



2792 - NIRSpec Spectroscopy of a Remarkably Luminous Galaxy at $z=10.19$

Cycle: 2, Proposal Category: GO

INVESTIGATORS

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OBSERVATIONS

| <i>Folder</i> | <i>Observation</i> | <i>Label</i> | <i>Observing Template</i> | <i>Science Target</i> |
|--------------------|--------------------|--------------|---------------------------------|-----------------------|
| Observation Folder | | | | |
| | 1 | NIRSpec | NIRSpec Fixed Slit Spectroscopy | (2) XMM3-3085-updated |
| | 2 | NIRCam | NIRCam Imaging | (1) XMM3-3085 |

ABSTRACT

We propose NIRSpec and NIRCam observations for an extremely luminous galaxy, XMM3-3085 at $z=10.2$ with $M_{\text{UV}}=-23.7$ mag, whose high redshift is suggested by recent HST grism spectroscopy. XMM3-3085 is the most luminous galaxy at $z>10$, and such a luminous system is not expected theoretically, indicating an unusually vigorous period of early star formation with high efficiency, the existence of AGN activity, or stellar populations characterized by a top-heavy initial mass function possibly with Pop-III stars. Thanks to its bright nature, a quick 1 hour NIRSpec/PRISM observation will allow us to confirm the HST-based redshift efficiently, and moreover, detect various emission lines including [OIII]1665, CIII]1908, [OII]3727, [NeIII]3869, Hdelta, Hgamma, and [OIII]4363. Combined with NIRCam observations tracing the continuum redder than the Balmer break, we will measure the physical parameters including the [OIII]4363-based metallicity for the first time at $z>10$, to understand early stellar mass assembly and dust and metal enrichment, and will discuss the physical nature of this remarkably luminous galaxy, whose existence is a challenge for current galaxy formation models.

OBSERVING DESCRIPTION

We will conduct NIRSpec spectroscopy and NIRCам imaging for a remarkably luminous galaxy at $z=10.2$, XMM3-3085.

We choose NIRSpec/PRISM CLEAR with the 0.4" fixed slit to efficiently detect various emission lines and Lyman-alpha break. Since our targets are bright (23.9), we will use WATA with CLEAR, NRSRAPIDD6, and FULL subarray.

We conduct NIRCам F200W+F480M imaging to estimate a robust stellar mass.

Proposal 2792 - Targets - NIRSpec Spectroscopy of a Remarkably Luminous Galaxy at z=10.19

| Fixed Targets | # | Name | Target Coordinates | Targ. Coord. Corrections | Miscellaneous |
|---------------|-------------------|---|---|--------------------------|---------------|
| | (1) | XMM3-3085 | RA: 02 26 59.0800 (36.7461667d) Dec: -05 12 17.49 (-5.20486d) Equinox: J2000 <i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[High-redshift galaxies]</i> | | |
| (2) | XMM3-3085-updated | RA: 02 26 59.1143 (36.7463096d) Dec: -05 12 17.76 (-5.20493d) Equinox: J2000 <i>Comments:</i> <i>Category=Galaxy</i> <i>Description=[High-redshift galaxies]</i> | | | |

Proposal 2792 - Observation 1 - NIRSpec Spectroscopy of a Remarkably Luminous Galaxy at z=10.19

Wed Jan 10 01:00:34 GMT 2024

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|--------------------------|---|---------------------------------|--|------------------------|-------------------|---------------------------------|--------------------------|-------------------------|---------------------------|----------------------------|-------------------------|
| Observation | <p>Proposal 2792, Observation 1: NIRSpec Diagnostic Status: Warning Observing Template: NIRSpec Fixed Slit Spectroscopy</p> | | | | | | | | | | |
| 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 | | |
| | (2) | XMM3-3085-updated | RA: 02 26 59.1143 (36.7463096d) Dec: -05 12 17.76 (-5.20493d) Equinox: J2000 | | | | | | | | |
| | <p><i>Comments:</i> Category=Galaxy Description=[High-redshift galaxies]</p> | | | | | | | | | | |
| Acquisition | # | Target | TA Method | Subarray | Filter | Readout Pattern | Groups/Int | Integrations/Exp | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |
| | 1 | SAME | WATA | FULL | CLEAR | NRSRAPIDD6 | 3 | 1 | 1 | 171.788 | 145765 |
| Template | Slit | | | | Subarray | | | | | | |
| | S400A1 | | | | FULL | | | | | | |
| Dithers | # | Primary Dither Positions | | | | | Sub-Pixel Pattern | | | | |
| | 1 | 3 | | | | | NONE | | | | |
| Spectral Elements | # | Grating/Filter | Slit | Readout Pattern | Groups/Int | Integrations/Exp # | Autocal | Total Dithers | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |
| | 1 | PRISM/CLEAR | S400A1 | NRSIRS2RAPID | 80 | 1 | 1 | NONE | 3 | 3 | 3545.1 |

Proposal 2792 - Observation 2 - NIRSpec Spectroscopy of a Remarkably Luminous Galaxy at z=10.19

Wed Jan 10 01:00:34 GMT 2024

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|-----------------------------|---|----------------------------|--|------------------------|---------------------------------|-------------------------|---------------------------|---------------------------|----------------------------|-------------------------|
| Observation | <p>Proposal 2792, Observation 2: NIRCam Diagnostic Status: Warning Observing Template: NIRCam Imaging</p> | | | | | | | | | |
| 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) | XMM3-3085 | RA: 02 26 59.0800 (36.7461667d) Dec: -05 12 17.49 (-5.20486d) Equinox: J2000 | | | | | | | |
| | <p><i>Comments:</i> Category=Galaxy Description=[High-redshift galaxies]</p> | | | | | | | | | |
| Template | Module | | Subarray | | | Target Placement | | | | |
| | B | | FULL | | | Module Gap | | | | |
| Dithers | # | Primary Dither Type | | Primary Dithers | Subpixel Dither Type | | Dither Size | Subpixel Positions | | |
| | 1 | INTRAMODULEBOX | | 4 | STANDARD | | | 1 | | |
| Spectral Elements | # | Short Filter | Long Filter | Readout Pattern | Groups/Int | Integrations/Exp | Total Integrations | Total Dithers | Total Exposure Time | ETC Wkbk.Calc ID |
| | 1 | F200W | F480M | BRIGHT2 | 7 | 1 | 4 | 4 | 601.259 | |
| Special Requirements | Offset 38.0 arcsec, 38.0 arcsec Background Limited. Background no more than 40th percentile above minimum | | | | | | | | | |