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Development, Creation and Producing of an Automatic Systems for the Radioscopic Testing of the Materials and Components

V. L. Chakhlov, Ju.A. Moskalyov, A. K. Temnik, S. V. Chakhlov
H. Baumbach

Introscopy Institute of Tomsk Polytechnical University, 634028, Tomsk, Russia
e-mail: chakhlov@introscop.tomsk.su

Abstract

The investigations of the X-ray introscope on base of the CCD-camera and luminescent screens - X-radiation converters CsI(Tl) for the nondestructive testing in energy range up to 6 MeV were done.

The problem of development of high-efficient systems of digital radiography (SDR) for the wide X-radiation energy ranges is primarily conditioned by the problems of radiation detecting and converting it into a visible image for the subsequent digital processing. The principal difficulty here is the comparatively high penetration rate of X-radiation in the energy range up to 6 MeV. On the one hand it must be possible to test objects of large thickness and on the other hand the radiation converter – scintillation screen should be relatively thin in order to perform the effective detection.
Most of the existing and developing SDR employ the classic layout. It consists of the X-radiation source, betatron, the luminescent screen, the radiation converter, turning mirror, lens, CCD-camera, controller, and computer with software for image processing.
Since X-radiation with energy up to 6 MeV has high penetrability and produces rather weak radiation contrast, the development of SDR with digital image processing and with high contrast sensitivity presents a relatively complicated scientific and technical problem. For successful solution of this problem the all elements of SDR should provide the maximum detection efficiency, radiation and light image contrast, and the minimal level of scattered radiation.
Usually the SDR is considered to consist of two principal units. The first is the X-Ray image detector and the second is an image processing unit. The former is located in the irradiated region and includes a scintillation screen, mirror, lens, shielded CCD-camera, and controller. The latter is located in a radiation safe room and includes a digital interface and a computer with software for image processing.