

BLOCK

TUNABLE LASER
TECHNOLOGY

AT THE HEART
OF INNOVATION



海纳光学

电话: 0755-84870203

网址: www.highlightoptics.com

**MINIATURIZED QUANTUM-CASCADE LASERS
FOR INSTRUMENTATION & RESEARCH**

As a leader in high-performance mid-infrared (IR) spectrometers, we have leveraged our expertise to develop next-gen Quantum Cascade Lasers (QCL) used around the world in life science, safety and environmental applications.

Quantum Cascade Lasers (QCLs) are tunable lasers that can make controlled incremental shifts in wavelength output. This enables the incredible power of lasers to be applied to broad-band spectroscopy applications where previously there were no solutions. Block's external cavity QCLs are effective for producing widely tunable systems and providing broadband tuning at microsecond speeds while still compact and multi-modal.

Our QCLs operate in “pulsed” mode (as opposed to “continuous wave”) for operating in a wide range of environments without requiring expensive and bulky external cooling. In addition to the first and only ruggedized QCL systems designed for manufacture and scalability, we also offer the expertise and collaboration to determine the best laser for your application.

LaserTune:

for research & development

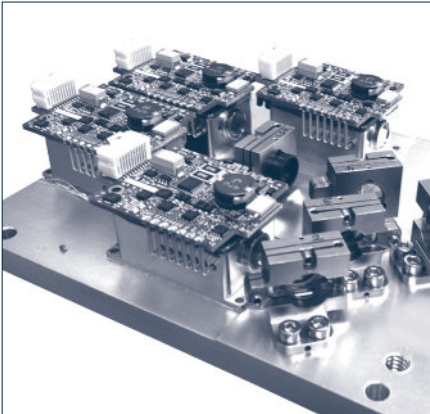
- Benchtop, turnkey laboratory tool
- Use in optical experimentation or spectrometer development
- Fully-integrated solution
- Optional IR detector



mQCL:

for OEM product integration

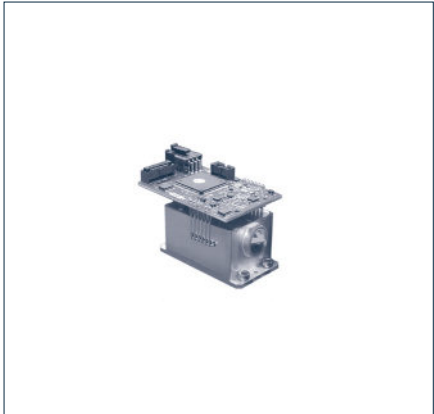
- Multi QCL optical module for system prototyping
- Broad wavelength applications
- Gap free tuning
- Noise sensitive measurements
- Trigger I/O for seamless integration



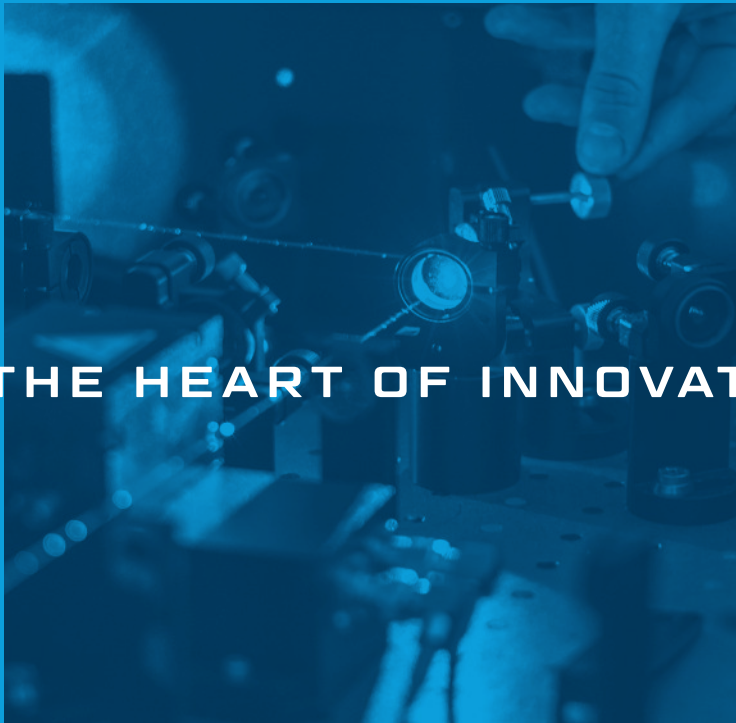
sQCL:

for portable OEM product integration

- Best in class ultra-miniature tuner and electronics
- Wide wavelength range in a single tuner
- OEM integration support
- Lowest cost in volume
- Command/Control SDK provided



AT THE HEART OF INNOVATION



LaserTune

Applications:
Research & Development
Product Specifications:
Dimensions: 6.25" x 5" x 4.9" Weight: 4.5 lbs (2.04 kg)
Tuner Selection (µm):
5.4–6, 6.1–7.3, 7.4–10.4, 9.9–12.8
Other ranges available, please contact us regarding your specific needs/requirements.



The LaserTune benchtop instrument comes ready out-of-the-box, with one to four mid-IR lasers that fulfill your gap-free wavelength requirements.

- Product Highlights**
- Complete turn-key system ready to work out of the box
 - Configurable lasers to achieve desired gap-free wavelength range from 5.4-12.8 µm
 - Wavenumber sweeps, step functions, static wavenumber control
 - On-board software allows you to easily control the laser
 - SDK provided to enable rapid integration

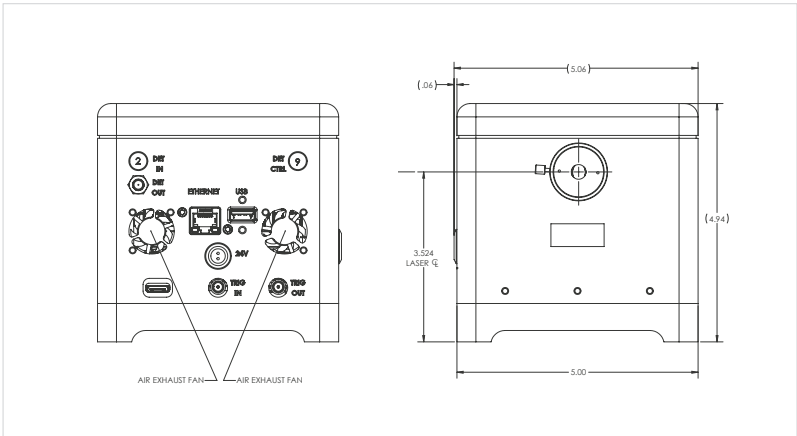


The MCT Detector for LaserTune

The MCT (Mercury-Cadmium-Telluride) Infrared Detector Module is a thermoelectrically cooled detector element and preamplifier package optimized for acquiring spectral data when coupled with LaserTune. The module operates at room temperature without requiring liquid nitrogen or other cooling techniques. Users can configure a spectrometer in a variety of ways for applications such as IR microscopy. Spectral data is acquired and viewed in the LaserTune application software without the need for additional data collection or processing electronics.

The detector module is also optimized for the emission profile and fast scan rate of the LaserTune QCL system. Since the module represents the same hardware employed in Block's spectrometer system, users get maximum versatility without sacrificing system performance.

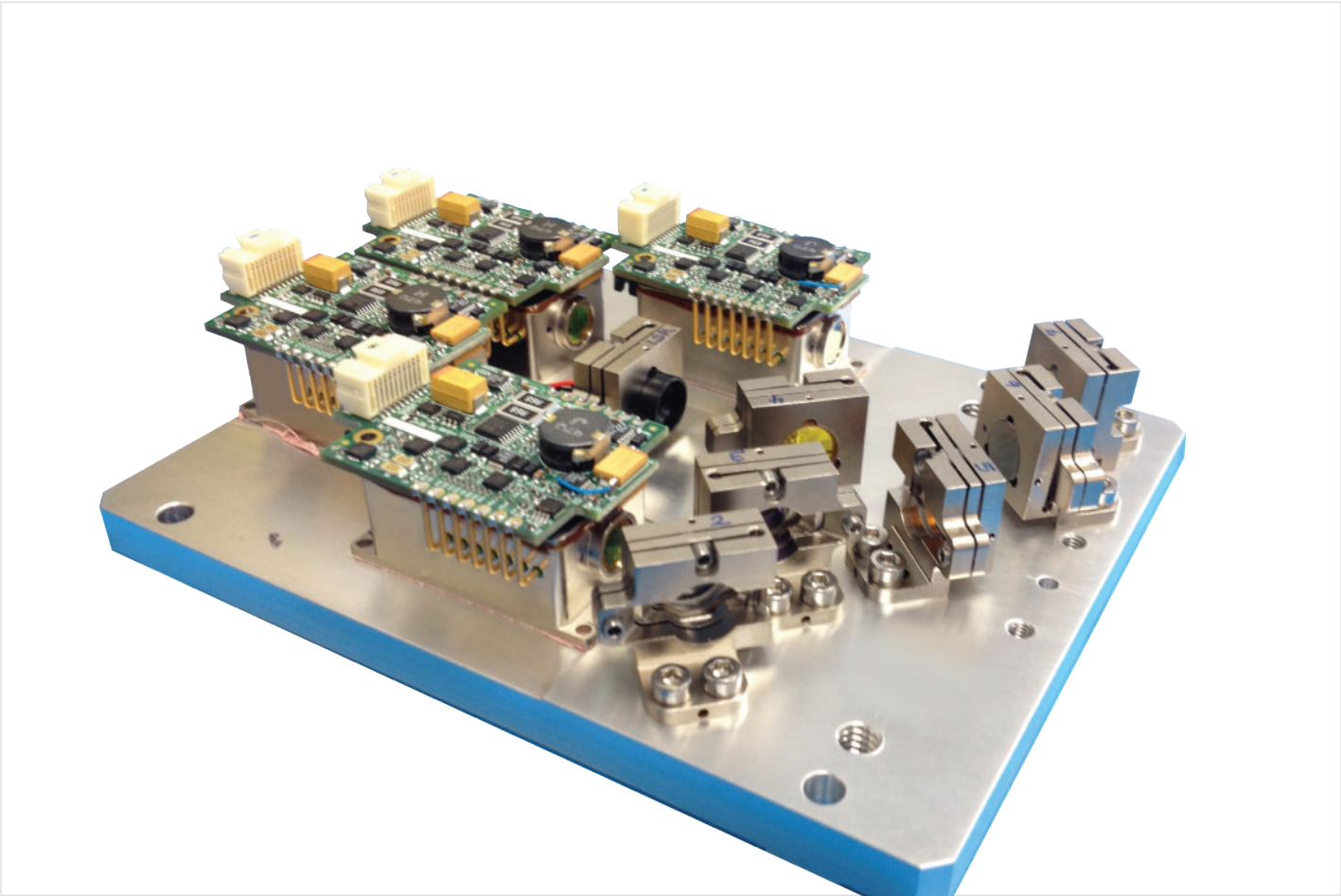
Number of Tuners	Wavelength Range
1-tuner	5.4 - 6.05 µm (1850 - 1650 cm-1)
	6.1 - 7.30 µm (1635 - 1370 cm-1)
	7.4 - 10.4 µm (1335 - 960 cm-1)
	9.9 - 12.8 µm (1010 - 780 cm-1)
2-tuner	5.4 - 7.30 µm (1850 - 1370 cm-1)
	6.1 - 10.4 µm (1635 - 960 cm-1)
	7.4 - 12.8 µm (1335 - 780 cm-1)
3-tuner	5.4 - 10.4 µm (1850 - 960 cm-1)
	6.1 - 12.8 µm (1635 - 780 cm-1)
4-tuner	5.4 - 12.8 µm (1850 - 780 cm-1)



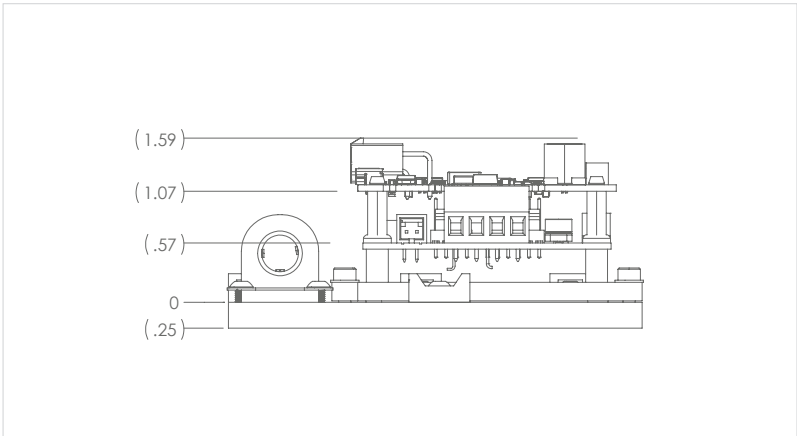
LaserTune provides an industry-leading sweep speed capability at 25 cm-1 per millisecond, a wide range of pulse durations, fast repetition rates, and a widely adjustable duty-cycle. With a tightly collimated beam, industry-leading pointing stability, and exceptional spectral accuracy, this rugged system is a reliable tool on any optical bench.

The MCT detector option provides all-in-one spectrometer capabilities. On-board software allows you to easily control the laser and collect the detector signal to produce complete exportable spectra. The compact, rugged, plug-and-play design makes LaserTune a reliable instrument for your lab.

Applications:
OEM Product Development
Product Specifications:
Dimensions: 7" x 5" x 5" Weight: 5 lbs (2.26 kg)
Tuner Selection (μm):
5.4–6, 6.1–7.3, 7.4–10.4, 9.9–12.8
Other ranges available, please contact us regarding your specific needs/requirements. These are all single tuners, but mQCL offers all the multi-tuner combinations of LaserTune. See "LaserTune Scanning Ranges" table on previous page.



Number of Tuners	Wavelength Range
1-tuner	5.4 - 6.05 μm (1850 - 1650 cm-1)
	6.1 - 7.30 μm (1635 - 1370 cm-1)
	7.4 - 10.4 μm (1335 - 960 cm-1)
	9.9 - 12.8 μm (1010 - 780 cm-1)
2-tuner	5.4 - 7.30 μm (1850 - 1370 cm-1)
	6.1 - 10.4 μm (1635 - 960 cm-1)
	7.4 - 12.8 μm (1335 - 780 cm-1)
3-tuner	5.4 - 10.4 μm (1850 - 960 cm-1)
	6.1 - 12.8 μm (1635 - 780 cm-1)
4-tuner	5.4 - 12.8 μm (1850 - 780 cm-1)



The mQCL provides multiple lasers in a fully functional module for easy product development and integration.

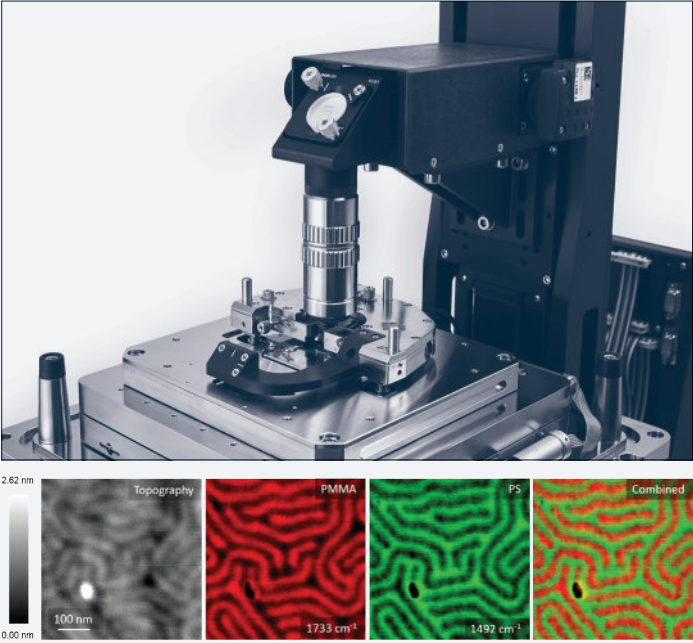
- Product Highlights
- OEM integration ready
 - Configurable lasers to achieve desired gap-free wavelength range from 5.4-12.8 μm
 - Wavenumber sweeps, step functions, static wavenumber control
 - On-board software allows you to easily control the laser
 - All the functionality of our LaserTune product in an OEM form factor and cost point
 - Available SDK enables rapid integration

The system accommodates configurations of 1-4 QCL tuners where the tuners, beam combining and steering optics, and optional visible alignment laser are all affixed to the optics plate. The mQCL tuner modules are controlled by miniature driver electronics with trigger I/O to enable seamless system timing. The interface to the electronics ranges from low-level serial to high-level Ethernet protocols, for options in your integration approach.

The mQCL is used in a wide variety of real-time applications requiring a mid-infrared laser source, including surface inspections, biometrics, in-line process control, laboratory analytics, air quality monitoring, pharmaceutical development and various life science applications.

The module is designed to be integrated into a variety of spectroscopic instruments, including products used in the

fields of Photoacoustic Spectroscopy (PAS), Cavity Ring-Down Spectroscopy (CRDS), Atomic Force Microscopy (AFM) and a range of dispersive and non-dispersive instruments. The mQCL is especially beneficial to IR microscopes and IR spectrometers that can conduct standoff, non-contact analysis due to the high spectral radiance of Block's QCLs.



“Integrating Block’s QCLs into our atomic force microscope (AFM) has enabled us to acquire both topography, IR spectra and spectral mapping with ~ 5 nm spatial resolution, about 1000X better than the resolution of the FTIR microscopes.”

– Sung Park, CEO, Molecular Vista

Applications:
OEM Product Development
Product Specifications:
Dimensions: 2" x 1.1" x 0.8" Weight: 2.25 oz (.06 kg)
Available Ranges (µm):
5.4–6.1, 5.5–7.5, 6.1–7.3, 7.4–10.4, 7.6–10.2, 9.9–12.8
Other ranges available, please contact us regarding your specific needs/requirements.

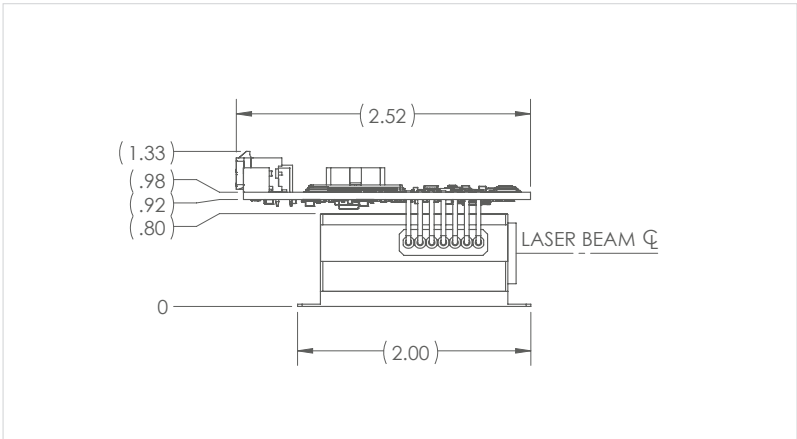
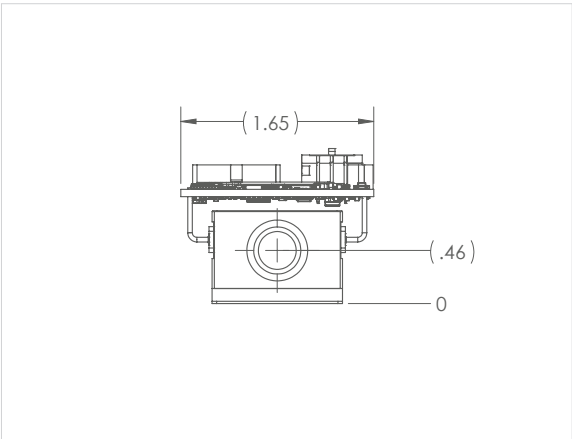
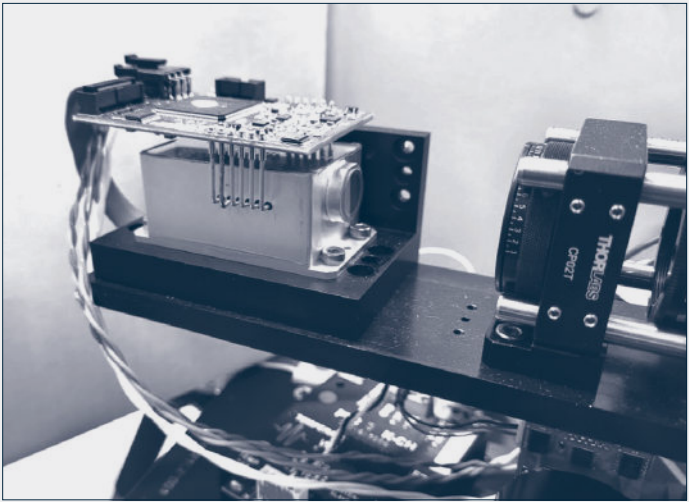
When low cost and extremely compact size are most important, the sQCL is the OEM integrators’ tunable laser of choice.

- Product Highlights
- OEM integration ready
 - Ultra-miniature footprint, including electronics
 - Cost effective solution for volume
 - Ruggedized for portable instruments
 - Wide thermal operating range
 - Wide choice of mid-IR lasers for desired wavelength range
 - Wavenumber sweeps, step functions, static wavenumber control
 - Available SDK enables rapid integration

Single Tuner Options

Blocks QCLs are supplied in 4 wavelength ranges that can be selected based on the application requirements. While these ranges represent the standard tuners we offer, additional ranges are available upon request.

The sQCL begins as a ruggedized design with a wide thermal operating range. The systems are designed to work off of 12v-dc power and 3.3v triggers for use in handheld or portable systems.



Product Specifications



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Gap Free Tuning Range	$\lambda \approx 5.4 - 12.8 \mu\text{m}$ (780-1850 cm^{-1}) achieved with a 4-tuner system; other configurations available
Mode of Operation	Pulsed
Spectral Linewidth	$< 2 \text{ cm}^{-1}$ (typical)
Spectral Accuracy / Repeatability	$< 0.5 \text{ cm}^{-1}$ (typical)
Maximum Peak Power	100 – 500 mW (dependent on number of tuners)
Power Stability	$< 5\%$ pulse-to-pulse (typical) $< 0.05\%$ over 10 msec @ 1MHz (typical)
Pulse Width	30 – 300 ns; continuously variable with external pulse control; 10 ns resolution with internal & external triggering
Pulse Repetition Frequency	Up to 3 MHz
Maximum Duty Cycle (DC)	8% (determined by pulse settings)
Beam Quality	TEM00 (nominal)
Beam Diameter	2 x 4 mm, collimated output
Beam Divergence	$< 5 \text{ mrad}$
Pointing Stability – single tuner	$\pm 0.5 \text{ mrad}$
Pointing Stability – across 4 tuners	$< \pm 1 \text{ mrad}$
Polarization	Vertically polarized; 100:1 extinction
Tuning Modes	Move Tune: Manually set wavelength Step Tune: Programmable wavelength steps Sweep Tune: Programmable linear sweeps
Step Tune Speed	10 cm^{-1} step in $< 1 \text{ msec}$ (100 cm^{-1} step in $< 2 \text{ msec}$)
Sweep Tune Speed	Linear sweep $> 25,000 \text{ cm}^{-1} / \text{sec}$
Operating Temperature Range	10°C to 30°C
Storage Temperature Range	-10°C to 55°C
Humidity Range	0 – 60% relative humidity, non-condensing
Power Requirements	100 – 240 VAC, ~50/60 Hz, 1.7A
Computer Control	Ethernet; HTML/SOAP interface Analog/Digital monitoring of wavelength
Analog Pulse Control	Internal Trigger – with trigger sync out & adjustable offset External Trigger – for laser pulse & wavelength tuning Pulse Control – directly control rising and falling edge
Cooling Options	Built-in air cooling
Laser Eye Safety	Class 3B (individual laser rating) / Class 1 (with combining optics)



Our engineers are constantly working to create innovative products that provide a huge boost to your project at a high performance to cost ratio. We look forward to hearing about your goals and how we can help you achieve them.

