treatment planning

Validation of neutron and γ-ray dose calculations using three neutron beam shaping assemblies and a scintillation detector

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For therapy planning and evaluation of the results of boron neutron capture therapy, the VITA dosimetric planning system (VITA DPS) is being developed at BINP. To ensure the effectiveness and safety of therapy, the VITA DPS includes determining the direction and power of neutron and γ-radiation, as well as analyzing the ratio of dose component distributions (boron, nitrogen, fast neutrons and photon) in the patient's body to ensure the possibility of optimal distribution of these doses, taking into account the limit values for different types of tissue. The result of the VITA DPS is an irradiation plan containing information on the spatial distribution of dose components in the patient's body. The article presents the results of the VITA SDP validation in experiments with the measurement of the boron dose and γ-radiation dose in a water phantom by the developed sensors for three beam formation systems: a target unit with a lithium target, a target unit with a lithium target with a moderator made of organic glass, a target unit with a lithium target placed inside the beam formation system developed by us earlier with a moderator made of MgF2 and a bismuth γ-radiation filter. The results of the studies demonstrate good agreement between the measured and calculated depth distribution of the boron dose and γ-radiation dose for all the cases considered. The deviation of the calculated and experimental data for the boron dose and γ-radiation dose for all experiments does not exceed 5%, comparable with the statistical error.

Acknowledgments:
This research was funded by a grant from the Russian Science Foundation (project No. 19-72-30005).