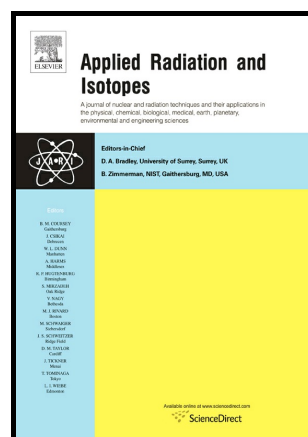


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PII: S0969-8043(17)30423-2  
DOI: <http://dx.doi.org/10.1016/j.apradiso.2017.06.005>  
Reference: ARI7909

To appear in: *Applied Radiation and Isotopes*

Received date: 22 March 2017  
Revised date: 29 May 2017  
Accepted date: 7 June 2017

Cite this article as: Mozhgan Sharifian, Mahdi Sadeghi and Behrouz Alirezapour Utilization of GEANT to calculation of production yield for  $^{89}\text{Zr}$  by charge particles interaction on  $^{89}\text{Y}$ ,  $^{\text{nat}}\text{Zr}$  and  $^{\text{nat}}\text{Sr}$ , *Applied Radiation and Isotopes* <http://dx.doi.org/10.1016/j.apradiso.2017.06.005>

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# Utilization of GEANT to calculation of production yield for $^{89}\text{Zr}$ by charge particles interaction on $^{89}\text{Y}$ , $^{\text{nat}}\text{Zr}$ and $^{\text{nat}}\text{Sr}$

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## Abstract

The  $^{89}\text{Zr}$ , is one of the radionuclide with near-ideal properties for PET due to its suitable half-life and decay properties. The cross-section of  $^{89}\text{Zr}$  via  $^{89}\text{Y}(\text{p},\text{n})^{89}\text{Zr}$ ,  $^{89}\text{Y}(\text{d},2\text{n})^{89}\text{Zr}$ ,  $^{\text{nat}}\text{Sr}(\alpha,\text{xn})^{89}\text{Zr}$  and  $^{\text{nat}}\text{Zr}(\text{p},\text{pxn})^{89}\text{Zr}$ , were calculated by the TALYS-1.8 code to predict the optimum range of charge particle energy. The Monte Carlo code GEANT4 was used to simulate the formation of  $^{89}\text{Zr}$  in the target body. The simulated  $^{89}\text{Zr}$  yield was in good agreement with published experimental results in the optimum energy range. According to the calculations, the  $^{89}\text{Y}(\text{p},\text{n})^{89}\text{Zr}$  was superior to the other reactions useful to medical application.

**Keywords:** Radionuclide;  $^{89}\text{Zr}$ ; PET; Production yield; Monte Carlo.

## 1. Introduction

The radionuclide zirconium-89 can be employed in positron emission tomography (PET) because of its suitable half-life ( $T_{1/2} = 78.41$  h), emission of low energy and suitable

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