

УДК 621.384.4

Image processing system for vidicon-based radiation-resistant cameras

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Annotation. Television monitoring systems for the main production processes at nuclear power plants (hereinafter –NPP) are an important research topic in our time. Reliability, quality, and radiation resistance – are among the main fundamental requirements for the created products.

Brief introduction. Cameras for use at NPP are used to detect defects and problems, and also provide safety controls at NPP around the world. The actual problem for research is the creation of color radiation-resistant cameras.

Formulation of the problem. The use of radiation-resistant chambers is due to the fact that with the help of human resources, observation at many NPP sites is impossible. High radiation, temperature and many other factors require the use of special devices for monitoring objects. But the use of simple cameras does not guarantee the receipt of information due to the high radiation on the object under study, which affects the properties of materials and can destroy them. Nowadays, radiation-resistant cameras are being created that can withstand up to 10^9 Rad and satisfactory images are obtained, but the main problem is that the images obtained on such cameras are black and white.

The aim of research. The aim of the work is to study the issue of creating a radiation-resistant camera that could obtain a color image. The goal implies the study of methods and the development of an algorithm for the operation of such a camera and image transformation (hereinafter, of a radiation-resistant television system).

Basic research principles. The main objectives of any television monitoring are identifying defects or any deficiencies that may be a violation of the integrity, process or damage to metal structures, their control, checking labels and recording the results of the control. In addition, the measurement control functions include measuring the geometric dimensions of damage, classifying them and checking for compliance with the requirements of regulatory documents.

Intermediate results. The system designed for television control at nuclear power plants has been reviewed, the main components have been identified and the principle of building a television camera has been investigated. The analysis of vidicon working is made and the basic principles of digital processing of images obtained by the camera are described.

The main result. After analyzing the goals and main purposes of the study, television cameras based on the vidicon, CMOS and CCD matrices were considered. For further research, cameras based on the vidicon were chosen, since they withstand greater radiation resistance, which is an important factor in monitoring vital objects at nuclear power plants. Based on research in the field of digital image processing, obtained from cameras with a vidicon, an algorithm is being developed for obtaining a color image of the area under study. The main option considered is the use of three vidicons with green, red and blue light filters.

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