



CALIBRATION EXPERIMENTS OF NEUTRON SOURCE IDENTIFICATION AND DETECTION IN SOIL

N. V. Gorin, E. N. Lipilina, G. V. Rukavishnikov*, D. V. Shmakov, A. I. Ulyanov
Russian Federal Nuclear Center VNIITF, Russia
E-mail: Grigory Rukavishnikov, v.s.mamontov@vniitf.ru, g.v.rukavishnikov@vniitf.ru
E-mail: Victor S Mamontov <v.s.mamontov@vniitf.ru>

ABSTRACT

In the course of detection of fissile materials in soil, series of calibration experiments were carried out on in laboratory conditions on an experimental installation, presenting a mock-up of an endless soil with various heterogeneous bodies in it, fissile material, measuring boreholes. A design of detecting device, methods of neutrons detection are described. Conditions of neutron background measuring are given. Soil density, humidity, chemical composition of soil was measured. Sensitivity of methods of fissile materials detection and identification in soil was estimated in the calibration experiments. Minimal detectable activity and the distance at which it can be detected were defined. Characteristics of neutron radiation in a borehole mock-up were measured; dependences of method sensitivities from water content in soil, source-detector distance and presence of heterogeneous bodies were examined. Possibility of direction detection to a fissile material as neutron source from a borehole using a collimator is shown. Identification of fissile material was carried out by measuring the gamma-spectrum. Mathematical modeling was carried out using the PRIZMA code (Developed in RFNC-VNIITF) and MCNP code (Developed in LANL). Good correlation of calculational and experimental values was shown. The methodic were shown to be applicable in the field conditions.