boron imaging

Prompt gamma-ray spectrometry for boron-neutron capture therapy

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Boron-neutron-capture therapy (BNCT) is a promising method of therapeutic treatment of malignant tumors. To implement BNZT in clinical practice, it is necessary to develop a dosimetry method that allows us to observe the level of boron accumulation in the patient's body in real time and to control the radiation dose received by the patient immediately during irradiation [1].
To generate neutrons in the research we used accelerator-based neutron source VITA, which allows generating neutrons of a wide range of energies. The work was performed at a proton current of - 2.05 MeV. A promising solution to this problem is the method of prompt gamma-ray spectrometry. The method is based on the registration of fast gamma quanta with an energy of 478 keV born from the reaction 10B(n,α)7Li.
As a result of this study, we propose a scheme for the realization of the instantaneous gamma spectrometry method at the accelerator-based neutron source VITA. Problems in the realization of this method are discussed and solutions are proposed. The results of experiments on registration of gamma-quanta with energy of 478 keV passed through boron-containing samples and different volumes of water are presented and discussed. The obtained spectra with a clearly distinguishable 478 keV line with predicted Doppler broadening are discussed. The feasibility of using a semiconductor detector made of high purity germanium to measure boron dose in boron neutron capture therapy by prompt gamma spectrometry is demonstrated.

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References:
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