DETERMINATION OF THE CONTRIBUTION OF REACTION $^{158}Gd(n,\gamma)^{159}Gd$ TO THE ABSORBED DOSE IN GdNCT

Kulabdullaev G.A., Abdullayeva G.A., Rakhmonov T.T., Kim A.A.,
Saitzhonov Sh.N., Dzhuraeva G.T., Nebesnyj A.F.
Institute for Nuclear Physics, Tashkent, Uzbekistan
E-mail: gkulabdullaevl@inp.uz

Gadolinium neutron capture therapy (GdNCT) is one of the most promising methods of treatment of radioresistant forms of malignant tumors [1]. It uses natural gadolinium-containing preparations. Natural gadolinium consists of the following isotopes: ^{152}Gd (0.205%), ^{154}Gd (2.23%), ^{155}Gd (15.10%), ^{156}Gd (20.60%), ^{157}Gd (15.70%), ^{158}Gd (24.50%), ^{160}Gd (21.60%). From them ^{155}Gd and ^{157}Gd have very large (n,γ) cross sections. There are different estimates of the contribution to the total dose of the secondary particles produced in the nuclear reactions with neutrons in these isotopes of natural gadolinium. Thus the major reactions are neutron capture ^{155}Gd $(n,\gamma)^{156}Gd$ and ^{157}Gd $(n,\gamma)^{158}Gd$, which together account for > 90 % of the contribution to the absorbed dose [2]. The contribution of other reactions is considered insignificant. Therefore it is interesting to investigate the products of other nuclear reactions with neutrons. One of them is ^{158}Gd $(n, \gamma)^{159}Gd$, where an excited nucleus ^{159}Gd becomes β-active. The analysis and evaluation of the contribution of the secondary particles produced in the reaction ^{158}Gd $(n, \gamma)^{159}Gd$ to the absorbed dose in GdNCT is implemented.

1. L.S.Yasui *et al.* // Int. Jour. Rad. Biol. 2008. V.84. P.1130.
2. G.A.Kulabdullaev *et al.* // Uzbek physical journal. 2013. V.15. № 4. P.127.