Complex Type-II Interband Cascade MQW Photodetectors

Multiple active subregions, each optimized for a different color, would enable multicolor operation.

NASA's Jet Propulsion Laboratory, Pasadena, California

Multiple-quantum-well (MQW) photodetectors of a proposed type would contain active regions comprising multiple superlattice subregions. These devices would have complex structures: The superlattice of each subregion would be designed for enhanced absorption of photons in a desired wavelength band (typically in the infrared) and multiple subregions of different design would be cascaded for multicolor operation.

The designs of these photodetectors would take advantage of the characteristic alignment of the edges of the electron-energy bands in type-II quantum-well structures: Within each finite superlattice, interband transitions would be used for detecting photons, and between finite superlattices, intraband relaxation and interband tunneling would be used for transport of charge carriers, all such as to enable detection of normally incident photons.

Absorption of photons in the active region of a photodetector according to the proposal could be significantly enhanced by designing the superlattice/MQW structures to contain closely spaced energy states. The photodetector could be operated with a small bias to facilitate transport of charge carriers. The superlattices could be somewhat chirped, with a preferred transport direction.

This work was done by Rui Yang of Caltech for NASA's Jet Propulsion Laboratory.

Further information is contained in a TSP (see page 1).