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## Analytical Model for Cross-Gain Modulation and Crosstalk in Quantum Well Semiconductor Optical Amplifiers

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**Abstract:** An analytical model of the dynamic characteristics of a quantum-well (QW) semiconductor optical amplifier (SOA) is developed. Closed-form expressions for the optical gain and crossgain modulation (XGM) for arbitrary input pulses are derived. The model takes into account the carrier capture and escape transitions between the QW and the continuum states. This model is also used to derive a closed-form expression for interchannel XGM crosstalk in multichannel SOA systems. The model/analysis provides insight into the effect of the SOA parameters on the performance of a wavelength-division multiplexed system. We found that crosstalk in a multichannel SOA system can be reduced by reducing the escape lifetime .