First and foremost, I thank the Almighty for affording me this opportunity and giving me the strength and patience to complete my doctoral research work successfully. This thesis would not have been possible without the blessings of the Almighty and also without the people behind my life for inspiring and guiding me. I would like to convey my deep and sincere gratitude to my supervisor, Prof. A. B. Bhattacharya, for providing precious guidance all through my research. He has been exceptionally kind with his time, knowledge and ideas. His outstanding knowledge and reasonable way of thinking have been of immense importance to me. The manner in which he inspired advised and assisted both in my academic and personal life has been remarkable. I am very lucky for having him as my supervisor. I also wish to express my heartfelt thanks to Prof. R. Bhattacharya for many important comments.

I am very much indebted and greatly thankful to my teacher Prof Sumit Roy for his kindness and sympathy. His endless optimism and kindness will always be in my memory. He provided me invaluable advice and guidance throughout my difficulties. I would also like to take this opportunity to convey my deep and sincere gratitude to my respected teacher Prof. S. Mukhopadhyay for his advice and helpful suggestions many times. I express my heartiest regards to Prof. B. N. Biswas and Prof S. K. Roy for their kind helps. I would like to convey special thanks and deep regards to Dr. Aninda Bose for his constant encouragement and support. I wish to express my sincere gratitude to Prof. Sarbeswar Choudhury for his helpful suggestions. I express my indebtedness and gratefulness to Dr George Kurian, Late Champak Garai and also to Mr Gangadhar Paitandy for their help and advice to me during days of my need.

I am grateful to the Head of the Department of Physics, University of Kalyani and to the Head of the Department of Computer Science and Engineering, University of Kalyani, for their supports throughout my work. I am also very thankful to the entire radio and atmospheric research groups for their friendship, assistance and support. Last but not the least my deepest gratitude goes to my family for their constant encouragement and support throughout. I am grateful to my mother, Anjali Roy for her care and love. I am deeply thankful to my wife, Sanjukta Mukherjee, for her cooperation, meticulous care at all the times.