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Laser Frequency Comb

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High Efficiency Quantum Cascade Laser

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 ~ 290 modes, covering...

High efficiency quantum cascade laser frequency comb ...

beatnote linewidth of 50.5 Hz and a maximum wall-plug efficiency of 6.5% covering a spectral coverage of 110 cm^{-1} at $\lambda \sim 8 \mu\text{m}$. The efficiency is improved by a factor of 6 compared with previous demonstrations. The high power efficiency and narrow beatnote linewidth will greatly expand the applications of

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quantum cascade laser frequency combs including high-precision remote sensing and spectroscopy.

High efficiency quantum cascade laser frequency comb

We demonstrate a surface-emitting quantum cascade laser (QCL) based on second-order buried distributed feedback/distributed Bragg reflector (DFB/DBR) gratings for feedback and outcoupling. The grating fabricated beneath the waveguide was found to fundamentally favor lasing in symmetric mode either through analysis or experiment. Single-lobe far-field radiation pattern with full width at half ...

OSA | High efficiency, single-lobe surface-emitting DFB ...

Quantum cascade lasers (QCLs) employ intersubband transitions between conduction-band (CB) energy states in multi-quantum-well (MQW) structures, carrier tunneling between adjacent MQW stages, and...

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High-Power Mid-Infrared Quantum Cascade Semiconductor Lasers

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 ...

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"

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Laser ...

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

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

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_{th} , T_0 , and for the slope efficiency η_{sl} , T_1 : 226 K and 653 K. Resonant-tunneling extraction from the lower level results in miniband-like extraction.

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

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...

MP Technologies, LLC | SBIR.gov

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

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With this technique, we demonstrate a high continuous wave wall-plug efficiency of an InP-based quantum cascade laser reaching $\sim 41\%$ with an output power of ~ 12 W from a single facet operating at liquid nitrogen temperature. At room temperature, the continuous wave output power exceeds the previous record, reaching ~ 5.6 W.

Continuous wave quantum cascade lasers with 5.6 W output ...

Abstract We demonstrate very high wall plug efficiency (WPE) of mid-infrared quantum cascade lasers (QCLs) in low temperature pulsed mode operation (53%), room temperature pulsed mode operation (23%), and room temperature continuous wave operation (18%). All of these values are the highest to date for any QCLs.

Very high wall plug efficiency of quantum cascade lasers

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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

...

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 μ m, 4.6 μ m, 4.8 μ m, 9.x μ m).

MirSense | High Power Quantum cascade lasers from RPMC Lasers

A team of UCF researchers has produced the most efficient

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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

MADISON, Wis.-- (BUSINESS WIRE)--Intraband announced today that it has received a Department of Defense (DOD) Navy STTR Phase II contract to develop quantum cascade lasers (QCLs) with 40% wall-plug...

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

Quantum cascade lasers (QCLs) are a type of semiconductor laser which utilizes epitaxially grown quantum wells that contain electrons in lasing states. They were first demonstrated in 1994 by the Bell Labs Team of Jérôme Faist, Federico Capasso,

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Deborah, Sivco, Carlo Sirtori, Albert Hutchinson, and Alfred Cho.

Quantum Cascade Laser Technology (QCLs) | QCL Chips ...

With regards to the third-order optical nonlinearity which favours phase locking due to cascaded four-wave-mixing processes, the first fully on-chip mid infrared frequency comb was demonstrated in 2012 with characteristic of frequency modulation rather than amplitude modulation of conventional mode-locked diode laser-based optical comb, followed by the recorded performance of a high efficiency quantum cascade laser frequency comb at 8 μm with a broad spectral coverage of 110 cm^{-1} for 290 ...

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