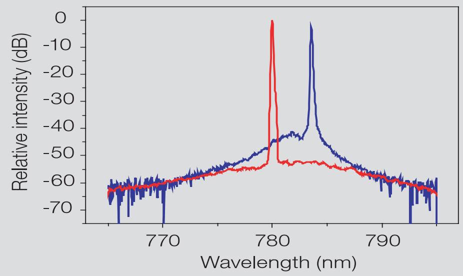
# Fabry-Perot and Anti-Reflection Coated Laser Diodes

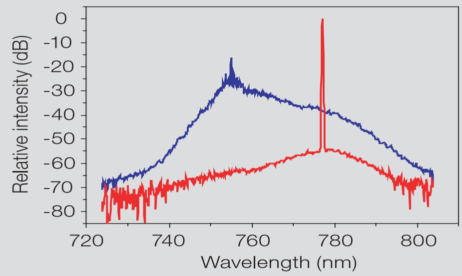
**FP diodes — high power at a low cost**
In TOPTICA's DL 100, an ECDL in Littrow design, both Fabry-Perot (FP) diodes and anti reflection coated (AR) diodes can be used. FP diodes are mass-produced, available at numerous wavelengths, and are optimized for maximum output powers. In addition, they are relatively cheap. With FP diodes, the internal resonator of the diode functions like an etalon, attenuating certain external modes, and therefore participating in the selection of the external mode.

The effect of the internal resonator is less pronounced when an AR coating is added on the output facet. AR diodes do not lase without external feedback. The AR coating improves coarse and mode-hop free tuning of an ECDL and allows for more stable single-mode operation. TOPTICA's DL pro lasers therefore feature AR diodes.

**AR diodes for best performance**
The internal resonator of both FP and AR diodes can be synchronized with the grating movement by changing the diode current simultaneously. This "feed forward" mechanism moves the internal mode structure of the laser diode along with the external modes, permitting larger mode-hop free tuning.

Important specifications for FP- or AR-based ECDLs are the output power available from the stabilized diode, the attainable wavelength range, and the mode-hop free tuning range. TOPTICA also sells laser diodes individually, and the diodes available from stock, together with their specifications, are listed in our regularly updated stock list at **www.laser-diodes.com**.


**Laser diode with (red) and without (blue) external grating feedback. The left graph shows an FP diode, the right graph an AR diode.**

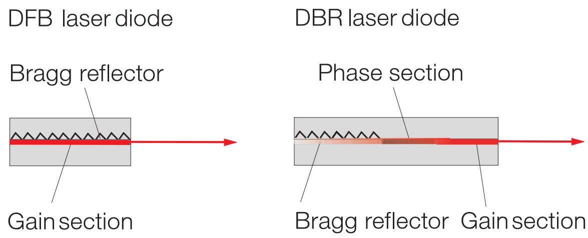
# DFB & DBR Diode Lasers

**Laser diodes with internal grating**
Distributed Feedback (DFB) and Distributed Bragg Reflector (DBR) laser diodes feature a grating structure incorporated in the semiconductor chip. The grating restricts the laser emission to a single longitudinal mode and thus determines the lasing wavelength. In a DFB laser, the grating is integrated into the active region ("gain section") of the diode. In a DBR laser, the grating ("Bragg section") is separated from the gain region. An additional "phase section" serves to maintain mode-hop free resonance conditions during a wavelength change.

Frequency tuning is accomplished by thermally or electrically varying the grating pitch. Thermal tuning offers extremely large mode-hop free scans of hundreds of GHz. Electric modulation, on the other hand, can be employed for fast frequency modulation over a smaller range (several tens of GHz @ kHz to MHz modulation frequencies).

**ECDL or DFB?**
Whether to choose an external cavity diode laser or a DFB/DBR laser depends on the individual application. Contact the TOPTICA experts to find the best solution for your needs. DFB diodes do not yet offer the wavelength range accessible by Littrow ECDLs. Tunable, narrow-band emission in the blue or red spectral range is the realm of external-cavity systems. An ECDL is also the preferred choice for applications that require a broad coarse tuning range, or an ultra-narrow linewidth (1 MHz or below).

The main advantage of a DFB laser is its extremely large continuous tuning range. Mode-hop free scans of several nanometers are routinely attained. Typical DFB laser applications are gas sensing, phase shifting interferometry, or the generation of tunable cw Terahertz radiation. The mechanical design of a DFB laser comprises no alignment-sensitive optical components, making these lasers particularly attractive for applications in rough industrial environments.




**Schematics of DFB and DBR laser diodes.**