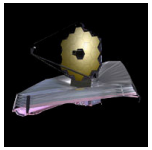

# 4426 - An unprecedented spatially resolved analysis of the brightest galaxy at z>10 in GOODS-N

Cycle: 1, Proposal Category: DD

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**OBSERVATIONS**

| *Folder* | *Observation* | *Label* | *Observing Template* | *Science Target* |
|---|---|---|---|---|
| Observation Folder | | | | |
| | 1 | GNz11-IFS | NIRSpec IFU Spectroscopy | (1) GNZ11 |
| Re-observation of programme 4426 | | | | |
| | 2 | GNz11-IFS-2 | NIRSpec IFU Spectroscopy | (1) GNZ11 |
| Second re-observation of programme 4426 | | | | |
| | 3 | GNz11-IFS-2 | NIRSpec IFU Spectroscopy | (1) GNZ11 |


**ABSTRACT**

Recent NIRCam and NIRSpec observations have unambiguosly confirmed the redshift of GN-z11 at z=10.6, making this the brighest galaxy at z>10 in the whole GOODS-S and GOODS-N CANDLES fields. The spectra have revealed a wealth of strong, nebular emission lines, making this the best candidate to investigate galaxies at their infancy. The proposed observation will obtain the first map of a Lyalpha halo beyond the epoch of re-ionisation, and also map the extension of UV nebular lines, which will provide the earliest constraints on the accretion and early enrichment of the circumgalactic medium. Most importantly, the observations are expected to explore the detection of a HeII emitter in the vicinity of GN-z11 which does not have any metal lines associated with it - if confirmed this would be the first clear detection of a PopIII galaxy. Finally, the proposed observations will set tight constraints on the presence or absence of an AGN.


**OBSERVING DESCRIPTION**

We propose observations for GN-z11 using the NIRSpec/IFS mode to explore the 2D spatially resolved properties of its ISM and its close circumgalactic environment. To this goal we plan to use the medium resolution (R~1000) G140M/F100LP and G235/F170LP spectral configurations to target the following lines: Ly-alpha, NIV]1486, CIV1548,1551, HeII1640, NIII]1747, CIII]1907,1909.

These lines have measured fluxes in the range of 7-22 x 10^-19 erg/s/cm2 from NIRSPEC/MSA observations using PRISM and R1000 gratings

(Bunker et al 2023). Considering these values and assuming a linewidth of ~120 km/s (500 km/s for Ly-alpha), with 10.6 hours of exposure time for G235M and 3.3 hours for G140M the ETC gives a S/N = 6-12 per resolution element (depending on the line) at the central ~0.2 arcsec region, then allowing us to explore its 2D properties beyond that zone.

No target acquisition is included, as the accuracy of the direct JWST pointing is enough to guarantee that the target is well centered in the NIRSpec IFU FoV.

We select a cycling medium dither pattern with 10 positions, which provides a good compromise between an amplitude (~0.5 ") large enough to "jump" the failed open microshutters, and to deal with other sources of background. This dither pattern also provides a good sub-pixel sampling, and allows to reconstruct the datacube with spaxels of 50 mas.

No extra background exposures are included. At high resolution we expect the background to be low and, in addition, there will plenty of spaxels free from galaxy emission suitable to derive the background.

We do not ask for MSA lekeage exposures, as we have verified that there are not very bright targets on the MSA FoV that could contaminate the IFU spectra. In addition, the presence of possible leakage would mainly affect the continuum, but our main goal is the analysis of the emission lines

**Fixed Targets**

| # | Name | Target Coordinates | Targ. Coord. Corrections | Miscellaneous |
|---|---|---|---|---|
| (1) | GNZ11 | RA: 12 36 25.4501 (189.1060421d)<br>Dec: +62 14 31.35 (62.24204d)<br>Equinox: J2000 | | |

*Comments:*
*Category=Galaxy*
*Description=[High-redshift galaxies]*
*Extended=YES*

## Observation

**Proposal 4426, Observation 1: GNz11-IFS**

Tue Feb 13 18:00:36 GMT 2024

**Diagnostic Status: Warning**

Observing Template: NIRSpec IFU Spectroscopy

## Diagnostics

(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

## Fixed Targets

| # | Name | Target Coordinates | Targ. Coord. Corrections | Miscellaneous |
|---|---|---|---|---|
| (1) | GNZ11 | RA: 12 36 25.4501 (189.1060421d)<br>Dec: +62 14 31.35 (62.24204d)<br>Equinox: J2000 | | |

*Comments:*
*Category=Galaxy*
*Description=[High-redshift galaxies]*
*Extended=YES*

## Template

| TA Method |
|---|
| NONE |

## Dithers

| # | Dither Type | Size | Starting Point | Number of Points | Points |
|---|---|---|---|---|---|
| 1 | CYCLING | MEDIUM | 1 | 10 | |

## Spectral Elements

| # | Grating/Filter | Readout Pattern | Groups/Int | Integrations/Exp | Leakcal | Dither | Autocal | Total Dithers | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | G235M/F170LP | NRSIRS2 | 26 | 2 | false | true | NONE | 10 | 20 | 38222.892 | 148904.4 |
| 2 | G140M/F100LP | NRSIRS2 | 16 | 1 | false | true | NONE | 10 | 10 | 11817.001 | 148904.3 |

## Observation

**Proposal 4426, Observation 2: GNz11-IFS-2**

Tue Feb 13 18:00:36 GMT 2024

**Diagnostic Status: Warning**

Observing Template: NIRSpec IFU Spectroscopy

## Diagnostics

(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

## Fixed Targets

| # | Name | Target Coordinates | Targ. Coord. Corrections | Miscellaneous |
|---|---|---|---|---|
| (1) | GNZ11 | RA: 12 36 25.4501 (189.1060421d)<br>Dec: +62 14 31.35 (62.24204d)<br>Equinox: J2000 | | |

*Comments:*
*Category=Galaxy*
*Description=[High-redshift galaxies]*
*Extended=YES*

## Template

| TA Method |
|---|
| NONE |

## Dithers

| # | Dither Type | Size | Starting Point | Number of Points | Points |
|---|---|---|---|---|---|
| 1 | CYCLING | MEDIUM | 1 | 7 | |

## Spectral Elements

| # | Grating/Filter | Readout Pattern | Groups/Int | Integrations/Exp | Leakcal | Dither | Autocal | Total Dithers | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | G235M/F170LP | NRSIRS2 | 26 | 2 | false | true | NONE | 7 | 14 | 26756.024 | |
| 2 | G140M/F100LP | NRSIRS2 | 16 | 1 | false | true | NONE | 7 | 7 | 8271.901 | |

## Special Requirements

Aperture PA Range 47.97164917 to 57.97164917 Degrees (V3 269.0 to 279.0)
Aperture PA Range 144.07164917 to 158.97164917 Degrees (V3 5.1 to 20.0)
Aperture PA Range 234.97164917 to 282.97164917 Degrees (V3 96.0 to 144.0)
Aperture PA Range 295.97164917 to 305.77164917 Degrees (V3 157.0 to 166.8)

## Observation

**Proposal 4426, Observation 3: GNz11-IFS-2**

Tue Feb 13 18:00:36 GMT 2024

**Diagnostic Status: Warning**

Observing Template: NIRSpec IFU Spectroscopy

## Diagnostics

(Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

## Fixed Targets

| # | Name | Target Coordinates | Targ. Coord. Corrections | Miscellaneous |
|---|---|---|---|---|
| (1) | GNZ11 | RA: 12 36 25.4501 (189.1060421d)<br>Dec: +62 14 31.35 (62.24204d)<br>Equinox: J2000 | | |

*Comments:*
*Category=Galaxy*
*Description=[High-redshift galaxies]*
*Extended=YES*

## Template

| TA Method |
|---|
| NONE |

## Dithers

| # | Dither Type | Size | Starting Point | Number of Points | Points |
|---|---|---|---|---|---|
| 1 | CYCLING | MEDIUM | 1 | 7 | |

## Spectral Elements

| # | Grating/Filter | Readout Pattern | Groups/Int | Integrations/Exp | Leakcal | Dither | Autocal | Total Dithers | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | G235M/F170LP | NRSIRS2 | 26 | 2 | false | true | NONE | 7 | 14 | 26756.024 | |
| 2 | G140M/F100LP | NRSIRS2 | 16 | 1 | false | true | NONE | 7 | 7 | 8271.901 | |

## Special Requirements

Aperture PA Range 47.97164917 to 57.97164917 Degrees (V3 269.0 to 279.0)
Aperture PA Range 144.07164917 to 158.97164917 Degrees (V3 5.1 to 20.0)
Aperture PA Range 234.97164917 to 282.97164917 Degrees (V3 96.0 to 144.0)
Aperture PA Range 295.97164917 to 305.77164917 Degrees (V3 157.0 to 166.8)