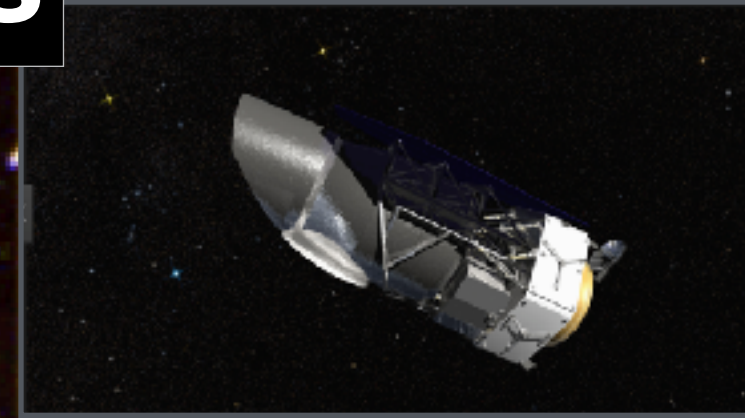


# Probing Cosmic Reionization Using Grism Observations



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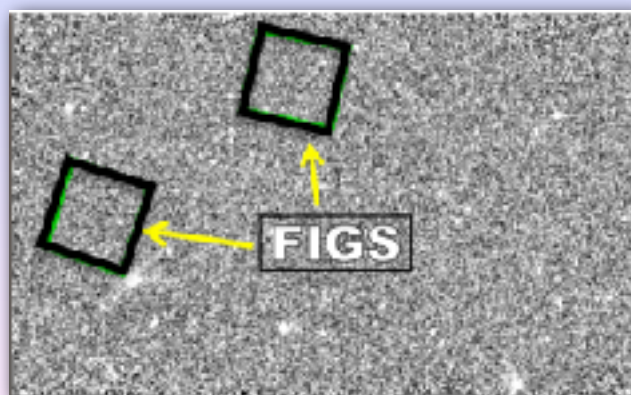
**Motivation:** Lyman-alpha (Lya) emission at redshift  $z > 7$  provides a practical tool to study cosmic reionization.. Grism provides unbiased spectroscopic observations of all galaxies in the field-of-view, free of night-sky contamination, unlike ground-based spectroscopy. Using deep grism observations from the FIGS survey, we have detected, for the first time, a galaxy at  $z=7.51$  with both Lya emission and continuum detection, successfully demonstrating the power of grism to study cosmic dawn. WFIRST will provide unprecedented survey area providing the necessary sample of Lya galaxies at  $z > 7$ .

## Observations from the deepest grism survey

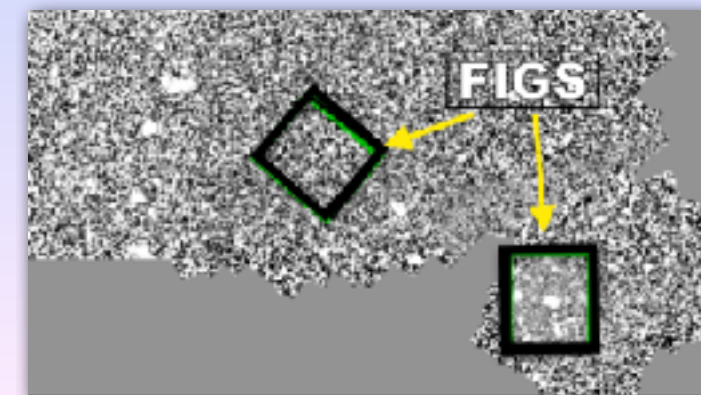
### Faint Infrared Grism Survey (FIGS; PI: Malhotra)

- currently the most sensitive G102 grism survey
- total obits: 160 (+160 ACS parallel); 40-orbit depth in each of the four HST legacy fields

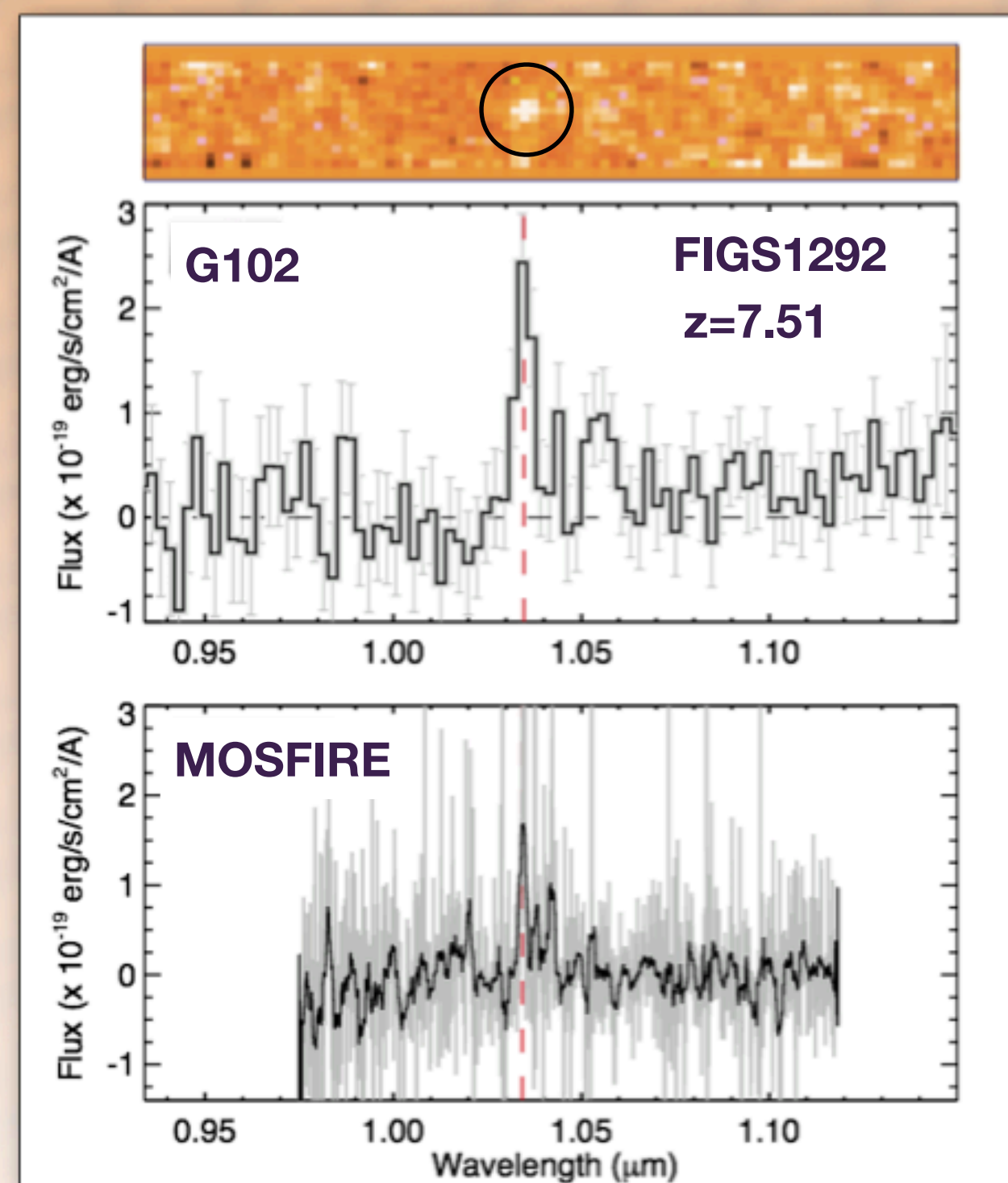
### CANDELS GOODS-N



### GOODS-S + UDF

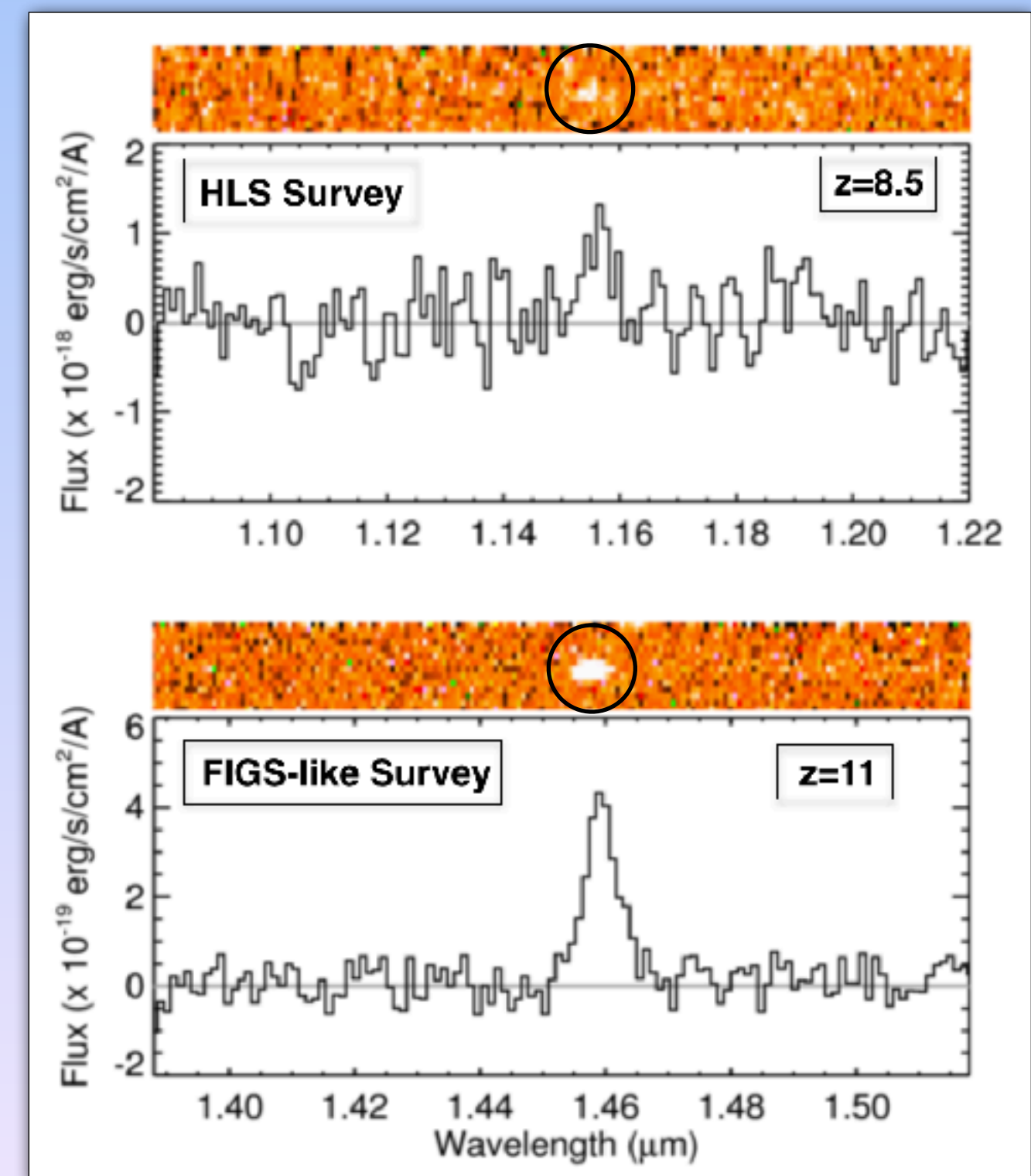


## Highest-redshift galaxy with Lyman-alpha and continuum break detection



**Figure 1:** Top and middle panels show 2D and 1D grism spectra of FIGS\_1292 galaxy with  $z=7.51$ , while bottom panel shows its ground-based MOSFIRE spectrum. The line flux measured from grism G102 spectrum is nearly 4x compared with the ground-based measured flux.

## Reionization using WFIRST Grism



**Top:** simulated galaxy spectra with Ly $\alpha$  line flux of  $2e-17$  erg/s/cm $^2$ , at  $z=8.5$ , from HLS-like survey ( $\sim 2000$  sec). **Bottom:** simulated spectra of a  $z=11$  galaxy expected from a deep FIGS-like survey (100ksec).