

## **ABSTRACT**

This work contains 103 pages, 73 figures, and 10 tables and 18 sources have been used.

### **Actuality of theme**

The use of the terahertz range in telecommunications is promising due to the overloading of lower frequency ranges, the growth of information traffic, which requires the transmission of gigabit digital streams along the communication lines, is relevant. Therefore, it is envisaged to create fundamentally new dimensions, impedance and energy efficiency of sub-and terahertz range devices for high-speed video transmission, for radio-relay systems of direct visibility, for fifth-generation mobile communication networks (5G) and radars for high-precision detection and detection of small-scale speed goals. Despite the fact that the range in the terahertz range is estimated at several kilometers due to limitations in the transmitter output power and receiver sensitivity, there are a number of promising applications of transmission channels based on this frequency range.

The development of the elemental base of radio electronic devices, the widespread introduction of digital technology for the formation and processing of signals, allow the use of new approaches to the solution of many problems that previously held back the implementation of the development of telecommunication systems of sub- and terahertz ranges. The development of sub-and terahertz ranges is of considerable interest due to unique properties, in particular, regarding the implementation of malicious, environmentally safe channels with gigabit throughput. These circumstances make this range unique for the construction of telecommunication systems and networks, including personal, local and urban transport wireless networks, as well as point-to-point radio (radio relay lines).

### **Relation with scientific programs, plans, themes**

The Master's dissertation was carried out in accordance with the research plan of the Telecommunication Department of the Institute of Telecommunication Systems within the framework of state budget research work (theme №2035-II) "Development of pulsed over the broadband radio-telegraph system of the terahertz frequency range".

## **The purpose and tasks of the research**

The purpose of this master's thesis is to make sure that wireless telecommunication systems can use the terahertz range for high-quality digital TV signals.

To achieve the research goal, the following main tasks were set and solved:

1. Analysis of the current state of technology development for the creation of wireless telecommunication systems terahertz range.
2. Development of the structural scheme of the wireless telecommunication system of the terahertz range.
3. Calculation of the energy budget of the radiolino terahertz range.
4. Creation of a pilot sample of the radio frequency range of the terahertz frequency range and conducting with its experimental research the parameters of digital television..

## **Object of research**

Technologies terahertz frequency range.

## **Subject of research**

Parameters of digital television signals and their change when transmitting these signals over the tertiary ring radio line.

## **Research methods**

Methods of the theory of radio waves propagation, principles of construction of receiving and transmitting devices. Methods of forming signals of analogue and digital television. Methods of measurement of analogue television signals, simulation, analytical calculations.

## **The practical value of the results obtained**

The transmission of a signal in the THZ range using modulation with high modulation position is not higher than the QAM-64 is reliable. Using modulation higher than QAM-64 (eg QAM-256), it is necessary to take the necessary measures to reduce the noise in the transmission and receiving paths, as well as to increase the frequency of the heterodyne.

The development of the master's thesis was brought to a concrete implementation in the form of a model transceiver system of the system operating in the frequency range 130.4 GHz.

### **Implementation**

The results of the Master's dissertation are introduced into the educational process of the Institute of Telecommunication Systems, namely as a laboratory work on the discipline "Telecommunication Wireless Systems - 1".

### **Keywords**

Terahertz radiation range, digital television, wireless telecommunication, transceiver, modulation.