



# HEDGEHOG™

## COMPACT, RAPID-SCAN, TUNABLE MID-IR LASER

Molecular spectroscopy applications benefit from rapid, high Signal-to-Noise Ratio data acquisition. This demands fast-scan mid-IR lasers delivering high-quality light. Until now, high tuning speed has come with compromises. The new Hedgehog from DRS Daylight Solutions changes this. For the first time, fast tuning and high-fidelity output is available from a compact, robust mid-IR laser. Hedgehog is built on Daylight's field-proven Quantum Cascade Laser (QCL) technology. Available center wavelengths span the mid-IR spectrum from  $< 4 \mu\text{m}$  to  $> 13 \mu\text{m}$ , and Hedgehog can provide pulsed or CW output<sup>2</sup>. Users can select from three model types (HHG, HHG-UT, or HHG-LT) depending on their application power and tuning range requirements. All models include a GUI option for ultra-quiet CW operation, high wavelength repeatability, and multiple tuning modes.

Hedgehog's small size and rugged design make it ideally suited to either laboratory use or OEM integration. Each Hedgehog is shipped with a compact, easy-to-use SideKick™ multi-function QCL controller. All control functionality is via USB/Ethernet connectivity and an included GUI and SDK command set. Daylight's proprietary HFQD™ (High-Fidelity QCL Drive) circuitry also protects your QCL chip.

With Hedgehog, high-speed, high-quality mid-IR spectroscopic data acquisition is now a reality. Hedgehog brings new capabilities to a wide range of molecular sensing applications including process control, detection of pollutants, chemical and biological agents, time-resolved spectroscopy, and cellular imaging. Please contact us today to learn how Hedgehog, and our highly experienced team, can help your application

### HIGHLIGHTS

- Tuning slew rates to  $> 30,000 \text{ cm}^{-1}/\text{s}$
- Ultra-low noise mode (CW RIN as low as  $-140 \text{ dBc}/\text{Hz}$ )
- High wavelength accuracy, precision and repeatability
- Available center wavelengths:  $< 4 \mu\text{m}$  to  $> 13 \mu\text{m}$
- Compact head ideal for OEM integration or lab use
- New Hedgehog-LT: greater utility than DFBs

# FOR SPECTROSCOPY AT SPEED, WITHOUT COMPROMISE

## HEDGEHOG SPECIFICATIONS

### PERFORMANCE SPECIFICATIONS<sup>1</sup>

MODEL	HHG	HHG-UT	HHG-LT
Tuning Range <sup>2,3</sup>	Up to 200 cm <sup>-1</sup>	Up to 400 cm <sup>-1</sup>	30 cm <sup>-1</sup>
Average Power <sup>2,3</sup>	Up to 500 mW	Up to 500 mW	Up to 150 mW
Peak Power <sup>3</sup>	Up to 1 W	Up to 1 W	Up to 200 mW

### PERFORMANCE

Center Wavelength Availability	< 4 μm to > 13 μm
Modes of Operation	Pulsed or CW <sup>2</sup>
Tuning Modes	Set λ, Step & Measure, Continuous Scans
Max. Tuning Speed (Step)	250 ms step-and-settle time to arbitrary λ
Max. Tuning Speed (Scan)	Slew rates to >5000 cm <sup>-1</sup> /s
Wavelength Accuracy	≤ 1 cm <sup>-1</sup>
Wavelength Repeatability	To ≤ 0.1 cm <sup>-1</sup> [5]
Average Power Stability	< 2% (1 hr)
Spatial Mode	TEM <sub>00</sub> (nominal)
Beam Divergence	< 4 mrad (full angle, 1/e <sup>2</sup> intensity width) <sup>4</sup>
Beam Pointing Stability	< 1 mrad (beam centroid change) <sup>3</sup>
Spot Size	< 2.5 mm (1/e <sup>2</sup> intensity radius) <sup>4</sup>
Polarization	Linear, vertical, >100:1

### CW PERFORMANCE<sup>1,2</sup>

Linewidth	≤ 100 MHz (FWHM, over 1s) <sup>5</sup>
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### PULSED PERFORMANCE

Energy Stability	< 3%, standard deviation
Linewidth	≤ 1 cm <sup>-1</sup> (FWHM)
Pulse Width <sup>6</sup>	40 to 500 ns, 20-ns increments
Repetition Rate <sup>6</sup>	0.1 kHz to 1 MHz, 0.1-kHz increments
Maximum Duty Cycle <sup>6</sup>	10% (custom up to 30%)

### OTHER SPECIFICATIONS

Triggering (Pulsed Operation)	Internal/External, External Pulse Input
Triggering (Scans)	External Wavelength Step, Scan Start
External Control Interfaces <sup>7</sup>	USB 2.0, Ethernet 10/100
Temperature Range (°C)	15 to 35 °C (operating)
Humidity	0—80% RH, non-condensing
Cooling	Passive Air (pulsed, up to 5% duty cycle) Water (CW, or >5% duty cycle pulsed)
Power Requirements	≤ 2A, 90 to 264 VAC, 47 to 63 Hz, single phase (or ≤ 3A, 24 VDC, OEM models)
Dimensions (L x W x H)	Head: 4.2 x 2.6 x 2.1 in. (11 x 6.5 x 5.2 cm) <sup>8</sup> Controller: 7.3 x 5.2 x 1.4 in. (19 x 13 x 4 cm) <sup>9</sup>

<sup>1</sup> All specifications are subject to change without notice and defined: at the tuning curve ceiling; after a 3-min warm-up; at the factory-recommended operating current.

<sup>2</sup> Requires CW-capable gain chip—please inquire.

<sup>3</sup> Depends on gain chip. Specifications to be agreed at time of order—please inquire.

<sup>4</sup> Measured at 4 μm; scales with wavelength—please inquire.

<sup>5</sup> With laser tuned for single longitudinal mode operation.

<sup>6</sup> Some chips can support pulses up to 10 μs, rep. rates to 3 MHz, and duty cycles up to 30%—please inquire.

<sup>7</sup> GUI compatible with Windows<sup>®</sup> 7, 8.1, and 10. Please inquire for other OS.

<sup>8</sup> Head includes cooling plate for lab use. Head with plate: 5.7 x 2.6 x 2.8 in. (14.5 x 6.5 x 7 cm).

<sup>9</sup> Daylight Solutions' SideKick™ model SK-1000. Dimensions listed exclude connectors.

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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

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



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