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Investigation of Efficient Production of ^{135}La for the Auger Therapy Using Medical Cyclotron in Poland

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Abstract : ^{135}La with the half-life of 19.5 h can be considered as a good candidate for Auger therapy. ^{135}La decays almost 100% by electron capture to the stable ^{135}Ba. In this study, all important possible reactions leading to ^{135}La production are investigated in details, and the corresponding theoretical yield for each reaction using the Monte-Carlo method (MCNPX code) are presented. Among them, the best reaction based on the cost-effectiveness and production yield regarding Poland facilities equipped with medical cyclotron has been selected. ^{135}La is produced using 16.5 MeV proton beam of general electric PET trace cyclotron through the ^{135}Ba(p,n)^{135}La reaction. Moreover, for a consistent facilitating comparison between the theoretical calculations and the experimental measurements, the beam current and also the proton beam energy is measured experimentally. Then, the obtained proton energy is considered as the entrance energy for the theoretical calculations. The production yield finally is measured and compared with the results obtained using the MCNPX code. The results show the experimental measurement and the theoretical calculations are in good agreement.

Keywords : efficient ^{135}La production, proton cyclotron energy measurement, MCNPX code, theoretical and experimental production yield
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