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A Detailed Ensemble Monte Carlo Study of the Effect of Quantum Well Width on Quantum Well Infrared Photodetector Characteristics

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**Abstract:** We present a simulation based investigation of the dependence of the device characteristics on the quantum well width in AlGaAs/GaAs quantum well infrared photodetectors (QWIPs) through the ensemble Monte Carlo technique. The simulations on two different standard Al<sub>0.3</sub>Ga<sub>0.7</sub>As/GaAs QWIPs with quantum well widths of 36 and 44 Å have shown that the gain in the former is considerably higher, which is due to much longer lifetime of the photoexcited electrons as a result of lower capture probability in the device. We discuss this observation by the investigation of the electron scattering rates in these structures through realistically evaluated scattering mechanisms between two and three-dimensional states in the multi-quantum well structure.

**Key Words:** Quantum well infrared photodetectors.

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