

# Quantum Well Infrared Photodetectors: Device Physics and Light Coupling

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## Abstract

Development of hand-held long wavelength infrared (LWIR) camera at Jet Propulsion Laboratory demonstrates the potential of Quantum well infrared photodetector (QWIP) for **simplifying** the design and construction of a highly **sensitive infrared imaging** systems. These cameras utilized long wavelength infrared sensitive focal plane arrays based on GaAs/AlGaAs multi quantum well structures with light coupling gratings. In the presentation, the operating principles of GaAs/AlGaAs multi quantum well structure designed for long wavelength infrared (LWIR) detection will be discussed. Device physics and optimization of the MQW structure to meet requirements set by different applications will also be discussed. Alternate optical coupling systems such as gratings are required because QWIP do not respond to normal incident light due to the quantum mechanical selection rules associated with intersubband transitions. The light coupling efficiency of two dimensional (2-D) gratings strongly depend on the wavelength and thus exhibit narrow band width spectral responses. Therefore, 2-D gratings can be utilized to select narrow spectral bands in multi color QWIP cameras. A set of 2-D grating parameters optimized for given spectral band can be obtained by using the modal expansion method.

The research described here was performed by the Center for Space Microelectronics Technology, Jet Propulsion Laboratory, California Institute of Technology, and was sponsored by the National Aeronautics and Space Administration, Office of Space Science.