

CW-MHF™

TUNE > 30 CM⁻¹ WITHOUT MODE HOPS

The CW–MHF™ Mid-IR Laser is the ultimate tool for high-resolution, mid-IR spectroscopy. If you need high spectral resolution, phasecontinuous tuning to avoid jumping over spectral lines, or both, the DRS Daylight CW-Mode-Hop-Free (MHF) laser will meet your needs. Narrow-linewidth operation and MHF tuning is a high bar to reach in any laser system. Unique in the industry, the CW-MHF system provides open-loop linewidths of ≤ 5 MHz (over 100 ms) and MHF tuning to > 30 cm⁻¹, and often to > 100 cm⁻¹. Drawing on years of precision engineering and manufacturing experience, the CW-MHF laser achieves this performance with a highly stable laser cavity that, guided by finite element analysis, was designed to reduce susceptibility to acoustic perturbation. The CW-MHF laser also includes two ways to modulate wavelength: via a PZT or current modulation. This exclusive combination of wide MHF tuning, narrow-linewidth operation, and modulation capability enables highresolution spectroscopy and/or locking to a wavelength reference.

HIGHLIGHTS

- Wavelength availability: < 4 to > 11 μm
- MHF tuning range: ≥ 30 100 cm⁻¹ (typical, depending on model)
- CW power > 70 mW typical
- Linewidth (FWHM): < 5 MHz (100 ms) and < 10 MHz (1s)
- Wavelength accuracy of ± 0.5 cm⁻¹ (± 15 GHz), unidirectional
- Ultra-quiet, with RIN as low as -140 dBc/Hz, enables higher-SNR spectroscopy
- Superb TEM₀₀ beam quality, low beam pointing
- SideKick™ controller, GUI, and SDK included with all systems
- Proprietary HFQD™ circuitry to protect your chips

TUNE > 30 CM⁻¹ WITHOUT **MODE HOPS**



- Environmental monitoring
- Fence line monitoring
- Combustion diagnostics
- •TIC, VOC, GHG, and explosives detection
- Process control
- Nanoscale imaging
- · Biomarker detection in breath
- Chemical and biological agent sensing
- •IR sensor development

SPECIFICATIONS

PERFORMANCE	
Operation	Continuous wave, mode-hop-free
	(CW-MHF) and extended CW ² tuning ³
Center Wavelength	Availability < 4 to > 11 μm

OPTICAL PARAMETERS

of tuning curve, typical
mins)
0 ms)
s)
le, 1/e² intensity)⁵
100:1
cm ⁻¹ tuning
tensity diameter)
cal)

OPTICAL PARAMETERS

Programmable uni- and bi-directional survey Scanning scan. Start, stop, step, pause, auto/manual scanning External Interface USB 2.0, Ethernet 10/100

Current Modulation ≥0.02 cm⁻¹, 200 Hz to 500 kHz;

1 MHz bandwidth

Piezoelectric Modulation ≥0.05% of nominal center wavelength {cm-1} at 100 Hz, 350 Hz bandwidth6

MECHANICAL PARAMETERS

<3 s for 30 cm⁻¹ scan Tuning Speed Wavelength Accuracy +0.5 cm⁻¹ uni-directional **Cooling Requirements** Water cooling **Ambient Temperature Range** 15 to 30°C Head Size (L x W x H) 6.75 x 4.40 x 5.73 inches

1. Unless stated otherwise, all specifications: are defined at the peak of the tuning curve only; apply to operation of the laser under typical laboratory conditions; after a 5-min warm up; are subject to change

- without notice.

 2. This laser is an inherently CW laser, and cannot provide pulsed output.

 3. Mode hops may occur when tuning across "extended" CW range.

 4. Depends on center wavelength selected please inquire.

- 5. Measured at 4 μ m; scales with wavelength please inquire. 6. Example: at 6 μ m (1667 cm⁻¹), specification would be 0.05% x 1667 = 0.8 cm⁻¹. Requires PZT driver approved by Daylight Solutions please inquire.

MODE HOP-FREE DESIGN

An external cavity laser will only tune without mode hopping when the two tuning elements—the grating and the cavity length itself—operate absolutely synchronously. The change in cavity length must precisely match the grating filter function as the laser tunes. By careful placement of the grating pivot point this condition can be met, but it requires highly precise engineering and exacting assembly. Only Daylight Solutions has mastered both the engineering and building of such fine mechanics in the mid-IR. The new CW-MHF has been completely redesigned for higher stability and increased versatility. Guided by an exhaustive Finite Element Analysis (FEA) of the vibrational modes of the tuning elements, the cavity is now highly resistant to acoustic perturbations and vibrations. The new design allows for narrower open-loop linewidth (<5 MHz in a 100-ms integration time) and reduced jitter both at a single wavelength and while scanning.

EXPANDED MODULATION FUNCTIONALITY

Standard on each CW-MHF, a piezoelectric tuning element (PZT) allows the wavelength of the laser to be modulated or finely adjusted. The enhanced mechanical stability of the CW-MHF allows for an increase in the PZT bandwidth to 350 Hz.

The CW-MHF also features a redesigned current modulation circuit optimized for high-resolution spectroscopy. The circuit has a widened bandwidth (200 Hz to over 1 MHz) with low phase delay. The overlap of the PZT and current modulation bandwidths allows the implementation of a traditional two-stage locking circuit to minimize the center linewidth drift and jitter.

CW-MHF lasers ship with Daylight solutions' next-generation SideKick™ laser controller. Replacing our TLC series control electronics, the new SideKick is a compact, low-noise design ideally suited to driving MHF laser heads. SideKick provides flexible, precise USB/Ethernet control of MHF laser: power; wavelength; temperature; and scan speed.

Higher resolution, smoother tuning, and the ability to lock the source tightly to a reference are hallmarks of the new CW-MHF series. These lasers enable research in high-resolution spectroscopy, greenhouse gas sensor development, the detection of biomarkers in breath, and the detec-tion of chemical and biological agents. Please contact us to learn more.

INVISIBLE LASER RADIATION AVOID EXPOSURE TO THE BEAM **CLASS 3B LASER PRODUCT**



COMPLIES WITH 21 CFR 1040 10 AND 1040 11 EXCEPT FOR DEVIATIONS PURSUANT TO LASER NOTICE NO. 50, DATED JUNE 24, 2007. COMPLIES WITH IEC 60825-01

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