Abstracts

Fast Microwave Detectors Based on the Interaction of Holes with Phonons

L.F. Jelsma. "Fast Microwave Detectors Based on the Interaction of Holes with Phonons." 1985 Transactions on Microwave Theory and Techniques 33.5 (May 1985 [T-MTT]): 367-372.

Experimental results and a proposed model are discussed in this paper on a new microwave detector which has subnanosecond response times and a pulsed power measuring capability between 0.5 W and >10 kW for a frequency band larger than 0-50 GHz. Our model suggests that electromagnetic energy is absorbed by holes in p-type germanium (Ge). This absorption increases the mobile hole temperature above the lattice temperature. The absorbed energy is determined by measuring the change in average mobility of the holes in the nonequilbrium state. We experimentally observed greater than > 50-V output pulses for kilowatt microwave input pulses to the detector and a bias current of 1 A. The detector exhibited a linear response between 0.5 W and 1 kW. We propose that the voltage pulses in the p-type Ge detector are caused by nonequilibrium holes exchanging energy with the phonons in the crystal lattice. This energy exchange modulates the hole mobility.

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