Low Noise QCL Driver Instrument
Operation and Applications

- Low Noise (QCL500 LAB or OEM):
  - <0.4µA RMS (100 kHz)
  - 1 nA / √Hz current noise density
- For QCLs or anode-grounded laser diodes
- Four current levels: 500 mA, 1 A, 1.5 A, 2 A
- Constant current source
- Up to 20 V Compliance Voltage
- 2-3 MHz Bandwidth
- Robust safety features
- Patented technology
BASELINE DRIVER NOISE
(QCL1500 at 100 mA)
Noise Current Density vs. Frequency for QCL Driver

- Measurement Noise Floor
- QCL Driver
CUMULATIVE NOISE
(QCL1500 at 100 mA)

RMS Noise Current vs. Frequency for QCL Driver

RMS Current (µA)

Measurement Noise Floor
QCL Driver

Frequency (Hz)

10^0 10^1 10^2 10^3 10^4 10^5

10^-3 10^-2 10^-1 10^0 10^1 10^2 10^3
BASELINE DRIVER NOISE
(QCL1500 at 100 mA)
Noise Current Density vs. Frequency for LD and QCL Driver

- Measurement Noise Floor
- Laser Diode Driver
- QCL Driver

Noise Current Density (nA / √Hz)
Frequency (Hz)
CUMULATIVE NOISE
(QCL1500 at 100 mA)

RMS Noise Current vs. Frequency for LD and QCL Driver

- Measurement Noise Floor
- Laser Diode Driver
- QCL Driver

Frequency (Hz)

RMS Current (μA)
What does Low Noise mean in real life?

- The linewidth of the QCL narrowed.

- The center wavelength did not vary.

- The scans became much more repeatable, indicating the signal-to-noise ratio was significantly improved.

- Laser diode driver electronic noise was masking:
  - optical noise
  - mechanical jitter
  - software bugs.

- Once fixed, sensitivity improved by an order of magnitude.
Related Application Notes

- **TN-LD02**: *How is Current Noise Measured at Wavelength Electronics?*
- **AN-LD08**: *Manage Ground Loops to Minimize Noise with the QCL Drivers*
- **AN-LD09**: *Troubleshooting Low Noise Systems*
- **AN-LD14**: *Quantum Cascade Laser Driver Basics*
- **AN-LD15**: *An Introduction to Quantum Cascade Lasers*
CONTROL SCREEN

QCL1000 LAB

POWER

WAVELENGTH ELECTRONICS

ENABLE

DATA
ROBUST SAFETY FEATURES

- Adjustable soft-clamp Never-Exceed current limit
- Password protection for critical settings
- Key switch, active and passive interlocks
- Current ramp
- Slow start delay
- Brown-out & overvoltage protection
- Driver over-temperature protection
- Relay shorts output when current is disabled
- Open circuit & short-circuit protection
ICONS

- Lock
- Control
- Monitor
- Limit
- Settings
- Save/Recall
- Password Protected
- VI Scan

WAVELENGTH ELECTRONICS
CONTROL SCREEN

Setpoint: 0.201 A
Mode: Constant Current

QCL1000 LAB

POWER

ENABLE

DATA

WAVELENGTH ELECTRONICS
LIMIT SCREEN

0.2007 A

Limit Current
0.580 A

MAX Supply Voltage
28.00 V

Cable Resistance
0.000 Ω

QCL1000 LAB

POWER

ENABLE

DATA

WAVELENGTH ELECTRONICS
SAVE/RECALL SCREEN

0.0000 A

Save Settings to: Tricorder Bench

Recall Settings from: Technician 1
Applications

Due to their unique construction, QCLs operate with high power in the near-IR through terahertz ranges. These wavelengths are particularly suited to detection of molecules significant to humans. Applications include:

- trace gas analyzers
- remote detection of explosive materials
- medical diagnosis using the breath
- non-invasive glucose testing
- emissions monitoring – marine, power generation
- pharmaceutical process quality control
- anesthesia and hospital air quality monitoring
- leak detection in industrial processes
**ORDERING INFORMATION**

- 500 mA    QCL500 LAB or OEM
- 1 A    QCL1000 LAB or OEM
- 1.5 A    QCL1500 LAB or OEM
- 2 A    QCL2000 LAB or OEM

**ACCESSORIES**

- NOISESCAN
- QCLTL-LO, QCLTL-1500, QCLTL-2000
  Test Loads
- RCKMT-LABSNGL, RCKMT-LABDUAL
  Rack Mount Kits
- INTLK REPL KIT
  Interlock Replacement Kit

**PATENTED TECHNOLOGY**

(Licensed from Battelle Memorial Institute)

- 6,696,887
- 6,867,644
- 7,176,755
If you would like

- hands-on experience with the new QCL LAB instrument
- additional information about our QCL drivers
- time to discuss your particular precision control needs

Come visit our booth.