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Research Article

USE OF RADIO RELAY DEVICES IN TELECOMMUNICATION SYSTEMS

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ABSTRACT

In this article, devices of digital radio relay lines, their classification, optimal options of RRL for use in modern telecommunication systems are considered. Theoretical research was conducted on the proposed options and the author's conclusions were given.

KEYWORDS

Radio relay lines, PDH, SDH, synchronous transport module - STM, frequency range, rain intensity, signal fading.

INTRODUCTION

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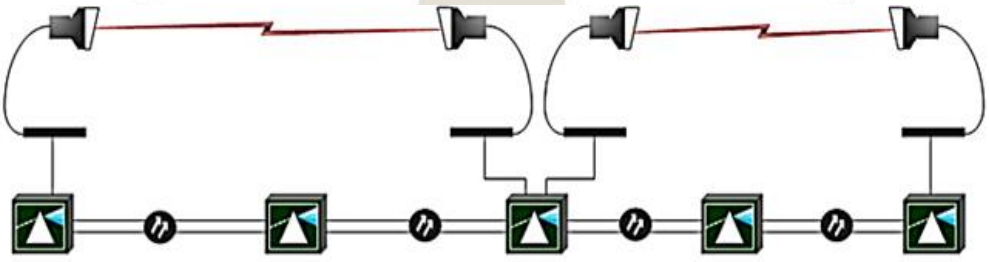
Radio relay communication is a special type of wireless communication that allows data transmission over long distances (tens and hundreds of kilometers), with high throughput (from hundreds of megabits to several gigabits). The reception and transmission of information are separated by different frequencies and occur at the same time. All of RRS operate in full duplex mode. The main purpose of digital radio relay communication lines is to create transport infrastructure in inter-zone, intra-zone and local networks for communication operators, to build technological communication lines, to connect high-speed LAN networks and to reserve optical fiber communication lines [1-5].

THE MAIN PART

RRL to back up fiber optic lines or connect fiber optic loop systems. Multiple radio backbones are established to provide high-throughput and fault-tolerant data transmission. In cases where it is not possible to lay optical fiber lines, communication operators use radio relay stations to create long-distance wireless trunk lines with several transit points to connect their regional networks (Fig. 1.a).

Linear distributed structure (oil pipelines, gas pipelines, railways, power supply systems), which have their own information structures, are located along the lines of communication cable production facilities, due to their geographical location, cannot always create information fault-tolerant ring structures [6-9]. In this case, the installation of radio relay communication lines in information centers allows to ensure reliable and problem-free operation of the production process of the enterprise (Fig.1.b).

Cellular contact operators transport infrastructure to build for digital radio relay from stations active is using. Own of the network wireless from the channels use cellular contact to the operators stationary contact of operator's lines for rent not get and operational expenses significant level reduce enable gives. A few in directions radio communication which provides radio relay mutually activity from the connectors use and digital RRS by dynamic routing protocols support technical minimal employee involvement with by itself recoverable wireless information transmission environment to create possibility gives (Figure 1.c).



a)

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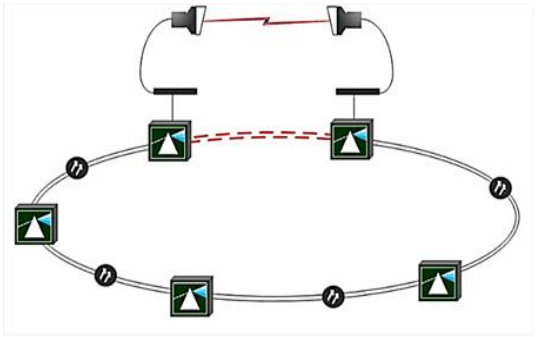

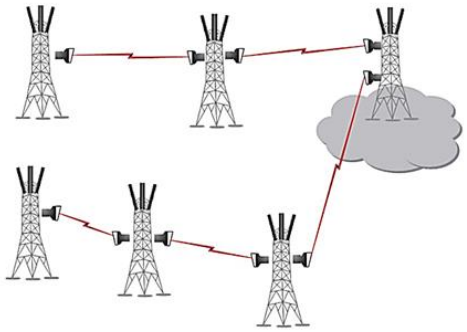

b) c)

Figure 1. Application of radio relay devices: a) linear distributed systems; b) communication operator network; c) mobile communication network.

Radio relay of the line optical to fiber relatively main advantages the following:

- Optical fibrous highway laying down possible was not or economic in terms of to the goal according to didn't happen difficult geographical in conditions (mountains, gorges, swamps, forests and others) to build RRS opportunity;
- Construction speed literally one how many day;
- RRS to work drop off for only initial, final and intermediate at points stations installation need a cable of the route whole length across laying down a must not;
- 0f the cable damage or theft danger not;
- Low cost wireless route.

Radio relay line (RRL) optic to fiber relatively main disadvantage really high to conductivity to reach possible is not. Wireless acceptance to do possible was maximum speed up to 10 Gbit/s, optical through a fiber backbone speed in terabits is measured [10-14].

Distribution of RRL for use possible was _ frequency range very wide - from 400 MHz to 94 GHz. In practice radio relay stations often 5, 7, 8, 11, 13, 18 GHz and high it works at frequencies (70-80 GHz). Frequency flow big that it was because of, to them of connection features serious difference does.

Main laws separate to show can:

- Frequency How tall in the atmosphere of the signal weakening so much a lot will be (dB/km). That's right, addiction linear not - 60 gigahertz in Fig. 2.a in the range attenuation index sharp respectively from the scale out to leave, then while decreasing, gradually grow up to go to see can Accordingly, the frequency how tall, If so, contact range so much short will be. If 5 GHz, 7 GHz radio relay lines 40-50 km or from him many p if, then at 70-80 gigahertz - up to 10 km and 60 GHz in frequency - the highest weakening because of even less. _
- Frequency How tall if, in the range (56 MHz, 112 MHz or from him many) wide frequency

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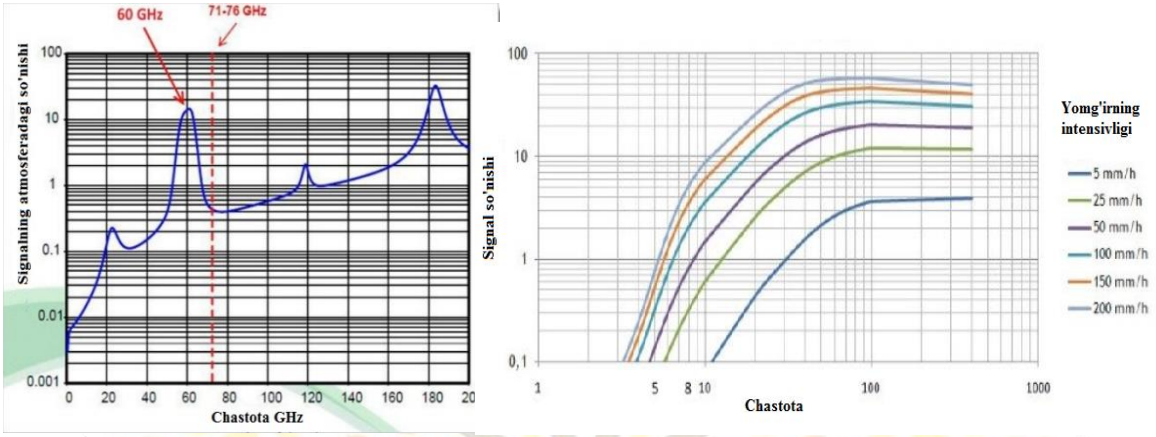
from channels use because of radio relay on the line to conductivity reach can Now called V-Band and E-Band bands - 60 GHz and 70-80 GHz - active respectively is being absorbed. Here radio relay of the line speed up to 10 Gbit/s possible.



a) b)

Figure 2. Signal attenuation in radio relay lines: a) frequency dependence of signal attenuation in the atmosphere; b) fading of the signal due to rain.

Now being used all RRLs two main type divided into:

- PDH (plesichron digital hierarchy) transfer technology used without;
- SDH (synchronous digital hierarchy) transfer technology used without.

PDH technology used without radio relay through information transmission actually 4 types in streams happen will be (Table 1).

Table 1.

Flow name	Formation	Speed
E1	32 data channels (64 kbit /s each) are aggregated into one E1 stream, which is the main PDH stream.	2 Mbps _
E2	4 streams of E1 multiplexing (combining).	8 Mbps _
E3	4 streams of E2 multiplexing (combining).	34 Mbps _
E4	4 streams of E3 multiplexing (combining).	139 Mbps _

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Theoretical in terms of, there is also an E5 stream, the speed of which is 565 Mbit / s, but in practice, the G.702 standard recommendations according to, it is not used. That's why for, 139 Mbit/s, in fact, this radio relay of technology maximum transfer is the ability. Of this surprising place no, PDH now outdated technology is, although using it work issued very a lot working RRLs there is even though [15-18].

SDH or Synchronous digital hierarchy - this new technology it is the most current transmission speed provides. SDH technology with radio relay of the equipment speed about speaking, synchronous transport module - STM concept applied. Speed streams STM-1 main stream 4, 16, 64, 256 and to others increase through harvest will be (Table 2).

Table 2.

Designation	Network bandwidth
STM-1	155 Mbps _
STM-4	622 Mbps _
STM-16	2.5 Gbit /s
STM-64	10 Gbit / s
STM-256	40 Gbit /s
STM-1024	160 Gbit / s

With that together, SDH equipment for PDH intended radio relay stations with complete suitable will come

CONCLUSION

Basically, equipment is used and manufactured for direct line-of-sight radio relay communication - the stations must be located within the so-called radio line of sight of each other. Basically, equipment is used and manufactured for direct line-of-sight radio relay communication - the stations must be located within the so-called radio line of sight of each other.

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