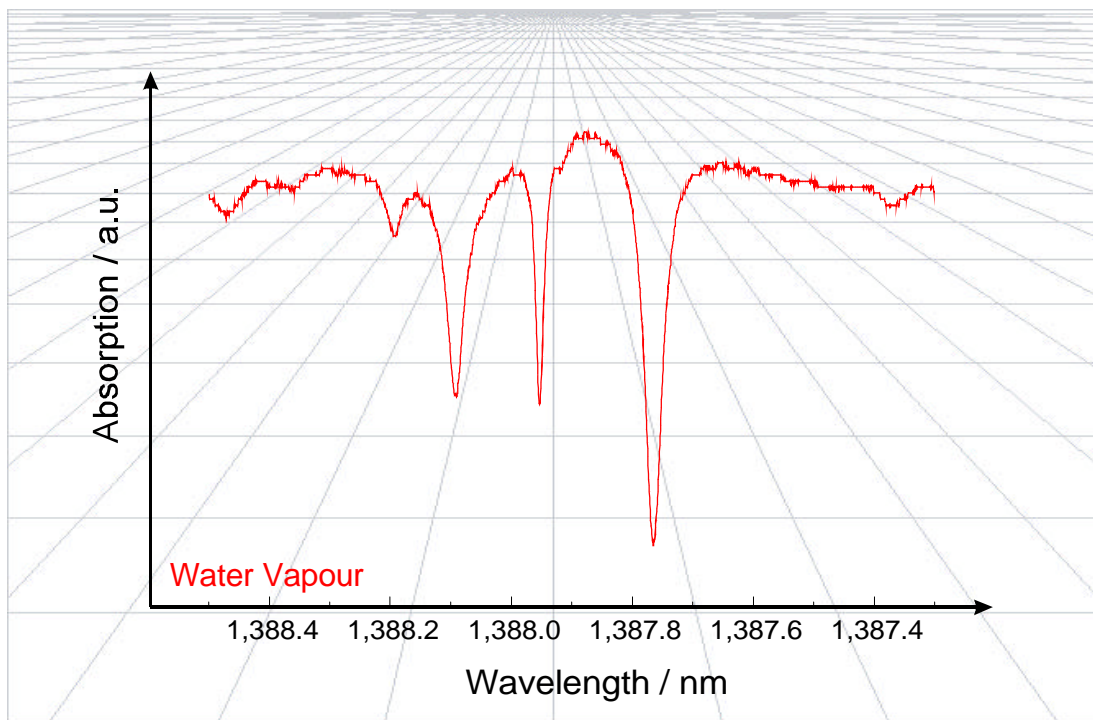
## Option: Single-mode fiber coupling

Due to the excellent mechanical stability of our Littman/Metcalf laser system, we are able to perform high efficiency fiber coupling with coupling efficiencies between 40% and 70% into single-mode polarization maintaining optical fibers. Optical isolators and angled fiber connectors (FC/APC couplers) are available upon request.

## Specifications: <http://www.sacher-laser.com/lmnspecs.php>

|                         |  |
|-------------------------|--|
| Output Power            | 10 mW .. 200 mW *                                      |
| Wavelength              | 630 nm .. 1740 nm, Please Check Individual Data Sheets |
| Wavelength Tuning       | 8 nm .. 120 nm *                                       |
| Piezo Fine Tuning       | 60 GHz .. 150 GHz @ 100 V Piezo Voltage *              |
| Mode-hop Free Tuning    | > 30 GHz, typically > 100 GHz *                        |
| Piezo Fine Tuning Speed | > 0.5 kHz Modulation Frequency @ 10 GHz Amplitude      |
| Linewidth               | 500 kHz @ 20 ms  |
| Side Mode Supression    | > 40 dB .. 50 dB *                                     |
| Beam Waist (2 $w_0$ )   | 3 mm x 1.5 mm .. 1.5 mm x 1.5 mm *                     |
| Beam Quality $M^2$      | < 1.5  |
| Output Polarization     | P - Polarized or S - Polarized *                       |

\* the actual value depends on the chosen wavelength



## Application Example

### [Water Vapor 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 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.

## About Sacher Lasertechnik

### [Company Profile](#)

Sacher Lasertechnik is leading manufacturer of tunable external cavity diode lasers (ECDLs) with more than 13 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 or our local representative](#)

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