

US-Patent 6,297,066  
US-Patents pending



## Lynx

*excellent with anti - reflection  
coated diode lasers*

Tunable Littrow  
External Cavity Diode Laser



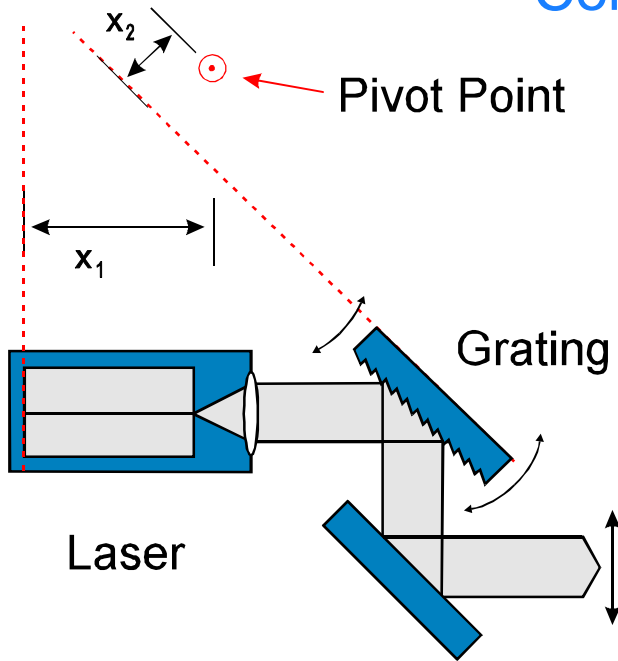
**More Power ...**  
**More Brilliance**

# Littrow Laser Diode

## Concepts, an Overview



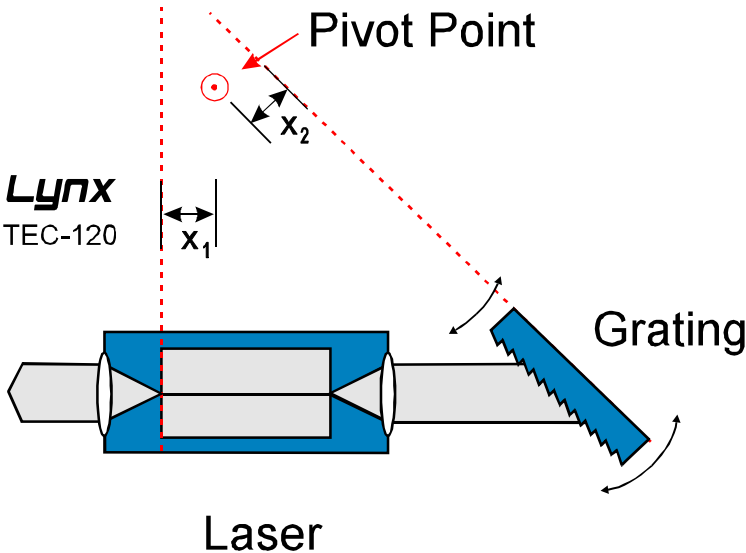
Lynx  
TEC-100



### Ricci / Hänsch Design

The extended cavity diode laser concept was developed by the group of Prof. Hänsch in the early 1990s for optical cooling and trapping [1, 2]. It was improved by Hildebrandt et al. by choosing anti-reflection coated diode lasers [3]. The laser system consists of a commercial diode laser, collimation optics and a diffraction grating for wavelength tuning. Since the laser emission is coupled out via the 0<sup>th</sup> order of the grating, the coupling of the laser to the cavity is weak and the mode-hop free tuning is limited to typically 10GHz. This design is still available for low budget applications by model no. TEC-100.

Lynx  
TEC-120

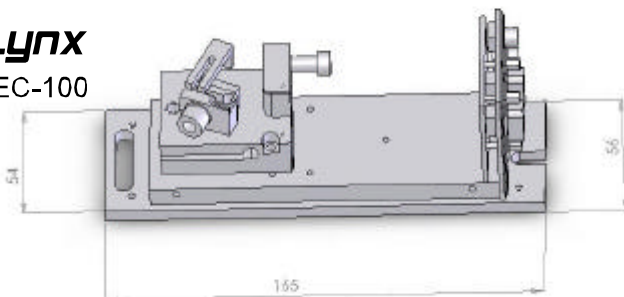


### Sacher Design

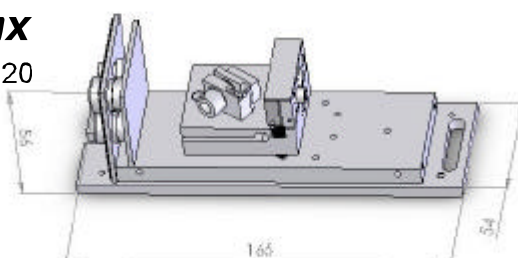
Sacher Lasertechnik improved the extended cavity concept by avoiding all compromises. The external cavity is realized with class D anti-reflection coated diode lasers and with a high efficiency diffraction grating. The output power is coupled out via the rear facet of the laser chip for avoiding any beam walk. This results in the best performance for an external cavity diode laser system in Littrow configuration. Several patent applications are pending. Typical power values range between 20mW and 200mW for single mode diode lasers, depending on the wavelength. This laser design is available by model no. TEC-120.

### Dimensions

Lynx  
TEC-100



Lynx  
TEC-120



### Technical Realization

The drawings on the left hand side show the technical realization and the dimensions of the TEC-100 and the TEC-120 external cavity diode laser systems.

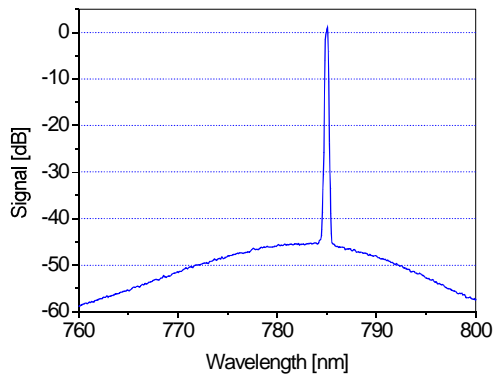
- [1] L. Ricci et al., Opt. Commun. 117, p. 541, 1995
  - [2] K. B. Mc Adam et al., Am. J. Phys. 60, p. 1098, 1992
  - [3] L. Hildebrandt et al., Appl. Opt. 42, p. 2110, 2003,
- Download:  
<http://data.sacher-laser.com/publications/ao2003.pdf>



# Key Features of our

# Littrow Laser System

## Side Mode Supression

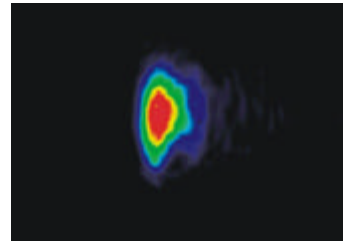


Example:

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

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.

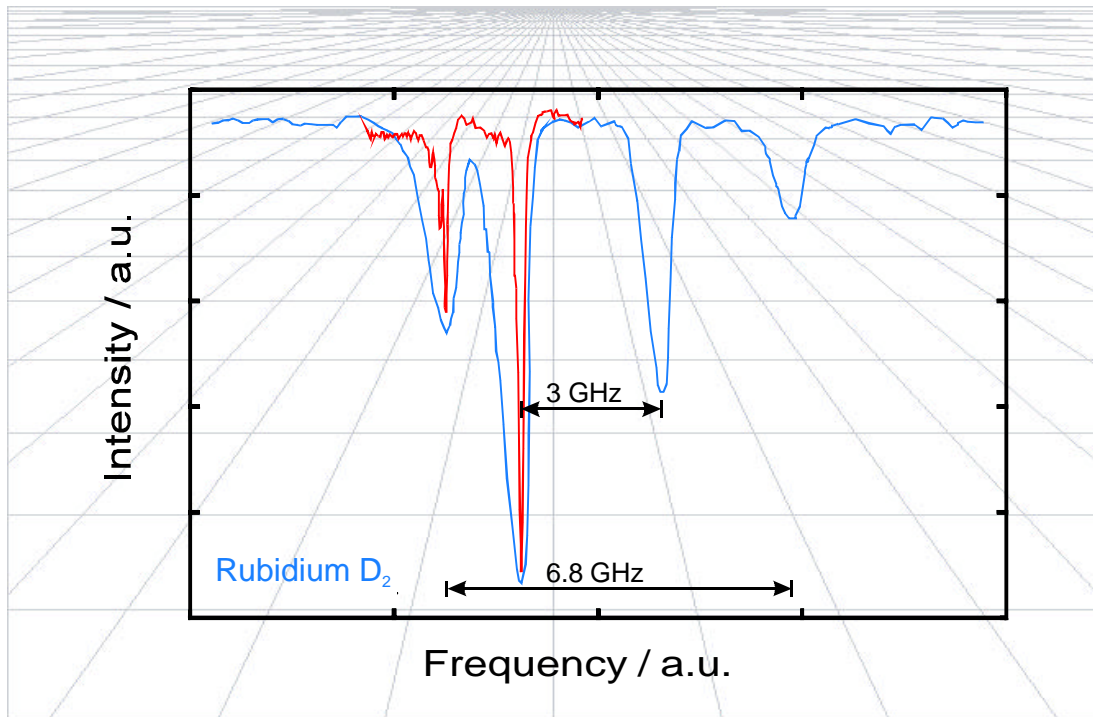
## Option: Single-mode fiber coupling

Due to the excellent mechanical stability of our Littrow laser system, we are able to perform high efficiency fiber coupling with coupling efficiencies between 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/lwspecs.php>

Output Power	10 mW .. 200 mW *
Wavelength	375 nm .. 1740 nm, Please Check Individual Data Sheets
Wavelength Tuning	2 nm .. 120 nm *
Piezo Fine Tuning	60 GHz .. 150 GHz @ 100 V Piezo Voltage *
Mode-hop Free Tuning	> 16 GHz, typically > 30 GHz *
Piezo Fine Tuning Speed	> 0.5 kHz Modulation Frequency @ 10 GHz Amplitude
Linewidth	1 MHz @ 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

### 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.

## 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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