

Ultra-Fast Gain Recovery and Compression Due to Auger-Assisted Relaxation in Quantum Dot Semiconductor Optical Amplifiers

Authors: Omar Qasaimeh

Abstract: The ultra-fast gain dynamics in quantum-dot semiconductor optical amplifiers (QD-SOAs) have been studied for different types of Auger-assisted relaxation processes. The ultra-fast gain recovery time and gain compression are studied for p-type doped and un-doped QD-SOAs using rate equation model. Our calculations show that the ultra-fast gain dynamics is governed by electron-electron Auger-assisted process for un-doped QD-SOA and by electron-hole Auger-assisted process for p-type doped QD-SOA. We find that the ultra-fast gain recovery time for un-doped QD-SOA is comparable with that of p-type doped QD-SOA when both electron hole and electron-electron processes present in the active region. We find that the percentage of ultra-fast gain compression in un-doped QD-SOA is limited to 72%. While for p-type doped QD-SOA, we find that the percentage of ultra-fast gain compression increases as the applied current increases where it can reach 95% at very high applied current.