614.

Accession Number

12395826

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Title

Space charge mediated negative differential resistance in terahertz quantum well detectors

Source

Journal of Applied Physics, vol.110, no.1, 1 July 2011, 013714 (8 pp.). Publisher: American Institute of Physics, USA.

Abstract

In terahertz quantum well infrared photodetectors, a built-in-charge-mediated regime transition of the electronic transport is thoroughly investigated. The very strong current discontinuity and negative differential resistivity behavior are explained in terms of band structure reorganizations. The analysis of bias versus current measurements reveals that the transition occurs when the first two wells of the structure become partially drained, and the second well enters the ionized regime before the first one. Both many-body effects and a careful model of the contact have to be considered to account for these features. The source of the built-in charge is identified as intersubband impact ionization. The regime transition is one of its few experimental proofs, and provides an original approach to investigate hot electron kinetics in multi-quantum-well structures. (25 References).