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# INCREASING THE SPECTRAL EFFECTIVENESS OF FIBER OPTICAL CHANNELS

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**Анотація**

Досліджено вплив хроматичної дисперсії на підносійні канали та виникнення нелінійності при прямому фотодетектуванні оптичного багатоканального сигналу.

**Ключові слова:** телекомунікаційна система передачі, OFDM-сигнал, хроматична дисперсія, інтерференційний шум, завадостійке кодування, волоконно-оптичний лінійний тракт.

**Abstract**

The effect of chromatic dispersion on subcarriers and emerging nonlinearities in direct photodetection of optical multichannel signal is investigated.

**Keywords:** telecommunication transmission system, OFDM signal, chromatic dispersion, interference noise, noise-coding, fiber-optic linear path.

## Introduction

The bandwidth of the OFDM signal in the frequency domain is limited from above by the bandwidth of the optical modulators, as well as by the variance distortion of the signal as it propagates through the fiber. To minimize the effect of the optical fiber dispersion on the signals, it is possible to apply compensation schemes in the optical path or pre-compensation on the transmission side, which will increase the system capacity by increasing the number of subcarriers in the RF OFDM signal area.

The lower frequency of the OFDM signal is associated with the occurrence of beating noise between the carrier signals. The use of different modulation formats in OFDM signal carrier channels repeatedly increases the speed of signal transmission in telecommunication transmission systems.

The purpose of the study is to study the fiber-optic path of the access network with the frequency distribution of channels in linear mode.

## Research results

For efficient use of the frequency band of the optical path, it is necessary to use noise-free encoding in BPSK, ASK, QPSK format subcarriers. In the case where the OFDM signal carrier channels have a QAM modulation format, then a protective band between the optical carrier and the OFDM signal should be provided due to the low noise immunity of the beats. Reducing the frequency spacing between subcarriers leads to a reduction in noise.

When using single-band signals, the frequency band is limited from below by the noise of the beating, and from above by chromatic dispersion. In practice, it is difficult to estimate the deterioration of subcarrier channel quality because of the complexity of signal distribution and interference noise. The proposed technique allows both predictive degradation of signals and reasonable use of certain types of coding to achieve the required quality indicators. The use of warning coding methods increases the OFDM signal bandwidth by halving the bandwidth.

## Conclusions

An undeniable advantage of this method of beating noise compensation is the ease of implementation. It should be noted that in the technical implementation of such a scheme it is necessary to provide high precision of manufacturing symmetrical branches of the receiver, using the same photodetectors. Although existing PD have certain regulatory errors, which may cause the PD output to have a residual carrier frequency and perform a partial rather than full compensation for the beating noise, signal quality indicators will improve. At the present level of production of photodetector modules, it is possible to minimize these errors.

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