

Design and optimization of InGaAs/InP photodetector for coordinate sensitive detection systems

M. Purica, E. Budianu, I. Grozescu, E. Rusu and S. V. Slobodchikov

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Abstract

The quadrant p-i-n photodiode and the position sensing detector based on the longitudinal photo-effect are the most suitable photodetector structures for coordinate sensitive detection systems. The optimization of a quadrant p-i-n photodiode structure on InGaAs/InP heterostructures, suited for infrared laser telemetry and optical centering applications, taking into account the influence of material characteristics and structure parameters on the photoresponse, is presented. The dependence of the longitudinal photo-voltage in the In/sub 0.53/Ga/sub 0.47/As p-n junction on the coordinate x of the light spot and temperature has been investigated. A linear dependence $V_{phl} = f(x)$ has been observed and the V_{phl} temperature dependence in the 100-300 K range is determined by carrier mobility change. The quadrant p-i-n photodetectors shows the wide spectral characteristics (0.9-1.7) μm with a responsivity of each element of 0.62 A/W and the p-n junction structure presents the slope of the inversion characteristics for the longitudinal photoelectric effect of $(0.8-1.0)10^3$ V/W.mm.