

"IN SITU" MONITORING OF SOIL CONTAMINATION BY MULTIFUNCTIONAL AT6101DR PORTABLE GAMMA SPECTROMETER TAKING INTO ACCOUNT RADIONUCLIDE DEPTH

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Emergencies in nuclear fuel cycle plants result in radioactive contamination of environment. That is why one of radiation monitoring objectives is monitoring of soil contamination level affected by radioactive emissions.

"In situ" method on the basis of AT6101DR portable gamma spectrometer allows soil radiation monitoring and can be particularly used to measure activity of natural (⁴⁰K, ²²⁶Ra, ²³²Th) and industrial (¹³⁴Cs, ¹³⁷Cs) radionuclides, as well as to determine the depth of industrial ¹³⁴Cs and ¹³⁷Cs radionuclides in the soil without sampling.

AT6101DR portable gamma spectrometer is a multi-function instrument, which consists of BDKG-11 spectrometric scintillation detection unit inside sealed container and a handheld PC with application software. It has measurement range of gamma radiation energy distribution from 50 to 3000keV.

Simulation model of gamma-quanta transfer from soil to detector working medium, simulation model of soil and of spectrometer's detection unit have been developed.

Results of mathematical simulation made it possible to calculate functional dependence between effective radiuses of soil and therefore to determine the spectrometer's sensitivity to monitored radionuclides depending on their depth in the soil. Instrument spectra for industrial ¹³⁴Cs and ¹³⁷Cs radionuclides are calculated for different depths (2 cm, 5 cm, 10 cm and 15cm).

The depth of monitored radionuclide in soil is determined by detector response function obtained in the process of mathematical simulation, which reproduces model spectrum to the specified accuracy. Radionuclide depth measurement also allows identification of radionuclides present in the sample.