

Compensation of carrier lifetime in double-pass semiconductor optical amplifiers

ABSTRACT

Bi-directional light propagation is expected to enable enhanced functionality of all-optical signal processing operations compared to unidirectional approaches. In this work, we report on compensation of slow gain recovery in semiconductor optical amplifiers (SOAs) in a double-pass condition. The unsaturated gain of the employed SOA is increased by 12.6 dB, and the corresponding normalized conjugate output of four-wave mixing is enhanced by 16.3 dB. The theory attributes this efficiency improvement to the unsaturated gain enlargement which, in turn, compensates for the inherently long carrier lifetimes of SOAs by 50%. The saturation output power remains virtually unchanged.

Keyword: Carrier lifetime; Double-pass; Four-wave mixing; Semiconductor optical amplifier; Unsaturated gain