

3.8. GAMMA-IMAGING SYSTEMS FOR ECOLOGICAL AND NUCLEAR ENVIRONMENT MEASUREMENTS

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At the moment a large number of nuclear reactors require decommission and subsequent disassembly. After long operation time the basic and accessory reactor equipment has a high contamination level. The individual character of this contamination requires the development of the specific optimal decontamination strategy in each case. For minimization of the staff radiation exposure it is desirable first of all to remove the most contaminated fragments of the equipment which determine dose conditions. Then the subsequent and as a rule the most long part of the work can be carried out under rather soft dose condition.

One of main problems in determination of the decontamination sequence is the search and identification of the most contaminated fragments of the equipment. One solution of this problem is the use of gamma-ray imagers. As a rule the inspected premises are characterized by lack of free space, have the high level radioactive contamination and are filled with the equipment. In a number of cases the access to these premises is complicated and hand-operated installation of the imaging device in the premise is necessary. Because of large dose rate levels the installation should be realized as quickly as possible. Then the device should be controlled remotely from a rather clean premise. All these restriction are the reason for development of special portable gamma-ray imagers with small weight and reasonable sensitivity.

Some systems developed for nuclear environment and ecological measurements are described. Systems are based on scintillating and modern solid state position sensitive detectors; the gamma image is formed on detector plain by pinhole or multi-hole coded aperture.

Typical system performances are the following.

Gamma-channel FoV: 30°.

Angular resolution: 1°.

Sensitivity – registration of Cs-137 source for exposure dose:

– 0.05 μ Sv (equivalent $3 \cdot 10^8$ Bq (10 m Ci) at 10 m in 10 min) with pinhole;

– 5 nSv (equivalent $3 \cdot 10^7$ Bq (1 m Ci) at 10 m in 10 min) with coded aperture.

Results of application of these instruments at different cases are presented also.