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**Modeling and experimental data of zirconium-89 production yield**

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**Abstract**

The radionuclide zirconium-89 can be employed for the positron emission tomography (PET). In this study  $^{89}\text{Zr}$  excitation function via  $^{89}\text{Y}(p,n)^{89}\text{Zr}$  reaction was calculated by the TALYS-1.8 code based on microscopic level density model. The formation of  $^{89}\text{Zr}$  was simulated using the Monte Carlo simulation code MCNPX to calculate the integral yield in the  $^{89}\text{Y}$  target body for threshold up to 40 MeV incident-proton energy. The target thickness was based on calculation of the stopping power using the SRIM-2013 code matched to any incident-proton energy. The production yield of the  $^{89}\text{Zr}$  simulated with the Monte Carlo method for the  $^{89}\text{Y}(p,n)^{89}\text{Zr}$ ,  $^{89}\text{Y}(d,2n)^{89}\text{Zr}$ ,  $^{\text{nat}}\text{Sr}(\alpha,xn)^{89}\text{Zr}$  and  $^{\text{nat}}\text{Zr}(p,pxn)^{89}\text{Zr}$  reactions and the results were in good agreement with published experimental results for the optimum energy range. An experimental yield of 53.1 MB/ $\mu\text{A}$  for the 15 MeV proton-induced on  $\text{Y}_2\text{O}_3$  powder as a disk-target obtained for 1 hour irradiation at the AMIRS cyclotron.

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