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STUDY OF THE EXCITATION FUNCTION IN REACTIONS WITH PROTONS FOR INTERMEDIATE AND HEAVY MASS NUCLEI

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Modern nuclear reaction studies show that in next eight years it will be an almost twofold increase in the consumption of radionuclides that are part of radiopharmaceuticals used in both diagnostic and therapeutic methods of nuclear medicine [1]. Today, one of the most promising radionuclide is terbium, whose radioactive isotopes can be used both diagnostic and therapeutic procedures in theranostics methods [2]. Other important radionuclides for theranostics are isotopes of antimony. The ^{117,119}Sb isotopes can be considered for the Auger therapy approach [3]. This leads to study of the basic characteristics of such isotopes and determine the optimal conditions of nuclear reactions for their production.

In this work, the reactions ^{nat}Gd(p,x)^{160,156,155}Tb and ^{117}Sn(p,n)^{117}Sb, ^{119}Sn(p,n)^{119}Sb were studied for proton energies below 14 MeV. This range is could be optimal for producing radionuclides in medical cyclotrons [4]. Therefore, the experimental investigations of the excitation function behavior for regions near its maximum have been carried out. This allows not only to determine the region that is optimal for the production of radionuclides, but also to check a number of modern models described reactions occurring through the compound core, taking into account the contribution from pre-equilibrium processes. For the reaction ^{117}Sn(p,n)^{117}Sb such information was obtained for the first time, which made it possible to clarify the position of the maximum and the behavior of the excitation function for high energies. The obtained data were compared with the prediction models for the ALICE/ASH, PRECO-2006, TALYS codes and with the TENDL-2023 systematics.

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