ABSTRACTS

Tsytsulin A. K, Baranov P. S., Zimin V. A., Mantsvetov A. A., Siryy R. S. **Integral sensitivity of solid-state image sensors. PP. 3–14**. Expressions are obtained for the integral sensitivity of area CCD and CMOS sensors under different input conditions. The cases when the energy illumination or photometric illumination in lux is set, either on the image sensor or on the object, are considered; expressions are obtained for the case of a given exposure. The resulting expressions allow us to calculate the value of the output signal of the image sensor for any initial source data. **Keywords**: solid-state image sensor, integral sensitivity, illumination, energy illumination, exposure

Ivanov V. G., Kamenev A. A. **Justification of the perspectivity of using Focal Plane Arrays with a quantum mechanism of action in thermal imaging cameras for observing highly dynamic scenes. PP. 15–24**. The factors limiting the threshold sensitivity of the created matrix photodetector arrays (MPAs) based on microbolometers in thermal imaging cameras, which must be increased tenfold to ensure the possibility of detecting and recognizing subtle or low-contrast objects of interest under conditions of high dynamics of changes in the characteristics of the observed scene have been identified. It is shown that the insufficiently high threshold sensitivity of uncooled MPAs of this class with a thermal mechanism of action does not allow realizing a high frame rate of a thermal imaging camera. To achieve a high frame rate along with high sensitivity of thermal imaging cameras, it is advisable to use cooled MPAs with a quantum mechanism of action. **Keywords**: infrared range, quantum photodetector, microbolometer, surveillance, object of interest, threshold sensitivity, thermal imaging camera, thermal mechanism.

Korolev V. O., Logunov S. V., Chernogubov A. V., Gel V. E., Fattakhov R. R. **Method for recognizing types of artificial Earth satellites based on data from radio engineering complexes and radar stations**. **PP. 25–36**. A technique for recognizing the types of artificial Earth satellites based on data obtained during radio engineering and radar monitoring of near-earth space is described. **Keywords**: radio engineering complex, radar station, artificial Earth satellite

Chernogubov A. V., Denisov A. V., Kurnikov A. S. **Detection and identifycation of artificial space objects by means of television laser location. Pp. 37–43.** The principle of operation of a television laser locator is considered. An algorithm for detecting and identifying artificial objects in space is presented. A project of a television laser locator device for remote measurement of the distance to the object of observation is proposed. **Keywords**: opto-electronic equipment, television laser locator, space debris

Chernogubov A. V., Logunov S. V., Denisov A. V., Kapitonov D. A. **Estimation of linear resolution on the ground for remote sensing systems from space. Pp. 44–49.** The process of processing the view information of the Earth's subsurface from space obtained from optoelectronic remote sensing systems operating in the visible and near-infrared ranges of the spectrum (0,4...2,5 microns) is considered. A method for calculating the linear resolution on the terrain is proposed. A test object is introduced to evaluate the quality of the received images. **Keywords**: linear resolution on the ground, remote sensing of the Earth, optical-electronic complex, the underlying surface of the Earth.

Kamenev A. A., Tonyshev A. Y. **Methodic for calculating optical contrasts between the underlying surfaces of the ground scene in the visible and near-infrared range. PP. 50–58**. A technique has been developed for evaluating optical contrasts between typical underlying surfaces of a ground scene, based on the procedure of convolution of the spectral energy characteristics of the solar radiation flux incident on the underlying surfaces with their spectral brightness coefficients. It is shown, that in low light conditions (at sun angles less than 10 deg.) optical contrasts between typical underlying surfaces in narrower spectral ranges exceed the contrasts in the visible range (0,4...0,8 μm) and increase in the near-infrared range. **Keywords:** visible range, near-infrared range, spectral brightness coefficient, optoelectronic means, underlying surface, spectral density of irradiance of the surface

Poljakov V. V., Dashkin E. R. **Adaptive detection of small man-made space objects by ground-based passive optical-electronic systems. PP. 59–68**. A method for adaptive detection of small man-made space objects in the form of «space debris» by ground-based passive optical-electronic systems under conditions of a priori uncertainty of statistical characteristics of detected signals and non-stationary interference background is proposed. It is proposed to obtain numerical characteristics of distributions of detected signals using the median filtering method and the method of excluding sharply changing observations from processing. **Keywords:** near-earth space, small man-made objects, «space debris», optical-electronic system, adaptive signal detection, signal filtering

Flerov A. N., Flerova A. A. **The calculation of system settings, auto sync signals of the phased array sub-nanosecond range. PP. 69–77**. The system of automatic pulse synchronization (SAS), which is part of the antenna modules of the phased array of the sub-nanosecond range, is considered. A method is proposed for calculating the SAS parameters for the spread and temperature instability of signal propagation delays in the lattice channels exceeding the duration of radiation pulses. **Keywords:** pulse phased array, ultra short pulse, time spatial synchronization, automatic time synchronization system, parameter optimization

Dvornikov S. V., Ustinov A. A., Pshenichnikov A. V., Pogorelov A. A., Litkevich G. Y., Manaenko S. S., Dvornikov S. S., Vlasenko V. I., Yakushenko S. A., Bortniker V. Y., Gladkiy N. A., Markov E. V., Adnan M. E. **Rationale for an optimum receiver for signals with a continuous phase**. **PP. 78–90**. The article presents the results of a theoretical study of the optimal reception of a class of signals with a continuous phase. Analytical expressions are given that determine their properties, the structure of a coherent receiver is substantiated. Indicators for assessing its effectiveness have been developed. The simulation results are presented. Directions for further research are formulated. **Keywords:** signals with continuous phase, optimal receiver, Bayesian decision criterion, bit error probability.

Dvornikov S. S., Dvornikov S. V., Kryachko A. F. **Analytical model for estimating the immunity of switching modulation signals in vote frequency channels. PP. 91–98**. The article presents an empirical approach to the derivation of a formula for calculating the noise immunity of permutation modulation signals manipulated with a constant weight code under conditions of Gaussian noise with their incoherent processing. The choice of the international telegraph code with a weight equal to three as a manipulating one is substantiated. The results of a comparative assessment of the results obtained in relation to the known ones are given. The directions of further research are determined. **Keywords**: permutation modulation, constant weight code manipulation, noise immunity, symbol error probability, incoherent signal processing.

Kryachko M. A., Markov E. V., Gladkiy N. A., Kryachko A. F. Dvornikov S. V. **Analysis of the spectral efficiency of multichannel rts signals. PP. 99–107**. The results of the study of the possibilities of increasing the efficiency of using the frequency resource in multichannel radio engineering systems are presented. The results of the analysis of the use of frequency channels in mobile radio communication systems of various standards are presented. The results of a comparative assessment of the rate of decay of the energy spectrum level for phase shift keying and manipulation signals with a minimum shift are presented. Directions for further research are substantiated. **Keywords:** widening the frequency band, spectrally effective signals, Gaussian low-pass filter, methods of multiplexing subscriber channels.

Vysozkiy D. V., Ulyanov G. N., Cherenok N. G. **Improving the data transfer rate in wired telephone channels with the preservation of potentially possible noise immunity. PP. 108–118**. A new approach to data transmission based on polynomial carriers described by Chebyshev polynomials of the first kind without a weight function is extended to wire communication systems that use widely used telephone lines. A new method of data transmission over a standard telephone channel is described, which allows, while maintaining the noise immunity of the relative phase manipulation method, to provide a four-fold increase in the transmission speed. **Keywords:** polynomial carriers, the Chebyshev polynomials, the standard telephone channel, basis function, polynomial symbol, and the FFT algorithm.

Kamenev A. A., Lapovok Y. V., Ponomarev S. A. **Temperature assessment techniqueand the forces of the inherent heat radiation of the external surfaces of the ground stationary object taking in to account the factors of the external environment. PP. 119–128**. An analytical technique has been developed for assessing the temperature and strength of the intrinsic thermal radiation of the external surfaces of structural elements of ground stationary objects. Test dependences of these characteristics were obtained for a typical element (roof) of a stationary ground object (building) at a fixed air temperature inside it on changes in the parameters of external conditions (incident solar radiation flux, air temperature, wind speed) for the conditions of the northwestern region, typical for summer and winter seasons. **Keywords:** infrared range, ground stationary object, temperature of the outer surface, radiation intensity, air temperature, wind speed

Suslin V. I., Polushin A. V., Lykova E. M. **First domestic high-orbital television apparatus for detection MBT-A. PP. 129–135**. Describes the first stage of development of onboard and ground system equipment at the All-Union Scientific Research Institute of Television for the detection of rockets from high orbit. **Keywords:** detection, high-orbit, television system