

# RESEARCHING OF THE METHODS OF ILLEGAL ACCESS AND OFFERING THE METHOD OF PROTECTION OF THE INFORMATION SIGNAL AGAINST ILLEGAL ACCESS IN THE FIBER-OPTIC COMMUNICATION LINE

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**Abstract** — In this article, modern methods and means of illegal access to information in fiber-optical communication systems are investigated. Also, it is considered their working principles. As a result of research and analysis of data, a new method was proposed that is necessary for the protection of information in fiber-optic communication systems.

**Index Terms**— Optical networks, illegal access to information, confidentiality of illegal access to information.

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## 1 INTRODUCTION

On the basis of the carried-out analyses of the existing methods and means of ensuring of information security in the fiber-optic communication line counteraction methods to the modern technical means of unauthorized information retrieval in FOCS are offered.

The information security method from illegal access in fiber lines of communication is created and it can be used in fiber transmission systems of confidential information[1].

The method of protection of an information signal against illegal access in a communication fiber line realized in the device for detection of connection to a communication fiber line, consisting in detection of connection to a communication fiber line by formation of the transmitted information signals restricted on the power level, their input in a fiber line of communication, transmission on a fiber line of communication, reception on other end of a fiber line of communication, measurement of levels of the accepted signals, detection of connection to a fiber line of communication and formation of an alarm bell is known. A lack of this method is the high probability of false alarm caused by low accuracy of monitoring of attenuation of information signals in a fiber line of communication and instability of their average level.

The method of protection of an information signal

against illegal access in a communication fiber line consisting in detection of connection to a communication fiber line by formation of the information and control optical signals restricted on the power level, their input in a fiber line of communication, reception of the specified signals, separation of a control signal and comparing of level of its power with the power level of a reference signal, detection of connection to a fiber line of communication and formation of a signal of transmission control of information is known. Lack of this method is the low performance of information security from illegal access in a communication fiber line as there is a possibility of unauthorized connection to a fiber line of communication and an output from it the transmitted information and control optical signals in case of high reserve of interception, especially when the method optical information retrieval tunneling is applied[2].

The most close to offered on set of signs is the method of protection of an information signal against illegal access in a communication fiber line which is in what on the transmitting end of a fiber line of communication is created by the original information signal and the masking sync create the normalized inverse masking sync with opposite characters synchronized with the masking sync create the transmitted information

signal by multiplication of the original information signal and the normalized inverse masking sync with opposite characters, create a summed signal by mixing masking a sync and transmitted an information signal, create by modulation by a summed signal subject to transmission of optical radiation and enter into a communication fiber line, and on the receiving side of a fiber line of communication bring out of it the accepted optical radiation, define the mean power level of the accepted optical radiation, select the masking sync from the accepted optical radiation by its demodulation and filtering, create the inverse masking sync synchronized with the selected masking sync, modulate inverse masking a sync additional auxiliary optical radiation, set the mean power level modulated additional auxiliary optical radiation equal to the mean power level accepted optical radiation, creates resulting optical radiation by mixing, accepted optical radiation and modulated the additional auxiliary optical radiation then select an information signal from resultant optical radiation by its demodulation and filtering.

Lack of the known method is low efficiency information from illegal access are sewn up in couple connections to the fiber-optic communication line with the similar receiving device[3].

### THEORITICAL FRAMEWORK

For elimination of the specified shortcoming it is necessary to use a noise signal with the accidental nature of change which an opportunity to select from a summed signal an information signal from - for absence of an inverse noise signal in a communication fiber line.

The goal is achieved by the fact that in the known method of protection of an information signal against illegal access in a communication fiber line which is that on the transmitting end of a fiber line of communication create an information signal, create a summed signal by mixing of a noise and information signal, create by modulation by a summed signal of the optical radiation which is subject to transmission and enter into a communication fiber line, and on the receiving side of a fiber line of communication bring out of

it the accepted optical radiation, create a summed signal from which select an information signal of the accepted optical radiation the following operations are entered: before formation of a summed signal on the receiving side create the original and inverse noise signal, modulate the original noise signal of optical radiation and enter into a communication fiber line, and on the transmitting end of a fiber line of communication bring out of it the accepted optical radiation, create a noise signal which is subject to offset of an information signal of the accepted optical radiation, and separation of an information signal on the receiving side makes by mixing of the detainee of an inverse noise signal to a summed signal and delay period of an inverse noise signal is defined by expression  $t_{\text{delay}} = 2L/v$  where: L-length of an optical fiber; v-speed of optical radiation in an optical fiber.

On figure.1. It is shown the flowchart of one of possible versions of the device realizing the offered method of protection of an information signal against illegal access in a communication fiber line. The device realizing the offered method of protection of an information signal against illegal access in a communication fiber line contains: on the transmitting end 1 generators 2 of an information signal, the adder 3, a source 4 transferred optical radiation, the photo detector 5 of a noise signal, the directional coupler 6 with inputs 6-2 and an output 6-1, a fiber line 7 communications, on receiving to the 8th side the directional 9th coupler with inputs 9-1 and an output 9-2, the photo detector 10 of a summed signal, the adder 11, lines of a time delay 12, the generator 13 of an inverse noise signal, a source of the 14th noise optical radiation and generator 15 a noise signal.

In case of implementation of the offered method of protection of an information signal against illegal access in a fiber line of communication execute the following operations[4]:

- on the receiving side of the 8th fiber line 7 communications:

- 1) create a noise signal by means of the generator 15,
- 2) create an inverse noise signal by means of the inverter 13,

- 3) by means of the line of a time delay 12 make time delays of an inverse noise signal for a while,
- 4) modulate a noise signal the transferred noise optical radiation in a source of the 14th optical radiation,
- 5) Enter through an input of 9-1 directional coupler 9, into a fiber line 7 communications the transferred noise optical radiation.

- on the transmitting end of 1 fiber line 7 communications:

- 1) create the transmitted information signal by means of the generator 2,
- 2) bring through an output of 6-1 directional coupler 6, out of a fiber line 7 communications of the accepted noise optical radiation,
- 3) by means of the photo detector 5 create a noise signal of the accepted noise optical radiation,
- 4) create a summed signal by mixing by means of the adder 3 of information and noise signal,
- 5) modulate a summed signal the transferred optical radiation in a source 4 transferred optical radiation,
- 6) Enter through input 6-2 directional couplers 6, into a fiber line 7 communications the transferred optical radiation.

- on the receiving side of the 8th fiber line 7 communications:

- 1) remove through an output 9-2 directional couplers 9 of a fiber line 7 communications the accepted optical radiation,
- 2) by means of the photo detector 10 create a summed signal of the accepted optical radiation,
- 3) the delayed inverse noise signal select with the adder 11 by offset to a summed signal an information signal When using of the offered method of protection of an information signal against illegal access in a communication fiber line in which before formation of a summed signal on the receiving side the noise signal which is transmitted to the transmitting end of a fiber

line of communication for mixing to an information signal is created.

On the receiving side in the course of offset to a summed signal the delayed inverse noise signal occurs complete phase coincidence of noise and its inverse signal. As a result of which the noise signal is completely compensated, are selected an information signal and information security in a communication fiber line from illegal access is provided.

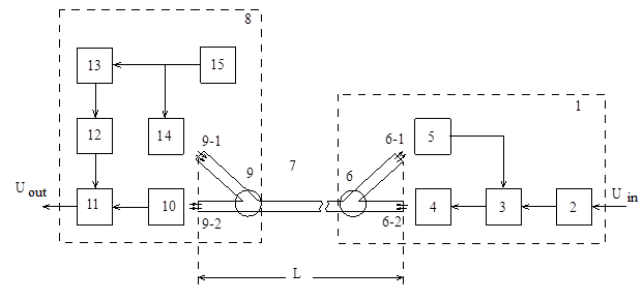


Figure.1. Flowchart of the offered device

Method of protection of an information signal from unapproved access to the fiber-optical communication line, consisting that on the transferring party of the fiber-optical communication line form an information signal, form a total signal by mixing of a noise and information signal.

**CONCLUSION**

1. Analyzed all possible unauthorized access to fiber optic lines, considered destructive methods for the removal of information, non-destructive methods for the removal of information, optical-radio wave methods.
2. Analysis and methods of protection against unauthorized access to fiber optic links.
3. An optoelectronic method of counteraction to modern technical means of unauthorized information retrieval in fiber-optic communication systems has been developed.
4. A block diagram of the implemented optoelectronic method of counteraction to modern technical means of unauthorized removal of information in FOCL has been developed.

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