TOPTICA PHOTONICS

Scientific Diode Lasers

Femtosecond Fiber Lasers

OEM Lasers

Laser Diodes

Optical Data Storage Products

Laboratory Tools

ToptiCalc for free

www.toptica.com

A Passion for Precision.

DFB / DBR Lasers

High-power, widely tunable:
Distributed Feed-Back laser diodes
Distributed Bragg Reflector laser diodes

Spectrally narrow DFB / DBR diodes at virtually any wavelength between 760 - 2000 nm!

Distributed Feed-Back (DFB) and Distributed Bragg Reflector (DBR) laser diodes feature a grating structure within the semiconductor material. The grating narrows the wavelength spectrum and guarantees single-frequency emission. Tuning is accomplished by modulating either laser current or operating temperature. Thermally tuned DFB and DBR lasers offer extremely large mode-hop free tuning ranges of many hundred GHz. Electric modulation, on the other hand, can be employed for fast frequency modulation within a smaller range (several 10 GHz @ kHz to MHz modulation frequencies).

Applications

High-resolution spectroscopy
Laser cooling, ultra-cold atoms
Plasma physics
Trace gas analysis
Combustion monitoring
Seed laser for LIDAR measurements
Generation of tunable cw THz radiation

TOPTICA Photonics AG · Lochhamer Schlag 19 · 82166 Graefelfing/Munich · Germany
T +49 89 85837-0 · **F** +49 89 85837-200 · sales@toptica.com · www.toptica.com

DFB and DBR lasers

TOPTICA提供波长从730um到2.8nm的DFB激光器

可以满足大气原子吸收谱线，也能满足碱金属的共振跃迁

TOPTICA can provide DFB diodes at virtually any wavelength between 730 nm and 2.8 µm – wavelengths that match not only the absorption lines of atmospheric gases but also the resonance transitions of alkali atoms. A major advantage of the DFB systems is the absence of any critical opto-mechanical components, permitting high long-term stability and reliability. This diode laser therefore opens new possibilities for projects that require automated operation or for air-borne and even satellite-based experiments.

DFB激光器的一个最主要的优点是不需要任何要求很高的光学机械元件，有很高的长期稳定性和可靠性。

For maximum frequency stability, we recommend our patented ColdPack housing. Here, four thermoelectric elements serve to stabilize the laser temperature, or alternatively rapidly heat or cool the laser diode. A long-term frequency stability of 20 MHz (rms) over 9 hours has been demonstrated with a DFB diode without any external frequency stabilization. For precision spectroscopy, a wide range of control devices is available (TOPTICA's series DC 110 and iScan™ technology).

Frequently Asked Questions

集成到一个半导体芯片上

What is the difference between DFB and DBR laser diodes?

衍射光栅

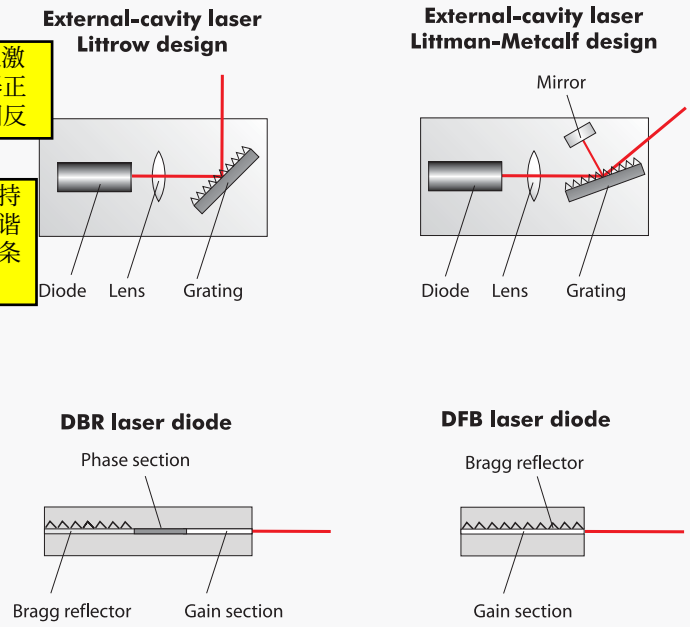
In both DFB and DBR diodes, a diffraction grating – often referred to as “Bragg grating” or “Bragg reflector” – is incorporated in the semiconductor chip. The grating selects a single longitudinal laser mode and therefore determines the lasing wavelength. In a DFB laser, the grating is integrated into the active section of the diode. In a DBR laser, by contrast, the grating (“Bragg section”) is separated from the active region (“gain section”). An additional “phase section” serves to maintain resonance conditions. Changing the grating pitch by varying the temperature or the laser current tunes the wavelength of DFB and DBR lasers. Some DBR diodes additionally provide individual control of the different chip sections, allowing e.g. for rapid electrical modulation of the Bragg and phase current while keeping the gain current (and consequently the laser power) constant.

光栅选择一个激光纵模也决定了激光波长

对于DFB激光器来说，光栅集成在二极管的工作区中

DBR激光器正好相反

维持了谐振条件



Schemes of tunable diode lasers.

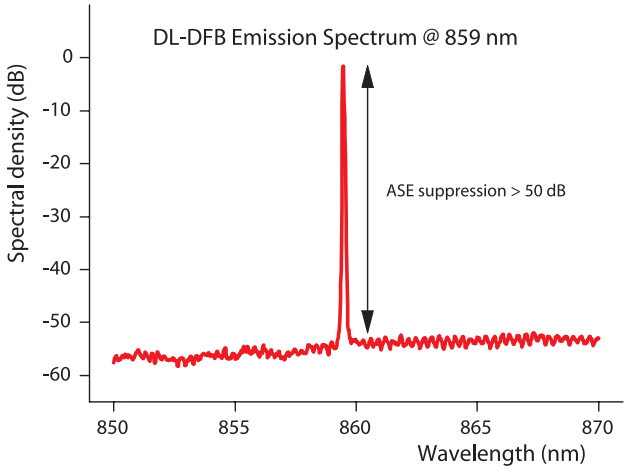
通过温度或激光电流改变光栅距离从而调节DFB和DBR激光器的波长。

When should I use a DFB laser rather than an ECDL?

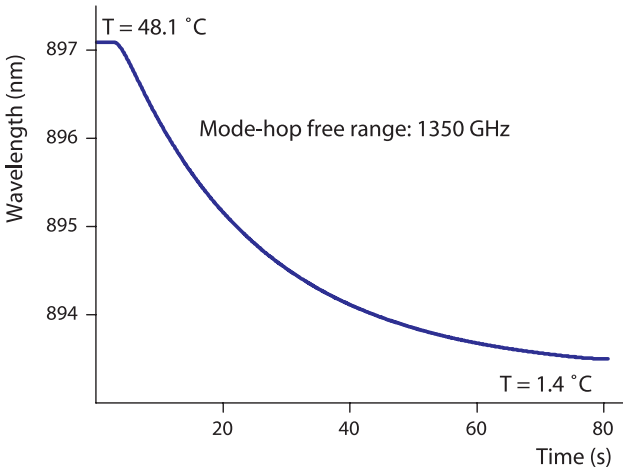
DFB diodes have not yet conquered the full wavelength range accessible by single-mode laser diodes. Tunable, narrow-band emission in the blue or red spectral range is the realm of external-cavity laser systems. Moreover, an ECDL has advantages for applications that require an ultra-narrow line-width (1 MHz or below). The main advantage of a DFB laser is its extremely large tuning range. Mode-hop free scan ranges of several nm (1000 GHz and more) are routinely attained. Moreover, the robust mechanical design – the laser contains no critical optomechanical components – makes DFB laser systems particularly attractive for demanding applications in harsh industrial environments. **Please inquire about our DFB-based OEM laser systems.**

I already have a DL 100 laser. Can I use my control electronics for a DFB laser head?

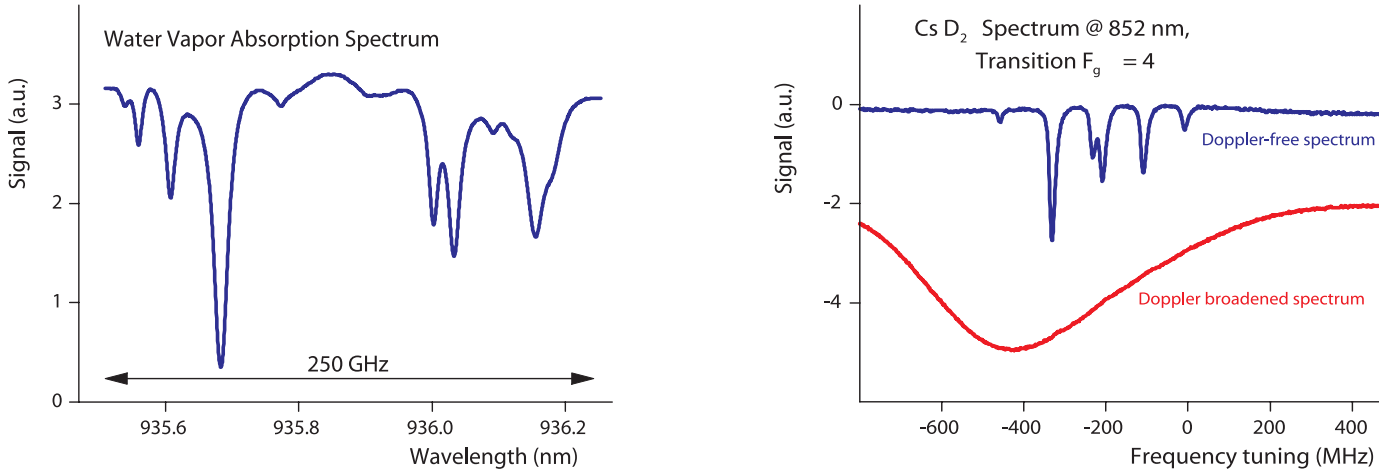
Yes. The DFB and DBR laser heads can be operated with our established control electronics of the DC 110 series. Thus, a wide range of options is available for DFB and DBR based laser systems, including frequency scans or frequency stabilization techniques using a PID or Lock-In regulator. The only issue to consider is that small thermal load of a ColdPack or TO-3 package will require an adjustment of the temperature regulator settings. Corresponding arrangements can be made with TOPTICA.



Emission spectrum of a DFB laser @ 859 nm, recorded with a grating spectrometer with 60 pm resolution. The background of amplified spontaneous emission (ASE) is suppressed by more than 50 dB.



Frequency tuning of a DFB laser @ 895 nm. The laser temperature was decreased from 48.1 °C to 1.4 °C, resulting in a mode-hop free scan of 1350 GHz.



Absorption spectra of water vapor (left) and Cesium (right). The water spectrum was recorded by thermally modulating the emission wavelength of a DFB laser. In case of the Cs spectrum, the laser diode was electrically modulated. All hyperfine and cross-over lines are resolved.

Options for DL DFB laser head	
APP-DFB	Anamorphic prism pair for beam shaping
Isolator	35 dB optical isolator, adjusted to laser wavelength
FiberDock™	Fiber coupler (patent pending)
DFB-Mod	PCB for high-frequency modulation
TOPTICA offers two DL DFB laser heads of different size. The standard laser head (length 114 mm) comprises the laser diode, collimating optics and (optionally) an anamorphic prism pair. For additional integration of an optical isolator and fiber coupler, a long (228 mm) laser head is available. The DFB-Mod PCB may be built into either laser head.	
Technical data	
Wavelengths	730 nm – 2.8 µm available
Output power	10 – 150 mW*
Beam profile	Single-mode (TEM_{00})
Linewidth	2 – 4 MHz
Mode-hop free tuning range	Typ. 1 – 3 nm
Thermal tuning	~ 25 GHz / K
Electric tuning	1 – 7 GHz / mA**
Frequency stability	< 20 MHz / 9 hrs.***
* Depending on wavelength ** At slow (quasistatic) modulation frequencies *** Without external frequency stabilization	
TOPTICA follows a policy of continuous product improvements. Specifications are subject to changes without notice.	
Please download our regulary updated stock list from our web site, www.toptica.com	

Distributors

China
Universal Technology Co. Ltd.
Attn: Mr. Alex Cai
Rm. A2102-2103
Vantone New World Plaza
#66 NanLiShi Lu
No.2 Fu Cheng Men Wai Street
Beijing 100037, P.R. of China
Phone: +86 10 6803 0880
Fax: +86 10 6805 7596
oe@universalhkco.com.cn
www.universalhkco.com.cn

France
Opton Laser International
Attn: Dr. Costel Subran
Parc Club d'Orsay Université
29, rue Jean Rostand
F-91893 Orsay Cedex, France
Phone: +33 1 6941 0405
Fax: +33 1 6941 3290
ventes@optonlaser.com
www.optonlaser.com

India
Simco Global Technology & Systems Ltd.
Attn: Dr. R. S. Daryan
Simco House (Head Office)
14 Bhawani Kunj
Behind Sector D-II, Pocket-II,
Vasant Kunj
110017 New Delhi, India
Phone: +91 11 2689 9867
Fax: +91 11 2612 4461
simcorsd@del2.vsnl.net.in
www.simco-group.com

Israel
OR-YAM Optronics Ltd.
Attn: Mr. Shmuel Kaufman
80 Harav Yitzhak Nissim street
Homat Shmuel
93125 Jerusalem, Israel
Phone: +972 2 676 8539
Fax: +972 2 676 8538
or-yam@013.net

Italy
Crisel Instruments, srl.
Attn: Dr. Giancarlo Penco
Clivo di Cinna, 196
I-00136 Roma, Italy
Phone: +39 06 3540 2933
Fax: +39 06 3540 2879
info@crisel-instruments.it
www.crisel-instruments.it

Japan
Opto Science, Inc.
Attn: Mr. Toshio Sato
Naitocho Building
I-Banch-Shinjuku-Ku
Tokyo 160-0014, Japan
Phone: +81 3 3356 1064
Fax: +81 3 3356 3466
info@optoscience.com
www.optoscience.com

Japan
FIT, Inc.
Attn: Mr. Jun Kohara
1-3 Nihonbashi-Odenmacho
Chuo-Ku
Tokyo 103-0011, Japan
Phone: +81 3 3666 7100
Fax: +81 3 3667 7094
sales@fitinc.co.jp
www.fitinc.co.jp

Korea
JINSUNG LASER
Attn: Mr. Ha-Won Lee
#535-5, Bongmyung-Dong
Yusung-Gu
Hanjin Officetel Rm# 1016
Daejeon, 305-301, South Korea
Phone: +82 42 823 5300
Fax: +82 42 823 7447
sales@jinsunglaser.com
www.jinsunglaser.com

Taiwan
SLEO Photonics Co. Ltd.
Attn: Mr. Jimmy Chao
6F, No. 2, Lane 74
An-der Street
Hsin Tien City, Taipei County
Taiwan 231, R.O.C.
Phone: +886 2 2211 5408
Fax: +886 2 2211 5401
sleo8607@ttn.net

United Kingdom & Ireland
Mr. Howard Potter
19 Silistria Close
Woking, Surrey, UK, GU21 2TL
Great Britain
Phone: +44 1483 799 030
Fax: +44 1483 799 076
howard.potter@toptica.com
www.toptica.com

USA & Canada
TOPTICA Photonics, Inc. (TPI)
Attn: Mr. Alain Bourdon
Suite 101
94, North Elm Street
Westfield, MA - 01085, U.S.A.
Phone: +1 413 562 5406
Fax: +1 413 562 5408
sales@toptica-usa.com
www.toptica-usa.com

Distributors only for Optical Disc Testing:

Taiwan
Omega Scientific Taiwan Ltd.
Attn: Mr. James Ting
3F-3, No.415, Sec. 4
Sinyi Road
110 Taipei City
Taiwan R.O.C.
Phone: +886 2 8780 5228
Fax: +886 2 8780 5225
omega001@ms3.hinet.net

Japan
ALTECH ADS Co. Ltd.
Digital Storage Media Div.
Attn: Mr. Yoshinori Matsuura
3F YM Shinjuku Building
4-1 Yotsuya 4-Chome
Shinjuku-Ku
160-0004 Tokyo, Japan
Phone: +81 3 5363 3005
Fax: +81 3 5363 0945
info@altech.co.jp
www.altech.co.jp

Every other country not listed above:

TOPTICA Photonics AG
Lochhamer Schlag 19
D-82166 Graefelfing/Munich
Germany
Phone: +49 89 85837-0
Fax: +49 89 85837-200
sales@toptica.com
www.toptica.com

TOPTICA PHOTONICS

TOPTICA Photonics AG
Lochhamer Schlag 19
D-82166 Graefelfing/Munich
Germany
Phone: +49 89 85837-0
Fax: +49 89 85837-200
info@toptica.com
www.toptica.com

A Passion for Precision.