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FUNCTIONING PRINCIPLES OF CDMA CELLULAR MOBILE COMMUNICATIONS

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ABSTRACT

This article is about a unified radio communication system that meets the needs for the exchange of information with mobile objects and creates conditions for the implementation of traffic control systems while ensuring integrated safety.

Keywords: CDMA - Code Division Multiple Access, multiple access, noise-like signals, Walsh code, access channels

INTRODUCTION

In recent years, significant progress in telecommunication technologies has been achieved due to the transition to digital modes of communication, which, in turn, are based on the rapid development of microprocessors. The system of the GSM-Rail Ways (GSM-R) standard has been introduced as such a system. The GSM-R network consists of cells located along the railway and can use the infrastructure of existing GSM networks. GSM-R technology makes it possible to transfer technological radio communications to a new powerful unified digital system platform. It provides optimal coverage of the service area, implements intelligent functions and supports a wide range of radiotelephony and data services. [1]

One of the striking examples of this is the emergence and rapid introduction of communication technology with digital noise-like signals, based on the method of code division multiple access (CDMA), in the coming years of the new century will eclipse all others, displacing analog NMT, AMPS and seriously competing with digital technologies such as GSM. CDMA is called a broadband system and the signals transmitted over the air are noise-like. Broad band - because

it occupies a wide bandwidth. Noise-like signals - because when several subscribers are working at the same frequency on the air at the same time, the signals are superimposed on each other (you can imagine noise when everyone is talking at the same time). Interference-resistant - because when a narrow band (<150 kHz) interference signal appears in a wide frequency band (1.23 MHz), the signal will be received almost undistorted. The system will recover the lost data due to error-correcting coding, see Figure 1.1, where the useful signal is shown.

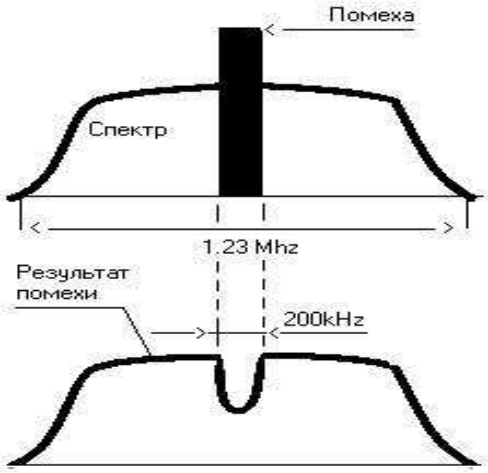

Figure 1. Signalandinterference

And in the GSM standard this will not work. Due to the fact that GSM is in itially narrowband itself. The bandwidth used is 200 kHz. [2]

The standard uses separate processing of reflected signals arriving with different delays, and their subsequent weight addition, which significantly reduces the negative influence of the multipath effect. With separate processing of beams in each reception channel, 4 correlators operating in parallel are used at the base station, and 3 correlators at the mobile station. The presence of correlators operating in parallel allows for a soft "handover" mode when switching from cell to cell.

Soft "handoff" mode occurs by controlling a mobile station with two or more base stations. The transcoder, which is part of the main equipment, evaluates the quality of signal reception from two base stations sequentially frame by frame. The process of selecting the best frame leads to the fact that the resulting signal can be generated in the process of continuous switching and subsequent "gluing" of frames received by different base stations participating in the "handover". [3]

The handshaking protocols in CDMA, as well as in the AMPS standards, are based on the use of logical channels. CDMA channels use convolutional coding at a specific rate of 1 (on channels from the base station) and 1/3 (on channels from the mobile station). The total bandwidth of the communication channel is 1.25 MHz.

In CDMA, channels for transmission from the base station are called forward (Forward), for reception by the base station - reverse (Reverse). The channel structure in CDMA in the IS-95 standard is shown in Figure 2.

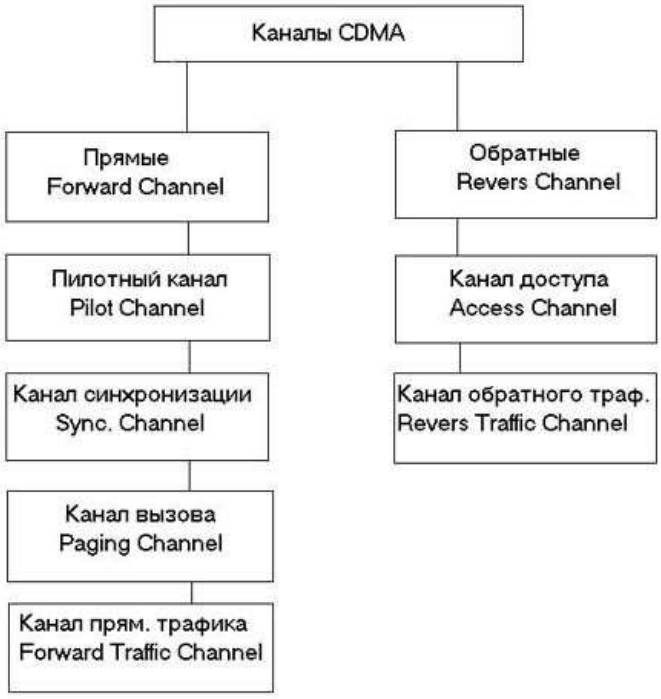

Figure 2: Channel structure in CDMA

Direct channels in CDMA:

- Pilot channel - used by the mobile station for initial synchronization with the network and monitoring the base station signals in time, frequency and phase.
- Synchronization channel - provides identification of the base station, the level of emission of the pilot signal, as well as the phase of the pseudo-random sequence of the base station. After the completion of the specified stages of synchronization, the connection establishment processes begin.
- Call Channel — Used to call a mobile station. After receiving the paging signal, the mobile station transmits an acknowledgment signal to the base station, after which the call establishment and channel assignment information is transmitted to the mobile station via the paging channel. The paging channel starts working after the mobile station has received all the system information (carrier frequency, clock frequency, clock delay).
- Direct access channel - intended for transmission of voice messages and data, as well as control information from a base station to a mobile one.

Return channels in CDMA:

- Access Channel — Allows the mobile station to communicate with the base station when the mobile station is not yet using the traffic channel. The access channel is used to establish calls and responses to messages sent on the call channel, commands and requests to register with the network. Access channels are combined (combined) by call channels.
- Reverse Traffic Channel — Provides the transmission of voice messages and control information from the mobile station to the base station.

Each logical channel is assigned its own Walsh code. There can be 64 logical channels in one physical channel. there are 64 Walsh sequences to which logical channels are assigned, each of which has a length of 64 bits. [4]

When the sign of the data message bit is changed, the phase of the used Walsh sequence is changed by 180 degrees. Since these sequences are mutually orthogonal, there is no mutual interference between transmission channels of one base station. Interference on the transmission channels of the base station is created only by neighboring base stations that operate in the same radio frequency band and use the same bandwidth, but with a different cyclic shift.

Currently, CDMA equipment is the newest and most expensive, but at the same time the most reliable and most secure.

The considered information on the principles of construction and calculation of CDMA mobile communication systems play an important role in the formation of specialists in the field of modern telecommunication technologies. [5]

LITERATURE

1. GromakovYu.A. Standards and systems of mobile radio communication // Technologies of electronic communications. Volume 67.M .: Eco-Trends, 2006, 239 p.
2. Gonorovsky IS Radio engineering circuits and signals.-4th ed.-M .: Radio and communication, 2001.
3. Rameau S, Winnery J. Fields and waves in modern radio engineering, trans. from English - 2nd ed. M. - L. 1998
4. Knyazev AD, Petrov BV, Kechiev LN et al. Design of radio-electronic and electronic-computing equipment taking into account electromagnetic compatibility.-M .: Radio and communication, 2001.
5. 5.Kartashevsky V.G. Mobile communication networks / V.G. Kartashevsky, S.N. Semenov, T.V. Firstov. - M .: Eco-Trends, 2001.