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Calculation methods and models applicable on the operational radioprotection at the VVR-S nuclear research reactor Magurele Bucharest

The VVR-S nuclear research reactor owned by Horia Hubulei - National Institute of Physics and Nuclear Engineering (IFIN-HH), has functioned between 1957 and 1997 at a nominal thermal power of 2 MW, using low-enriched nuclear fuel (10%) type EK-10 and highly enriched fuel (36%) type S-36. The VVR-S research reactor served as the basis for experimental research and radioisotope production. Between 2010 -2017 was carried out different activities for dismantling of the VVR-S Nuclear Research Reactor installations. We made the necessary measurements to determine de the potential dose implication corresponding with the planning dismantling activities. We need to determine, close to reality, before to send worker in the field, the risk implication in accordance with ALARA applicable principle. We knew the potential radionuclides in the reactor and the dose rate expectations. Neutron activated materials is by far the major contributor to the total inventory of radioactive reactor. The principal radionuclides implicated are the ^{60}Co , ^{137}Cs , (^{152}Eu and ^{154}Eu), ^{241}Am with theirs correlation factors respectively. We used geometry simulation in close proximity with reality to observe de dose rate and activity. For dose rate assessment we use MicroShield 9.04 software on annular cylinder external dose point geometry, to simulate individual parts and integrating the results after a descriptive model corresponding with physical reality and probe factors. For a correct assessment of the activity by gamma-ray spectrometry it was necessary to have information on the activity distribution and on the full energy peak efficiency dependence on this distribution. So, detailed study of the dependence of the efficiency of the detector in the particular geometry was carried out by Monte Carlo simulation using the GESPECOR software. We developed different studies using RESRAD, SAFRAN and AMBER code to verify our suppositions implementing calculation methods and models applicable on the operational radioprotection.

Biography

Ioan Iorga has been working from 2002, in several big projects like ROM 04029, BOA 3J0021 or EMERSYS. He is Senior Researcher in the decommissioning team from the NIPNE-HH Institute from Romania. Under his coordination was successfully completed the dismantling of radionuclide effluents pipes between the reactor and the treatment plant. He has published more than 10 papers in reputed journals presenting his work. He is one of main author of the VVR-S decommissioning plan. He finalized PhD at Faculty of Physics University of Bucharest with thesis studies to assess nuclear and radiological installation prior to decommissioning. Today his main research is focused in the real situation on the decommissioning field, analyzing of the radioactive waste, implementing of the simulated model and calculus in the operational radioprotection.

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