

# Table of contents

<b>List of figures</b>	<b>xxiii</b>
<b>List of tables</b>	<b>xxvii</b>
<b>Nomenclature</b>	<b>xxix</b>
<b>1 Introduction</b>	<b>1</b>
1.1 Dwarf galaxies: an introduction . . . . .	1
1.2 The Interstellar Medium . . . . .	2
1.2.1 A brief overview of the interstellar medium in galaxies . . . . .	2
1.2.2 Interstellar dust . . . . .	4
1.2.3 Extinction by dust grains . . . . .	5
1.2.4 Formation and evolution of dust grains . . . . .	9
1.2.5 Properties of dust grains: Composition and size distribution . . . . .	12
1.2.6 Deriving the properties of dust grains from diffuse emissions . . . . .	16
1.3 Multi-wavelength observations . . . . .	17
1.3.1 Interstellar Medium in dwarf galaxies . . . . .	19
1.3.2 Star formation in dwarf galaxies . . . . .	20
1.4 Cosmological importance of dwarf galaxies . . . . .	21
1.5 Objectives and outline of the thesis . . . . .	21
<b>2 UV observation of Holmberg II</b>	<b>25</b>
2.1 Holmberg II: A general introduction . . . . .	25
2.2 <i>AstroSat</i> /UVIT observation of Ho II . . . . .	26
2.2.1 <i>AstroSat</i> . . . . .	26
2.2.2 UV observations . . . . .	27
2.2.3 UVIT image processing . . . . .	28
2.2.4 UVIT images of Ho II . . . . .	32
2.3 Conclusions . . . . .	33

<b>3</b>	<b>ULX in Holmberg II</b>	<b>35</b>
3.1	Introduction . . . . .	35
3.2	Ultra luminous X-ray sources (ULX) . . . . .	35
3.3	X-ray observations . . . . .	37
3.4	Results and Discussions . . . . .	39
3.5	Conclusions . . . . .	43
<b>4</b>	<b>ISM in Holmberg II</b>	<b>45</b>
4.1	Introduction . . . . .	45
4.2	Dust in Ho II . . . . .	46
4.3	Diffuse UV - IR correlation study in Ho II . . . . .	46
4.3.1	Data acquisition . . . . .	48
4.3.2	Selection of locations . . . . .	49
4.3.3	Results and Discussions . . . . .	52
4.4	Diffuse FUV emission in Ho II: 3D radiative transfer modelling for dust scattering . . . . .	58
4.4.1	Single scattering model . . . . .	59
4.4.2	Sources of UV emission in Ho II . . . . .	59
4.4.3	Results and Discussions . . . . .	60
4.5	Diffuse IR emission in Ho II: Multi-temperature dust populations . . . . .	63
4.5.1	Observational data . . . . .	63
4.5.2	Analysis of IR dust emission . . . . .	66
4.5.3	Multi-temperature dust spectra . . . . .	67
4.5.4	Results and Discussions . . . . .	69
4.6	Conclusions . . . . .	71
<b>5</b>	<b>ISM in LMC-30 Doradus</b>	<b>73</b>
5.1	Introduction . . . . .	73
5.2	The Large Magellanic Cloud and 30 Doradus . . . . .	73
5.3	Observations and data analysis . . . . .	75
5.3.1	The model and input parameters . . . . .	75
5.4	Results and Discussions . . . . .	78
5.5	Conclusions . . . . .	84
<b>6</b>	<b>Summary and future outlook</b>	<b>85</b>
6.1	Key Outcomes . . . . .	85
6.1.1	<i>AstroSat</i> /UVIT observation of Ho II . . . . .	85

---

6.1.2	Nature of emission from the ULX source Ho II X-1 . . . . .	86
6.1.3	Interstellar dust properties . . . . .	87
6.2	Future prospects . . . . .	88
<b>Bibliography</b>		<b>91</b>