Analytical Instrumentation, Methods & Materials

HIGH-POWER, HIGH-EFFICIENCY INFRARED-EMITTING QUANTUM CASCADE LASERS

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The Invention

UW Madison researchers have designed Quantum Cascade Lasers (QCLs) configured to achieve interstage carrier injection and lasing, without carrier leakage. This includes QCLs that also exhibit photon-induced carrier transport (PICT). The design enables QCLs that achieve wall-plug efficiencies (WPEs) close to the fundamental limit for their lasing wavelengths, e.g., about 40% for mid-wavelength IR and about 25% for long- wavelength IR. Taking a mid-wavelength IR QCL as an example, this means that in order to generate 1 Watt of mid-wavelength IR light, only 1.5 Watts of heat needs to be removed. This is almost of factor of 4 lower than existing mid-wavelength IR QCL devices, a critical improvement for commercial applications of the devices.

Applications

This innovation enables practical use of mid-IR QCL devices for a wide range of civilian and defense applications: e.g., missile avoidance systems, long-distance communications between low-Earth-orbit satellites and Earth; and long-distance free-space communications under adverse weather conditions.

Additional Information

For More Information About the Inventors

- Dan Botez
- Luke Mawst

Tech Fields

- Analytical Instrumentation, Methods & Materials : Lasers

For current licensing status, please contact Michael Carey at mcarey@warf.org or 608-960-9867