

## ABSTRACTS

*Ivanov V. G., Kamenev A. A.* **Capabilities of opto-electronic means with matrix photodetectors based on InGaAs for observations of ground objects at night conditions.** PP. 3–10. On the basis of data on the parameters of optical-electronic means (OEM ) with a matrix Focal Plane Arrays photodetector's (FPA's) based on InGaAs, their capabilities for observing ground-based objects in the near infrared (NIR) range under natural night lighting conditions have been estimated. It is shown that on a moonless night, the signal-to-noise ratio at the output of such FPA's with a sensitivity in the region of  $0,9...1,7 \mu$  can reach 10, which ensures the registration of ground objects with an optical contrast threshold of 0.5% on the observed scene. **Keywords:** infrared range, contrast, matrix photodetector, observation, night vision device

*Ivanov V. G., Kamenev A.A., Lapovok Y.V.* **A technique for evaluating the brightness of the instrumental background of space telescopes to determine the thermal state of infrared array photodetectors and the requirements for removing thermal power from the optical system.** PP. 11–19. A technique has been developed for evaluating the brightness of the useful and background (instrumental) signals recorded by highly sensitive infrared matrix photodetectors of space telescopes when observing ground-based scenes. The use of this technique makes it possible to estimate the signal-to-noise ratio at the output of such photodetectors and the area of the radiation panels of LEO spacecraft required to obtain contrast images of scenes to remove the power of the apparatus background of the optical system. **Keywords:** instrumental background, Earth radiation, infrared range, space telescope, matrix photodetector, ground scene, thermal regime.

*Nacharov D. V.* **Incorrectly exposed image quality improvement.** Pp. The method of incorrectly exposed image quality improvement by means of power-law intensity transformations is presented. Image classification algorithm and analytical expressions for the choice of quantitative parameters

of the power-law transformation functions are given. **Keywords:** dynamic range, exposition, histogram, sub range, power-law intensity transformation

*Makarov S. B., Zavjalov S. V., Ovsyannikova A. S.* **Spectral and energy efficiency of optimal APM signals with extended signal constellations. Pp. 30–42.** The possibility of increasing the spectral efficiency of single-frequency M-ary signals with extended sizes of the signal constellation while ensuring minimal energy losses by using optimal envelope shapes obtained in the course of solving the optimization problem is considered. An analytical solution is given to the problem of optimizing the shape of signals in accordance with the criterion for minimizing the level of out-of-band signals. The numerical solutions of the optimization problem are shown and the time and spectral characteristics of the obtained optimal signals are given. Estimates of the approximation to the Shannon boundaries of the values of the spectral and energy efficiency are given for the case of optimal signals. It is shown that estimates of the spectral and energy efficiency and their comparison with the Shannon boundary depend significantly on the definition of the occupied frequency band and on the chosen criterion for optimizing the signal shape. It is concluded that with an increase in the size of the signal constellation from 4 to 256, the spectral efficiency of optimal signals begins to exceed the spectral efficiency of signals based on RRC pulses by a factor of 7. **The Keywords:** spectral efficiency, energy efficiency, APM, signal constellation.

*Kulikov G. V., Dang Xuan Khang.* **Noise immunity of reception of signal with amplitude-phase shift keying in a two-path communication channel. PP. 43-49.** Statistical radio engineering methods have been used to analyze the noise immunity of receiving 16-APSK and 32-APSK signals in a two-path communication channel, when there is interference in the form of a reflected beam at the receiver input along with a direct beam signal. The dependences of the bit error probability on the time delay, the intensity of such interference and the signal-to-noise ratio in the radio channel are obtained. It is shown that interference of even low intensity can cause energy losses of several decibels, and that systems using modulation with a ring structure of the signal constellation are less resistant to interference in the form of a reflected beam than with a square structure, especially with large positional signals. **Keywords:** amplitude-phase shift keying, two-path communication channel, bit error probability, noise immunity

*Suslin V. A., Suslin A. V., Dvornikov S. V.* **Doppler effect in the channels of communication systems of the space segment. PP.** The article considers the conditions for communication between spacecraft.

The negative consequences of the Doppler effect on the maximum permissible speeds of spacecraft in the Earth's orbit are estimated. Graphical dependences of the frequency change on their mutual position are obtained. Proposals for processing broadband signals under the conditions of emerging time delays are formulated. An approach to estimating the mutual time delay of signals with a Doppler shift based on uncertainty functions is presented. **Keywords:** allowance for the Doppler effect, allowance for signal time delays, uncertainty function, optimization algorithms

*Dvornikov A. S., Gudkov M. A., Chudakov A. M., Dvornikov S. S., Rusin A. A., Gel V. E., Dvornikov S. V., Ustinov A. A.* **Method for evaluation of radio communication system functioning stability. PP. 57–63.** The article considers a method for evaluating the effectiveness of opposing radio systems in the course of an electronic conflict, depending on their energy potentials. On the basis of the apparatus of a homogeneous Markov chain, the resulting equations are obtained, which characterize the efficiency of the functioning of each of the considered systems. The results of analytical modeling are presented, which make it possible to assess the potential capabilities of the warring parties. **Keywords:** stability of radio links, energy potential of the system, homogeneous Markov chain, unconditional state probabilities.

*Ayukov B. A., Dvornikov S. V., Kryachko A. F.* **Suggestions for calculation of the load of trunking networks. PP. 64–70.** The article presents a scientific and methodological apparatus for calculating the need for channels in trunking networks to ensure a given network availability factor. A network state model is proposed, which is described by a system of linear differential equations in terms of the theory of continuous Markov chains. The potential load of the trunking network built on the equipment of the DMR standard is estimated. Graphs of the dependence of the average number of occupied channels on the number of subscribers and the dispersion of the network state on the probability of loading are presented. Proposals for the practical application of the developed proposals are formulated. **Keywords:** network load estimation, system state model, continuous Markov chains, estimation of the required number of channels in the network

*Kryachko M. A.* **Proposals to increase the spectral efficiency of signals of mobile radio communication systems. PP. 71–78.** The article presents the results of improving the spectral efficiency of  $\pi/4$  DQPSK signals due to their additional smoothing by means of Gaussian filters. The mechanism of signal smoothing due to additional filtering is considered. Justified quantitative indicators and substantiated the structure of the

modulator. Proposals are formulated for the practical application of the results obtained in the interests of increasing the efficiency of mobile radio communication systems. **Keywords:** Gaussian filter, spectral efficiency of signals, reduction of out-of-band emissions

*Yachmenev A. V.* **Evaluation of the efficiency of the hybrid method of passive location. PP. 79–83.** The article considers an approach to evaluating the effectiveness of the hybrid method of passive location from the standpoint of a queuing system with failures. An analytical expression is proposed for calculating the probability of servicing incoming requests with coordinate information from the standpoint of using an ultrashort-wave channel with a bandwidth of 16 kbit/s. The efficiency of the service system is calculated in terms of the allowable number of applications transmitted through independent channels. Suggestions for the practical application of the results are formulated. **Keywords:** passive location, throughput, probability of timely service, system efficiency

*Tsytsulin A. K., Bobrovskiy A. I.* **To the centenary of the dominant principle. PP. 84–93.** The main provisions of the dominant principle of A. A. Ukhtomsky and its development in the form of the dominant information principle, which determines the key operations at birth, transmission and processing of information, are considered. The role of a new paradigm based on these principles in providing a conditional maximum of information quality in the synthesis of video information systems is shown. **Keywords:** dominant information, background information, noise information, information quality, information theory paradigm, optimization

94–100.

*Sagdullaevich Yu. S.* **A man with an open soul, a great worker of science, soviet and russian scientist. In memory of Mark Iosifovich Krivosheev. PP.** A story about the life and achievements of Professor Krivosheev.