# The NIRSpec GTO Galaxy Assembly IFS Survey

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for the NIRSpec Galaxy Assembly GTO Team



EWASS2018, Symposium "**Early Science with JWST",** Liverpool, 3-6 April, 2018

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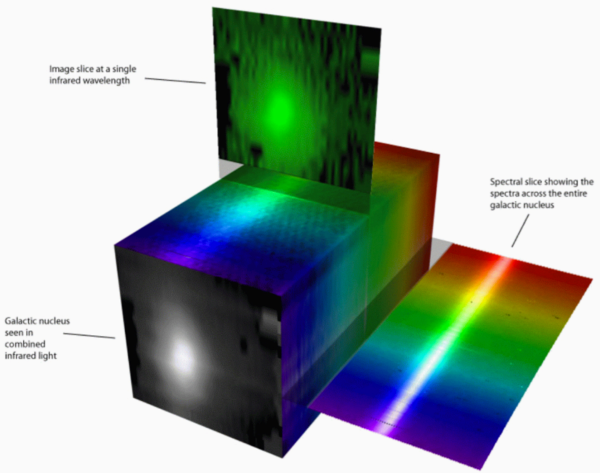
| ** More directly involved in the IFS-part of the GA program | |

# NIRSpec IFS: Science Capability

- NIRSpec IFU => First IFS in space at near- IR wavelengths

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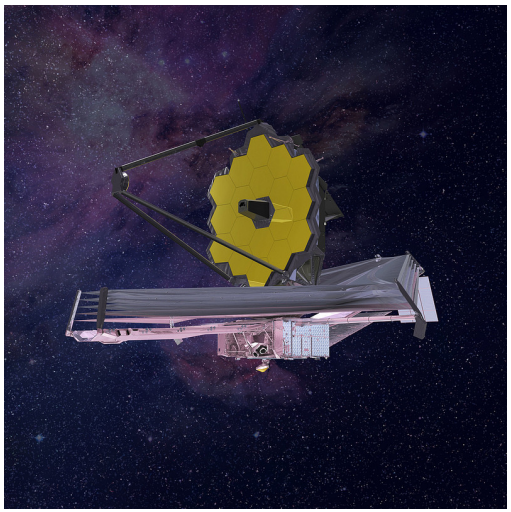


Inherent potential of IFS

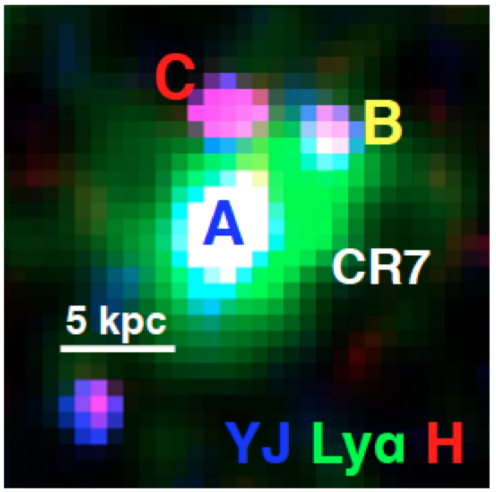
JWST capabilities

- IFS at high sensitivity (orders of magnitude improvement)
- IFS over a wide spectral coverage (0.6 – 5.3 microns) free from at. absorption
- IFS at high angular resolutions ( ~ 0.1”)
- IFS with a very stable PSF

# NIRSpec –IFS @ high-z

- FOV: 3” x 3” → ~ 20 x 20 kpc$^2$ @ z~ 4-6
- Scale: 0.1” / spaxel → ~ 650 pc/spx @ z ~ 4-6
- Δλ: 0.6-5.3mu → Hα out to z~7
  Hβ out to z~10
  UV lines @ z> 4

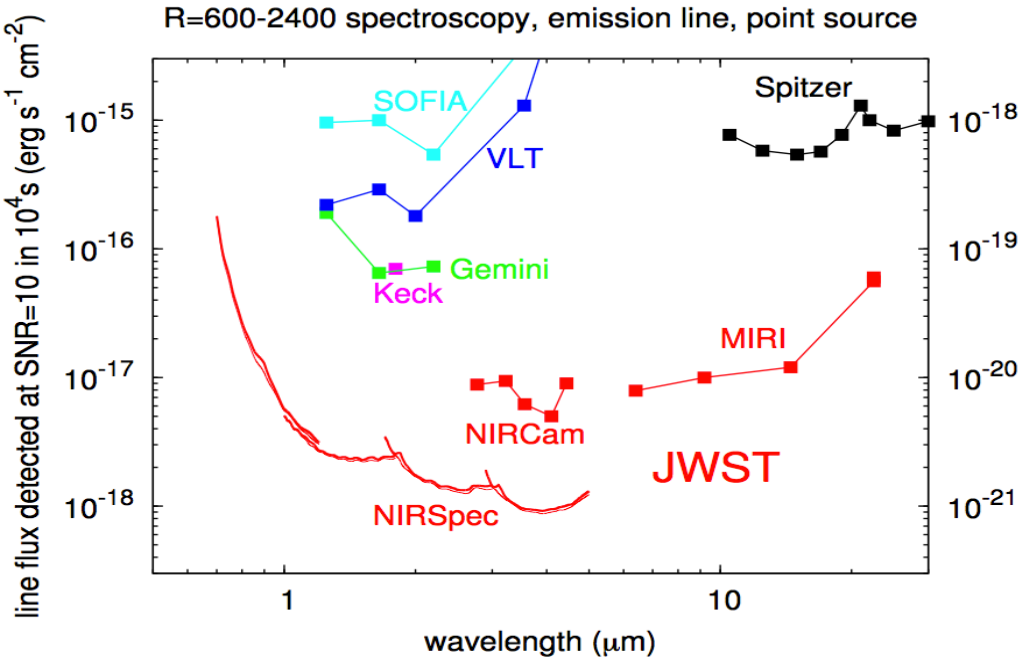
e.g. CR7 @ z=6.6



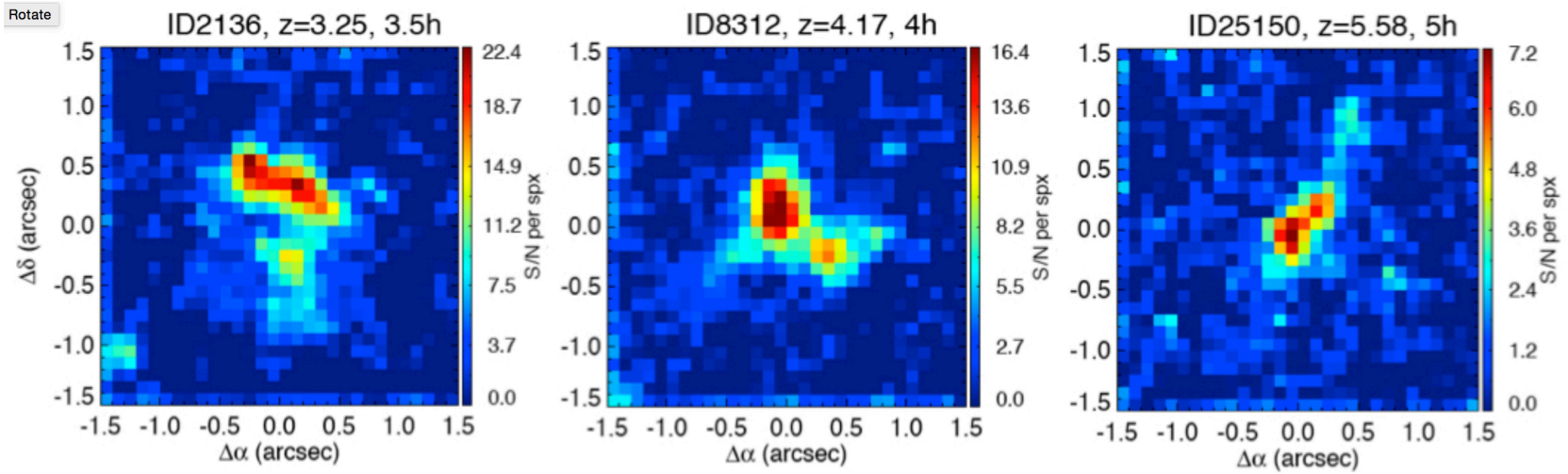

NIRSpec IFU FoV

- R: 2700 , 1000, 100
- At R =100 the whole range 0.6-5.3μm → 1 setting
- At R=1000 and 2700 to cover ~ 1 - 5.2μm → 3 settings
- Velocity resolution up to ~ 100 km/s (for R2700)

# NIRSpec –IFS @ high-z




Thanks to these sensitivities (and angular resolution) it will be possible to study the internal structure of the most luminous and extended galaxies at very high-z (i.e. z~3-6+) by means of IFS




S/N estimates for Halpha

# The NIRSpec GTO Galaxy Assembly IFS Survey: Overall Goal and Plan

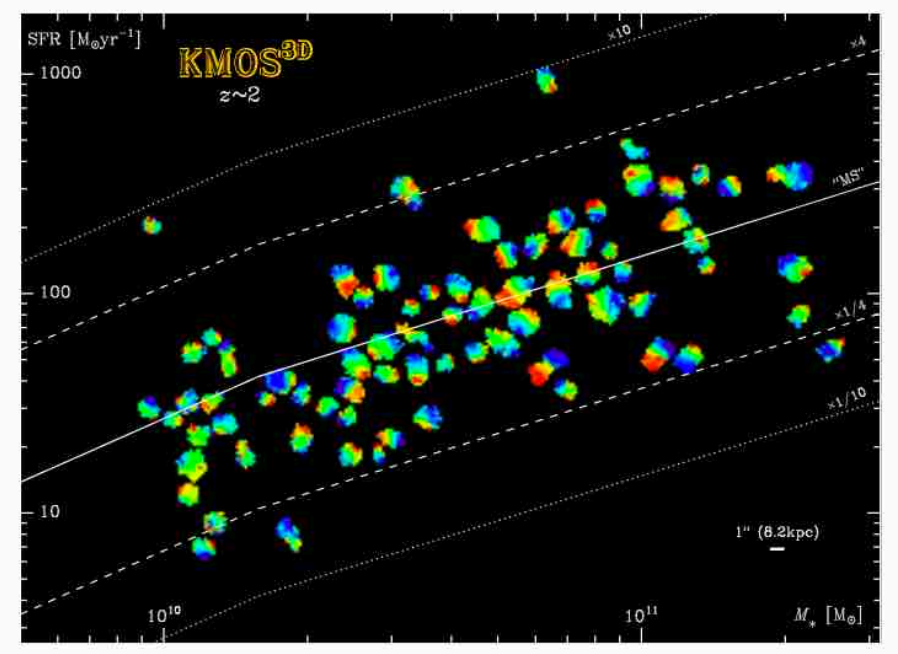
- Generic goal
  - Characterize the internal structure of a sample of high-z SFGs and AGNs to investigate the physical processes driving galaxy evolution across cosmic time

- Overall Plan
  - Sample:
    - ~50 targets among the most luminous and extended (i.e. appropriate for the IFU)
    - Complementary to the samples for NIRSpec MOS surveys ( see Bunker et al. this session)
  - Observations:
    - High resolution (R2700) observations of the main optical emission lines (Hbeta – **Hα)** in a selected wavelength band
    - Low resolution (R100) observations over 0.6-5.3 microns for the continuum, for the SFGs

# Extend ground-based IFU work done for z < 3 up to 8+

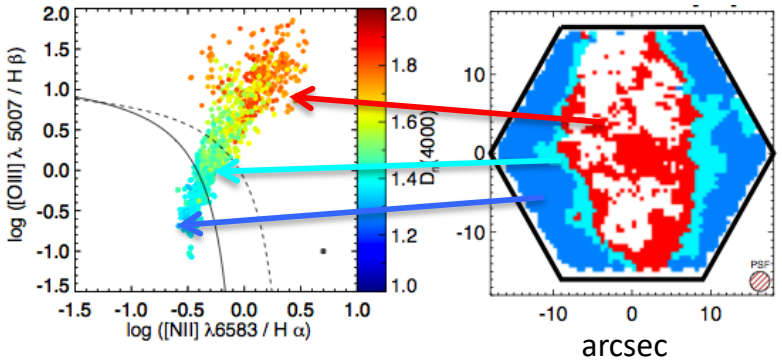
## Some of the science cases (I/II)

Mapping dynamics and kinematics
for different classes of galaxies (in and out of the ''main sequence'') out to z~6



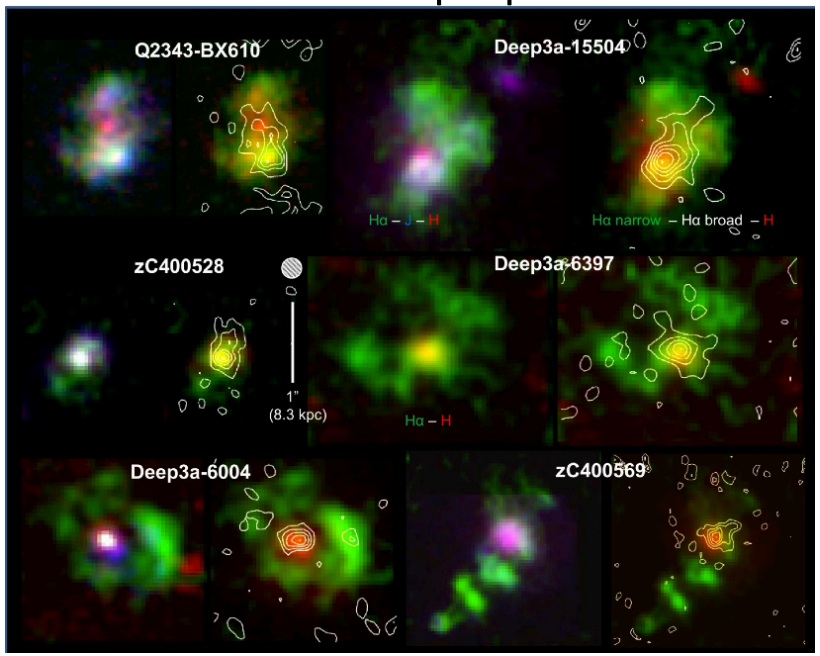

Wisnioski+15

Mapping stellar populations
and BPT diagnostics



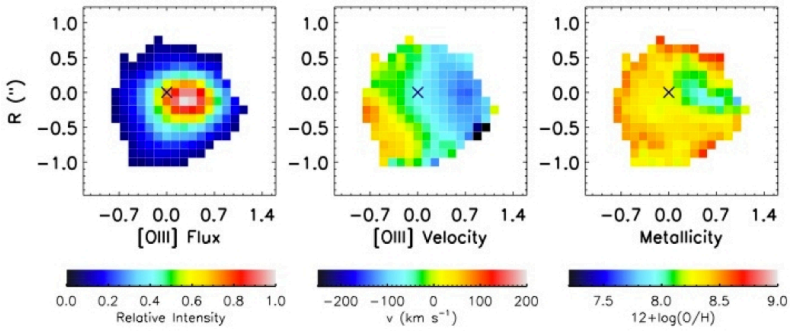

Belfiore+14 (local)

SF distribution and outflow properties in SFGs




Forster-Scheiber+14 (SINS z~2)

Evolution of metallicity and metallicity gradients for z>2.5

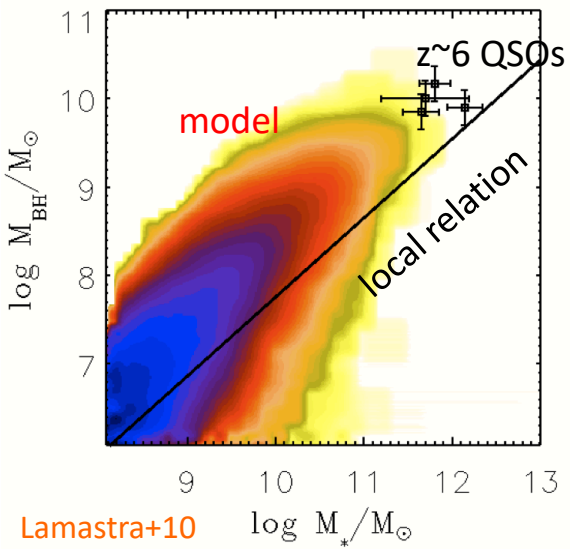



Cresci+10
(AMAZE, z~3)
[also Wuyts+16]

# Extend ground-based IFU work done for z < 3 up to 8+

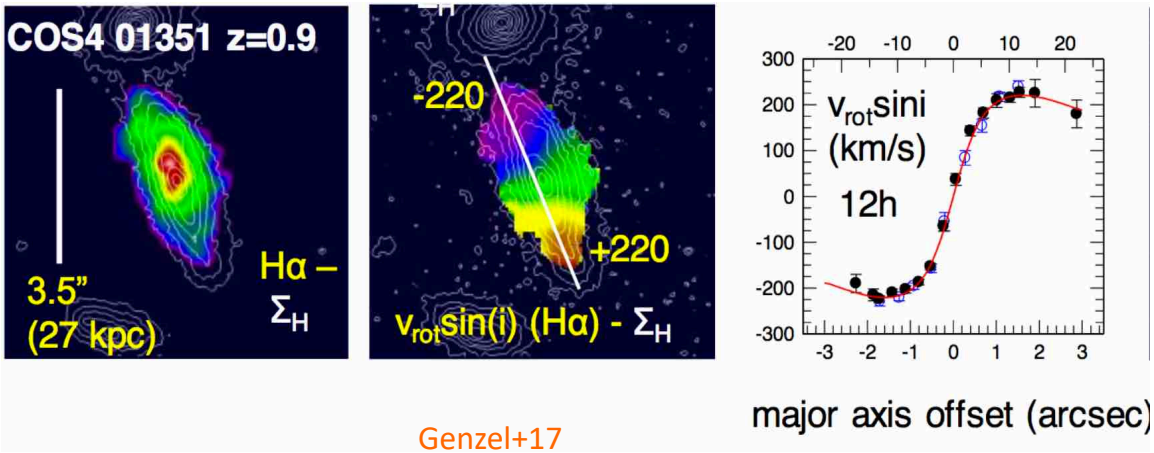
## Some of the science cases (II/II)

Evolution of the $M_{BH}$-$M_{sph}$ relation



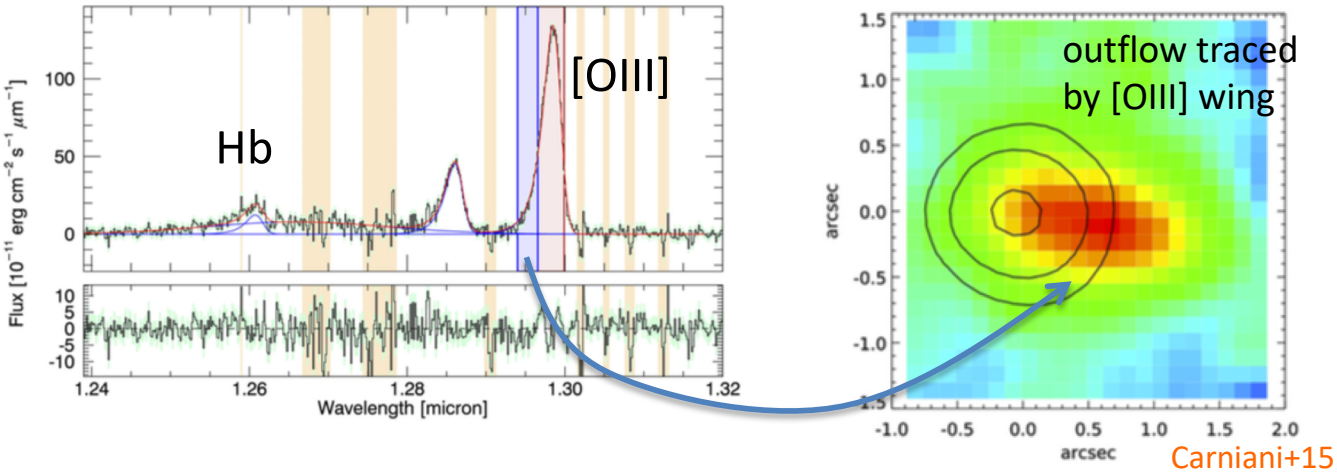

Lamastra+10

Dynamical and stellar masses, and the evolution of DM/baryon ratio

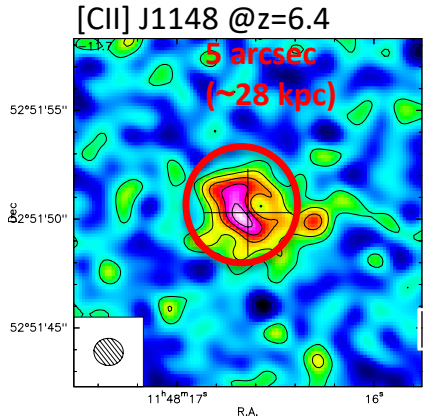



Genzel+17

Mapping the properties of primordial SMG and quasar hosts, and their outflows



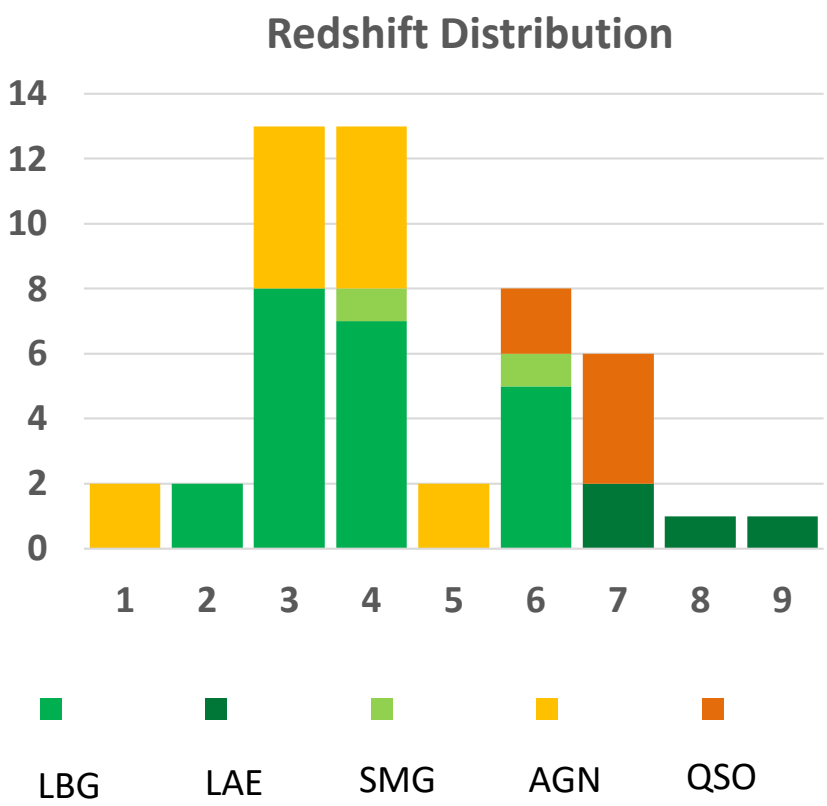

Carniani+15




Cicone+14

# GA-IFU Program Summary: 48 targets (1.5 < z < 8.7)

| Sample | # targets, z, location | Band | lines | t (h) |
|---|---|---|---|---|
| LBGs Opt-UV sel. | 2 @ z~ 2 in GS | G140H | [OII]… | 2 |
| | | G235H | …[SIII] | 2 |
| | | R100 | | 0.5 |
| | 8 @ z~ 3 in GS and FF | G235H | Hb – Ha | 4 |
| | | R100 | | 1 |
| | 7 @ z~4 in GS and COS | G395H (G235H for 4891) | Ha – [SIII] | 4.5 |
| | | R100 | | 1 |
| | 5 @ z~6 in GS and COS | G395H | Hb – Ha | 5 |
| | | R100 | | 1 |
| SMGs | 2 @z~4 and 6 in the field | G395H | (Hb)– Ha– ([SIII]) | 2 |
| | | R100 | | 1 |
| LAEs | 4 @z>6.6. 2 EGS, 1 COS, 1 UDS | G395H | Hbeta-(Ha-[SII]) | 5 |
| | | R100 | | 1 |
| AGNs | 2 @ z~1.5 in COS | G140H | Hbeta-[SII] | 0.75 |
| | 10 @ z~3.5 in GS and COS | G235H | [OII]-[SII] | 1 |
| | 2 @z~4.7 in GS and field | G235H | [OII]… | 1 |
| | | G395H | …[SIII] | 1 |
| QSOs | 6 @z>6 in the field | G395H | Hb – Ha | 3 |



# GA-IFU Program Summary: 48 targets (1.5 < z < 8.7)

by sample

| Sample | # targets, z, location |
|---|---|
| LBGs Opt-UV sel. | 2 @ z~ 2 in GS |
| | 8 @ z~ 3 in GS and FF |
| | 7 @ z~4 in GS and COS |
| | 5 @ z~6 in GS and COS |
| SMGs | 2 @z~4 and 6 in the field |
| LAEs | 4 @z>6.6. 2 EGS, 1 COS, 1 UDS |
| AGNs | 2 @ z~1.5 in COS |
| | 10 @ z~3.5 in GS and COS |
| | 2 @z~4.7 in GS and field |
| QSOs | 6 @z>6 in the field |

by APT proposal

| APT proposal | Prop ID | # tar | Slew / Coordination |
|---|---|---|---|
| GOODS-S: SFGs+AGNs | 1216 | 20 | 3 large slews |
| COSMOS: SFGs+AGNs+CR7 | 1217 | 15 | 2 large slews |
| EGS: 2 LAES | 1262 | 2 | Slew with MIRI |
| BR1202: AGN, Field | 1220 | 1 | (2 pointings) |
| QSO_1: J1148, 0010 | 1218 | 2 | |
| QSO_2: J1120 | 1263 | 1 | slew with MIRI |
| QSO_3: J2348 | 1219 | 1 | slew Reio+MIRI |
| QSO_4: J0020, J0109 | 1222 | 2 | slews with Reion. |
| ID14-MAC0416 in FF | 1208 | 1 | slew with NIRISS |
| SMG: GN20+ HLFS3 | 1264 | 2 | slews with MIRI |
| HIMIKO | 1215 | 1 | slew WIDE/UDS |

- Observations distributed into 11 APT proposals to improve efficiency (i.e. smart accounting, share slew)
- 7 proposals are in coordination with other GTO programs, 5 involving other instrument GTOs

- THE END