First of all I am thankful to the Supreme power, the God, who always guided me to work on right path of life, blessed with the support to pave the path for every success and gave me strength to fulfill dreams and expectations of my beloved mother and my loved ones by completing this task. Behind every achievement that we see in this world today are unseen hands of many. Similarly in my diligent endeavor to carry out this work I was fortunate enough to have support from a large number of people to whom I owe many things. It is a pleasure to convey my gratitude in my humble acknowledgment to all for fueling my aspiration through their consistent support and cooperation.

I am indebted to many people for the successful completion of this thesis. I express my deep sense of gratitude to my advisor and source of enlightenment, Prof. Surinder Singh, Department of Physics, Guru Nanak Dev University, Amritsar for guiding me to my desired destination. I am thankful for their expertise and insights in the fields of radiation effects and characterization, and their support and patience, and their valuable comments during the entire efforts with the research. This research would not have been possible without their guidance, support and encouragement. He has taught me the way to do research and pushed me to work hard. I am grateful to him for the time and patience that he has generously spent on my research in these years.

My special thanks are for Prof. Lakhwant Singh, Department of Physics, Guru Nanak Dev University, Amritsar, who played a major role in this thesis. He provided me with direction and valuable advice. He spent lot of his precious time reading my thesis chapters and sharing his valuable comments about them with me. It would be no exaggeration to say his words were always a sparkling light of motivation to me. I would like to extend my special thanks to Prof. R.C. Singh, Head, Department of Physics whose support and understanding helped me to overcome many difficulties during my studies.

I wish to extend my sincere thanks to Director, IUAC, New Delhi, Dr. Sundeep Chopra, Senior Scientist, IUAC and Accelerator User Committee for providing me a chance to use beam time and all the required facility at IUAC New Delhi. A very special thanks goes to my collaborator, Dr. S. P. Lochab, Scientist, IUAC, New Delhi, for his professional way to straighten and clarify my ideas, and advising me strategically. His thorough
encouragements compounded with his most humanitarian behaviour are worth praises. I sincerely thank to Dr. K. Ashokan, Scientist for extending his full support and cooperation in my research work at IUAC. His pleasant nature and scientific approach always influence me to be a good researcher. My special thanks go to Shaila Bahl and Mr. Birendra Singh at IUAC for the support during the ion beam and gamma irradiation experiments. I would also like to express my heartfelt thanks to Dr. Fouran Singh, Dr. Pawan Kularia, and Dr. D.C. Aggarwal, IUAC for their support in doing my experimental works. The financial support from University Grant Commission (UGC), New Delhi during this work is acknowledged.

I am indeed very gratified to Dr. Atul Khanna, Dr. Kuldeep Singh, Dr. R. Thangaraj, Dr. Anupinder Singh and Dr. Aman Mahajan, Department of Physics, Guru Nanak Dev University, Amritsar whose help was necessary for completing this research work. I am also thankful to Mr. Santokh Singh, Lab. technician for moral support. My time at university was made enjoyable in large part due to many friends that became a part of my life. I offer my sincere thanks to my friends Dr. Daljit, Komal Saini, Dr. Navjeet, Dr. Vibha, Vanita, Vandana, and Dr. Jaskiran Kaur. I appreciate their friendship and support during this period. Special thanks to my friends Shaila Bahl and Dr. Prabha Sana at IUAC, for lending me a supporting hand whenever I needed.

I also want to express my deepest gratitude to my brothers, Gulkanwar and Harsanjeev for their unconditional support in all my pursuits and assistance whenever needed. They have been always proud of my achievement and encouraged me when I faced problems on research. Without their inspiration, affection and constant guidance, this work would not have been completed. Above all, I would like to thank my massi ji for always believing in me and teaching me that any goal I set forth is attainable. Her support, love and prayers helped me through the time of this degree and I can never thank her enough.

The word ‘thanks’ itself falls short with respect to the person without whom I wouldn’t have seen the light of day. Most of all, I thank my beloved mother, who shares my burdens and my joys. This thesis is equally her achievement. For me, it is she who makes all things possible.

Sukhnandan Kaur