STATEMENT

The work contained in this thesis has been carried out at the Physical Research Laboratory, Ahmedabad under the guidance of Prof.B.G.Anandarao. The work done for the thesis consists of two aspects: (i) instrumentation and (ii) Observations of HII regions and their interpretation. The Imaging Fabry Pérot spectrometer (IFPS) has been designed and built at PRL. A major part of the funds for this work was granted by the DST. The observations of the two HII regions for the thesis work have been made at Gurushikhar observatory, Mt Abu. The thesis is divided into six chapters.

Chapter I contains an overview of HII regions. The introduction, evolution and definition of important physical parameters is discussed. The significance of kinematic studies of the HII regions and the aim and the scope of the present studies are stated in this chapter.

Chapter II is concentrated on the details of the instrument developed to carry out the present work. The author describes here, the design, fabrication and performance of high resolution piezo-scanned Imaging Fabry-Perot Spectrometer and the reasoning for the selection of the present instrument. A brief description of Fabry-Pérot Spectrometer is given. This chapter also provides a brief introduction to different types of detectors used for astronomical observations discussing their merits and demerits. A comparison of their characteristic properties is also given.

Chapter III gives the details of the observations made and the method of analysis. Data reduction softwares developed for the extraction of the kinematic information are discussed here. An estimate of the errors involved in observations and data analysis is given.

Chapter IV presents the kinemaics of the nearest HII region, the Orion nebula and the results obtained from the present analysis. The importance of the new results obtained is discussed and comparison with earlier results is made. Velocity field across the important features *viz bar* ionization front, dark *bay* and the molecular cloud regions is detailed. Velocity field structure across the bar ionization front is obtained for the first time. Certain high veocity flows are found across the nebula, which seem to be new and do not correspond to any of the earlier detected peculiar objects like knots, jets and HH objects. A jet like feature about 1.5 arc min north-west of the trapezium stars is found. Possible interpretation is given for the existence of such features. Iso-velocity contour map is generated and a comparison is made with maps at infrared and radio wavelenghts. A synthetic profile is generated at a particular position on the nebula and compared with the observed profile.

In chapter V, studies on another HII region Trifid Nebula are discussed. This provides complimentary studies to those on Orion nebula in order to check the proposed models on HII regions. An iso-velocity contour map is generated for Trifid nebula. A jet like feature arc min SE of the ionizing star is observed.

Chapter VI is the concluding chapter which summarizes the important results obtained from the present analysis and scope for future studies.