APPLICATION OF OPTICAL LASER SYSTEMS IN DIFFERENT AREAS AND PROSPECTS OF THEIR FURTHER DEVELOPMENT

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The appearance of lasers has directly influenced and continues to influence various areas of science and technology, lasers being used to address specific scientific and technical problems. The conducted studies have confirmed the possibility of the significant improvement in many optical devices and systems and led to the creation of innovative devices (brightness amplifiers, quantum hygrometer, high-speed optical circuits, etc.). New scientific and technical areas, like holography, nonlinear and integrated optics, laser technology, laser chemistry have sprung into existence, as well as the use of lasers for the controlled nuclear fusion and other energy problems.

The high mono-chromaticity and the coherence of the laser radiation provide successful application of lasers in spectroscopy, initiating chemical reactions to separate the isotopes in the systems measuring linear and angular velocities in all applications based on the use of the interference in communication systems and holography.

To implement the bi-signal (simultaneous) transmission in the optical data transmission lines, the parallel signal generation of two lasers in different optical bands is required, for example, in red and green spectrum. The conducted research and the development of differential bi-signal methods of the optical signals manipulation in open channels indicate that opportunities to optimize the system performance and increase the transmission distance of optical signals under the atmospheric noise can be realized based on the bi-signal lines, using modern methods of digital signal processing by improving the energy signal box. The exponential characteristic of the attenuation of the optical signals in the atmosphere increases significantly the maximum distance transmission with a slight improvement of the signal / noise ratio at the receiver output.

The most important feature of the wireless optical communication is the high degree of the protection against the unauthorized access channel. An unauthorized interception is impeded, because it requires an accurate beam focus and the application of the unique method of encoding information pulses for each model. To detect the access attempts, a number of measures based on different principles are developed, such as: the reference of the wave front, the analysis of the received signal changes, etc., which further enhances the security of the communication channel.

The conducted research studies and the development of differential bi-signal methods of the optical signals manipulation in the open channels indicate that opportunities to optimize the system performance and increase the transmission distance of optical signals under the atmospheric noise can be realized based on the bi-signal lines, using modern methods of digital signal processing by improving the energy signal box. The exponential characteristic of the attenuation of optical signals in the atmosphere increases significantly the maximum distance transmission with a slight improvement of the signal / noise ratio at the receiver output.

Keywords – laser, wireless systems, optical transmitter, optical channel.