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Test method for the parameters of thermoelectric terahertz detectors

热电型太赫兹探测器参数测试方法

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Foreword

This document complies with the provisions of GB/T 1:1-2020 "Standardization Work Guidelines Part 1: Structure and Drafting Rules of Standardization Documents" Drafting: Please note that some content in this document may be subject to patents: The publisher of this document assumes no responsibility for identifying patents: This document is proposed by the Chinese Academy of Sciences: This document is under the jurisdiction of the National Optoelectronic Measurement Standardization Technical Committee (SAC/TC487): This document was drafted by: China Electronics Technology Co:, Ltd:, the 41st Research Institute of China Electronics Technology Group Corporation, China Science and Technology Institute of Aerospace Information Innovation, Nanjing University, China Institute of Metrology, Changchun Optics, Precision Mechanics and Physics Research of the Chinese Academy of Sciences Institute, Guilin University of Electronic Science and Technology, China Jiliang University: The main drafters of this document: Zhang Peng, Liu Zhiming, Jiang Wanshun, Lu Yonghong, Tu Xuecao, Gao Han, Wang Pu, Yin Bingqi, Sun Qing, Kang Lin, Wu Bin, Liu Hongyuan, Yu Xinsheng, Jiang Yue, Jia Xiaohydrin, Deng Yuqiang, Li Junlin, Han Jiaguang, Zhan Chunlian: Parameter testing method for pyroelectric terahertz detectors

1 Scope

China's national test method for the parameters of thermoelectric terahertz detectors. Terahertz radiation lies between the microwave and infrared bands, and it has been the least accessible part of the spectrum because neither electronic nor optical techniques reach it comfortably - the gap has its own name, the terahertz gap. Its attraction is that many materials transparent to it - clothing, paper, plastics, ceramics - are opaque to visible light, while water and metals absorb or reflect strongly, which makes it the basis of security screening, non-destructive inspection of composites and coatings, and molecular spectroscopy of a range that visible and infrared do not cover. Thermoelectric detectors work by absorbing the radiation and measuring the temperature rise, which makes them broadband and room-temperature but slow and insensitive relative to cooled alternatives - so their parameters have to be measured honestly.

This document describes the principles, test conditions, instruments and equipment, samples, test steps and test numbers for parameter testing of pyroelectric terahertz detectors: data processing: This document applies to pyroelectric terahertz detectors: Terahertz Gaulay detector and terahertz quantum well detector are implemented with reference:

2 Normative reference documents

The contents of the following documents constitute essential provisions of this document through normative references in the text: Among them, the dated quotations For undated referenced documents, only the version corresponding to that date applies to this document; for undated referenced documents, the latest version (including all amendments) applies to this document:

GB/T 13584-2011 Infrared detector parameter test method

3 Terms and definitions

The terms and definitions defined in GB/T 13584-2011 and the following apply to this document: 3:

1 The working wavelength covers the terahertz band, which generates heat energy by absorbing terahertz radiation and converts the heat energy into electrical signals:

Note: Usually includes terahertz thermopile detectors, terahertz pyroelectric detectors and terahertz microbolometers: 3:

2 Thermal energy is generated under the action of terahertz radiation, which causes a temperature difference at both ends of the thermopile: The temperature difference is converted into telecommunication energy according to the Seebeck effect: A type of detector: 3:

3 Heat energy is generated under the action of periodic terahertz radiation, which causes the temperature of the pyroelectric material to change: The temperature changes are converted according to the pyroelectric effect: A detector that is converted into electrical signals: 3:

4 Terahertz microbolometer terahertzbolometer Heat energy is generated under the action of periodic terahertz radiation, which causes the temperature of the thermo-sensitive film to

change, causing the resistance of the thermo-sensitive film to change: , a detector that generates electrical signals under the action of an external bias current: 3:

5 Responsivity The detector outputs an electrical signal, which is the ratio of the power or energy of the incident electromagnetic wave: [Source: JJG (Electronics) 30904-2008, 3:1, with modifications] 3:6 noiseequivalentpowernoiseequivalentpower Within the unit measurement bandwidth, when the detector output signal-to-noise ratio is 1, the electromagnetic wave power incident on the detector: