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Disk and Ring Microcavity Lasers and Their Concentric Coupling

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Abstract

Structures of concentric microdisk and rings were studied theoretically and experimentally. A three-dimensional (3D) model was developed, emphasizing the possibility of coupling several concentric microresonators. The 3D analysis resulted in closed form analytic expressions for the six field components from which the limitations and necessary conditions for concentric coupling were derived. We emphasized the important differences between our results and the predictions of the more commonly used 2D models — the latter are failing to predict the concentric coupling actual feasibility. Finally, we present experimental results of coupled ring VCSELs — revealing a good match to the 3D model predictions.