Low frequency noise in reverse biased P-*InAsSbP*/n-*InAs* infrared photodiodes

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Abstract

We report the first experimental study of low-frequency noise in reverse biased P-*InAsSbP*/n-*InAs* infrared photodiodes at 300 K and 77 K. At room temperature, the current noise spectral density, S_I, depends on frequency as $1/f$ over the entire current range and tends to the Nyquist noise when the frequency increases. At small reverse currents $I_{rb} \leqslant 3 \times 10^{-5}$ A, S_I is proportional to I_{rb}^2; at higher currents this dependence changes to $S_I \sim I_{rb}^4$. With temperature decrease down to 77 K, S_I becomes proportional to $I_{rb}^{0.5}$, while the reverse current decreases and the differential resistance grows by 4 orders of magnitude. The noise was also studied in the photovoltaic mode at 100 K, where S_I is proportional to I_{ph}^2. We conclude that at 100 K, the Nyquist noise is dominant and can be used for estimations of the specific detectivity of P-*InAsSbP*/n-*InAs* diodes.

Keywords: Mid-IR photodetectors, *InAs* photodiodes, low frequency noise, backward bias, photovoltaic mode

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