

tunable mid-IR external-cavity

CW-MHF LASERS



Room Temperature[†] —	No Cryogenic Cooling (Chiller required for CW operation)
Operation:	CW-MHF
Center Wavelengths: (units in μm)	4.4 [‡] , 4.5, 4.6, 4.9, 5.3, 6.1, 7.8 [‡] , 9.5, 10.5
OPTICAL PARAMETERS	
Tuning Range:	Guaranteed $\geq 30\text{cm}^{-1}$ min. 60cm^{-1} Typical*
Minimum Avg. Power:	1 mW
Maximum Avg. Power:	>70 mW Typical
Power Variations:	<1% over 5 mins. <4% avg. over 1 day
Linewidth:	<45 MHz CW-MHF FWHM
Beam Divergence:	<5 mrad
Beam Waist:	30–50 cm Typical (from exit port [§])
Polarization:	Linear 100:1, Horiz. Direction
Pointing Stability:	<1 mrad up to 100cm^{-1} tuning
Spot Size Minimum:	<2.5 mm 1/e Electric Field Dia.
Beam Quality:	TEM00
ELECTRICAL PARAMETERS	
CW-MHF:	True Continuous Wave Mode Hop Free operation
CW:	Extended CW tuning range also included
Triggering:	Internal and External Pulse, External Trigger
Scanning:	Uni- and Bi-directional survey scan, Start, Stop, Step, Pause scanning programmable
External Interface:	RS-232, GPIB supported, USB supported in 2010
Wavelength Modulation**:	PZT Modulation up to 1cm^{-1} at 100 Hz. QCL Current Modulation up to 0.05cm^{-1} at 0.01 to 2 MHz
MECHANICAL PARAMETERS	
Full Range Tuning Speed:	<3 sec for 100cm^{-1} scan
Display Accuracy:	$\pm 0.5\text{cm}^{-1}$ uni-directional
Display Repeatability:	<0.02 cm^{-1} uni-directional
QCL Operational Temp:	15°C Typical
Relative Temp:	$\pm 5^\circ\text{C}$ Programmable
Package Size:	6.5" L \times 4.45" W \times 3.81" H

[†] Ambient Temp. 20°C , 10% to 90% Humidity

[‡] Wavelengths in development

[§] See diagram on back

** Additional Electronics Required



Daylight Solutions is pleased to provide the world's first broadly tunable, room-temperature, mid-IR lasers based on quantum-cascade-laser technology. Center wavelengths span the mid-IR spectrum from $4\ \mu\text{m}$ to $12\ \mu\text{m}$ and provide continuous tuning of up to $100\ \text{cm}^{-1}$ ($\pm 5\%$ for a $10\text{-}\mu\text{m}$ center wavelength). Offering excellent linewidth characteristics, these CW lasers tune mode-hop-free across that range. The coarse tuning resolution is further enhanced by PZT actuation to allow fine-resolution wavelength tuning and modulation. All lasers offer superb wavelength accuracy and stability throughout their tuning range.

Designed by the world's leading experts in tunable lasers, these sources are small, robust, and utilize specially designed miniature lenses to optimize system performance. Each system integrates TEC technology for behind-the-scenes temperature control, so only a water chiller is needed—no cryogenic cooling!

To round out the turn-key system, each tunable laser is shipped with an intuitive, easy to use multifunction controller. The controller is accessible to a PC through RS-232 and GPIB interfaces, future firmware upgrades will enable USB interface. This allows external control of the tunable laser for a variety of applications, including scientific research and its development. The controller is also manually accessible through its easy to use front panel.

Daylight Solutions' overall system leverages the last 15 years in tunable-laser development and manufacturing, and incorporates the company's latest patent-pending tuning and packaging technology for the mid-IR.

The availability of robust, easy-to-use tunable lasers in the $4\text{--}12\text{-}\mu\text{m}$ region of the spectrum is now a reality. These lasers enable application research in the field of molecular detection and imaging. Common applications include industrial process control, the detection of biomarkers in the breath, cellular imaging, and the detection of chemical and biological agents.

Daylight Solutions' mid-IR laser platform technology opens up the mid-IR to all researchers—today.

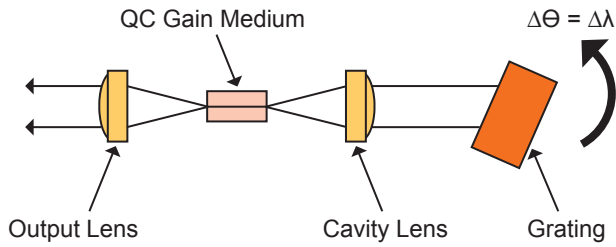
Call today for pricing and availability of specific wavelengths

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Email: info@daylightsolutions.com
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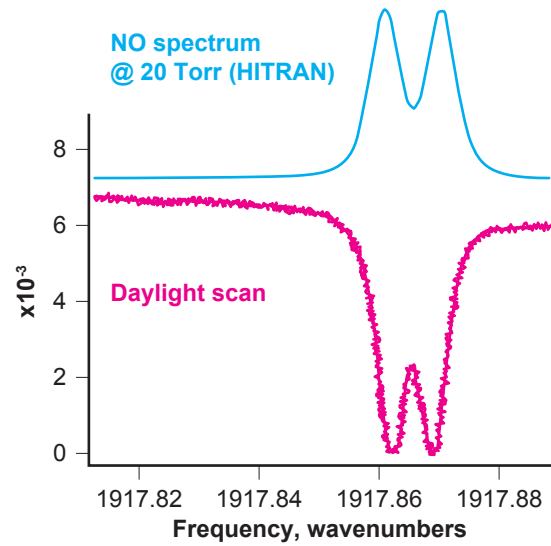


Reference Performance and Function: Tunable CW-MHF Laser

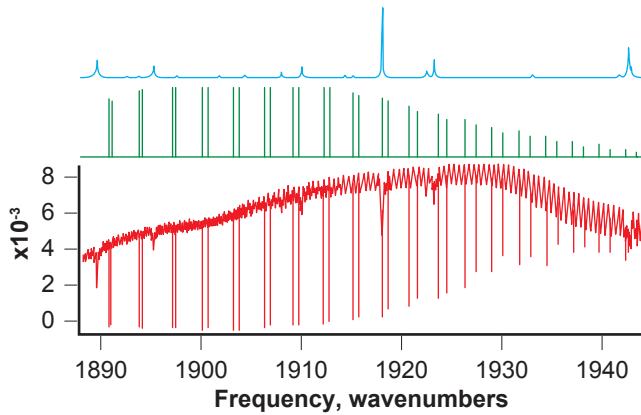


Cavity Design for ECqCL™

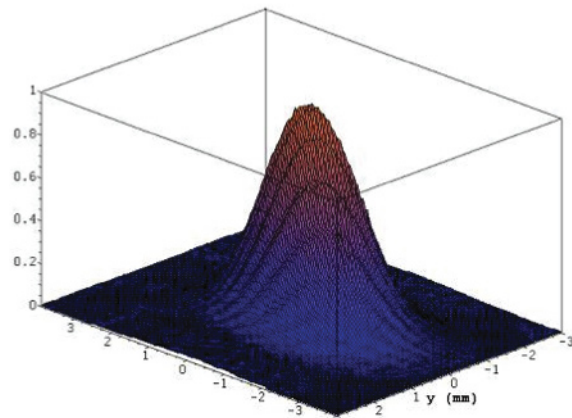
- Stepper motor rotates grating for survey scans
- Select single wavelength or scan continuously
- Wavelength modulation up to 1 cm^{-1} (30 GHz) @ $\leq 100 \text{ Hz}$
- Current modulation $\leq .05 \text{ cm}^{-1}$ @ 10 kHz to 1 MHz



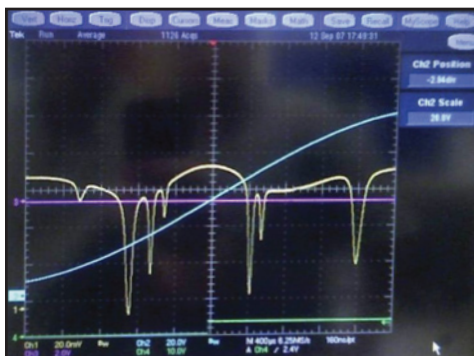
- Water absorption spectrum (HITRAN)
- Nitric Oxide absorption spectrum @ 20 Torr (HITRAN)
- DLS EC_QCL scan (55 cm^{-1})



Beam Profile — M^2 Typical 1.3

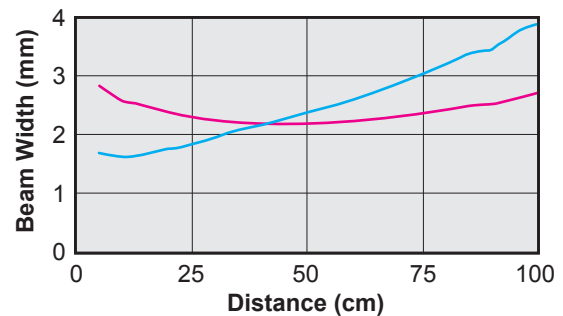


λ Modulation of NH_3



- 1 cm^{-1} PZT scan
- 100 Hz Repetition Rate

Beam Propagation — Typical



- X diameter (mm)
- Y diameter (mm)