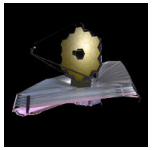

# 1492 - Characterization of LSF and Zero-Point Correction

Cycle: 1, Proposal Category: CAL/NIRSPEC

**INVESTIGATORS**


| *Name* | *Institution* |
|---|---|
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**OBSERVATIONS**

| *Folder* | *Observation* | *Label* | *Observing Template* | *Science Target* |
|---|---|---|---|---|
| FS | | | | |
| | 1 | S200A1 | NIRSpec Fixed Slit Spectroscopy | (1) IRAS-05248-7007 |
| | 3 | S400A1 | NIRSpec Fixed Slit Spectroscopy | (1) IRAS-05248-7007 |
| | 5 | S1600A1 | NIRSpec Fixed Slit Spectroscopy | (1) IRAS-05248-7007 |
| MOS | | | | |
| | 7 | MSA stepping | NIRSpec MultiObject Spectroscopy | (1) IRAS-05248-7007 |
| IFU | | | | |
| | 8 | IFU LSF | NIRSpec IFU Spectroscopy | (1) IRAS-05248-7007 |
| | 9 | IFU LSF | NIRSpec IFU Spectroscopy | (1) IRAS-05248-7007 |

**ABSTRACT**

This program will expand the NIRSpec LSF characterization and wavelength zero point calibration correction derived during commissioning. Observations will acquire spectra of spatially unresolved emission line sources used during commissioning in the FS and IFU apertures using nod/dither positions not yet covered in the commissioning program. The observed emission lines will be used to update the wavelength zero point for the instrument model. The unresolved emission lines will be used to characterize the LSF shape for each disperser, as both a function of wavelength and position within the aperture. MOS observations will also be acquire for zero point correction information for input into the instrument model update. This MOS observation includes a set of 10 exposures with the source stepped across the full pitch of a shutter at even

intervals (roughly 25 mas per step). The MOS portion of the commissioning program will not provide the sampling necessary to measure these zero point offsets.

This calibration program is provisional and may change in response to system developments and final science program.

**OBSERVING DESCRIPTION**

This activity will observe an unresolved emission line source in order to characterize the instrumental LSF as a function of wavelength. By dithering the source at multiple positions over multiple apertures, these observations will also be used to help anchor the wavelength zero-point correction for offset point sources. The primary wavelength calibration activity, part of the instrument model, comprises exposures with internal calibration lamps, which uniformly illuminate all apertures and are thus not suited for this particular task (nor is the external wavelength verification activity in Commissioning, which also involves extended sources). The preferred target is a planetary nebula in the LMC that has previously been shown to be a point source in HST/ACS observations, thus it should not be spatially resolved by NIRSpec at any wavelength. It is also located in the CVZ, which enables maximum scheduling flexibility.

For the LSF measurements, observations with all the dispersers are needed for characterization across the full wavelength range at each resolution. As a baseline, the apertures are limited to the S200A1, S1600A, and S400A slits and the IFU. In principle, the S200A1 slit should be a reasonable proxy for the other S200 slits and the MOS shutters, so those are not included here. A future calibration program may want to add those apertures if available science data indicates there could be discrepancies; the separate MOS zero-point observations described below can also be used, though limited to only the medium-resolution gratings. The slit observations include two primary dither positions with spectral sub-pixel dithers to help improve the sampling. The IFU observations include a 4-pt nod for background subtraction as well as improved sampling.

For the zero-point characterization, the same FS and IFU observations can be used. However, an additional MOS observation is also required - the zero point correction depends on source position within an aperture, and unlike for the other two modes, science sources will rarely if ever be located at fixed positions within MOS shutters. The MOS observation includes a set of 10 exposures with the source stepped across the full pitch of a shutter at even intervals (roughly 25 mas per step). The medium-resolution gratings are preferred for this part as they should provide sufficiently accurate line centroids and minimized blending (note that individual lines will not be resolvable even with the high-resolution gratings).

TIMING CONSTRAINTS

The observations in this program can be scheduled anytime in cycle 1.

# Proposal 1492 - Targets - Characterization of LSF and Zero-Point Correction

**Fixed Targets**

| # | Name | Target Coordinates | Targ. Coord. Corrections | Miscellaneous |
|---|---|---|---|---|
| (1) | IRAS-05248-7007 | RA: 05 24 20.7650 (81.0865208d)<br>Dec: -70 05 1.52 (-70.08376d)<br>Equinox: J2000 | | |

*Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.*
*Category=Calibration*
*Description=[Line spread function, Planetary nebulae, Wavelength]*

## Observation

**Proposal 1492, Observation 1: S200A1** Mon Jul 17 23:01:18 GMT 2023

**Diagnostic Status: Warning**

Observing Template: NIRSpec Fixed Slit 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) | IRAS-05248-7007 | RA: 05 24 20.7650 (81.0865208d)<br>Dec: -70 05 1.52 (-70.08376d)<br>Equinox: J2000 | | |

*Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.*
*Category=Calibration*
*Description=[Line spread function, Planetary nebulae, Wavelength]*

## Acquisition

| # | Target | TA Method | Subarray | Filter | Readout Pattern | Groups/Int | Integrations/Exp | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | SAME | WATA | SUB32 | F140X | NRSRAPID | 3 | 1 | 1 | 0.08 | 23101 |

## Template

| Slit | Subarray |
|---|---|
| S200A1 | SUBS200A1 |

## Dithers

| # | Primary Dither Positions | Sub-Pixel Pattern |
|---|---|---|
| 1 | 5 | SPECTRAL |

## Spectral Elements

| # | Grating/Filter | Slit | Readout Pattern | Groups/Int | Integrations/Exp | # | Autocal | Total Dithers | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | G140M/F100LP | S200A1 | NRSRAPID | 30 | 1 | 1 | NONE | 15 | 15 | 724.777 | |
| 2 | G235M/F170LP | S200A1 | NRSRAPID | 17 | 1 | 2 | NONE | 15 | 15 | 420.967 | |
| 3 | G395M/F290LP | S200A1 | NRSRAPID | 20 | 1 | 3 | NONE | 15 | 15 | 491.077 | |
| 4 | G140H/F100LP | S200A1 | NRSRAPID | 40 | 1 | 4 | NONE | 15 | 15 | 958.477 | |
| 5 | G235H/F170LP | S200A1 | NRSRAPID | 30 | 1 | 5 | NONE | 15 | 15 | 724.777 | |
| 6 | G395H/F290LP | S200A1 | NRSRAPID | 30 | 1 | 6 | NONE | 15 | 15 | 724.777 | |
| 7 | PRISM/CLEAR | S200A1 | NRSRAPID | 5 | 1 | 7 | NONE | 15 | 15 | 140.527 | |

## Observation

**Proposal 1492, Observation 3: S400A1** Mon Jul 17 23:01:18 GMT 2023

**Diagnostic Status: Warning**

Observing Template: NIRSpec Fixed Slit 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) | IRAS-05248-7007 | RA: 05 24 20.7650 (81.0865208d)<br>Dec: -70 05 1.52 (-70.08376d)<br>Equinox: J2000 | | |

*Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.*
*Category=Calibration*
*Description=[Line spread function, Planetary nebulae, Wavelength]*

## Acquisition

| # | Target | TA Method | Subarray | Filter | Readout Pattern | Groups/Int | Integrations/Exp | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | SAME | WATA | SUB32 | F140X | NRSRAPID | 3 | 1 | 1 | 0.08 | 23101 |

## Template

| Slit | Subarray |
|---|---|
| S400A1 | SUBS400A1 |

## Dithers

| # | Primary Dither Positions | Sub-Pixel Pattern |
|---|---|---|
| 1 | 2 | SPECTRAL |

## Spectral Elements

| # | Grating/Filter | Slit | Readout Pattern | Groups/Int | Integrations/Exp | # | Autocal | Total Dithers | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | G140M/F100LP | S400A1 | NRSRAPID | 30 | 1 | 1 | NONE | 6 | 6 | 289.911 | |
| 2 | G235M/F170LP | S400A1 | NRSRAPID | 20 | 1 | 2 | NONE | 6 | 6 | 196.431 | |
| 3 | G395M/F290LP | S400A1 | NRSRAPID | 30 | 1 | 3 | NONE | 6 | 6 | 289.911 | |
| 4 | G140H/F100LP | S400A1 | NRSRAPID | 40 | 1 | 4 | NONE | 6 | 6 | 383.391 | |
| 5 | G235H/F170LP | S400A1 | NRSRAPID | 25 | 1 | 5 | NONE | 6 | 6 | 243.171 | |
| 6 | G395H/F290LP | S400A1 | NRSRAPID | 30 | 1 | 6 | NONE | 6 | 6 | 289.911 | |
| 7 | PRISM/CLEAR | S400A1 | NRSRAPID | 5 | 1 | 7 | NONE | 6 | 6 | 56.211 | |

## Observation

**Proposal 1492, Observation 5: S1600A1** Mon Jul 17 23:01:18 GMT 2023

**Diagnostic Status: Warning**

Observing Template: NIRSpec Fixed Slit Spectroscopy

## Diagnostics

(Visit 5:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

## Fixed Targets

| # | Name | Target Coordinates | Targ. Coord. Corrections | Miscellaneous |
|---|---|---|---|---|
| (1) | IRAS-05248-7007 | RA: 05 24 20.7650 (81.0865208d)<br>Dec: -70 05 1.52 (-70.08376d)<br>Equinox: J2000 | | |

*Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.*
*Category=Calibration*
*Description=[Line spread function, Planetary nebulae, Wavelength]*

## Acquisition

| # | Target | TA Method | Subarray | Filter | Readout Pattern | Groups/Int | Integrations/Exp | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | SAME | WATA | SUB32 | F140X | NRSRAPID | 3 | 1 | 1 | 0.08 | 23101 |

## Template

| Slit | Subarray |
|---|---|
| S1600A1 | SUB2048 |

## Dithers

| # | Primary Dither Positions | Sub-Pixel Pattern |
|---|---|---|
| 1 | 2 | SPECTRAL |

## Spectral Elements

| # | Grating/Filter | Slit | Readout Pattern | Groups/Int | Integrations/Exp | # | Autocal | Total Dithers | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | G140M/F100LP | S1600A1 | NRSRAPID | 40 | 1 | 1 | NONE | 6 | 6 | 222.015 | |
| 2 | G235M/F170LP | S1600A1 | NRSRAPID | 20 | 1 | 2 | NONE | 6 | 6 | 113.775 | |
| 3 | G395M/F290LP | S1600A1 | NRSRAPID | 30 | 1 | 3 | NONE | 6 | 6 | 167.895 | |
| 4 | G140H/F100LP | S1600A1 | NRSRAPID | 70 | 1 | 4 | NONE | 6 | 6 | 384.375 | |
| 5 | G235H/F170LP | S1600A1 | NRSRAPID | 40 | 1 | 5 | NONE | 6 | 6 | 222.015 | |
| 6 | G395H/F290LP | S1600A1 | NRSRAPID | 50 | 1 | 6 | NONE | 6 | 6 | 276.135 | |
| 7 | PRISM/CLEAR | S1600A1 | NRSRAPID | 5 | 1 | 7 | NONE | 6 | 6 | 32.595 | |

## Observation

**Proposal 1492, Observation 7: MSA stepping**

Mon Jul 17 23:01:18 GMT 2023

**Diagnostic Status: Warning**

Observing Template: NIRSpec MultiObject Spectroscopy

## Diagnostics

(Visit 7:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

## Fixed Targets

| # | Name | Target Coordinates | Targ. Coord. Corrections | Miscellaneous |
|---|---|---|---|---|
| (1) | IRAS-05248-7007 | RA: 05 24 20.7650 (81.0865208d)<br>Dec: -70 05 1.52 (-70.08376d)<br>Equinox: J2000 | | |

*Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.*
*Category=Calibration*
*Description=[Line spread function, Planetary nebulae, Wavelength]*

## Acquisition

| # | Target | TA Method | Subarray | Filter | Readout Pattern | Groups/Int | Integrations/Exp | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | SAME | WATA | SUB32 | F140X | NRSRAPID | 3 | 1 | 1 | 0.08 | 23101 |

## Template

| Obtain Confirmation Images | Science Aperture | Primary Candidate List | Filler Candidate List | Spectral Overlap Map | Spectral Overlap Threshold |
|---|---|---|---|---|---|
| No | Q4 Field Point 1 | | | jwst-nirspec-mr | 1.5 |

## Spectral Elements

| # | Exposure Specification | MSA Configuration | Nod Pattern | Pointing | Aperture PA | Dispersion Offset (Shutters) | Cross-Dispersion Offset (Shutters) | Total Dithers | Total Integrations | Total Exposure Time |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 (G140M/F100LP) | Q4 Field Point 1 Long Slit | | | 0.0 | | | 1 | 1 | 87.533 |
| 2 | 2 (G235M/F170LP) | Q4 Field Point 1 Long Slit | | | 0.0 | | | 1 | 1 | 87.533 |
| 3 | 3 (G395M/F290LP) | Q4 Field Point 1 Long Slit | | | 0.0 | | | 1 | 1 | 58.356 |

## Observation

**Proposal 1492, Observation 8: IFU LSF** Mon Jul 17 23:01:18 GMT 2023

**Diagnostic Status: Warning**

Observing Template: NIRSpec IFU Spectroscopy

## Diagnostics

(Visit 8:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

## Fixed Targets

| # | Name | Target Coordinates | Targ. Coord. Corrections | Miscellaneous |
|---|---|---|---|---|
| (1) | IRAS-05248-7007 | RA: 05 24 20.7650 (81.0865208d)<br>Dec: -70 05 1.52 (-70.08376d)<br>Equinox: J2000 | | |

*Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.*
*Category=Calibration*
*Description=[Line spread function, Planetary nebulae, Wavelength]*

## Acquisition

| # | Target | TA Method | Subarray | Filter | Readout Pattern | Groups/Int | Integrations/Exp | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | SAME | WATA | SUB32 | F140X | NRSRAPID | 3 | 1 | 1 | 0.08 | 23101 |

## Dithers

| # | Dither Type | Size | Starting Point | Number of Points | Points |
|---|---|---|---|---|---|
| 1 | 4-POINT-NOD | | | | |

## 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 | G140M/F100LP | NRSIRS2RAPID | 10 | 1 | false | true | NONE | 4 | 4 | 641.911 | |
| 2 | G235M/F170LP | NRSIRS2RAPID | 10 | 1 | false | true | NONE | 4 | 4 | 641.911 | |
| 3 | G395M/F290LP | NRSIRS2RAPID | 5 | 1 | false | true | NONE | 4 | 4 | 350.133 | |
| 4 | G140H/F100LP | NRSIRS2RAPID | 20 | 1 | false | true | NONE | 4 | 4 | 1225.467 | |
| 5 | G235H/F170LP | NRSIRS2RAPID | 5 | 1 | false | true | NONE | 4 | 4 | 350.133 | |
| 6 | G395H/F290LP | NRSIRS2RAPID | 15 | 1 | false | true | NONE | 4 | 4 | 933.689 | |
| 7 | PRISM/CLEAR | NRSIRS2RAPID | 5 | 1 | false | true | NONE | 4 | 4 | 350.133 | |

| Special Requirements | Guide Star in Guider 1 |
|---|---|

## Observation

**Proposal 1492, Observation 9: IFU LSF** Mon Jul 17 23:01:18 GMT 2023

**Diagnostic Status: Warning**

Observing Template: NIRSpec IFU Spectroscopy

## Diagnostics

(Visit 9:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

## Fixed Targets

| # | Name | Target Coordinates | Targ. Coord. Corrections | Miscellaneous |
|---|---|---|---|---|
| (1) | IRAS-05248-7007 | RA: 05 24 20.7650 (81.0865208d)<br>Dec: -70 05 1.52 (-70.08376d)<br>Equinox: J2000 | | |

*Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.*
*Category=Calibration*
*Description=[Line spread function, Planetary nebulae, Wavelength]*

## Acquisition

| # | Target | TA Method | Subarray | Filter | Readout Pattern | Groups/Int | Integrations/Exp | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | SAME | WATA | SUB32 | F140X | NRSRAPID | 3 | 1 | 1 | 0.08 | 23101 |

## Dithers

| # | Dither Type | Size | Starting Point | Number of Points | Points |
|---|---|---|---|---|---|
| 1 | CYCLING | LARGE | 1 | 5 | |

## 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 | G140M/F100LP | NRSIRS2RAPID | 10 | 1 | false | true | NONE | 5 | 5 | 802.389 | |
| 2 | G235M/F170LP | NRSIRS2RAPID | 10 | 1 | false | true | NONE | 5 | 5 | 802.389 | |
| 3 | G395M/F290LP | NRSIRS2RAPID | 5 | 1 | false | true | NONE | 5 | 5 | 437.667 | |
| 4 | PRISM/CLEAR | NRSIRS2RAPID | 5 | 1 | false | true | NONE | 5 | 5 | 437.667 | |

## Special Requirements

Guide Star in Guider 1