Star Formation Across Cosmic Time (SFACT) survey

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January 12, 2023

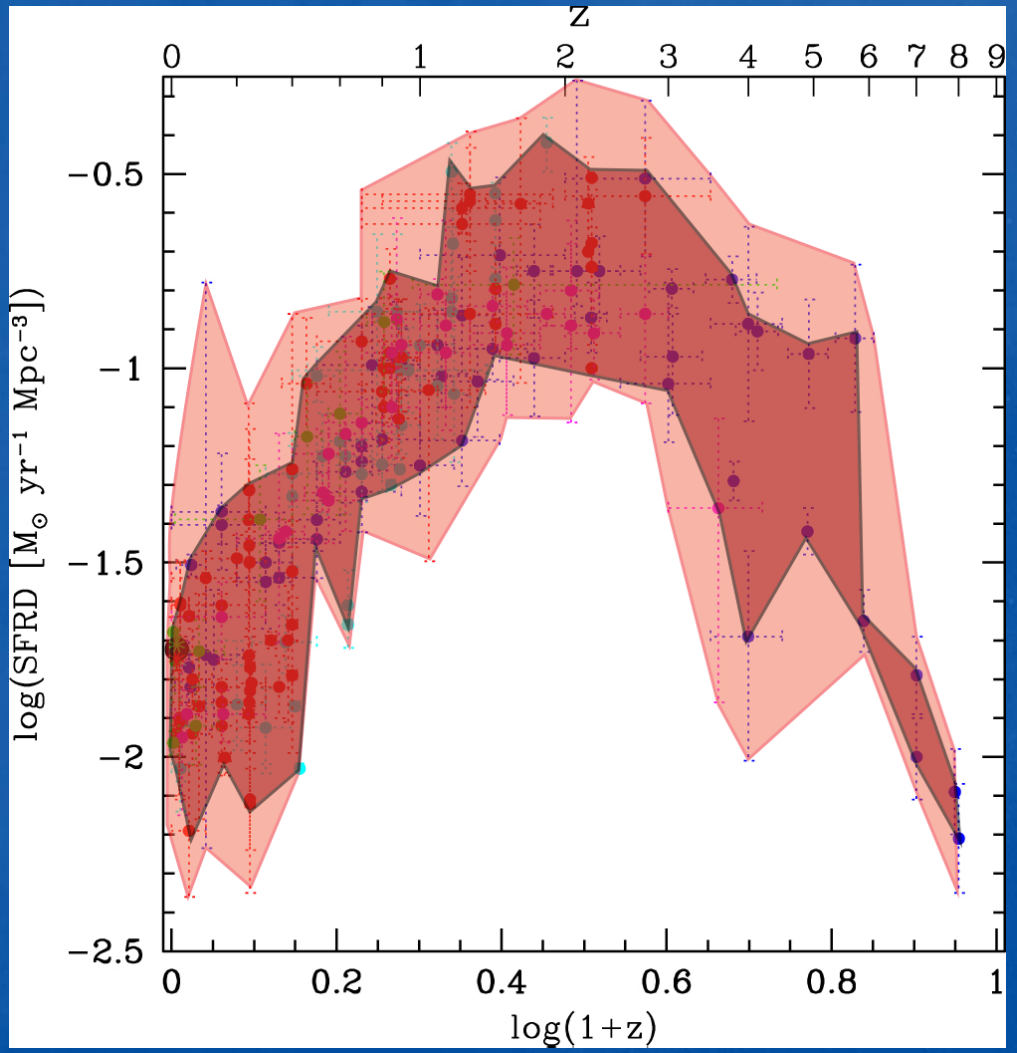
What is SFACT?

Star Formation Across Cosmic Time

Emission-Line Galaxy (ELG) survey

Motivated by uncertainties in Madau plot

- ~1 dex spread
- many methods



van Sistine et al. 2016

How SFACT is Different

Wide + Deep

25-30 deg^2 out to z ~1.5

Emission-line selection function

Hα, [O III] λ5007, [O II] λ3727

Imaging + Spectroscopy

WIYN 3.5m telescope with ODI + Hydra

Consistent methodology

Observations

WIYN 3.5m

40’ x 48’

25-30 deg^2

5.4 total hours on one field

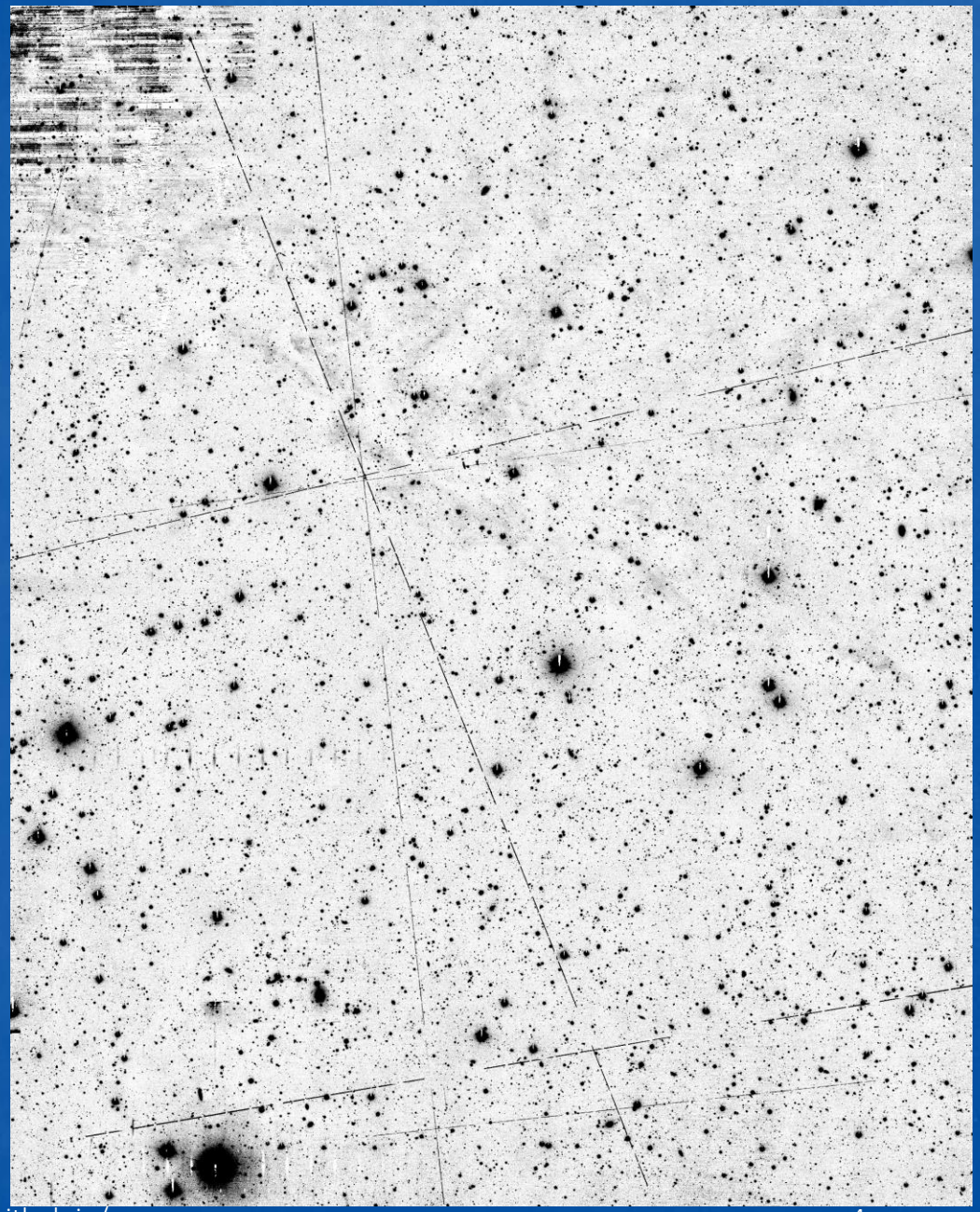
90 min per NB

20 min per BB

Broadband filters (~SDSS filters)
+ custom narrowband filters

Median r~22.5

6 filter composite image from one field



Redshift windows

NB1: 6950Å

NB2: 6590Å

NB3: 7460Å

Currently:

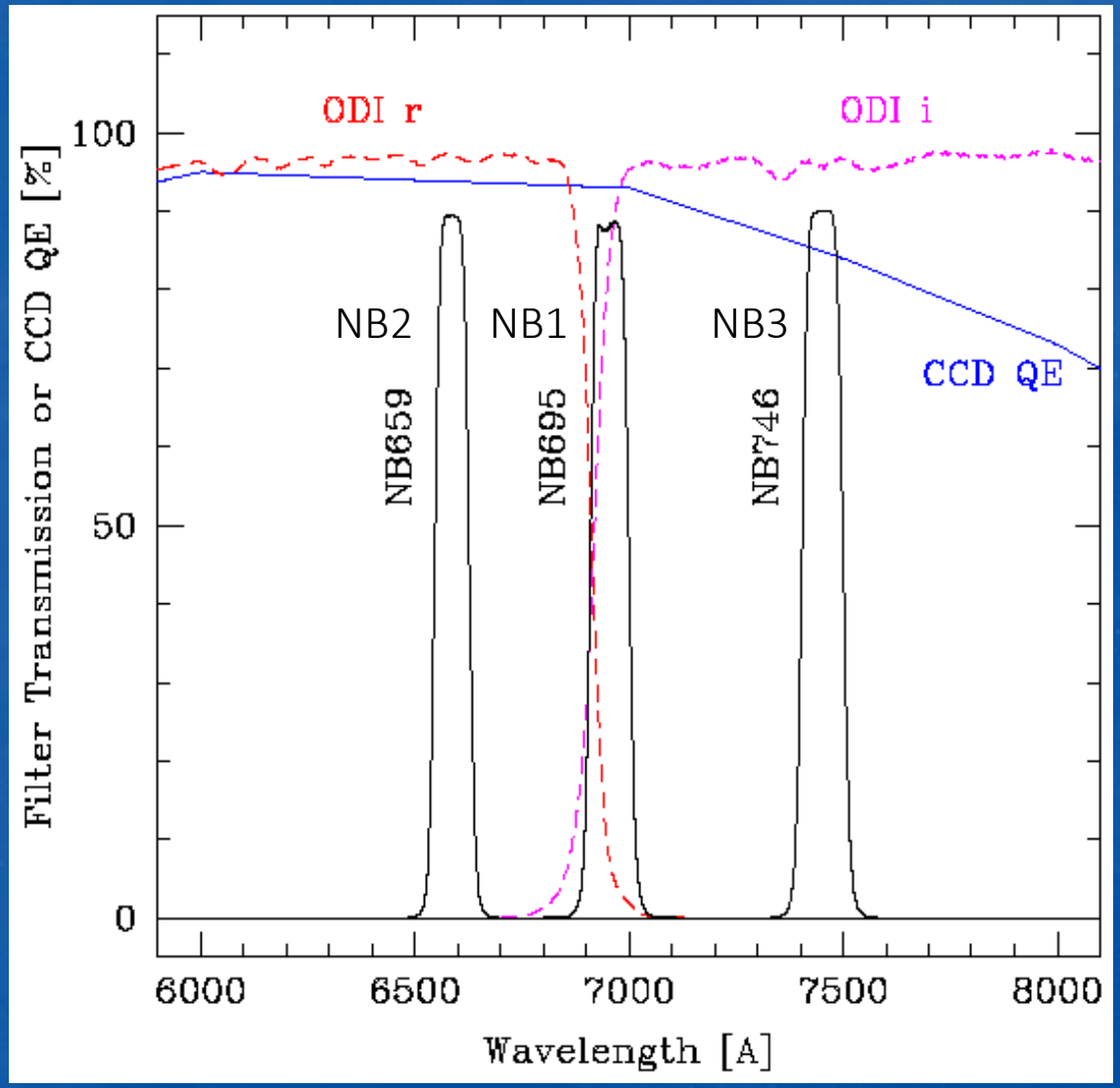
3 NB filters

z<1.0

Future:

5 NB filters

z<1.5



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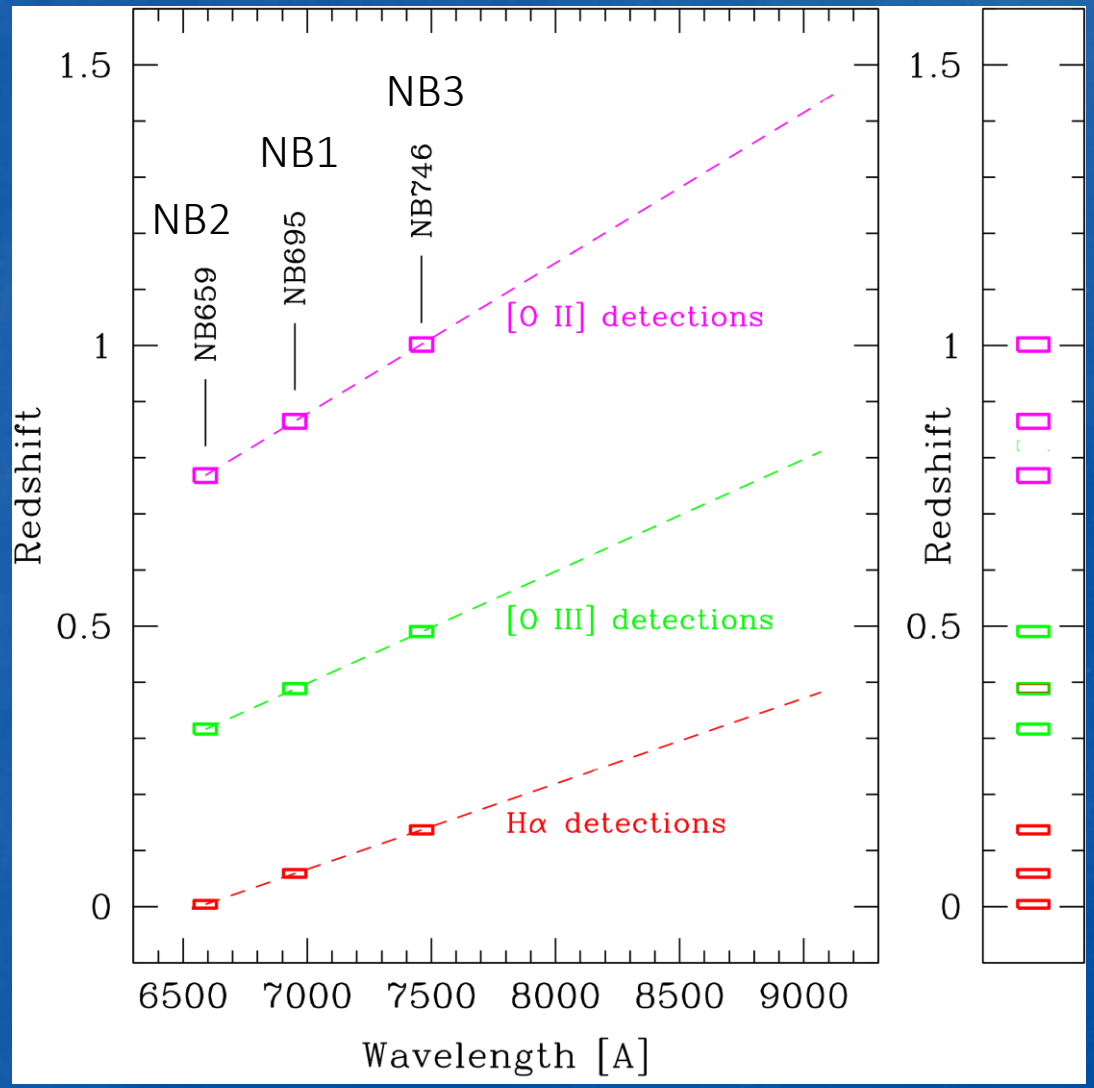

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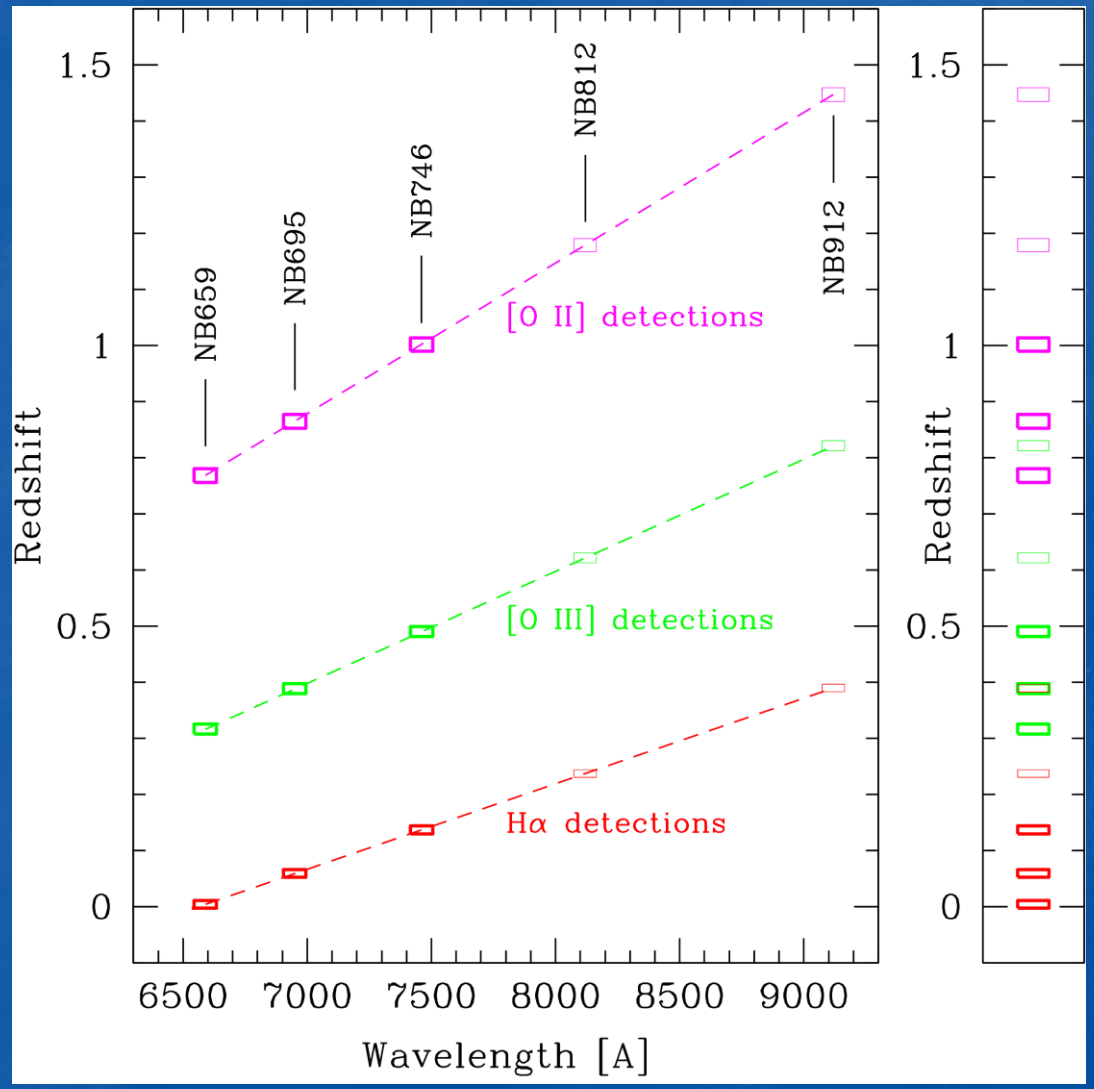
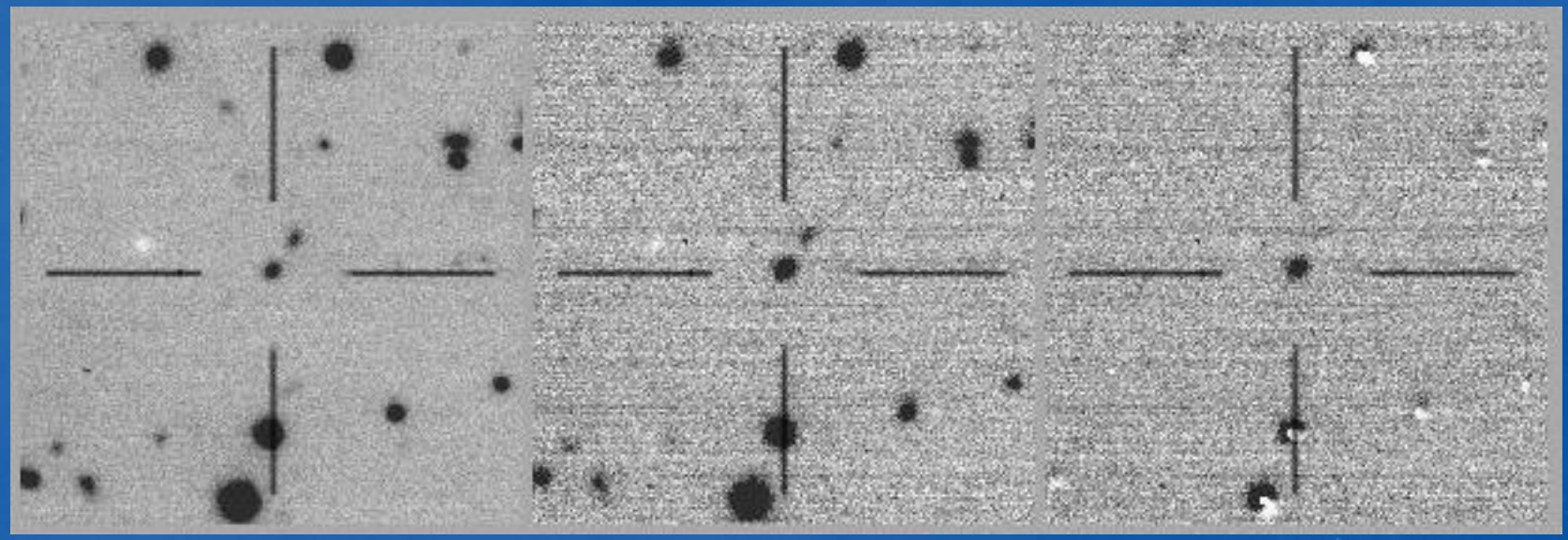


Identifying ELG candidates

[O III]
z = 0.3906

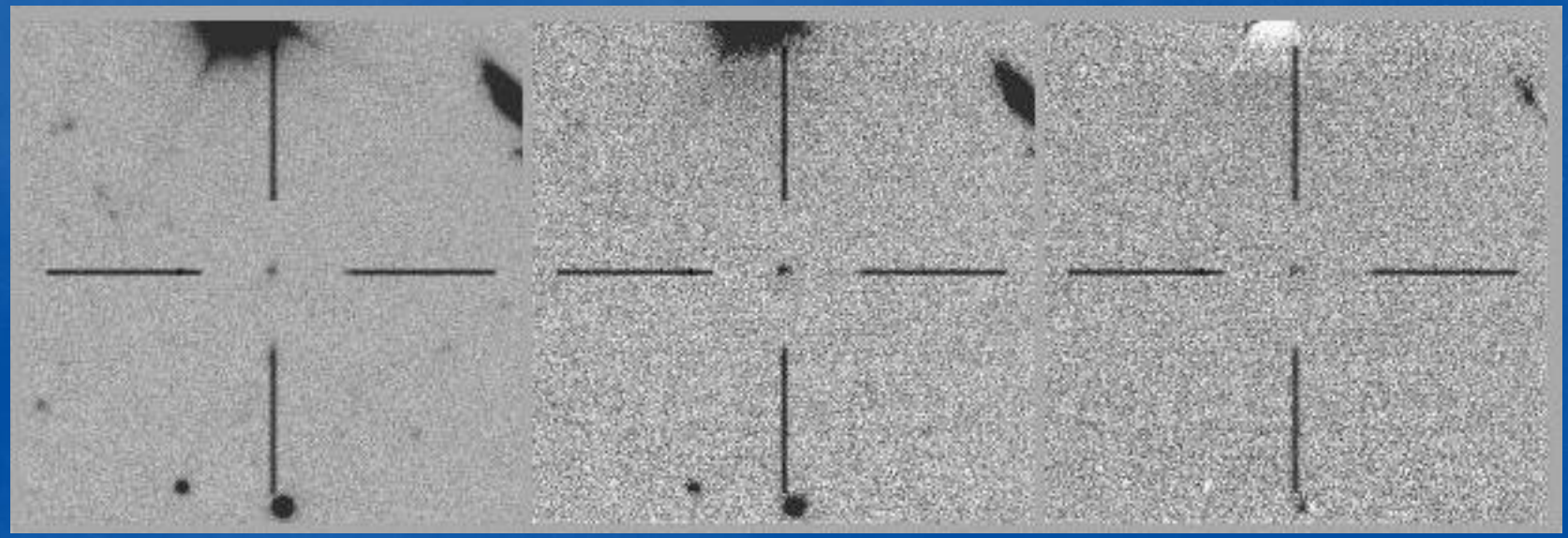
NB flux = 1.01 × 10^{-15} erg s^{-1} cm^{-2}



Continuum | Un-subtracted NB | Difference

[O II]
z = 0.7670

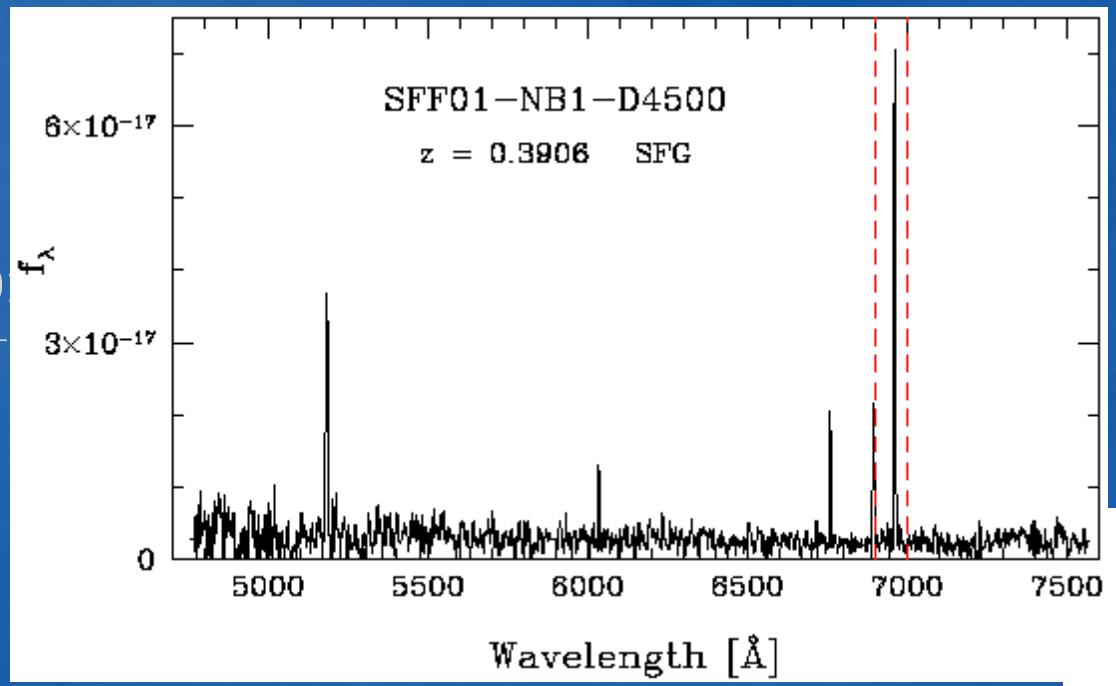
NB flux = 2.04 × 10^{-16} erg s^{-1} cm^{-2}

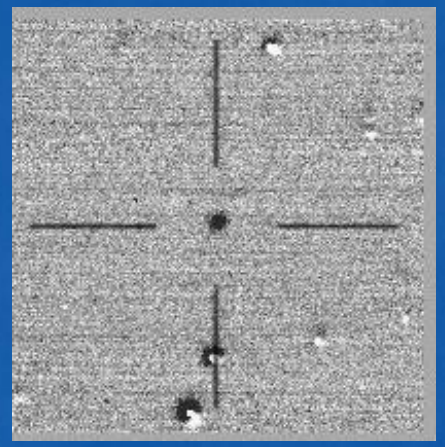


Confirming ELG candidates

[O III]
z = 0.3906

NB flux = 1.0
× 10^{-15} erg s^{-}
cm^{-2}





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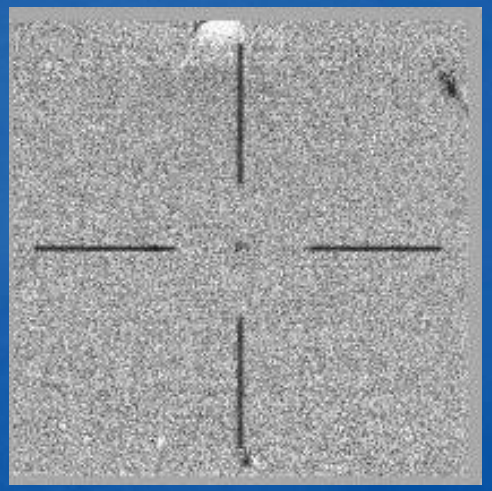
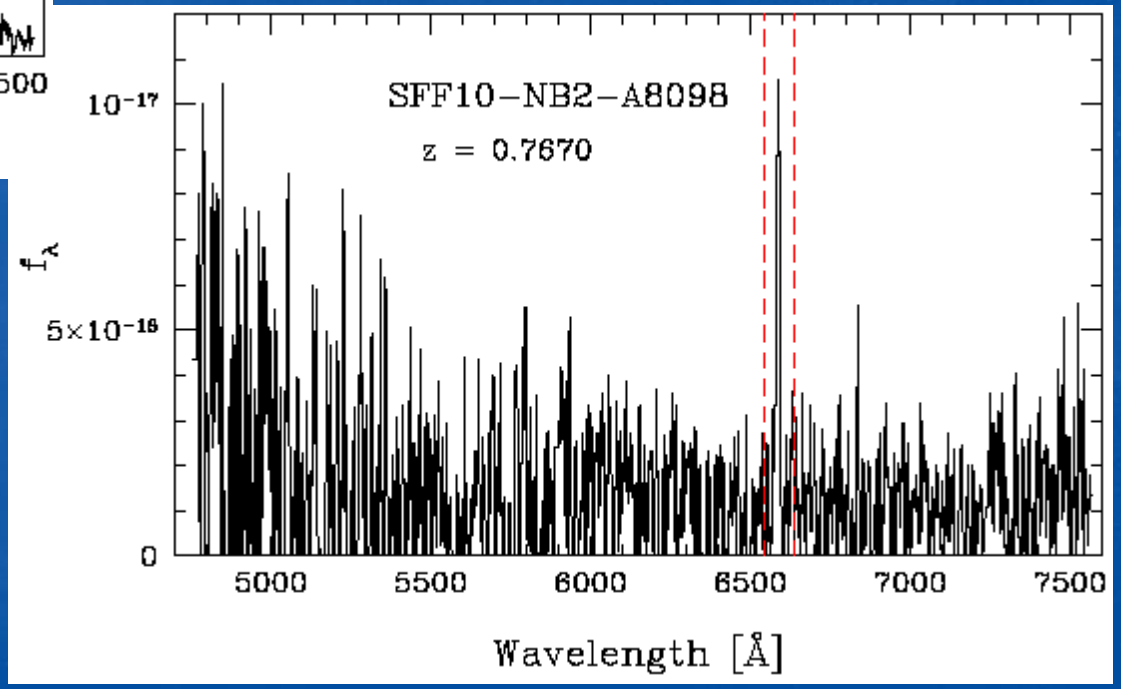




Preliminary SFRD determination

Thesis Sample:

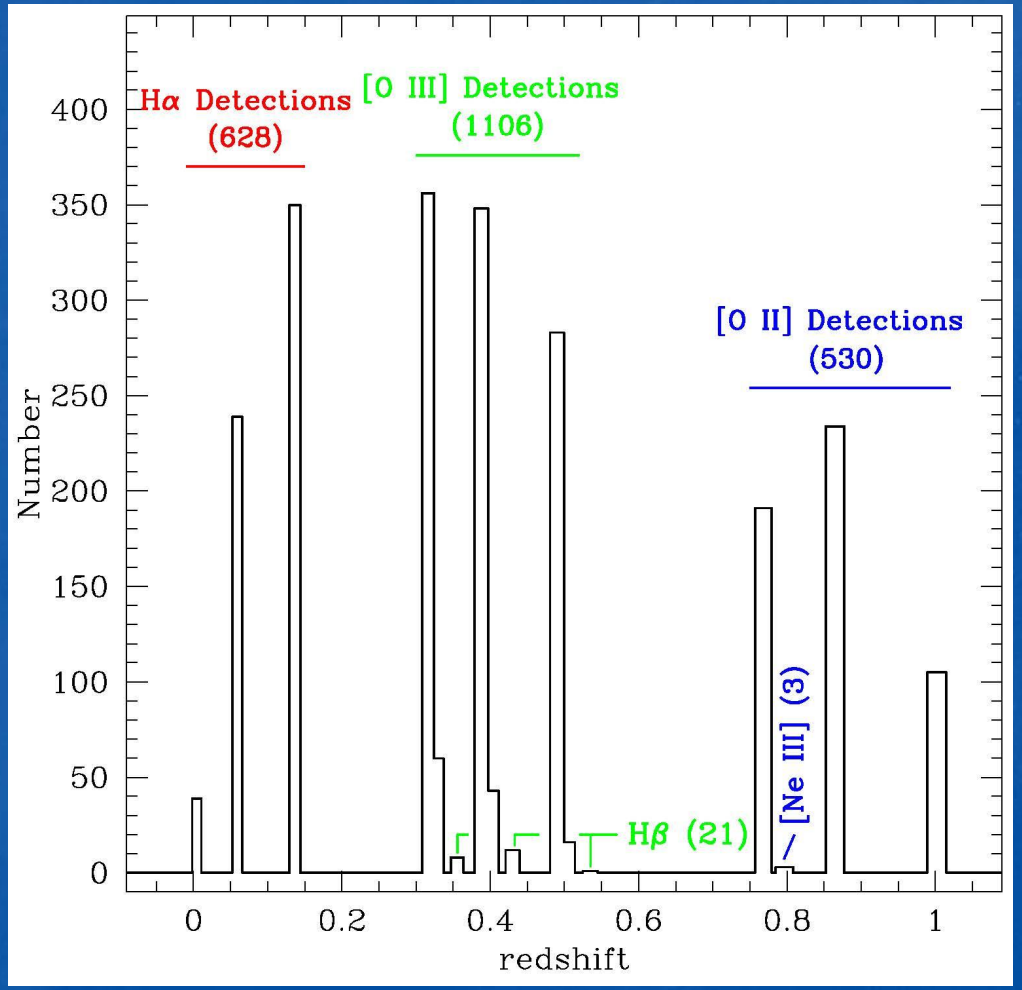
12 fields

1684 ELG candidates

1134 candidates with follow-up spectroscopy

938 ELGs detected via a primary emission line

>156 ELG/deg^2



Star Formation Rates

0.31 < z < 0.32

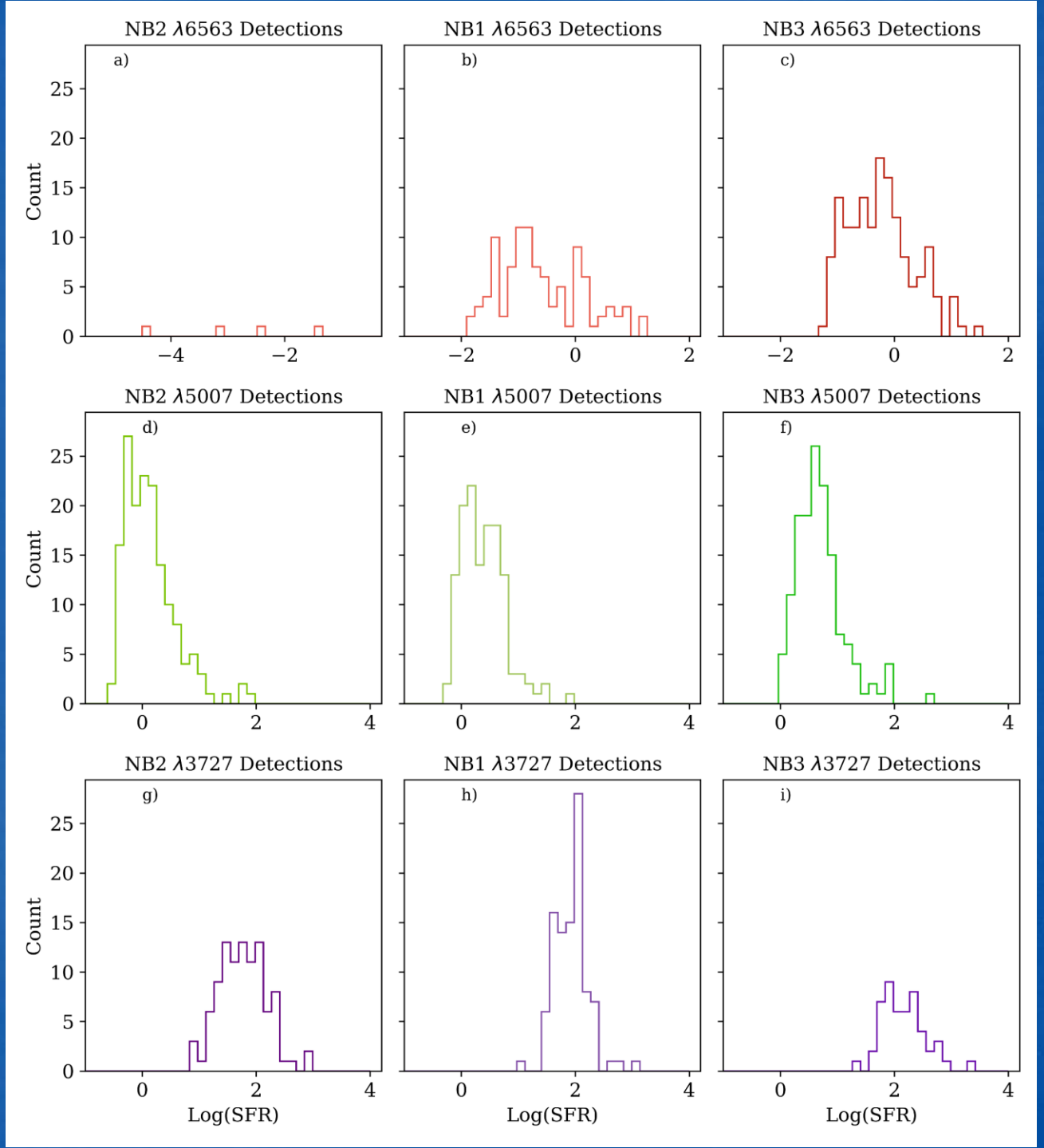
0.38 < z < 0.40

0.48 < z < 0.50

0.76 < z < 0.78

0.85 < z < 0.88

0.99 < z < 1.01



Hα detections:
258 galaxies
Median log(SFR) = -0.42 $M_\odot\ yr^{-1}$

[O III] detections:
434 galaxies
Median log(SFR) = 0.40 $M_\odot\ yr^{-1}$

[O II] detections:
246 galaxies
Median log(SFR) = 1.92 $M_\odot\ yr^{-1}$

0.00 < z < 0.01

0.05 < z < 0.07

0.13 < z < 0.14

0.31 < z < 0.32

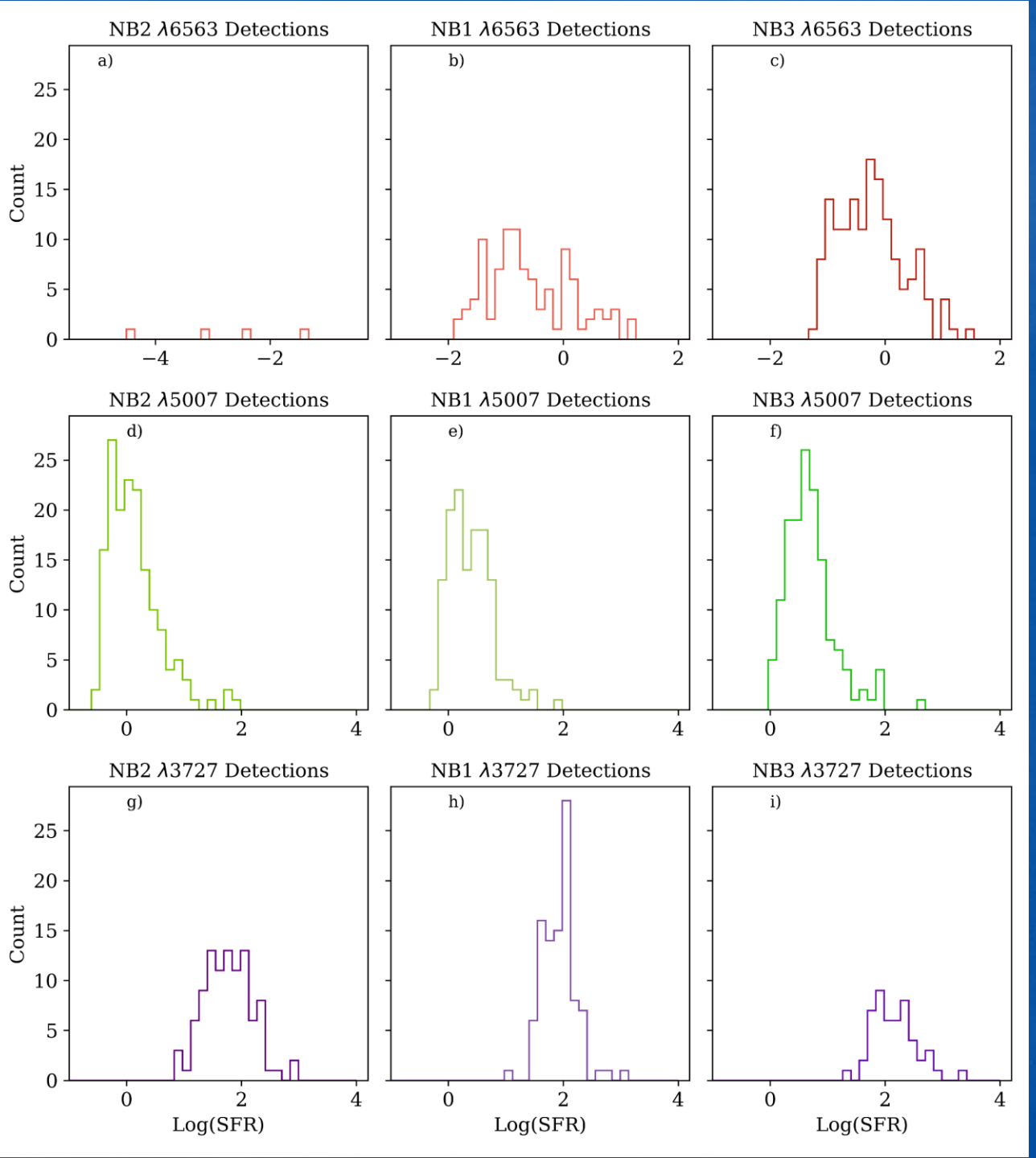
0.38 < z < 0.40

0.48 < z < 0.50

0.76 < z < 0.78

0.85 < z < 0.88

0.99 < z < 1.01



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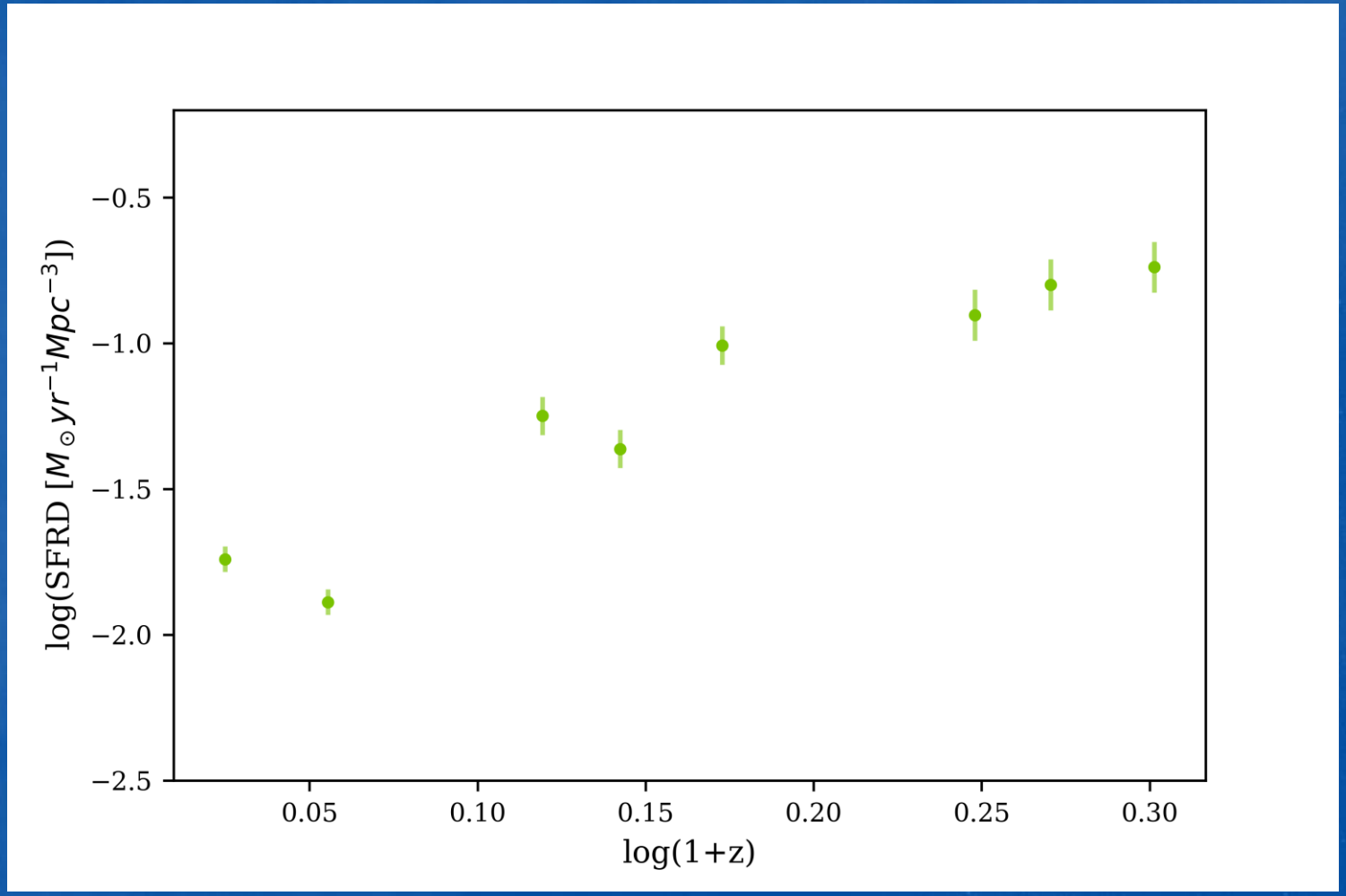
Star Formation Rate Density

Preliminary

12 fields

Errors dominated by survey depth correction uncertainty and absorption correction uncertainties

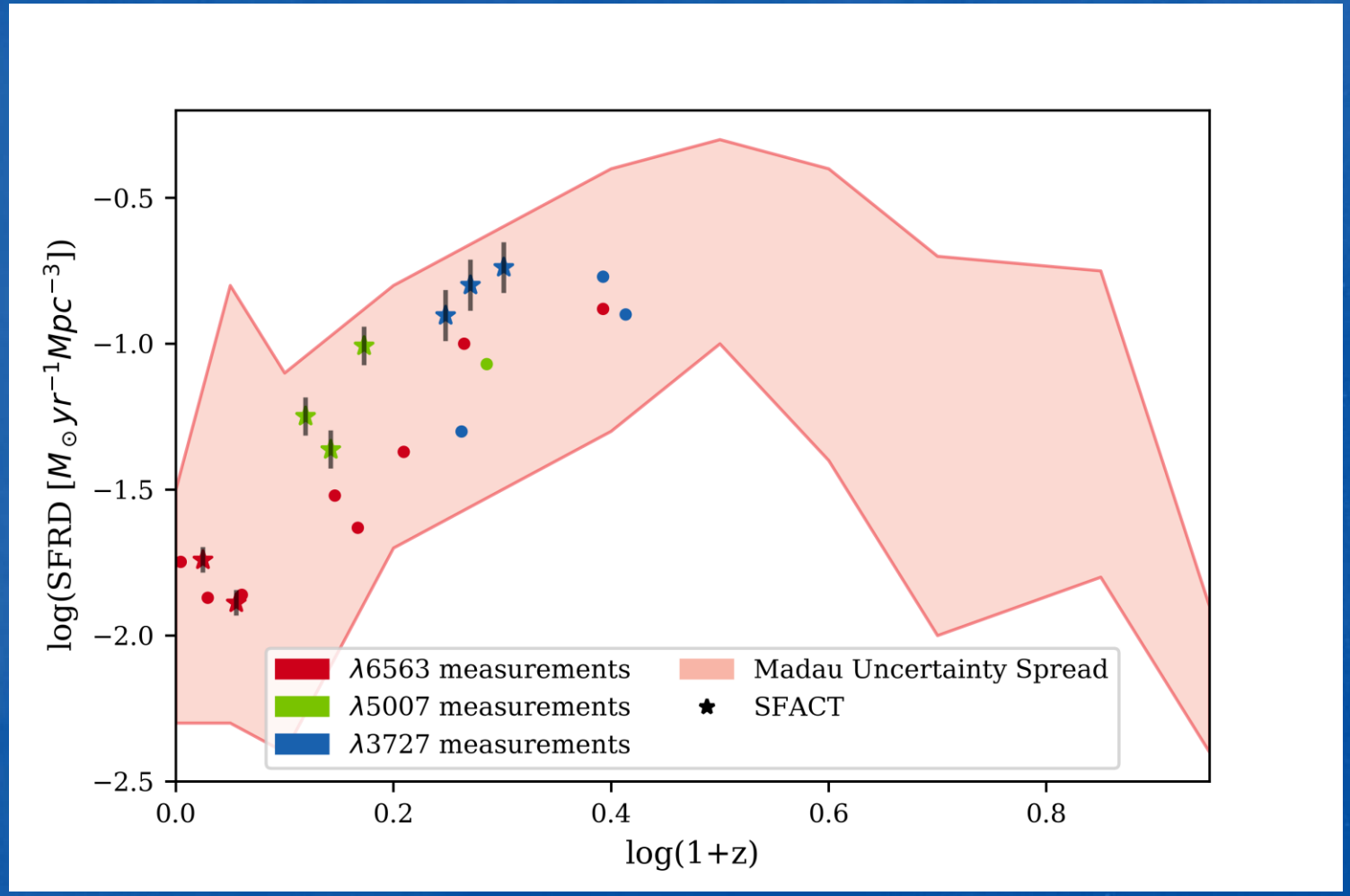


Star Formation Rate Density

Good agreement with published studies at z<0.1

Within overall uncertainties of Madau plot

Other surveys: Ly et al. 2007, Sullivan et al. 2000, LAGER, DAWN, vanSistene et al. 2016, and HiZELS



What's next?

Conduct follow-up spectroscopy

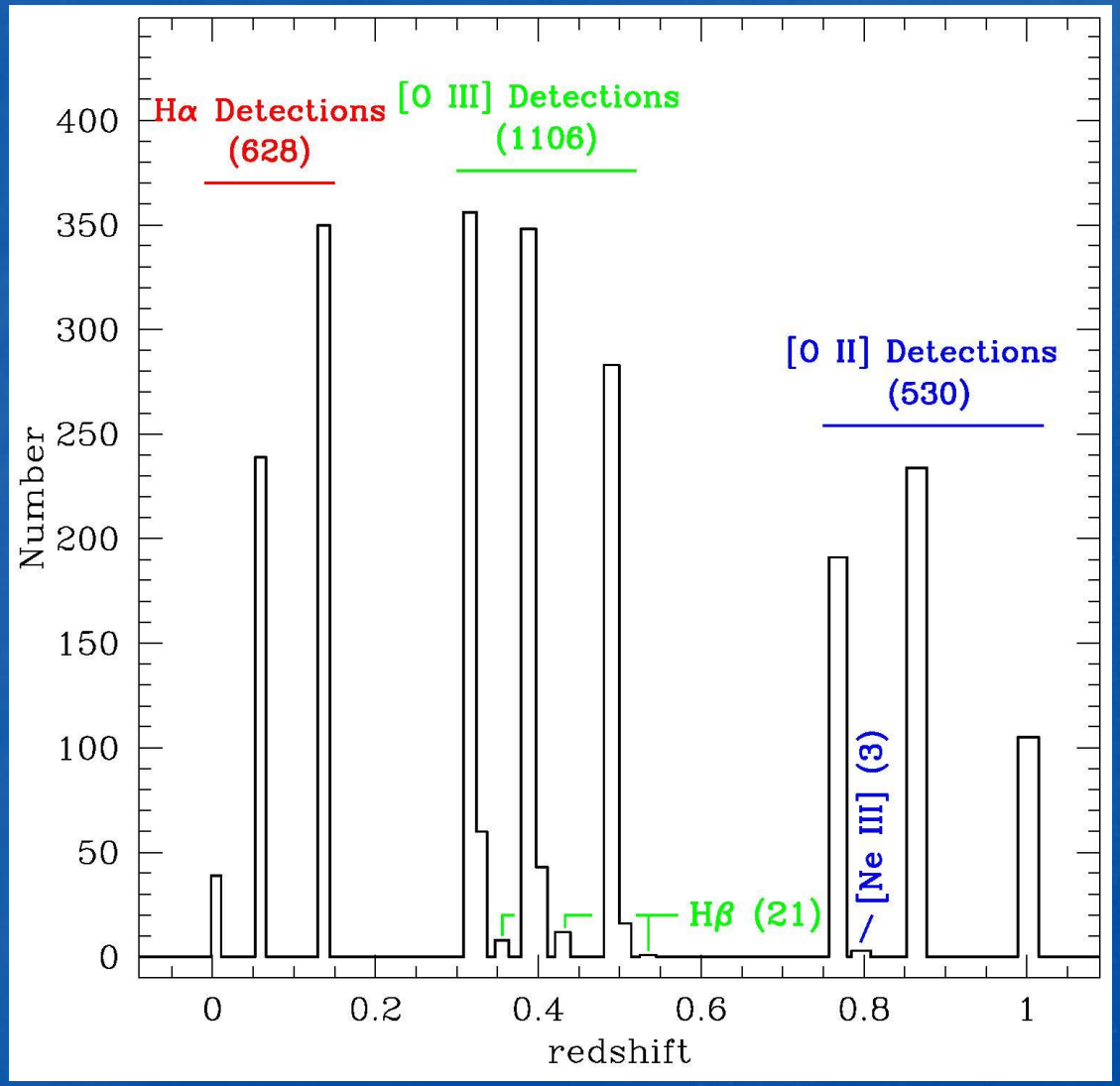
- 5500 candidates
- 2400 with spectra

Take more images

- 43 target fields so far
- goal of 50-60 fields
- process existing data

Forthcoming papers in AAS journals

Expect reliable SFRD paper in summer



Summary

SFACT uses emission lines to detect star-forming galaxies at $z < 1.5$

Deep and wide survey with imaging and spectroscopy

Preliminary star-formation rate density results promise high-confidence measurements at $z < 1.5$

Survey is in progress; watch for papers!

Thank you!

Other questions? Email me: Jsieben@iu.edu