THE AUTOMATIC RADIATION CONTROL SYSTEM OF THE INR LINEAR ACCELERATOR (TROITSK).

Abstract

The radiation monitor system (RMS) at accelerator INR is a part of radiation safety system of experimental complex INR. RMS is intended for continuous monitoring of radiation field behind biological protection of linear accelerator INR with the personnel dose control and alarm purposes.

Three-level system RMS consists of the operator computer, microprocessor data acquisition modules and networks of UDBN-02R neutron detectors and BDRC-01P photon detectors, located inside and behind biological protection of the accelerator (fig. 1).

DETECTOR COMPLEX AND HARDWARE MAINTENANCE RMS

Detectors UDBN-02R and BDRC-01P are established in places of a radiation maximum found by portable dosimeter MKC-01R at installation regular work. The case with the panel of switching, managements and indications allows to power on UDBN and BDRC separately. Light-emitting diode indication allows the operator to estimate serviceability of all power.

UDBN and BDRC cases are established in the control room RMS and includes the adapter and microprocessor modules of data gathering BOCK-64-16. Gathering and processing of detectors UDBN-02R given from a network is carried out through blocks of agreeing electronics in the microprocessor module. The microprocessor module for data acquisition has the 64 counter channel and 8 input/output registers for managing signals on external executive devices. The adapter plates provides amplification and formation of the UDBN signal. Block BOSK-64-16 provides reception of the data, their processing and data transmission on the operator’s computer. The computer exchanges the data through interface RS-485 with microprocessor module RMS.

The microprocessor block on modern element base for reception of the data from detectors is intended for the control of radiation parameters of an environment and allows to develop the independent or removed systems of the radiating control up to 64 microprocessor blocks in a network.

RMS SOFTWARE

The software allows to accept and process signals from detectors UDBN and BDRC on two-level: the bottom level ensures the functioning into two microprocessors, top – processing and display of the information in the operator’s computer. The algorithm of processing takes into account the background of each detector.

On the microprocessor module, realizing algorithm of work of the independent radiation control module, meets the following basic requirements:
• carries out data gathering from detectors, initial processing on the set algorithm of the information acting from each detector of neutrons and data exchange from the computer of the top level with an interval, setting by the operator;
• time of interrogation of detectors is set by the operator from 0,1 с up to 10с;
• analyzes the acting information in comparison with the established test objective levels and at their excess automatically contacts the computer of the top level;
• integrates indications of detectors for change and transfers integrals for change in the computer of the top level;
• The software allows to work with up to 64 blocks BOSK-64-16 in separate independent networks of the radiating or technological control.

The accelerating complex map with the detector network and a display window with a doze rate and a doze from the beginning of a session on each detector (fig. 1) are displayed on the screen of the attendant operator.

The convenient graphic interface of work with the operator carries out necessary functions of the control and recording of radiating conditions.

RMS system carries out also the control of emissions scale of radioactive gases and aerosols through the special ventilation pipe of accelerator INR by a special technique of emissions measurement. For these purposes BDMG-08R detector for monitoring of gamma radiation of radioactive gases and aerosols is built - in a pipe of special ventilation, from which part of air pumps through filters. These filters are processed later.

The development of radiation control system is directed on realization of new norm NRB-99 and sanitary rules OSPORB-99 on maintenance of radiation safety of the personnel and the population.

REFERENCES

Fig. 1: The set of RMS detectors in the accelerator and experimental halls, the operator console information.