Texas Spectroscopic Search for Lyα Emission at the End of Reionization Constraining the Lyα Equivalent Width Distribution at z > 6 (Jung et al. 2018, ApJ, 864, 103)

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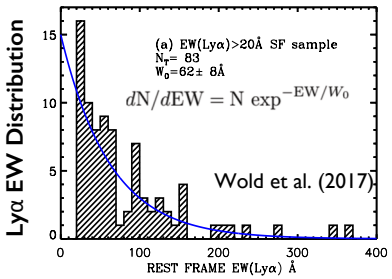
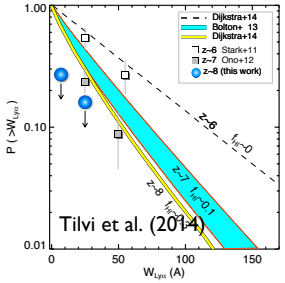
[1] Topic: Lyα Emission as a Probe of Cosmic Reionization

- Neutral hydrogens in the IGM affect the observed features of Lyα emission

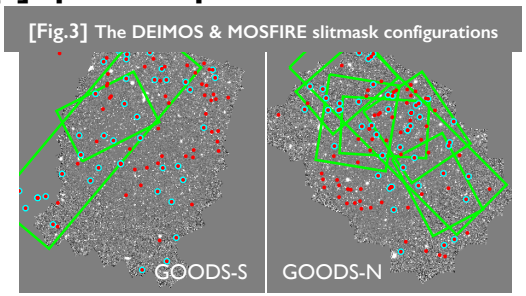


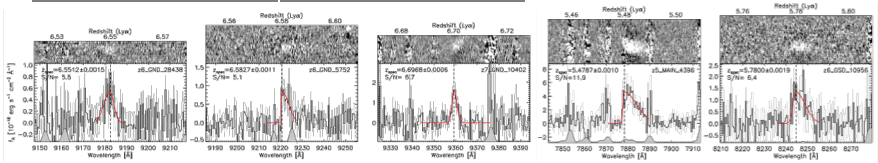
[Fig.1] Lyα galaxy EW distribution with the best fit exponential, characterized by e-folding scale, w_0.



[Fig.2] Observed Lyα EW distribution with the model predictions

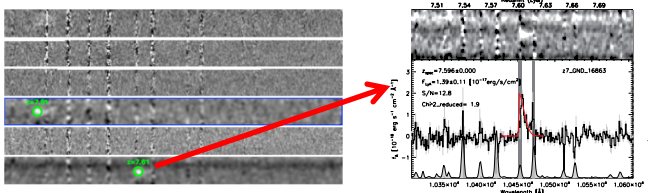
[2] Spectroscopic Observation for ~ 200 z = 5.5 – 8.2 galaxies with Keck/DEIMOS and MOSFIRE





[Fig.4] Five detected Lyα emitters from the **DEIMOS** data

✓ Our MOSFIRE data provides deep NIR spectroscopic observations for 72 galaxies, including the deepest (t_{exp}~16-20hr) NIR data for six candidates.



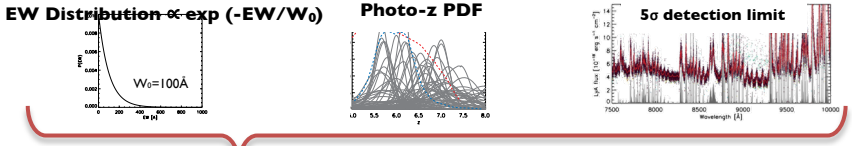
← **[Fig.5]** 2D spectra of the deepest MOSFIRE observations (left) and a new discovery of Lyα emission at z=7.6 (right)

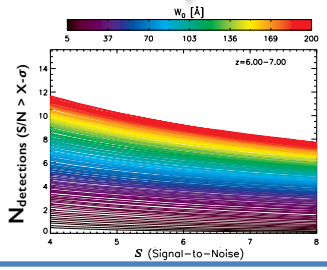
[3] Measuring the Lyα Equivalent Width Distribution

★ Simulating the expected number of detections accounting for incompleteness (e.g., observing depth, wavelength coverage, P(z) distribution, UV continuum level)

- We simulate mock emission lines for our observed galaxies in a Monte-Carlo fashion.

i) Lyα strength from P(EW) ii) Line location from P(z) iii) Determine S/N levels



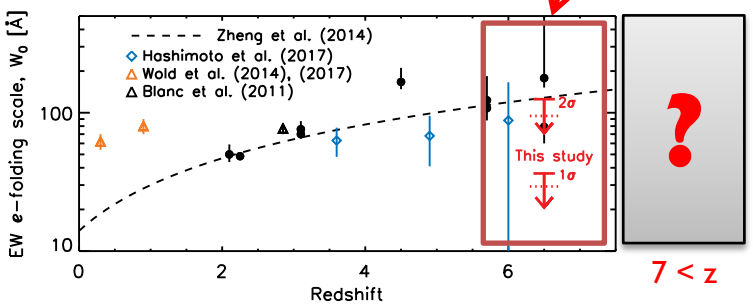


- From the simulations, we calculate the posterior distribution of the expected number of detections as a function of S/N for e-folding scales of W_0=5-200Å.

← **[Fig.6]** The mean expected number of detections as a function of S/N for a range of EW distributions for z ~ 6.5.

[4] Lyα Equivalent Width Distribution at z ~ 6.5 from DEIMOS

From the MCMC sampling using the PDFs of simulated $N_{detections}$ with the actually observed detections, we calculate the posterior distribution of the Lyα EW e-folding scale (W_0).



[Fig.7] Our measurement shows a weak evidence that the e-folding scale (W_0) begins to drop at z > 6 (~36Å in 1σ upper limit, red arrow), suggesting an increasing HI fraction in the IGM. With our MOSFIRE observations, we will extend this study at z > 7.