

# MIRcat-QT™

## RAPID-SCAN, ULTRA-BROADLY TUNABLE MID-IR CW/PULSED LASER SYSTEM

Demanding Mid-IR spectroscopy applications such as nanoscale and microscale chemical imaging benefit greatly from rapid, high-SNR data acquisition. However, until now, Mid-IR laser sources required compromises in beam quality and wavelength fidelity to achieve high scan speeds. With the introduction of the new MIRcat-QT, you can now have superior beam quality, wavelength fidelity, and fast continuous scanning ( $>1,000 \text{ cm}^{-1}$  at 5 Hz) all in one ultra-broadly tunable, CW/pulsed Mid-IR laser.

Incorporating the next generation of Daylight's field-proven Quantum Cascade Laser (QCL) technology, MIRcat-QT delivers uncompromised performance in application-critical areas. This includes: tuning speeds to  $>30,000 \text{ cm}^{-1}/\text{s}$ , tuning ranges to  $>1,000 \text{ cm}^{-1}$ , CW RIN as low as  $-145 \text{ dBc}/\text{Hz}$ , peak power output up to  $1 \text{ W}^{[2]}$ , average power output up to  $0.5 \text{ W}$ , and wavelength repeatability as low as  $<0.1 \text{ cm}^{-1[2]}$ . In addition, MIRcat-QT provides a single  $\text{TEM}_{00}$  output beam, which enables high-efficiency fiber coupling.

MIRcat-QT's flexible, modular design allows users to factory-configure their system for up to four pulsed or CW/pulsed modules, upgrade it later, or add a visible aiming beam<sup>6</sup>. With Daylight's proprietary HFQD™ (High-Fidelity QCL Drive) circuitry, your QCL chips are protected. With a GUI and SDK command set included as standard, MIRcat-QT users can control wavelength set-points, scans, power, triggering, pulse width, duty cycle, and repetition rate in pulsed operation. MIRcat-QT brings new capabilities and agility to a wide range of molecular sensing applications including: process and quality control, remote sensing, imaging, and spectroscopy. Please contact us today to learn how MIRcat-QT, and our highly experienced team, can help you.

# FOR SPECTROSCOPY AT SPEED, WITHOUT COMPROMISE.

## HIGHLIGHTS

- Tuning sweeps @ 5 Hz (>1,000  $\text{cm}^{-1}$  in < 200 ms)
- Pulsed AND CW operation modes
- Lowest relative intensity noise (RIN)
- Pulse repetition rates up to 5 MHz
- Pulse widths down to 50 ns

## MIRcat-QT SPECIFICATIONS

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

Wavelength Availability	Center wavelengths from <4 $\mu\text{m}$ to >13 $\mu\text{m}$
Modes of Operation	Pulsed or CW <sup>2</sup>
Available Configurations	Select 1, 2, 3, or 4 standard or custom laser modules
Standard Configurations	MIRcat-2400-PX-A (Pulsed, 6.5—12.4 $\mu\text{m}$ ) <sup>3</sup> MIRcat-2400-PX-B (Pulsed, 5.5—11 $\mu\text{m}$ ) <sup>3</sup> MIRcat-2400-PCX-B (CW/Pulsed, 6—11 $\mu\text{m}$ ) <sup>3</sup>
Tuning Modes	Set $\lambda$ , Step & Measure, Continuous Scans
Max. Tuning Speed (Step)	250 ms step-and-settle time to arbitrary $\lambda$
Max. Tuning Speed (Scan)	Slew rates to >30,000 $\text{cm}^{-1}/\text{s}$
Wavelength Accuracy	$\leq 1 \text{ cm}^{-1}$
Average Power Stability	< 3% (1 hr)
Spatial Mode	TEM <sub>00</sub> (nominal)
Beam Divergence	< 4 mrad (full angle, 1/e <sup>2</sup> intensity width) <sup>2,5</sup>
Beam Pointing Stability	< 2 mrad (beam centroid change) <sup>2</sup>
Spot Size	< 2.5 mm (1/e <sup>2</sup> intensity radius) <sup>2</sup>
Polarization	Linear, vertical, >100:1

### PULSED OPERATION

Peak Power	Up to 1W (depends on module)
Energy Stability	< 3%, standard deviation
Linewidth	$\leq 1 \text{ cm}^{-1}$ (FWHM)
Pulse Width <sup>7</sup>	40 to 500 ns, 20-ns increments
Repetition Rate <sup>7</sup>	0.1 kHz to 1 MHz, 0.1 kHz increments
Maximum Duty Cycle <sup>7</sup>	10% (custom up to 30%)

### CW OPERATION

Average Power	Up to 500mW (depends on module)
Linewidth	$\leq 100 \text{ MHz}$ (FWHM, over 1s) <sup>8</sup>

### OTHER PARAMENTERS

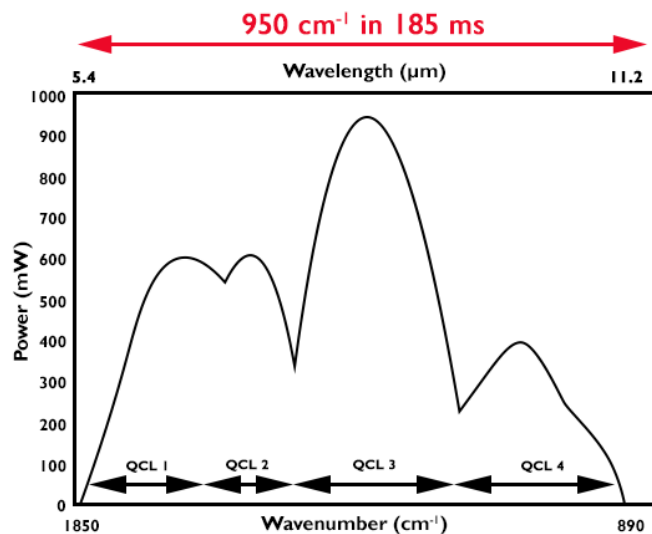
Triggering (Pulsed)	Internal/external, external pulse input
Triggering (Scans)	External wavelength step, scan start
External Control Interface <sup>9</sup>	USB 2.0
Temperature Range (°C)	15 to 30 °C (operating)
Humidity	0—80% RH, non-condensing
Cooling	Passive Air (pulsed, up to 5% duty cycle) Water (CW, or >5% duty cycle pulsed)
Power Requirements	$\leq 2 \text{ A}$ , 90 to 264VAC, 47 to 63Hz, single phase
Dimensions (L x W x H)	17.9 x 9.8 x 6.3 in. (45.5 x 24.9 x 16 cm)

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DRS Daylight Solutions  
15378 Avenue of Science, Suite 200  
San Diego, CA 92128  
Tel. +1 858 432 7500

## HIGH-SPEED TUNING



Tuning speeds to >30,000  $\text{cm}^{-1}/\text{s}$  across four, QCL chips

<sup>1</sup> All specifications are: subject to change without notice; defined at the tuning peak of each gain module; after a 10-min warm-up; at the factory-recommended operating current.

<sup>2</sup> Depends on chip(s) selected. CW requires CW-capable chip. Specifications to be agreed at time of order.

<sup>3</sup> Typical value. To request a specified value, please inquire.

<sup>4</sup> Fastest inter-module switching speeds may require water cooling—please inquire.

<sup>5</sup> Measured at 4  $\mu\text{m}$ ; specification scales with wavelength—please inquire.

<sup>6</sup> Requires return to factory.

<sup>7</sup> Some chips can support pulses up to 10  $\mu\text{s}$ , PRF up to 3 MHz, and duty cycles up to 30%—please inquire.

<sup>8</sup> With laser tuned for single longitudinal mode operation.

<sup>9</sup> GUI compatible with Windows<sup>®</sup> 7, 8.1, and 10. Please inquire for other OS. Ethernet control available—please inquire.

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



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