# THE PREVALENCE OF CIII EMISSION AT $1.5 < z < 4$

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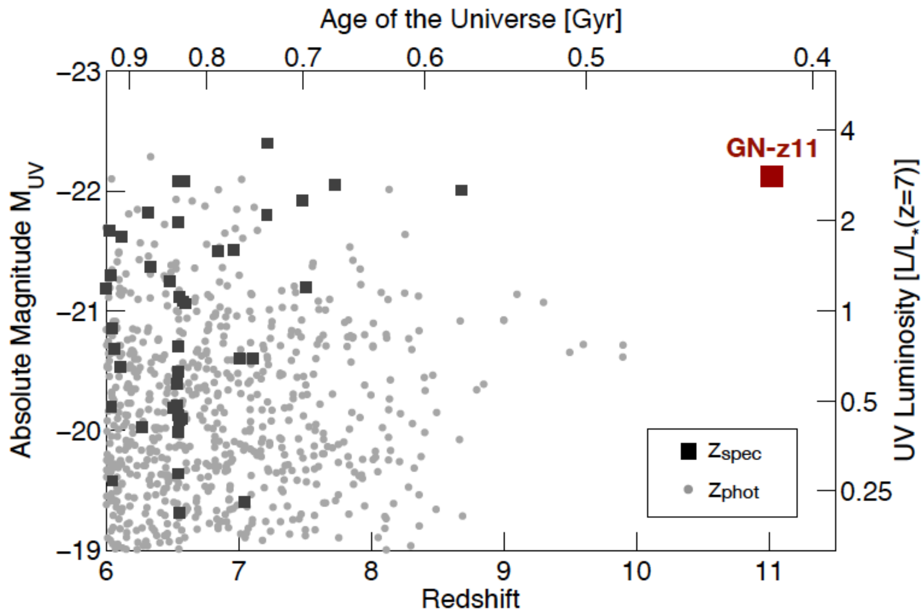
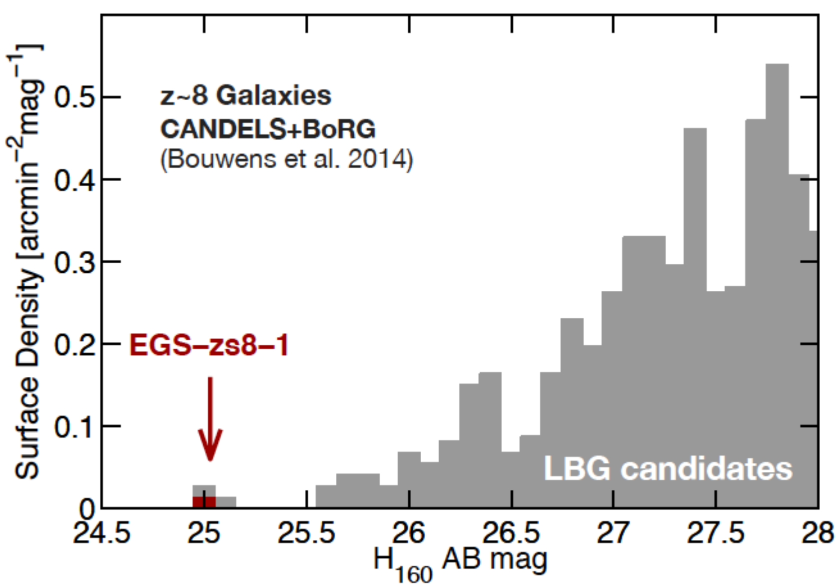
# The current state of high-z studies

- Hundreds of photometric candidates at z > 5 from CANDELS, HUDF, BoRG, etc.
- But relatively few spectroscopic confirmations from Ly-α or continuum breaks

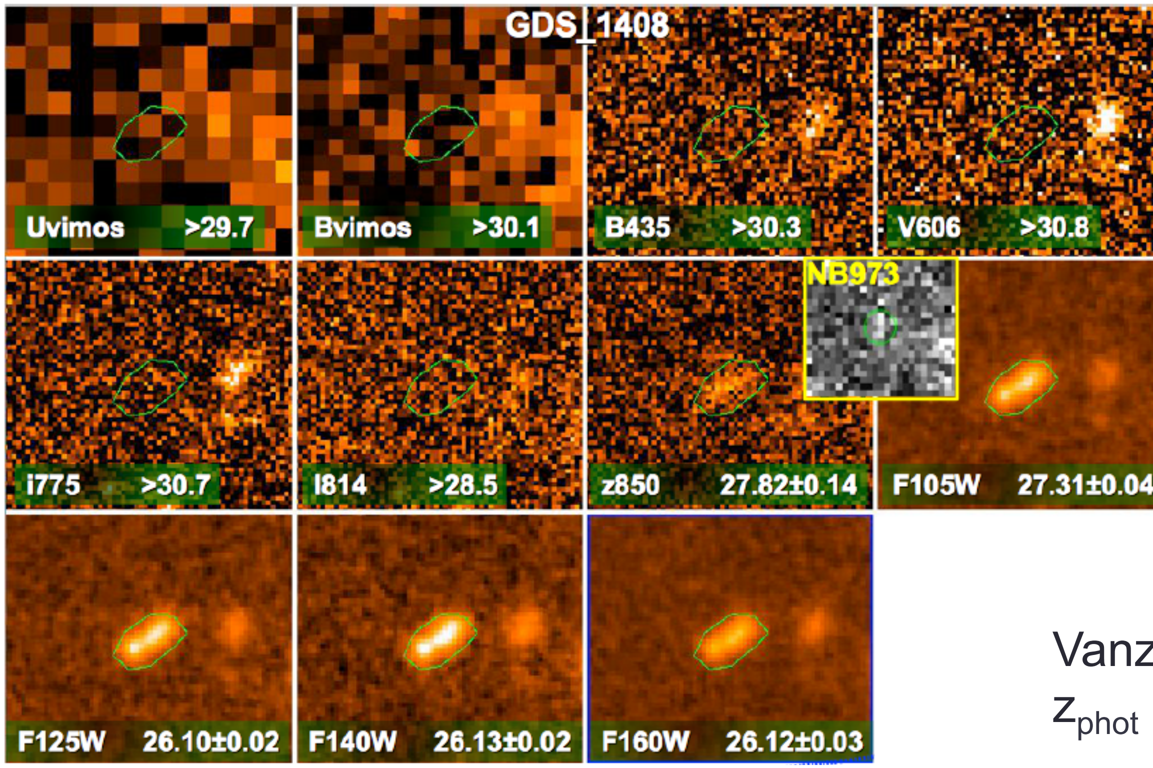



Oesch+16




Oesch+15

# We usually do OK with the brightest ones, but…



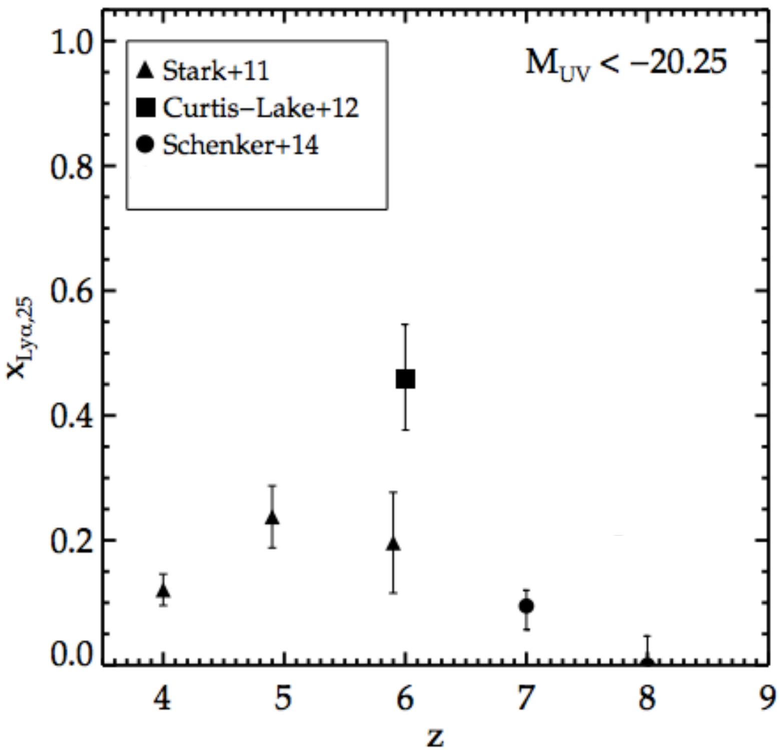

Vanzella+14

$z_{phot} \sim 7$

z-band dropout HUDF-J033242.56-274656.6

# What's going on at high-z?

- Increasingly neutral IGM at z>6 leads to increased scattering of Ly-α photons (Stark+11, Pentericci+11, Treu+13, Dijkstra+14, …)




Stark+16

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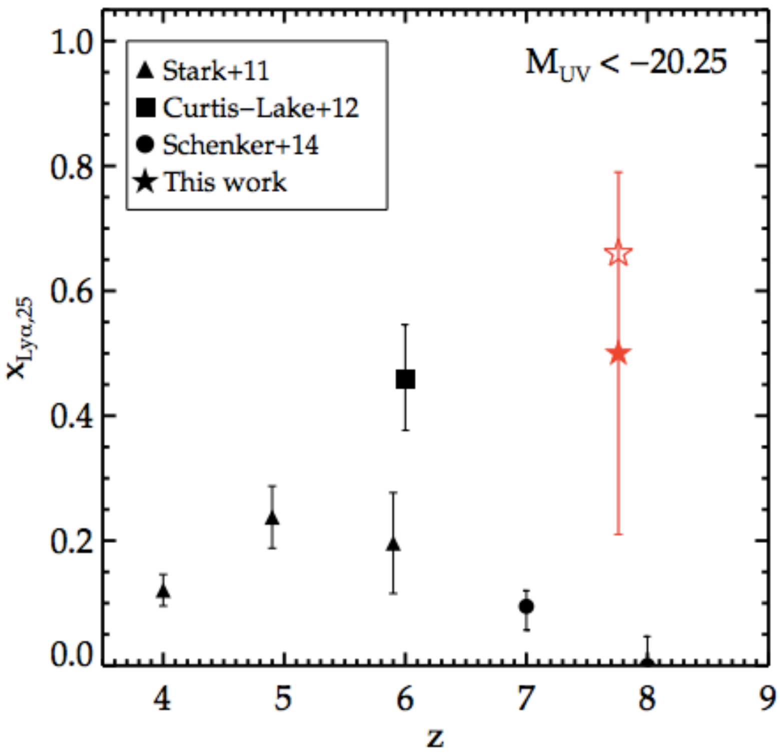
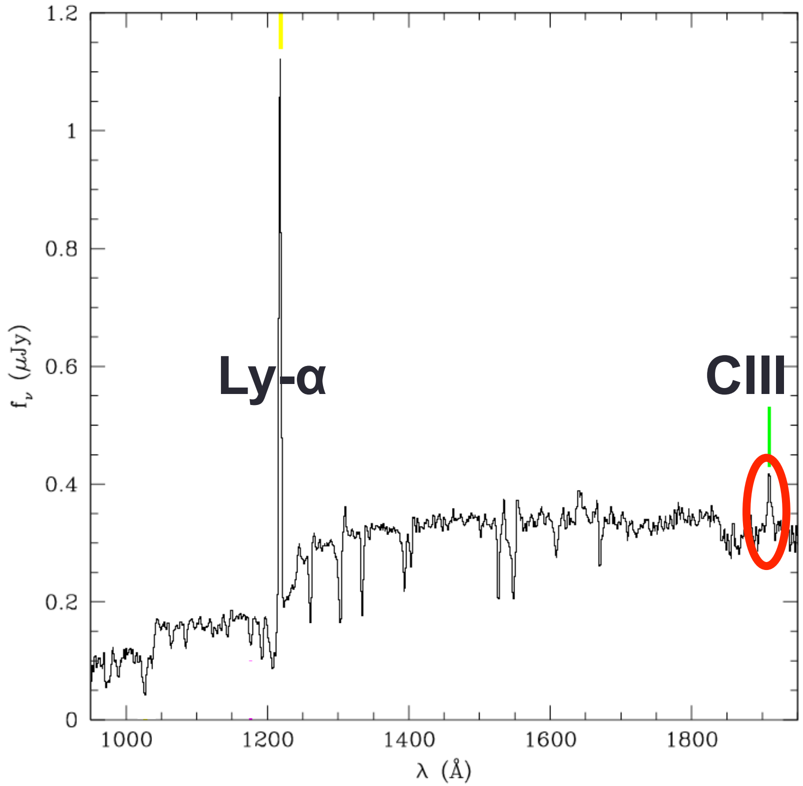
- (New results indicate that this may not be true around the most extreme galaxies)




Stark+16

# CIII: the best thing since Ly-α?

- Up to 10% of Ly-α but is not energetic enough to ionize Hydrogen




Shapley+03
(z~3 LBG stack)

# CIII: the best thing since Ly-α?

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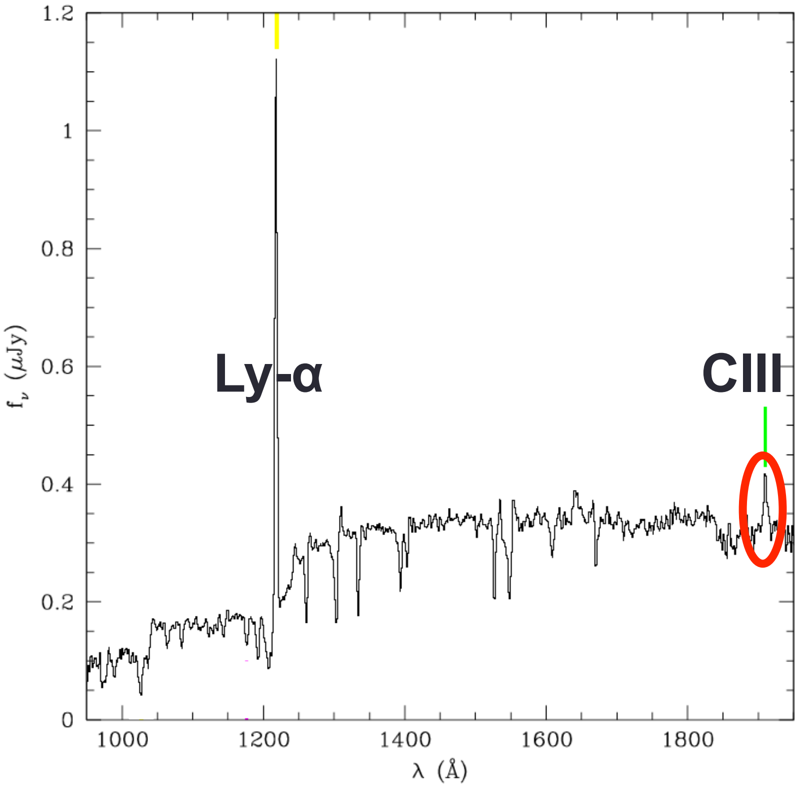
- Photoionization models ➔ high electron temperatures and ionization parameters, low metallicity
  - "Easier" to interpret than Ly-α

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- Focused on local/low-mass populations (e.g. Stark+14, Zitrin+15, Rigby+15)
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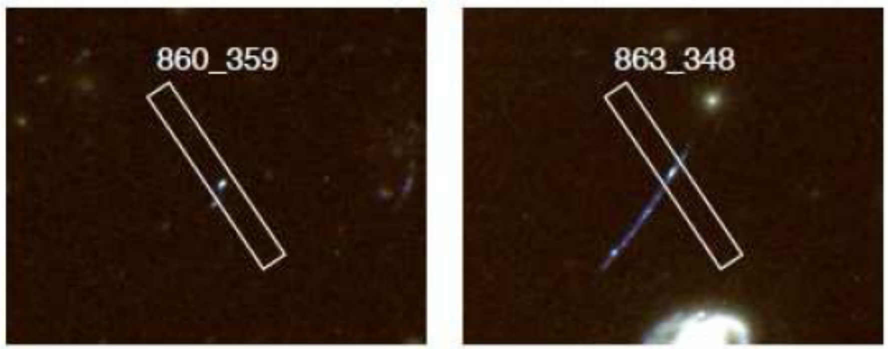
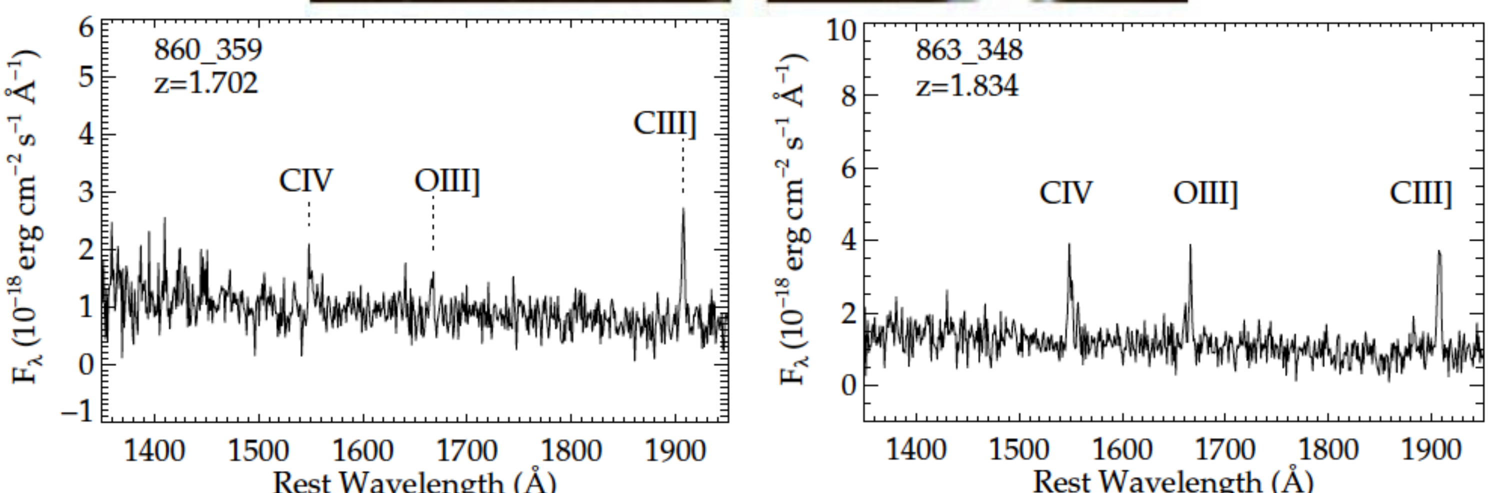



z ~ 2 (lensed)



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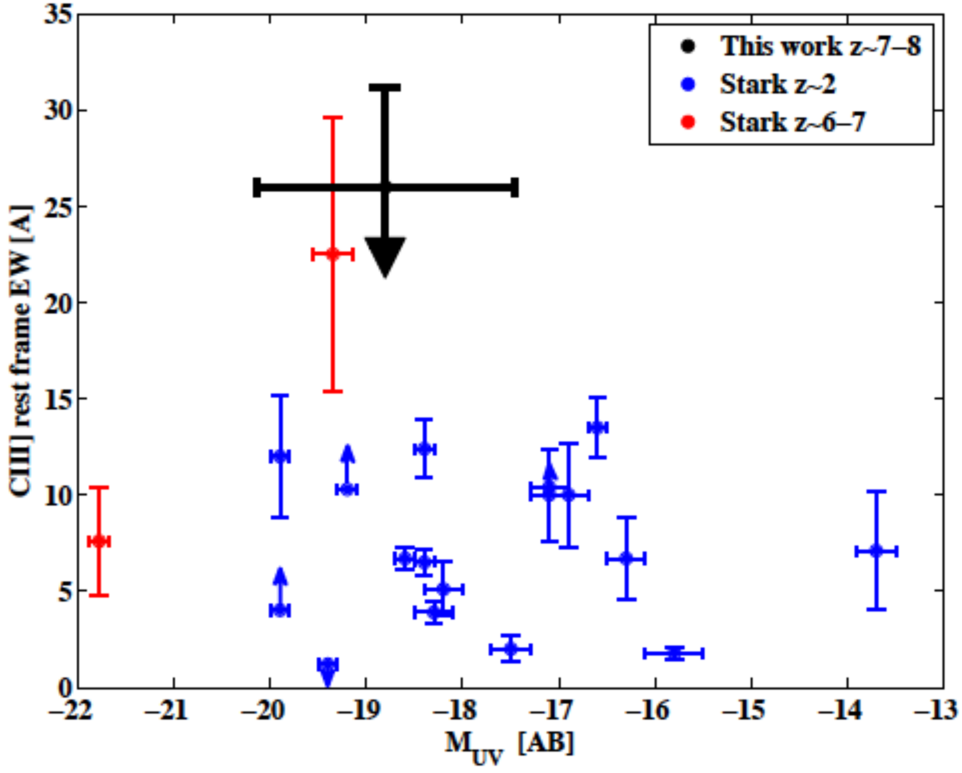

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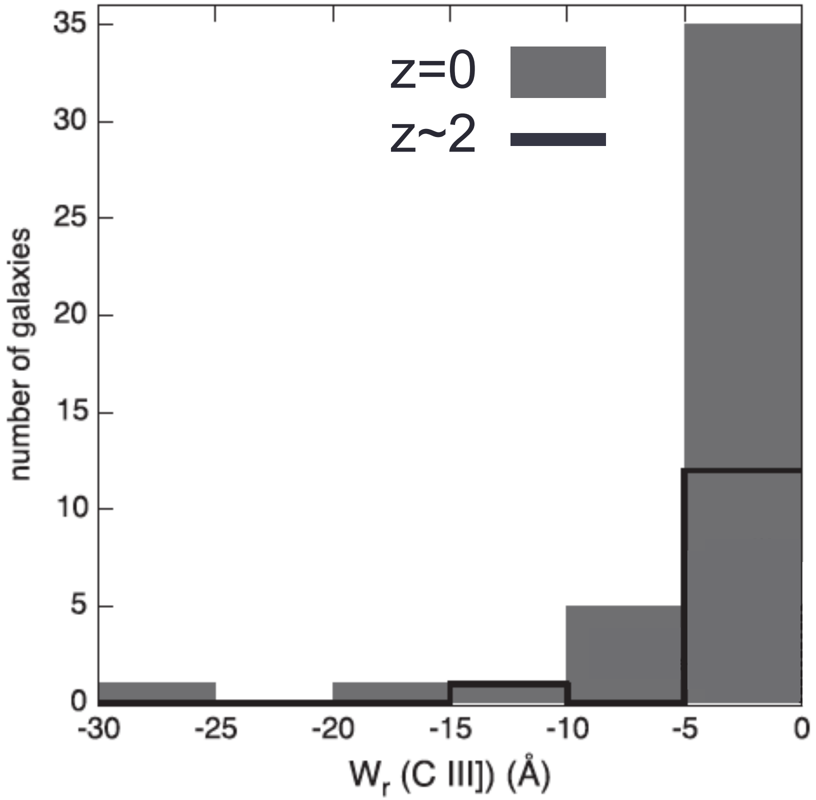
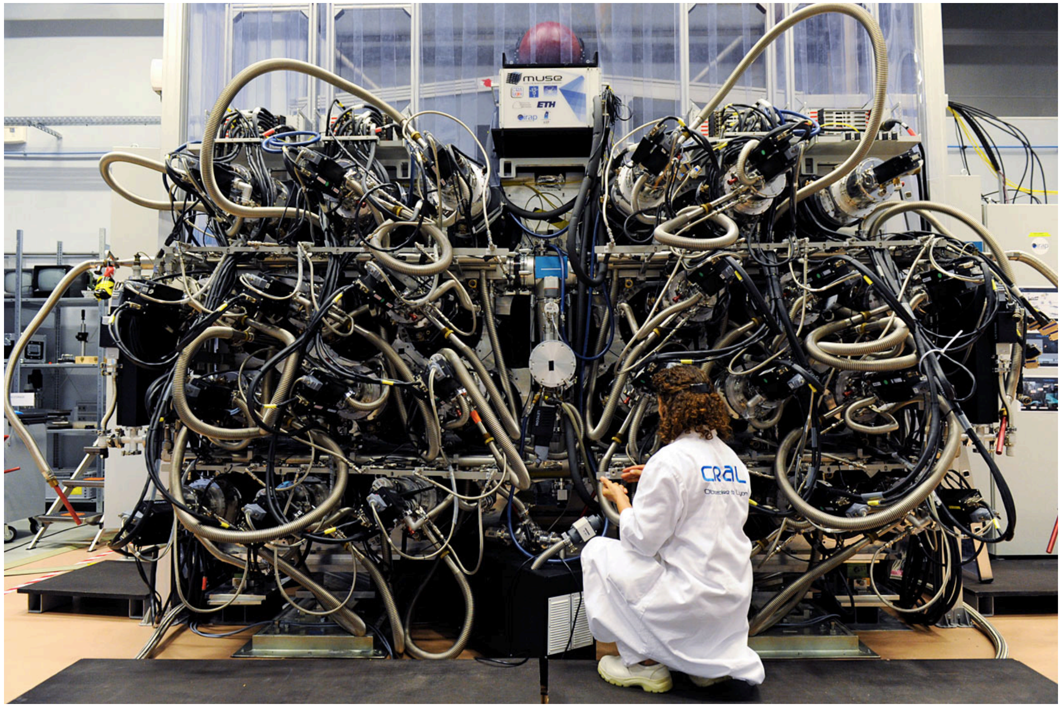


# MUSE spectroscopy

- MUSE at the VLT
- R~3000
- 4650-9300 Å
- 1'x1' Integral Field Unit



ESO

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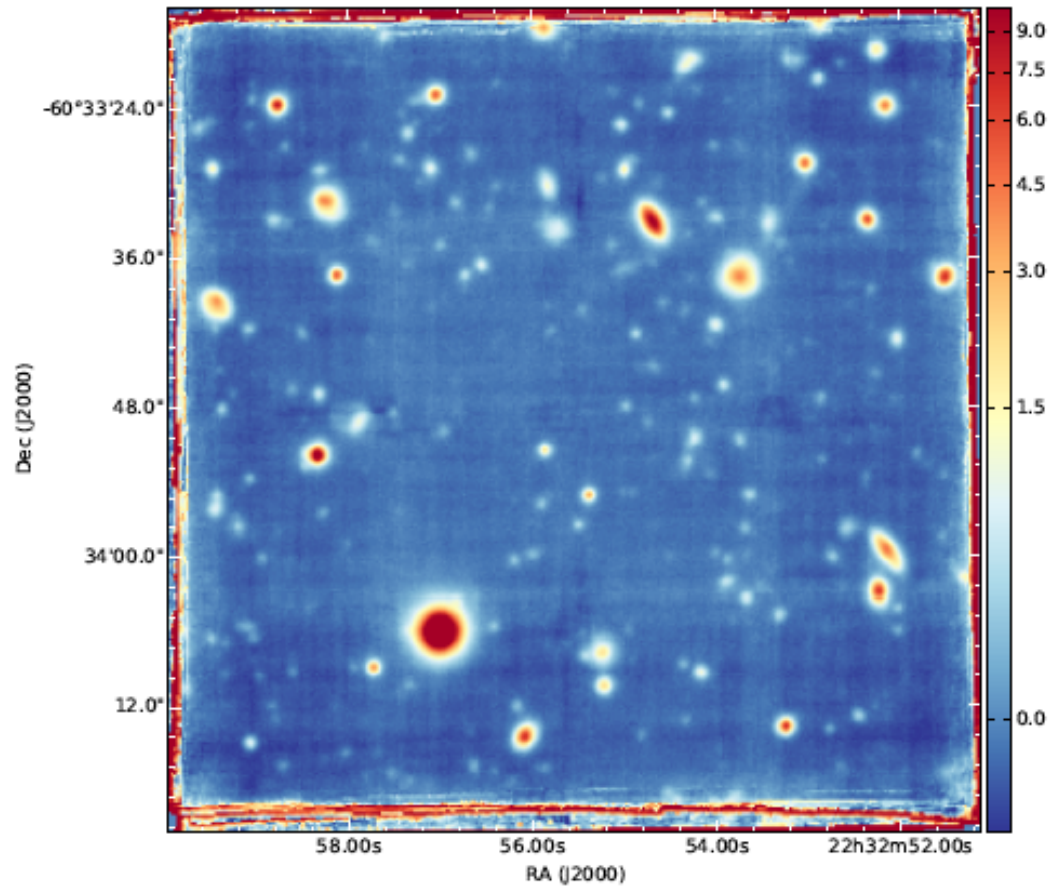
- 20 hours in the UDF (GTO)
- 27 hours in the HDF-S (Bacon+15)

- SB limit: $10^{-19}$ erg/s/ $cm^2$/arcsec$^2$




HDF-S

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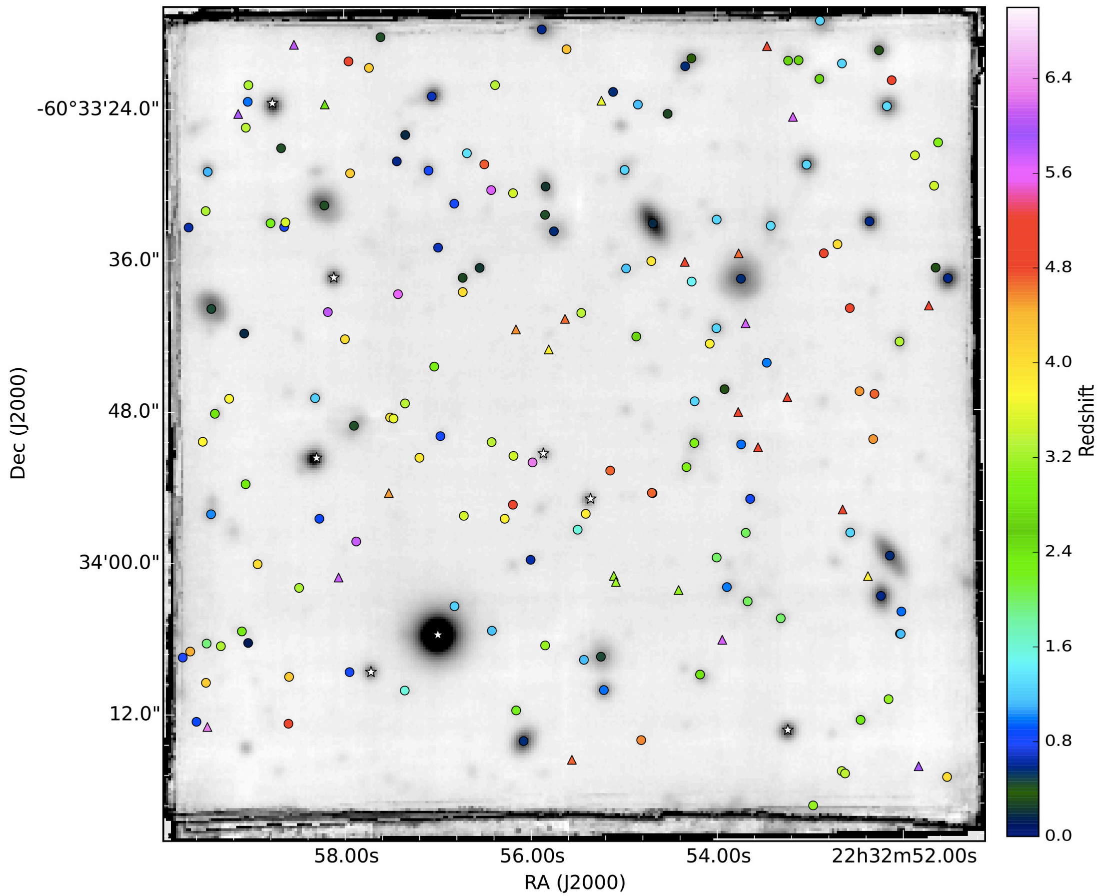
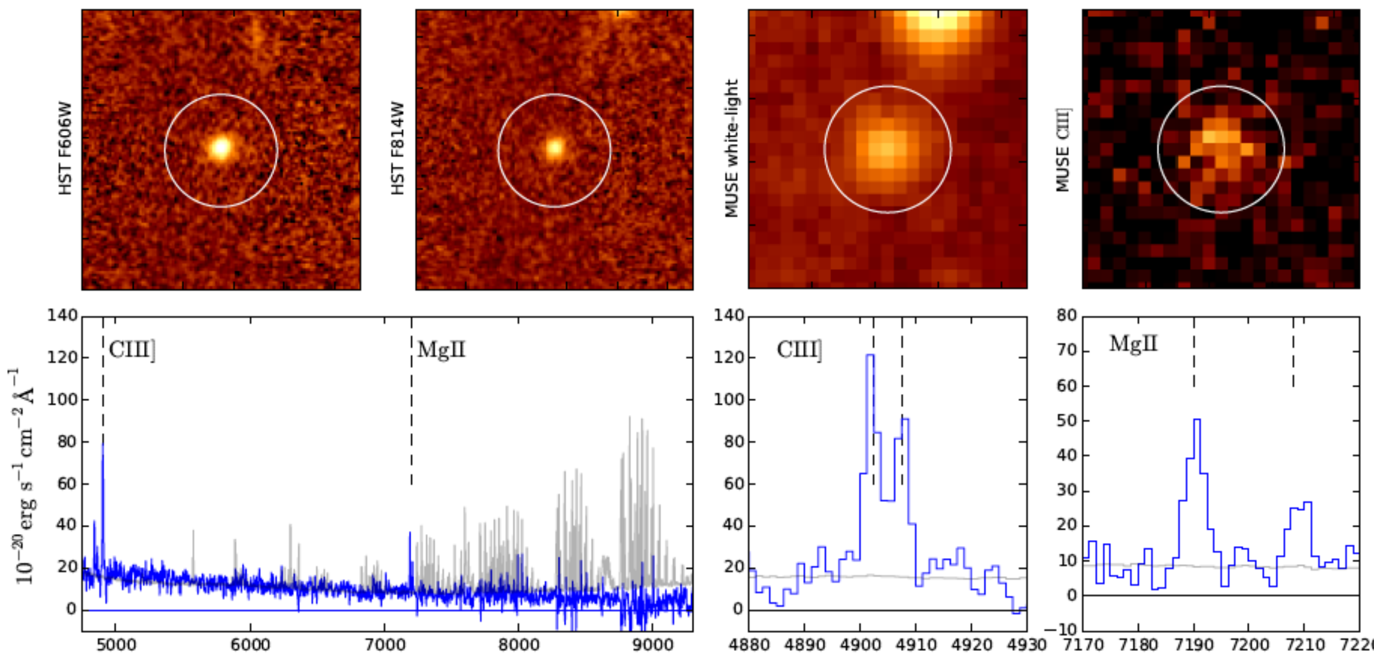



HDF-S

# Redshift determinations and line measurements

- Continuum-detected (HST and/or MUSE white-light) sources are visually inspected (Bacon+15, Inami+ in prep.)




Bacon+15

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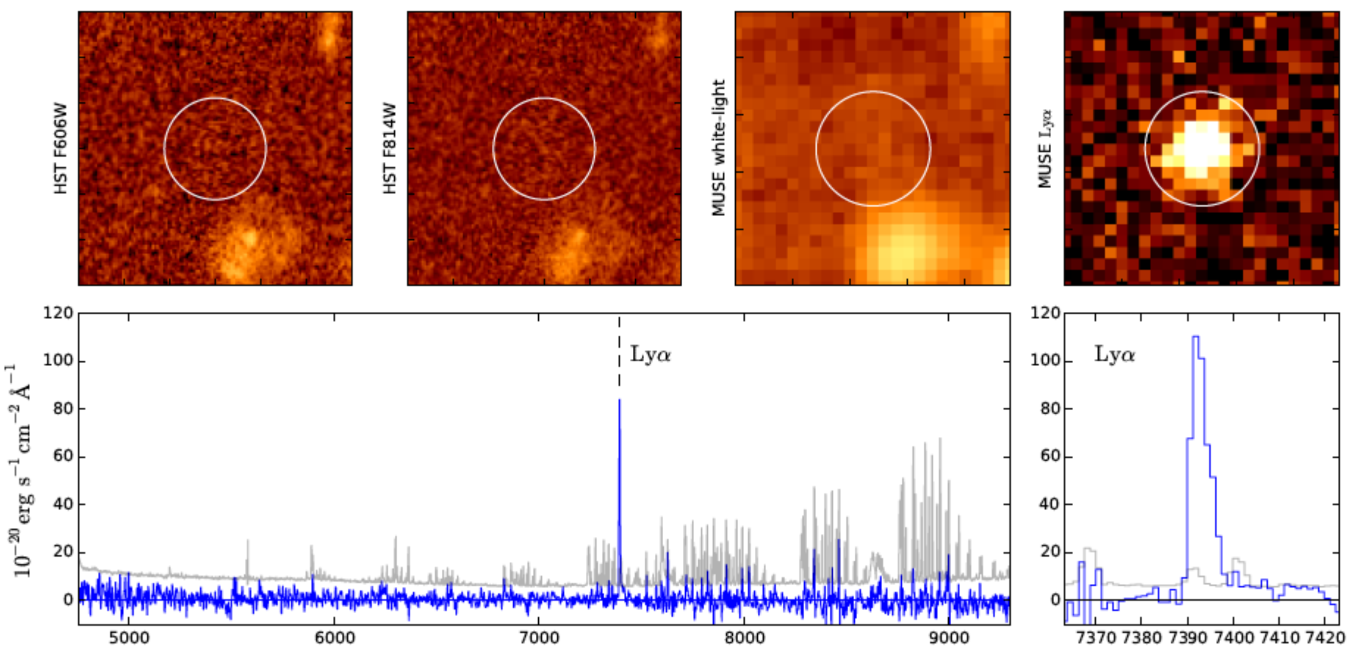


Bacon+15

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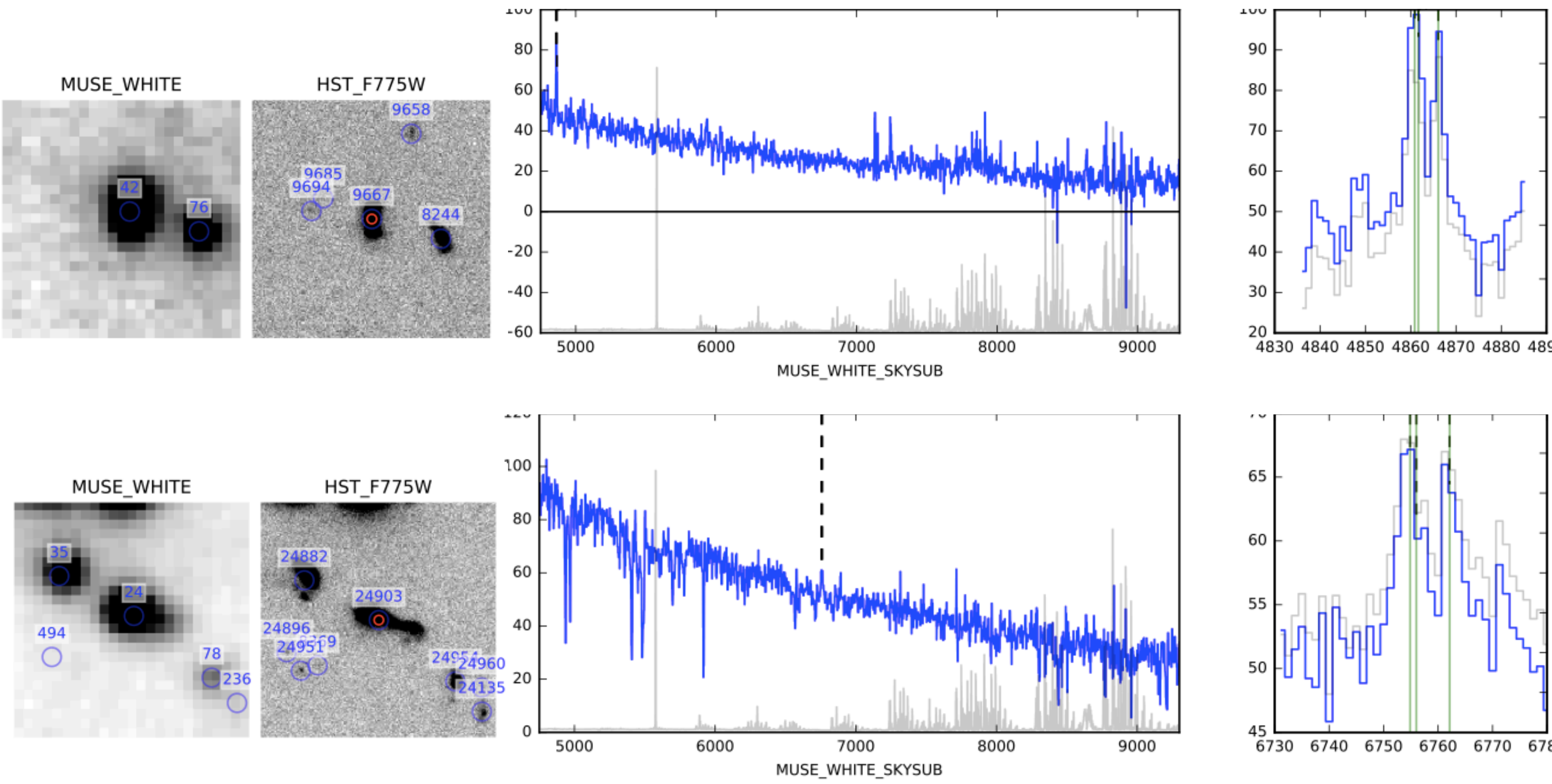
- Source detection in MUSE narrow-band images for line-dominated objects (Richard+15)
- Line fluxes and EWs determined with **platefit** (Tremonti +14, Brinchmann+14)
- Redshifts for other sources from 3D-HST grism spectroscopy (UDF only) or photometry

# 37 CIII emitters from 1.5 < z < 4



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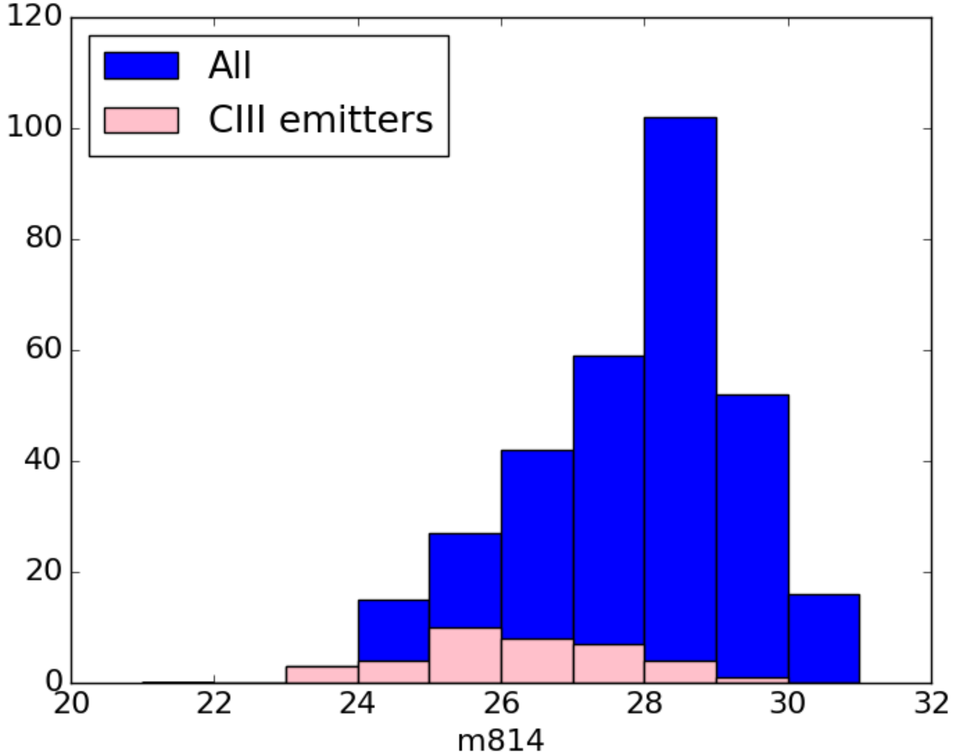
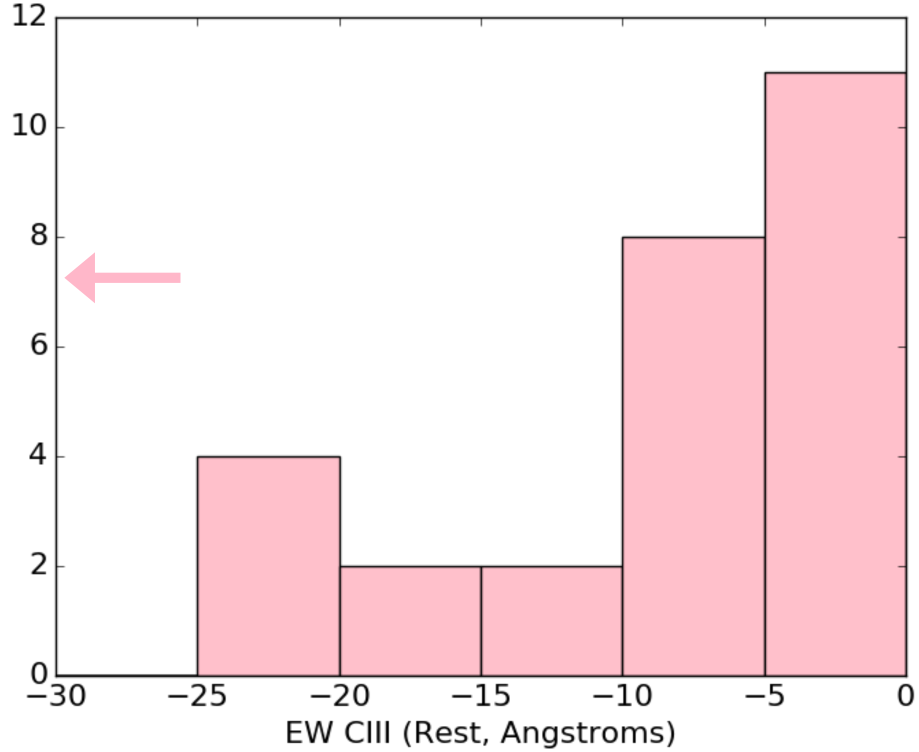
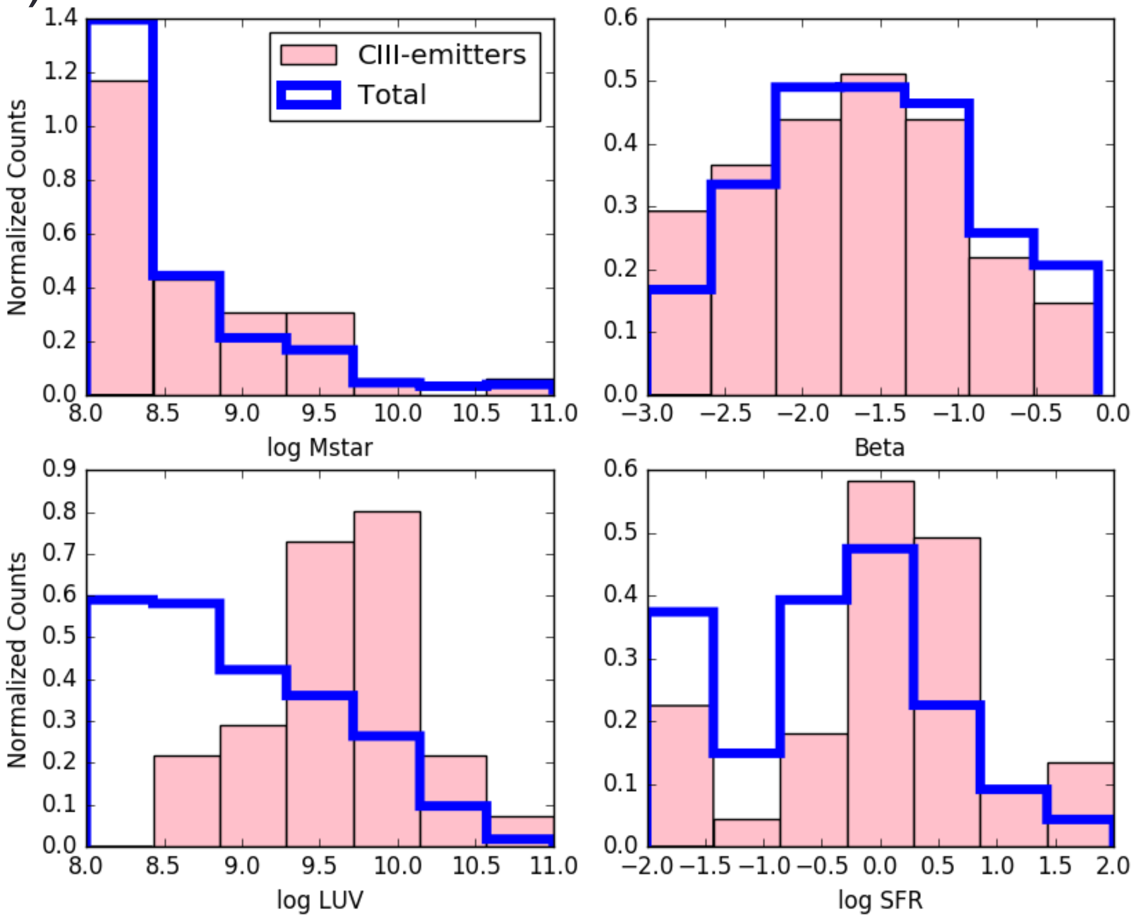
- 38% (17/45) of m814 < 26 galaxies at these z's have CIII detection



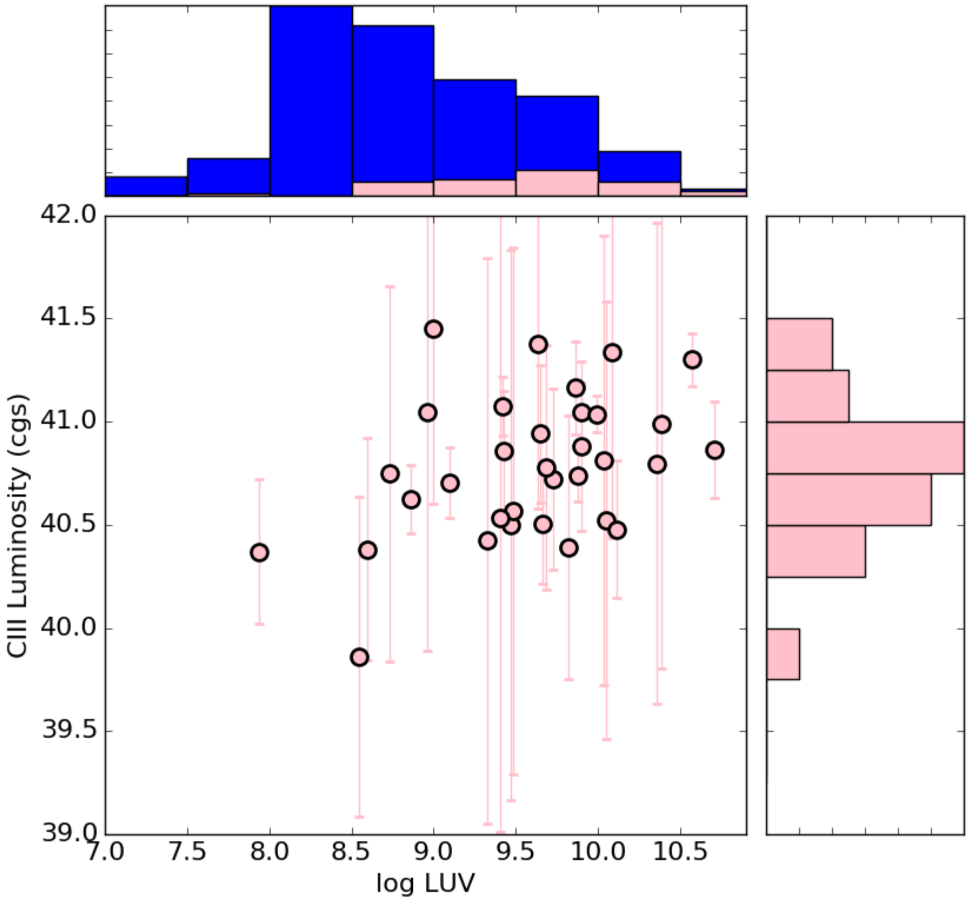
# Are the CIII emitters intrinsically different?

- Compare e.g. SED-derived quantities (MAGPHYS – da Cunha+08)



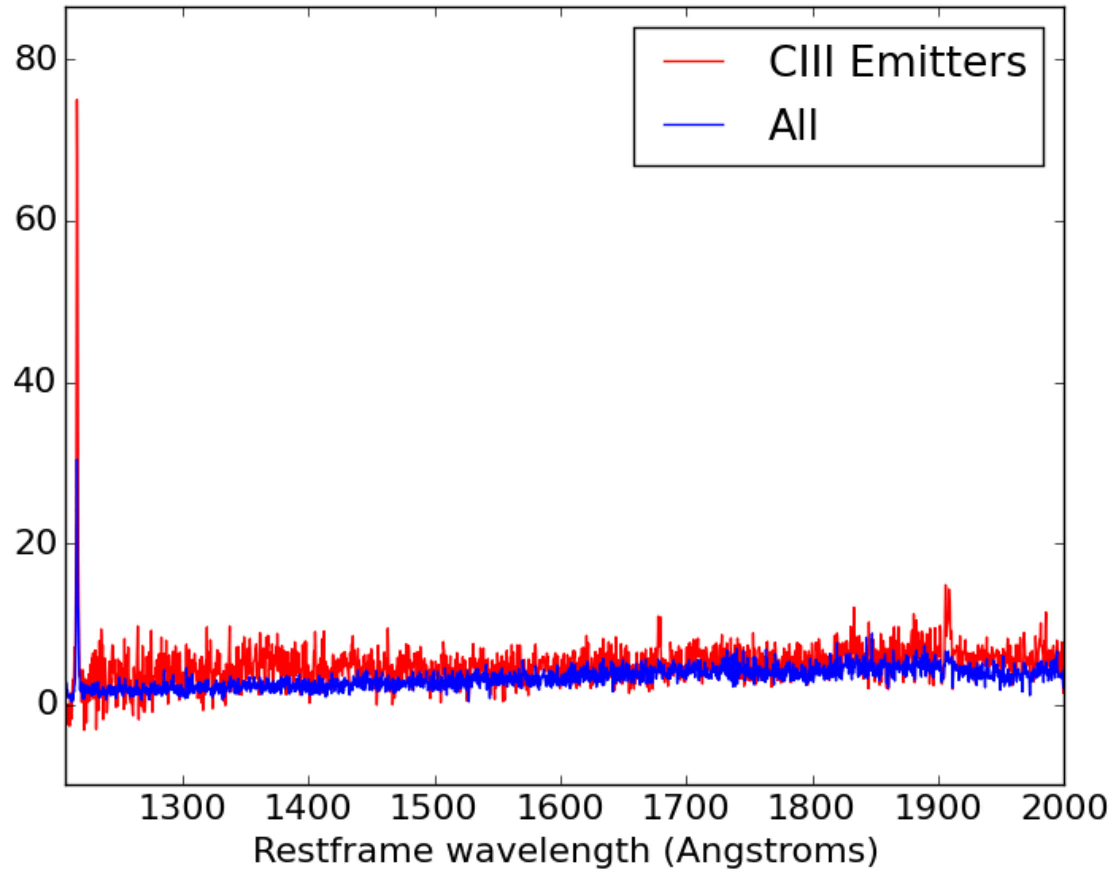
# Are the CIII emitters intrinsically different?

- Relation between LUV and CIII luminosity tentative



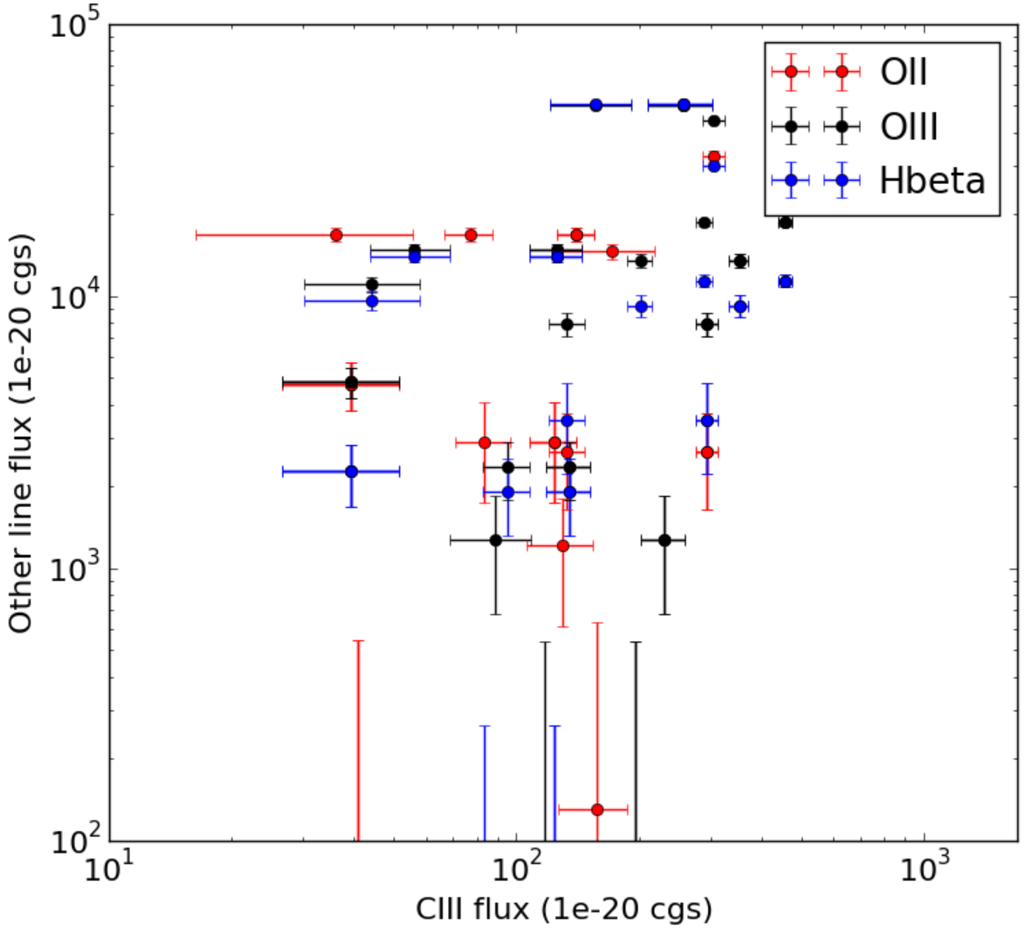
# Are the CIII emitters intrinsically different?

- Brighter Ly-α and continuum, but no additional UV lines compared to LAEs



# Are the CIII emitters intrinsically different?

- Brighter optical emission lines (OIII, Hβ, OII; from 3D-HST in UDF) ➔ brighter CIII



# Conclusions and Outlook

- Sample of 37 $1.5 < z < 4$ CIII emitters down to $10^{-19}$ erg/s/cm$^2$/arcsec$^2$
- Will be supplemented by:
  - Deeper UDF pointing (up to 80h)
  - 9 additional MUSE pointings in UDF to 10h depth
  - …

In general, CIII emission visible in

- (UV-) brightest galaxies
- Objects with strong optical emission lines