DEVELOPMENT OF THE FUNCTIONAL DIAGRAM OF THE DIGITAL INFORMATION RADIO SYSTEM

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Today, telecommunications are the basis for the development of society, and information resources are becoming the main national wealth. Constantly growing volumes of transmitted information, expansion of the range of services and a number of other factors set the task of continuous increase in throughput and data transfer rate in digital transmission systems. Currently, radio modems are used for this purpose, which are a radio transmission system and are designed to transmit digital data. The radio system of transmission (RSP) is understood as a set of technical means ensuring the formation of typical transmission channels, group paths and a linear path through which telecommunication signals are transmitted through the propagation of radio waves in open space.

The purpose of this work is to develop a functional radio modem scheme. All equipment of the transmission system (Fig. 1) can be divided into two parts: channel-forming and group equipment (CLC) and receiving-transmitting equipment. Channel-forming and group equipment at the transmitting end ensures the conversion of incoming Ethernet traffic into E1 streams followed by multiplexingformation of flow E3. At the receiving end, the signal is reversed (demultiplexing and E1-Ethernet conversion).

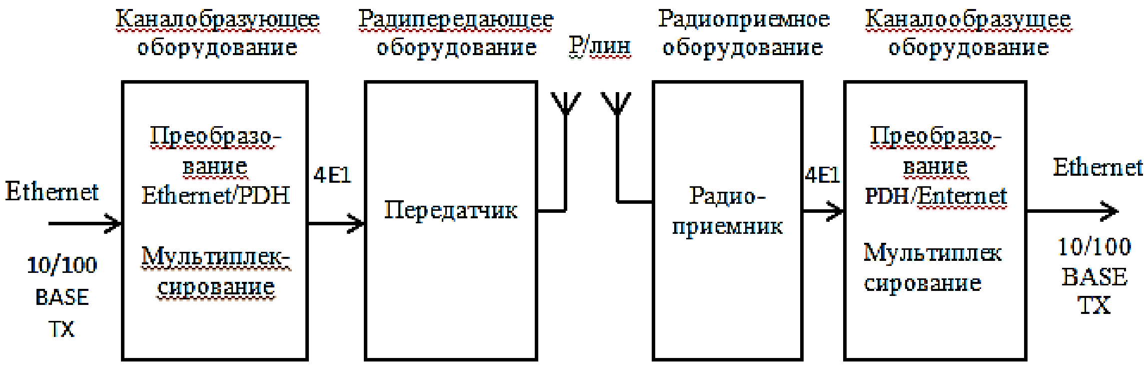

Fig.1. Transmission system block diagram

In this case, a broadband radio system is used to form a radio signal and transmit it over a distance. The radio communication system together with the propagation path of radio waves form a linear path. Radio transmission equipment consists of a transmitter and antenna-feeder device. In the terminal equipment, a high-frequency wideband signal is formed at the transmitting end. At the receiving end, reverse operations are performed: a high-frequency radio signal is demodulated and a useful signal is extracted. The direct conversion receiver directly demodulates the RF signal at the carrier frequency into the baseband (baseband signal), where the signal can be detected and the information contained in it can be recovered. At the transmitting end of the RSP, direct quadrature modulation of the unmodulated signals occurs, as a result, the signal spectrum is transferred to the specified microwave range (2.4 GHz), amplified, filtered and emitted towards the receiving station using an antenna.

In bilateral RSP for the transmission and reception of radio signals of opposite directions using a separated antenna-feeder path (Fig. 1). In the process of transmission in all parts of the FSS signals undergo certain distortions. The causes of distortion are the effects of various interferences and non-ideal characteristics of elements. Interference in the RSP itself is called in-system. These include: thermal noise arising in the radio receiver, terminal equipment, antenna-feeder path, and crosstalk arising during multichannel transmission in almost all elements of the EPR. In addition to intra-system interference, any RSP is influenced by interference from other trunks in multi-stemming systems, from other radio-electronic means (RES), radio emission from space, Earth, atmosphere, etc. Due to the imperfect characteristics of the elements of the FSS, linear and nonlinear distortions of the transmitted signals appear. Figure 2 shows the developed simplified block diagram of a transmitting terminal stage of a digital transmitter, the principle of action of which is given below. According to ITU-R Recommendation F.59b, digital radio communication systems can only be connected to other equipment at well-defined hierarchical digital speeds.

A digital stream E3 is input to the input of the in-phase and quadrature flow shaping device (coder) of the digital transmitter. As a result, the bit rate has an effective transfer rate of 34 Mbps. Next, the generated digital stream is divided into two streams, which are twice as slow as 17 Mbit / s. These streams are used to form an in-phase digital stream (I) and a quadrature digital stream (Q). Signal processing is carried out using a quadrature modulator.

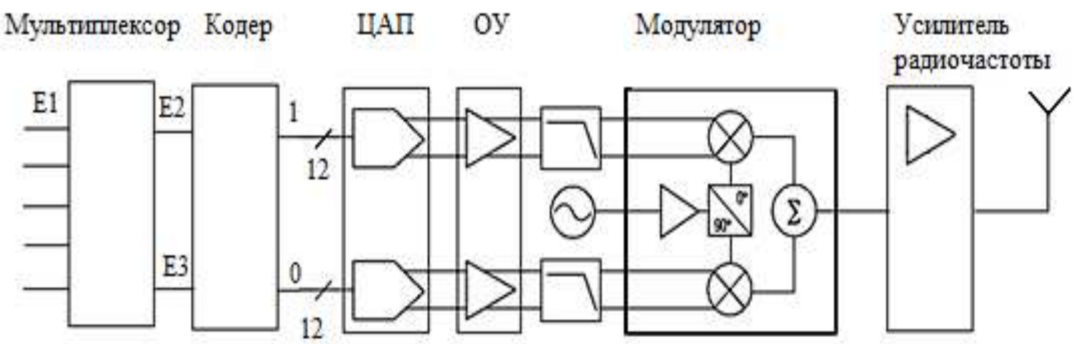

Fig.2. Block diagram of the transmitting terminal stage of the digital transmitter.

This scheme uses the MAX 2022 modulator. It is a universal device that can be used regardless of the type of modulation, but with an additional conversion of the modulating and modulated signals. Quadrature modulators are balanced-type devices that do not require filtering to isolate the total or difference component of the modulated signal. They can also be used as step-up frequency converters. The quadrature modulator and the IF to RF converter (in the transmitter), as well as the RF to IF converter and the quadrature demodulator (in the receiver) are analog. At the input of the modulator, separately in each quadrature channel I and Q, are used the DAC. In the transmitting channel, signals from a programmable logic integrated circuit (FPGA) are fed to the DAC. The carrier wave at the modulator output is high frequency.

The programmable logic integrated circuit APA300-PQ352I (Actel) performs the functions of E1 multiplexing into the E3 stream. This chip allows you to combine low-speed E1 channels into one high-performance trunk channel E3. In modern digital transceiver circuits, a digital modulator and demodulator. In this case, the input of the demodulator should be an ADC (usually with a decimator), and at the output of the modulator - a DAC (with an interpolator). With this inclusion, the ADC and DAC do not convert the LF, but a significantly higher frequency signal. As a result, the modulator and demodulator operate at higher sampling rates and, accordingly, with less noise introduced by digital conversion. The main element of the modulator and demodulator is the multiplier (mixer).

LITERATURE

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