AUTOMATIC SYSTEM OF GAMMA RADIATION EXPOSURE DOSE RATE CONTROL IN PIK REACTOR AREA

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A question about exploitation safety improving of nuclear objects has got special urgency after a well-known accident at the Chernobyl atomic power station. Therefore normative requirements of control for radiation situation around various types of operating reactors including research ones, raised up. For this purpose the automatic system of gamma radiation exposure dose rate (EDR) measurements, which is to be the main part of the whole enviroment radiation control system around PNPI, has been worked out in the institute.

The system is able to carry out a constant automatic gamma radiation EDR control in reactors PIK and WWR-M area, and also to predict the radiation situation in emergency.

The system includes:

- automatic posts of control (APC), situated in controlled area (CA) and observating area (OA);
- central post of control (CPC) situated in a building of radiation safety department (RSD) of PNPI and duplicate post of control (DPC) situated in one of civil defence buildings and removed from CPC for 3 km;
- post of meteorogical control, situated near a building of RCD.

The automatic posts of control, 10 of which are situated in buildings of PNPI (CA), and another 10 — in organizations of Gatchina and Gatchina region (OA), are intended to measure gamma radiation EDR and to transmit information to CPC. For this purpose each of them includes three detecting blocks, which give range of measure from 10 mkR/h to 1000 R/h. Such a wide range allows to control gamma radiation both during normal work of reactors (like natural background), and for within the design-basis accident or beyond the design-basis accident. Switching from range to range is realised by contactless method which increases reliability and longevity of the equipment. Transmissin of information is realised with ultrashort waves transmitter in automatic regime.

Central and duplicate posts of control are intended to gather information about gamma radiation EDR, which is coming from all APC, to store, and process this information and to make space-time prediction calculations of radioactive situation in emergency for 50 km distance. For this purpose CPC includes radio-set and transmitter, which serve for information exchange with APC and transmission of instructions to them, and two PC, one of which is reserve.

The post of meteorogical control serves for measuring and transmitting main meteorogical data on PC of CPC.

Measuring EDR on APC is carried out constantly. If EDR does not exceed natural background, information about it is transmitted to CPC every 2 h. In the case of exceeding set point of EDR the system switches to alarm regime automatically. In this case period of inquiry of APC does not exceed 100 s.

Keeping in mind that APCs are situated far away from CPC, and consequently from personal, some actions for reliability improving are taken, as follows:

– conservation of post capasity for work during 48 h due to using internal reserve accumulators if electrical power fails;

– carrying out the blocks for being in order and transmission of disrepair signal to CPC;

– forming and transmission of the unauthorized access signal to CPC.

Program for PC is set in such a way, that it is able to get radiactive situation reflected on display both in tabular form and on geografical region map.

Gamma radiation EDR data in necessity can be given on collective use indicator panel, which is up to 3 km distance from APC.

During creating the system particular attention was paid to reliability.

Guarantee period of the system operating is 12 years.