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Comparison of measured and simulated by numerical simulation dose rates of DRMs during storage and irradiation period of radioactive sources in work places of gamma facility.

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To follow the radiation safety rules depending on generated actual radiation power i.e. exposition dose rate (EDR) in different locations of source work places is an assessment of its side effects on the environment, especially on human health.

The observation and investigations were provided on radioactive sources of Panoramic Gamma Irradiator of Gamma Sterilization Complex of National Nuclear Research Center of Azerbaijan. The current activity of the Co60 source of our gamma facility is 245000 Ci. Maximum throughput 5160 liters/h, 123 m³/day at 1 MCi, 30 kGy.

Radiation level control in the facility is actually performed as follows: 7 dose rate monitors (DRMs) were installed in each area of the working zone, which were placed in irradiation, operation, water deionization, ventilation rooms according to which the radiation safety regulations are monitored.

- Comparative analysis of 7 DRM indicator parameters were registered during storage under the water pool and during the irradiation process.

In other words, the actual parameters of DRMs in the maze actual parameters of other (in the operation room, water deionization room, ventilation room) DRMs were observed and compared.

- EDR distribution depending on the distance.

Analyzes of the distribution of EDR depending on the distance between the radioactive source and DRM parameters were analyzed.

- Registration and comparative analysis of the actual performance of DRMs during the operation of the ventilation system.

If there are any negative effects on the DRMs during the operation of the ventilation system, this is also the indicator of side effects of air in the work area. That is the indicator of dispersion of radioactive dust or high levels of ionization of air.

Depending on the activity of radioactive source usage, its half-life and gamma stability is important to calculate radiation distribution in all work places of the facility and comparing the results of simulation with the parameters of DRMs in the working area gives us an opportunity to monitor and manage of the radiation safety.

Numerical simulation of dose rate in the points where are DRM located was made by using software toolkit GEANT4 (CERN). Comparison of measured and simulated results shows good agreement. The accuracy of calculated dose rate values did not exceed 15%.

Country OR Intl. Organization

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