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Feedback Sensitivity of Detuned DBR Semiconductor Lasers

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Abstract

A distributed Bragg reflector (DBR) laser represents a simple realization of a semiconductor laser operating in a single longitudinal mode. We present a so far missing theoretical study how its reflection tolerance depends on the detuning between lasing wavelength and maximum of the DBR reflectivity. The generic Lang-Kobayashi equations for lasers subject to optical feedback are extended to include the detuning parameter on base of the round-trip condition for stationary states. As a consequence, a well established formula for estimating the feedback tolerance is modified for detuned DBR lasers, too. Bifurcation analysis of the Lang-Kobayashi equations confirms the modified formula. Properly adapting the parameters of the DBR, the calculations yield a possible tolerance of the simple DBR laser against nearly 100 % feedback.

Keywords: distributed Bragg reflector lasers, lasers, semiconductor laser, Bragg reflectors, optical feedback

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