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Title:Quantum cascade lasers operating from 1.4 to 4 THz

Authors:Kumar, Sushil (1)

Author affiliation:(1) Department of Electrical and Computer Engineering and Center for Optical Technologies, Lehigh University, Bethlehem, PA 18015, United States

Corresponding author:Kumar, S.(sushil@lehigh.edu)

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Abstract:The development of terahertz (THz) quantum cascade lasers (QCLs) has progressed considerably since their advent almost a decade ago. THz QCLs operating in a frequency range from 1.4 to 4 THz with electron-phonon scattering mediated depopulation schemes are described. Several different types of GaAs/AlGaAs superlattice designs are reviewed. Some of the best temperature performances are obtained by the so-called resonant-phonon designs that are described. Operation above a temperature of 160 K has been obtained across the spectrum for THz QCLs operating at $\nu > 1.8$ THz. The maximum operating temperature of previously reported THz QCLs has empirically been limited to a value of $\sim \hbar\omega/k_B$. A new design scheme for THz QCLs with scattering-assisted injection is shown to surpass this empirical temperature barrier, and is promising to improve the maximum operating temperatures of THz QCLs even further.

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