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High-speed wavelength conversion in quantum-dot and quantum-well semiconductor optical amplifiers DAVID NIELSEN, S. L. CHUANG, University of Illinois at Urbana-Champaign, N. J. KIM, D. LEE, Chungnan National University, S. H. PYUN, W. G. JEONG, Sungkyunkwan University, C. Y. CHEN, T. S. LAY, National Sun Yat-Sen University — All-optical wavelength conversion is an important technology for advanced wavelength division multiplexed networks. The carrier localization available in quantum dots, due to the relatively slow carrier capture and escape times compared to intersubband relaxation in quantum wells, makes it possible to achieve efficient wavelength conversion through the non-linear optical process of four-wave mixing due to enhanced spectral hole burning. To examine the various carrier dynamics we experimentally investigate four-wave mixing in both quantum-dot and quantum-well optical amplifiers. Our results show superior conversion efficiency in a quantum-dot device compared to a quantum well device with identical gain at pump-probe detunings between 100 GHz and 1 THz, and a small-signal modulation bandwidth > 25 GHz. Cross-gain modulation measurements were performed as well and show a much smaller bandwidth of 1 GHz indicating that four-wave mixing is superior for high-speed signals.

David Nielsen
University of Illinois at Urbana-Champaign

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