

Acknowledgement

The Doctor of Philosophy that had been through was truly once in a lifetime experience. I realized many people deserve to be thanked for what I have been achieving and what I have become now. I would like to express my sincere gratitude to several individuals for their invaluable assistance and contribution to completing my research work.

I acknowledge my heartiest feelings of gratitude to my supervisor, Dr. Rajnikant Makwana, for guiding me with my research work and providing me with a friendly and warm atmosphere for completing my work successfully. I am highly obliged to him for his continuous encouragement and generous support to refine my path for research.

I would like to thank The Dean, Faculty of Science, and The Head, Department of Physics, The Maharaja Sayajirao University of Baroda, Vadodara, Gujarat-390002, INDIA, for providing all the necessary facilities to carry out my research work. I would like to thank DRC committee members for evaluating my research work every six months by conducting a progress report presentation. I would also like to thank the UGC-DAE Consortium for Scientific Research, Kolkata Centre for sanctioning the project grant (Sanction Number: UGC.DAE-CSR-KC/CRS/19NPO8/0919) to provide the funding during the course of the present work.

My sincere thanks to Dr. B. K. Nayak, Dr. S.V. Suryanarayanan, Nuclear Physics Division, BARC, Prof. N.L. Singh, and Prof. S. K. Mukherjee for mentoring me throughout this research work, providing suggestions, their valuable time and motivating me from time to time which encouraged me a lot to pursue the present work. I would like to thank The Director, the Tata Institute of Fundamental Research (TIFR) and the staff of the BARC-TIFR Pelletron accelerator for providing me with the necessary support during the beam-time to perform the experiments related to the present work. I would like to thank Dr. S. C. Sharma, Nuclear Physics Division, BARC, and Dr. T. N. Nag, Radiochemistry Division, BARC for providing their invaluable support during the experiment. I would like to thank Mr. Mayur Mehta, Mr. Rakesh Chauhan, and Dr. G. B. Patel for their help during the experiment. My sincere thanks to Yusuf Kavun, Kahramanmaras Sutcu Imam University, Turkey and Prof. Begoña Quintana Arnes, Universidad de Salamanca, Spain for their support

and direction during my research.

I would like to sincerely thank my colleagues and friends Dr. Paresh Prajapati, Dr. Bhargav Soni, and Dr. Ratankumar Singh for their encouragement, fruitful discussions, support and helped me during the experiment. Many thanks to my friends Dr. Vishwa Jain, Dr. Tanmay Macwan and Dr. Vibha Vansola for their moral support.

I would like to express my deep sense of gratitude to my late grandparents, Kusumben and Dhirubhai Vashi, and my extended family members Janakbhai Desai (father-in-law), Sureshbhai Desai (grandfather-in-law), and Avinash Desai (uncle in law) who unfortunately left us early. Their blessings had a spiritual strength at difficult times. I am sure they are pleased to see my growing academic quest.

I also would like to thank my grandmother-in-law Bhanuben Desai for her unconditional love and care, my mother-in-law Pritiben Desai and my sister-in-law Shivani Desai for their moral support.

I am pleased to dedicate my research work to my parents Nayanaben and Rasikbhai Vashi. It's your support and efforts led me to this stage! The word seems insufficient to express my deepest gratitude towards you both. Still, I express my profound gratitude to my parents, my siblings Dhvani Vashi and Krushank Vashi for their unconditional love, continuous encouragement, and unfailing moral support throughout my years of study and through the process of researching and writing this thesis and my life in general. I'll never be able to repay the unconditional love and support they have provided for every single decision I have made. I would like to thank Gitaben & Narendrabhai Vashi, my aunt and uncle, for their moral support. A very special thanks to my adorable life partner, Aditya Desai for his constant support, motivation and his faith towards me to carry out this work.

Finally, I am thankful to all those who have encouraged me and blessed me directly or indirectly. This accomplishment would not have been possible without them.

Thank you !!!

Vibhuti R. Vashi