

# Table of Content

<b>1. Introduction</b>	<b>1</b>
1.1. Motivation . . . . .	1
1.2. The Luminosity Function . . . . .	3
1.3. High-redshift Galaxies . . . . .	7
1.4. Star Formation Rate tracers . . . . .	10
1.5. This work . . . . .	13
<b>2. Data</b>	<b>15</b>
2.1. Sample Selection and HST data . . . . .	15
2.2. GREATS Spitzer/IRAC Photometry . . . . .	16
<b>3. The sample for <math>H\alpha</math> measurements at <math>z \sim 4.5</math></b>	<b>18</b>
3.1. IRAC Photometry . . . . .	18
3.2. Redshifts . . . . .	18
3.2.1. Spectroscopic Sample . . . . .	19
3.2.2. Photometric Redshift Sample . . . . .	20
3.2.3. Spectroscopic Sample vs. Photometric Sample . . . . .	20
<b>4. <math>H\alpha</math> measurements</b>	<b>22</b>
4.1. Spectral Energy Distribution Modeling . . . . .	22
4.2. $H\alpha$ flux measurements . . . . .	23
4.3. Detection Limit . . . . .	25
4.4. Alternative $H\alpha$ measurements . . . . .	26
4.4.1. Modeling the Nebular Emission with CIGALE . . . . .	29
<b>5. The <math>H\alpha</math> Luminosity Function</b>	<b>30</b>
5.1. The Faint-end of the $H\alpha$ Luminosity Function . . . . .	34
5.2. Schechter Parameters . . . . .	34
<b>6. Star Formation Rate Functions</b>	<b>38</b>
6.1. Dust Corrections . . . . .	38
6.2. Star Formation Rates . . . . .	39
6.3. Star Formation Rate Function at $z \sim 4.5$ . . . . .	40

6.4. The SFRD evolution . . . . .	43
<b>7. Discussion</b>	<b>46</b>
7.1. Evolution of the H $\alpha$ Equivalent Width . . . . .	46
7.2. Evolution of the H $\alpha$ Luminosity Function . . . . .	47
7.3. Differences between SFR(H $\alpha$ ) and SFR(UV) . . . . .	50
7.4. Cosmic Star Formation Rate Density History . . . . .	52
<b>8. Summary and Conclusions</b>	<b>55</b>
<b>Bibliography</b>	<b>57</b>