STUDY OF THE INFLUENCE OF TEMPERATURE ON THE READINGS OF THE SCINTILLATION DETECTOR NAI (TL)

R. E. Kelsingazina[1], E. Yeboah[1], V.S. Yakovleva[1], M.S. Cherepnev[1], S.V. Smirnov[2]

[1]National Research Tomsk Polytechnic University,

Russia, Tomsk, Lenin Ave., 30, 634050

[2]Institute of Monitoring of Climatic and Ecological Systems SB RAS,

Russia, Tomsk, 10/3 Akademichesky ave., 634055

E-mail: vsyakovleva@tpu.ru

Scintillation detectors based on the NaI (Tl) crystal are widely used in environmental field studies. Devices undergo temperature changes over a wide range under such operating conditions. Scintillators and photoelectronic multipliers are inherently sensitive to temperature changes[1]. And for this reason, temperature stabilization is provided in the detectors. The simplest stabilization method is the use of temperature-dependence coefficients that is part of the detector calculation program.

The object of the study in this work is BDKG scintillation detectors with a built-in temperature stabilization algorithm. An incorrect reading of the detector was revealed when it was measuring the background values of the gamma radiation dose rate in the previous studies conducted at TPU. Possibly it was related to the influence of the temperature. In this regard, it became necessary to verify the operation of the detector in controlled environmental conditions.

The aim of this work is to study the scintillation detector readings at different values of temperature and relative humidity for the subsequent calculation of temperature correction coefficient.

The paper presents the results of an experiment in the climate chamber TYR 3626 of the control and testing station (CTS) of the IMCES SB RAS. Precision measuring instruments of temperature MIT-8.10 and relative humidity IVA-6B were used to monitor the state of the environment in the chamber, the measurement errors of temperature was ± (0.03 - 0.04) ° C and of humidity was ± (2 - 3)% . The readings of two detectors of the same type - BDKG-03 were studied. The temperature in the chamber varied from –40 to + 40 ° C in increments of 5° C.

An analysis of the experimental results showed that dose rate measurements using the built-in algorithm give unreliable readings. The temperature correction coefficient determined from experiments is significantly different from the factory coefficient. Further processing of the results on the pulse count rate made it possible to reveal a weak linear dependence of the readings on temperature, identical for the two detectors. The temperature correction coefficient was calculated based on the found dependence.

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