Yield calculation of positron Emitters for high specific activity

By

Asim Nisar Sheikh

I.D: 13002139007

Supervisor

Dr. Muhammad Imran Jamil

Department of Physics

School of Science

University of Management and Technology C-II, Johar Town Lahore – 54770, Pakistan

IN THE NAME OF ALLAH, THE MERCIFUL
THE BENIFICIENT

SHURU ALLAH KAI NAAM SE JO BARA
MEHARBAAN AUR REHAM WALA HAI

Yield calculation of positron emitters for high specific activity

Submitted to University of Management and Technology Lahore in partial fulfilment of the requirements for the award of degree of

MASTER OF PHILOSOPHY

IN

PHYSICS

By

AsimNisar Sheikh

I.D

1	3	0	0	2	1	3	9	0	0	7

SESSION: 2013-2015

Department of Physics

School of Science

University of Management and Technology

C-II, Johar Town Lahore – 54770, Pakistan

IQRA BEISME RABIKALAZI KHALAQ

AL-QURAN(SURA ALAQ)

“Read! In the name of your lord, who has created all that exists.”

Parhoapnerab k naam se jis ne paidakia.

DECLARATION

I Mr**ASIM NISAR SHEIKH** Roll No. **13002139007** student of **M.Phil.(Physics)** in the field of **Nuclear Medicine** session 2013-2015 hereby declare that the matter printed in the thesis titled **Yield Calculation of Positron Emitters for High Specific Activity** is my own work and has not been taken from others,printed,published and submitted as research work, thesis or publication in any form in university,2research institution etc. in Pakistan or abroad.

Dated Signature of Deponent

CERTIFICATE

It is certified that the work contained in this project dissertation titled **Yield Calculation of Positron Emitters for High Specific Activity** has been carried out and completed by Mr**ASIM NISAR SHEIKH**Roll No. **13002139007** during his MS/M.Phil. (Physics) studies under my supervision.

____________________________ ____________________

Supervisor **External Examiner**
Dr. M.ImranJamil

____

Co-Supervisor
Dr. MazharHussain
Assistant Professor
Govt. College University, Lahore.

____________________________ ____________________________

Dr. EhsanEllahiKhawaja
Chairperson
Department of physics

UMT, Lahore.

Dr. Muhammad AzharIqbal
Dean
School of Science,

UMT, Lahore.

Dedication

Dedicated to ALLAH ALMIGHTY(the creator of all mankind) and MUHAMMAD(P.B.U.H)(the Leader of all mankind)

&

All human beings

ACKNOWLEDGEMENTS

All praise to ALLAH,who bestowed upon me HIS blessings, which enabled me to accomplish this work objectively and successfully. Also my deepest gratitude to all who offered me helping hand in accomplishing this task. However some names deserve explicit acknowledgements.

With the deep sense of respect, I am very thankful to my supervisor: **Dr.M.Imran Jamil** and Co-supervisor: **Dr.Mazhar Hussain** who has always been very kind to meguided me and encouraged me. I found him ready to take pain for my work at any time and who helped me a lot in this concern.

Thanks to all……………….

ASIM NISAR SHEIKH

ABSRRACT

The development of longer lived positron emitter radionuclides,(termed as non-standard positron emitters) are required to study the metabolic processes, labelling of organic compounds leading to analogue tracers (e.g. with halogens) and quantification of targeted therapy. The decay characteristics of those non-standard positron emitters (half-lives, prompt emission of associated gamma rays, positron energy and positron decay fraction) determine the qualitative and quantitative accuracy (i.e. blurring, spatial resolution, sensitivity, radiation dose, etc.) of the image, which ultimately defines their possible utilization in PET.

The radioisotopes can be used in clinical trials after standard bench marking. Yield calculation is an integral part of this business. In this work, we will select some positron emitters which may be potentially important in nuclear medicine. The reaction cross section data will lead to calculate the yields. The specific activity will be estimated keeping in view the impurity level in each isotope. The recommended reaction routes will be suggested for the production of selected isotopes for medical applications.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER NO 1	**INTRODUCTION**

1.1. History of Radioisotopes

In 1896, when Henry Bequrel discovered the phenomenon of radioactivity, a new idea was born to use these radioisotopes in medicine. A Hungarian physical chemist, George De Hevesy at first gave idea of using radio tracers in biological and life sciences. And since then a great work has been started for the production of new radioactive tracers and their uses. The advancement in the technology of nuclear reactor and their great role in the production of radioisotopes gave motivation to the general applications of tracers and particular applications of nuclear medicine. In this scenario γ-emitting radionuclides ^{18}F, ^{51}Cr, ^{99m}Tc, ^{131}I, etc. were introduced and serious efforts were also made to develop cyclotrons and accelerators for the production of positron emitters. Along with the production of radioisotopes via cyclotron, the development of nuclear data is an essential part for the purposeful use of radioisotopes.