

## High Efficiency Quantum Cascade Laser Frequency Comb

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### High Efficiency Quantum Cascade Laser

Recently, improvements in wall plug efficiency have been pursued with a view to realizing compact, portable, power-efficient and high-power quantum cascade laser systems 3, 4. However, advances...

### Highly power-efficient quantum cascade lasers | Nature ...

High Efficiency, Low Power-Consumption DFB Quantum Cascade Lasers Without Lateral Regrowth Nanoscale Res Lett . 2017 Dec;12(1):281. doi: 10.1186/s11671-017-2064-2.

### High Efficiency, Low Power-Consumption DFB Quantum Cascade ...

This process of a single electron causing the emission of multiple photons as it traverses through the QCL structure gives rise to the name cascade and makes a quantum efficiency of greater than unity possible which leads to higher output powers than semiconductor laser diodes.

### Quantum cascade laser - Wikipedia

High-Efficiency Quantum Cascade Laser Leads to Research Contract for Intraband | Business Wire Intraband received a \$1M DOD STTR contract to develop quantum cascade lasers (QCLs) with 40% wall plug...

### High-Efficiency Quantum Cascade Laser Leads to Research ...

The high power efficiency and narrow beatnote linewidth will greatly expand the applications of quantum cascade laser frequency combs including high-precision remote sensing and spectroscopy. AB - An efficient mid-infrared frequency comb source is of great interest to high speed, high resolution spectroscopy and metrology.

### High efficiency quantum cascade laser frequency comb ...

The step-taper active-region (STA) design concept is implemented for  $\sim 5.0$   $\mu\text{m}$ -emitting quantum cascade lasers (QCLs) grown by metal-organic chemical vapor deposition (MOCVD). Carrier-leakage suppression yields high characteristic temperatures for the threshold-current density  $J_{\text{th}}$ ,  $T_0$ , and for the slope efficiency  $\eta_{\text{sl}}$ ,  $T_1$ : 226 K and 653 K. Resonant-tunneling extraction from the lower level results in miniband-like extraction.

### High-efficiency, high-power mid-infrared quantum cascade ...

In recent years, quantum cascade lasers (QCLs) have proven to be very efficient coherent light sources in the mid-infrared region with a wide variety

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of applications, such as trace gas sensing, high-resolution spectroscopy, and free space communication [ 1 - 3 ].

### **High Efficiency, Low Power-Consumption DFB Quantum Cascade ...**

Because of their compact size, reliability, tunability, and convenience of direct electrical pumping, quantum cascade lasers have found a number of important civilian and defense applications in the midwave infrared and long-wave-infrared spectral range.

### **Progress in high-performance quantum cascade lasers**

In conclusion, we demonstrate a frequency comb source based on a dispersion-compensated quantum cascade laser frequency comb at  $\lambda \sim 8 \mu\text{m}$  with high power output up to 880 mW for  $\sim 290$  modes, covering a spectral coverage of  $110 \text{ cm}^{-1}$ . The wall-plug efficiency is 6.5%, enhanced by a factor of 6 compared with the previous results.

### **High efficiency quantum cascade laser frequency comb**

High -CW-power (i.e., watt -range), efficient mid-infrared (IR) ( $\lambda = 3\text{-}15 \mu\text{m}$ ) quantum cascade lasers (QCLs) are needed for a wide range of applications, from remote sensing to infrared...

### **High-Power, High-Efficiency Mid-Infrared Quantum Cascade ...**

Multi-watt continuous-wave room temperature operation with efficiency exceeding 10% has been demonstrated for quantum cascade lasers essentially in the entire mid-wave and long-wave infrared spectral regions.

### **Progress in high-power continuous-wave quantum cascade ...**

Researchers at Lehigh's Center for Photonics and Nanoelectronics use new phase-locking technique to achieve record-high output power for terahertz lasers, report highest radiative efficiency for any single-wavelength semiconductor quantum cascade laser. Terahertz lasers could soon have their moment.

### **Multi-Watt Terahertz Semiconductor "Quantum-Cascade" Laser ...**

Recently, quantum cascade lasers (QCLs)(2) have been drawing attention as new light sources in the MIR region. QCLs are new semiconductor lasers developed in 1994 that can oscillate in the MIR region. There has been a growing effort to develop QCLs as compact, high-speed, and narrow linewidth MIR light sources.

### **Mid-infrared Quantum Cascade Laser Operable in High ...**

In conclusion, we demonstrate a frequency comb source based on a dispersion-compensated quantum cascade laser frequency comb at  $\lambda \sim 8 \mu\text{m}$  with high power output up to 880 mW for  $\sim 290$  modes, covering...

### **High efficiency quantum cascade laser frequency comb ...**

The QCL series is a high power pulsed Quantum Cascade Laser based on proprietary technology which incorporates high-powered diodes (typically watt-level) emitting in the main transmission bands of the atmosphere ( $4.0 \mu\text{m}$ ,  $4.6 \mu\text{m}$ ,  $4.8 \mu\text{m}$ ,  $9.x \mu\text{m}$ ).

### **MirSense | High Power Quantum cascade lasers from RPMC Lasers**

affordable, and efficient laser diode technology in the visible, short-wave infrared (SWIR), and mid-wave infrared (MWIR) bands, especially in the area of quantum cascade lasers (QCLs) for the MWIR. QCL-based laser modules have been demonstrated in these bands. They are compact

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(approximately a few hundred

### **(SBIR) Navy - Affordable and Efficient High-Power Long ...**

A team of UCF researchers has produced the most efficient quantum cascade laser ever designed - and done it in a way that makes the lasers easier to manufacture. Quantum cascade lasers, or QCLs,...

### **Scientists create most efficient quantum cascade laser ever**

Array Packaging of High Power, High Efficiency, Quantum Cascade Lasers Amount: \$79,360.00 The use of directed energy at long distances, such as for aircraft defense, requires a high power (>100 W) light source within the mid-infrared spectral region (3-5 micron). Power scaling of individua...

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