Federal guidelines for estimating external exposure of radiation workers in Russia

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In this paper, an overview of Russian federal guidelines for optimizing work procedures in terms of radiation protection for planned field work is presented.
The general provisions, procedures and methods for applying the principles of optimization are provided in accordance with the Radiation Safety Standards (NRB-99/2009) and Basic sanitary rules of radiation safety (OSPORB-99/2010). Jobs in environments with actual or potential radiation hazards shall be planned on the basis of the principle of optimization in order to prevent unexpected exposure of the personnel. Control and optimization of dose to workers is a continuous process, which is carried out at various stages of radiation-hazardous work under constant involvement of the personnel in the planning procedure. Implementation of the principle of optimization should include considerations for human and organizational aspects for ensuring high level safety. The planning and optimization process includes education and training of personnel, estimation of radiation doses for the upcoming work, preparations for unplanned situations, and implementation of practical safety measures within the targeted radiation-hazardous works.
The optimization principle is most important in the planning phase where uncertainties in planned exposure must be considered. Variability of radiation risks related to different scenarios (choices) can be managed by modern simulation technology, and use of advanced tools (software) for simulating planned activities and conditions in digital models including the environment (premises of an industrial complex) with dynamic visualization of the radiation exposure conditions. Existing hardware and emerging information technologies allow practical application of such techniques.
Application of advanced information technology can reduce uncertainties related to the radiation environment by turning invisible radiation into directly perceivable risk information. In addition, virtual reality enables the user to create different scenarios (alternatives) for planned work, and compare these with a numerical assessment of the radiological consequences for the staff. Software providing such functionalities needs radiological input data (measurements or activity and radionuclide composition, as well as the geometry of the radiation sources) for simulating radiation conditions.
This paper provides basic requirements for application of such advanced support systems for solving the challenges of radiation safety related to complex work in nuclear environments. Examples of successful practical application of such system will also be presented for improving the work of radiation safety services at facilities of the State Corporation "Rosatom" and Federal Medical Biological Agency in Russian Federation.