

# Jordan University of Science and Technology

## Cross-Gain Modulation in Closely Spaced Energy States Quantum Dash Semiconductor Optical Amplifiers

**Authors:** Omar Qasaimeh and Hazem Al-Otum

**Abstract:** A detailed small-signal analysis of cross-gain modulation is performed for closely spaced energy state quantum dash (QDsh) semiconductor optical amplifier (SOA). The analysis takes into account the carrier transition in all electron and hole states, the gain dispersion of the active layer, the effect of the energy detuning between the probe and pump signals and the effect of doping on the characteristics of cross-gain wavelength conversion. Our analysis reveals that broadband conversion efficiency can be obtained in QDsh SOA when the energy of the pump signal is at 20 meV below the ground state. Also we find that large 3 dB bandwidth can be achieved when the energy of the pump and the probe signals is at +30 meV. Our analysis shows that doping the dashes with P-type concentration can enhance the efficiency and the intrinsic 3 dB bandwidth of cross-gain wavelength conversion.