ACKNOWLEDGEMENT

My Ph.D. years at the Department of Physics, The Maharaja Sayajirao University of Baroda, Vadodara, India and this thesis has mentorship from numerous outstanding individuals both from within the university and outside from it. It is to these individuals, that my heartfelt gratitude and thanks go out to, for without their help, this would not have been possible.

First and foremost, I would like to express my deep and sincere gratitude to Dr. Mitesh Sarkar, Assistant Professor, Department of Physics, Faculty of Science, The Maharaja Sayajirao University of Baroda, Vadodara, who has been my supervisor since the beginning of my research career in The Maharaja Sayajirao University of Baroda, Vadodara, Gujarat. The association with him, which started with the November 10 2008 as a UFUP project fellow, and later in June 20th 2010 as a Ph. D. student, has transformed me in scientific and as well as personal terms. He provided me many helpful suggestions, important advise, enunciation and constant encouragement during research work. His understanding, encouraging and personal guidance have provided a good basis for the present thesis. In addition, he is always accessible, and willing to help his students with their research. As a result, research life became smooth and rewarding for me.

My Special Gratitude goes to Dr. V. Ganesan (Centre Director), Prof. Ajay Gupta (Former Centre Director), Dr. V. R. reddy, Dr. Rajeev Rawat, Dr. Mukul Gupta, Dr. D. M. Phase, Dr. R. J. Chaudhary, Mr. Mohan Gangrade from UGC-DAE CSR, Indore, India to provide various measurement facilities and for their useful discussions. I am deeply grateful to Dr. Mukesh Chawda, Lecturer, Polytechnic Department, The Maharaja Sayajirao University of Baroda, Vadodara, Gujarat for his detailed and constructive comments, and for his important support throughout this work.

I am delighted to interact with Dr. A. Asokan and Dr. Kanjilal of IUAC, New Delhi during ion beam irradiation experiments. His insight into Ion-Matter interactions is second to none. Besides, he sets an example of a world-class researcher for his rigor and passion for research.

I am also thankful to the former Head of department Prof. A. C. Sharma, now Dean, Faculty of Science, for giving permission to visit national research facilities and for support.

I am grateful to all teachers, Head of the Department Prof. J. P. Singh and nonteaching staff of the Physics department, The Maharaja Sayajirao University of Baroda, for their help during various stages of my work. I must also thank the University authorities for providing all the necessary facilities for my research work.

I would like to thank my friends and colleagues that I have met in this my home far away from home called The MSU. All my lab buddies at the Material research laboratory made it a convivial place to work. In particular, I would like to thank Nishant for his friendship and help in the past years. All other folks, including Sangeeta, Pratik, Sudhanva, Digish, Ketan Prajapati, Paresh, Rakesh, Abhishek Shrama, Bhavya, Manish and my roommate Aditya had inspired me in research and life through our interactions during my days in MSU, Baroda.

I thank with love and gratitude all my friends Rajnikant, Ketan Chaudhari, Sumit Garg, Sumit ji Bhatiya, Amandeep sir, Prabhat, Gajendra, Abhishek Bhargava, Ladsingh, Avdhesh, Surendra Phogat sir, Someswar, Deepak, Adwitteya, Basant, Deepak and Kalyan. My special thanks to a person who is more than my friend Ms. Monika Kedia and her parents Mr. Bishwanath Kedia and Mrs. Shakuntala Kedia who supported me very much during the thesis writing.

I remember the days in IUAC and I thank my friends Ish, Shammi, Tanuj, Ratnesh and Sanjeev for their love and support.

During the course of this work, at MSU (2008 – 2016), My work is partially supported by the Inter University Accelerator Centre-New Delhi under UFUP project (project no. 42315) during the period 2008-2010 is gratefully acknowledged. I am also privileged for financial support to the Physics Department as a T. A. in duration of my Ph.D. work.

My deepest gratitude goes to my family for their unflagging love and support throughout my life; this dissertation is simply impossible without them. I am indebted to my father, for his care and love.

As a typical father (Mr. Chandraprakash Agrawal) in an Indian family, he worked industriously to support the family and spare no effort to provide the best possible environment for me to grow up and attend school. He never complained in spite of all the hardships in his life. I cannot ask for more from my mother (Mrs. Chandrakala Agrawal), as she is simply perfect. I have no suitable word that can fully describe her everlasting love for me. I remember her constant support when I encountered difficulties and I remember, most of all, her delicious dishes. My special gratitude is due to my brother and his family for their loving support.

Last but not least, thanks to God for my life through all tests in the past seven years. You have made my life more bountiful.

Naveen Agrawal