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Performance characteristics of variously detuned VCSELs

Krzysztof Tkacz, Robert P. Sarzala, Włodzimierz Nakwaski

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Abstract

A comprehensive model of an operation of vertical-cavity surface-emitting diode lasers (VCSELs) is used to simulate the operation of modern GaAs-based oxide-confined double intra-cavity contacted GaInNAs/GaAs quantum-well VCSELs emitting the 1.3- μm radiation. An impact of various detuning of the cavity mode with respect to a maximal active-region optical gain on VCSEL performance characteristics is examined. In particular, high-temperature VCSEL operation is investigated. Properly detuned VCSELs have been found to exhibit nearly constant lasing threshold within quite a wide range of ambient temperatures. In such temperature-insensitive VCSELs with relatively small 4 μm active regions, threshold currents change from 0.84 mA to 1.10 mA, *i.e.*, only by 22%, within quite a wide range of ambient temperatures between 300 K and 360 K.



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