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Accession Number

12296413

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Title

Submillimeter-wave Oscillations in Recessed InGaAs/InAlAs Heterostructures: Origin and Tunability

Source

Acta Physica Polonica A, vol.119, no.2, Feb. 2011, 111-13. Publisher: Institute of Physics of the Jagellonian University, Poland.

Abstract

By means of an ensemble Monte Carlo simulator, the appearance of THz oscillations in InAlAs/InGaAs slot diodes is predicted when the applied bias exceeds the threshold for intervalley transfer. Such high frequency is attained by the presence of a Gunn-like effect in the recess-to-drain region of the device channel whose dynamics is controlled by ballistic valley electrons. In this work we explain the mechanism at the origin of this effect and also the influence of the bias conditions, -doping, recess-to-drain distance and recess length on the frequency of the ultrafast Gunn-like oscillations. The simulations show that a minimum value for the -doping is necessary to have enough carrier concentration under the recess and allow the oscillations to emerge. Finally, we show that shortening the devices (small recess and recess-to-drain lengths) increases the oscillation frequency, so provides an interesting frequency tunability of this THz source. (4 References).