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Theoretical Stability Analysis of Quantum Dash DBR Lasers

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Abstract: A detailed theoretical analysis of stability in a quantum dash distributed Bragg reflector DBR laser is presented under the smallsignal condition. The influence of p-type doping and inhomogeneous line broadening on the hysteresis width of the quantum dash DBR laser is studied using a rate equation model that includes all of the multidiscrete energy levels in the valence and conduction bands. Our calculations show that a large hysteresis width is obtained by detuning the laser by 10 meV above the ground state energy and doping the dashes by acceptor concentration NA=3.71017 cm?3. Also we find that a large self-pulsation frequency is obtained by detuning the laser by ?15 meV from the ground state energy and doping the dashes by NA=2.5 1017 cm?3. The laser hysteresis width can be greatly reduced by doping the dashes with NA 11018 cm?3.