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## Efficiency of Four-Wave Mixing of Doped Closely Spaced Energy States Quantum Dash Semiconductor Optical Amplifiers

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**Abstract:** A detailed analysis of the efficiency of four-wave mixing (FWM) is performed for a closely spaced energy state quantum dash semiconductor optical amplifier (SOA). The analysis takes into account the effect of all discrete energy states, the gain dispersion of the quantum dash, and the effect of doping on the FWM characteristics. Our analysis reveals that large FWM efficiency can be obtained when the energy of the pump signal is equal to the first excited state. We find that at low-applied current doping the dashes by p-type concentration enhances the FWM efficiency. While at high applied current, we find that doping the SOA with p-type concentration slightly enhances the FWM efficiency of the ground state and the first excited state and lowers the FWM efficiency of the higher excited states. Also we find that doping the dashes by n-type concentration slightly modifies the FWM efficiency spectrum.