155. Title: Analysis and design of semiconductor detector for high-power terahertz pulse

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Abstract: A 0. 14 THz high-power terahertz pulse detector based on hot electron effect in semiconductors is designed in this paper. First, the working principle of the detector is analyzed and its relative sensitivity is derived according to the structural characteristics of the detector. Then a three-dimensional finite-difference time-domain method is used to simulate the voltage standing wave ratio (VSWR) and relative sensitivity in a linear region. With optimized structural parameters, the VSWR of the designed detector is less than 1.3 while the relative sensitivity is about 0.6 kW(-1), fluctuating no more than 10% in a frequency range of 0. 13-0. 16 THz. Subsequently discussed are the effect of Joule heat on the detector, and the relation between variation ratio of the output voltage and terahertz pulse duration. Finally the detecting simulations of the detector and its analysis results show that the detector with response time of picosecond-leval can handle a maximum power of about 2. 2 kW, while the maximum power of its linear working region reaches tens of watts, so it can accomplish the direct measuring of 0. 14 THz high-power terahertz pulses with nanosecond-level durations, increasing the accuracy of power measurement.