

Abstract

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Numerical characterization of InP-based quantum dot semiconductor optical amplifier

This paper is devoted to the development of a steady-state behavior of a quantum dot-semiconductor optical amplifier (QD-SOA). The investigated performance characteristics cover a wide range that includes material gain coefficient, spatial distribution of the occupation probabilities, fiber to fiber gain, gain spectrum as a function of the bias current, relaxation time, and capture time. A set of traveling-wave equations is used to model the signal and spontaneous photons along the device active region. The obtained results indicate a high gain that reaches 34 dB for an InAs/InGaAsP/InP-based QD-SOA, with a corresponding device length of 4 mm. The obtained signal-to-noise ratio is larger than 75 dB for all input powers without using an output filter.