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# Calibration of gamma radiation detection unit based on LaBr3 (Ce) crystal in the energy range from 30 keV to 10 MeV

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Gamma radiation spectrometric detection units based on lanthanum bromide LaBr3 (Ce) have significantly better energy resolution in comparison with detection units based on common NaI (Tl) crystals. To provide measurements in fields of high-energy gamma radiation in energy range from 30 keV to 10 MeV an experimental detection unit based on a LaBr3 (Ce) detector with dimensions of Ø38x38 mm was developed by SPE «ATOMTEX».
During the energy scale calibrating of the detection unit the energy range was divided into 2 subranges: from 30 keV to 3 MeV and from 3 MeV to 10 MeV. The energy scale of the detection unit in sub-range from 30 keV to 3 MeV was calibrated using OSGI type point sources of gamma radiation. Calibration in energy sub-range from 3 MeV to 10 MeV of the detection unit was carried out according to the spectra obtained in the field of capture gamma radiation at the neutron radiation calibration facility AT140 using titanium and nickel targets. The thermal neutron flux was formed by the container collimator of the facility with a Pu-Be source in the geometry of thermal neutrons. Obtained during the measurements the instrumental spectrum is complex due to neutron irradiation of the target, the detection unit and surrounding materials of constructions.
The scintillation detection unit with a NaI (Tl) crystal Ø63x160 mm was calibrated under similar conditions. The detection efficiency for both detection units in the entire energy range under consideration was estimated. An analysis of the acquired instrumental spectra in the field of capture gamma radiation from nickel and titanium targets showed that due to the better energy resolution the detection unit with a LaBr3 (Ce) crystal at smaller detector sizes can be calibrated more accurately in energy range from 5 MeV to10 MeV.
Results of the investigation were used to develop detection units with a LaBr3 (Ce) -based scintillation detector designed to measure the energy distribution of gamma radiation and for radiation control purposes such as identification of the radionuclide composition of a controlled object and measurement of the ambient dose rate equivalent of gamma radiation in mixed gamma-neutron fields in the range from 30 keV to 10 MeV.

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