

# Jordan University of Science and Technology

## Novel Closed-Form Model for Multiple-State Quantum Dot Semiconductor Optical Amplifiers

**Authors:** Omar Qasaimeh

**Abstract:** Novel closed-form model for multiple-state quantum-dot semiconductor optical amplifiers (QD-SOAs) is derived. The model takes into account the effect of the ground state, excited state and the wetting layer. The model is simple, accurate and exhibits negligible computational time compared with numerical simulation. In addition, the derived model is valid for arbitrary applied current and input photon density and is interesting for device design and optimization. Analytical expressions for the optical gain, effective saturation density, maximum output density and the transparency current are also derived. Our model revealed that the effective saturation density of QD-SOAs strongly depends on the photon density and the applied current.