



## 1633 - A Deep Molecular Survey of HD 189733b

Cycle: 1, 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                  | MIRI MRS A transit   | MIRI Medium Resolution Spectroscopy | (1) HD-189733         |
|                    | 2                  | MIRI MRS transit B   | MIRI Medium Resolution Spectroscopy | (1) HD-189733         |
|                    | 3                  | MIRI MRS transit C   | MIRI Medium Resolution Spectroscopy | (1) HD-189733         |
|                    | 4                  | NIRCam F322 transit  | NIRCam Grism Time Series            | (1) HD-189733         |
|                    | 5                  | INIRCam F444 transit | NIRCam Grism Time Series            | (1) HD-189733         |

## **ABSTRACT**

HD 189733b is the archetype of hot Jupiters. We propose to measure the molecular inventory and cloud composition in its atmosphere to high sensitivity. We will observe its transit spectrum over a large range of wavelength, using 5 transits: two observed with NIRCcam grisms, and three with MIRI MRS. The resulting composite transit spectrum spans from 2.4 to beyond 20 microns, and includes strong bands of the major atmospheric molecules (water, methane, carbon monoxide, and carbon dioxide), as well as strong bands of important minor species (HCN, ammonia, and hydrogen sulfide). There is evidence that exoplanets show a mass-metallicity trend that differs from planets in our Solar System when water vapor (oxygen) is used as the proxy for metallicity. We will measure the atmospheric metallicity of HD 189733b to a precision of 0.025-dex using CNO elements, and determine unequivocally whether it is consistent with the Solar System's relation, or not. We will also probe atmospheric chemical disequilibrium by detecting minor species that are depleted (methane) or enhanced by vertical transport (HCN), or produced by photochemistry (hydrogen sulfide, from sulfur photochemistry). Our analysis will successfully deal with possible interference due to stellar activity, and we will measure the cloud composition using vibrational modes in the thermal IR. Although this planet transits a very bright star ( $K_{\text{mag}}=5.54$ ), we are using moderately high spectral resolution and the observations will not be hindered by saturation. These are low-risk observations for Cycle-1 because the signals to be measured are large, and the scientific return is substantial.

## **OBSERVING DESCRIPTION**

5 transits of HD189733b, two with NIRCcam grisms (F322W2 and F444W), and one transit in each of the three grating settings for MIRI MRS.

# Proposal 1633 - Targets - A Deep Molecular Survey of HD 189733b

| Fixed Targets | #  | Name                          | Target Coordinates                                | Targ. Coord. Corrections                                | Miscellaneous |
|---------------|--|-------------------------------|---|---|---------------|
|               | (1)  | HD-189733                     | RA: 20 00 43.7093 (300.1821221d)                  | Proper Motion RA: -2.3805594617508174E-4 sec of time/yr |               |
|               |  | Dec: +22 42 35.19 (22.70978d) | Proper Motion Dec: -0.25022499999067804 arcsec/yr |   |               |
|               |  | Equinox: J2000                | Epoch of Position: 2015.5                         |   |               |
|               | <i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i> |                               |   |   |               |
|               | Category=Star  |                               |   |   |               |
|               | Description=[Exoplanets]   |                               |   |   |               |

Proposal 1633 - Observation 1 - A Deep Molecular Survey of HD 189733b

| <b>Observation</b>          | <b>Proposal 1633, Observation 1: MIRI MRS A transit</b> <span style="float: right;">Thu Jul 15 21:00:11 GMT 2021</span><br><b>Diagnostic Status: Warning</b><br>Observing Template: MIRI Medium Resolution Spectroscopy   |   |   |                          |                 |                  |                    |                     |                  |               |                    |                     |                  |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |          |         |       |        |    |     |   |      |   |     |           |       |   |          |          |  |        |    |     |   |      |   |     |           |       |
|-----------------------------|---|---|---|--------------------------|-----------------|------------------|--------------------|---------------------|------------------|---------------|--------------------|---------------------|------------------|----------------------|--------------------|--------------------------|-----------------|------------------|--------------------|---|---|---------------|--------------------|---------------------|------------------|---|----------|---------|-------|--------|----|-----|---|------|---|-----|-----------|-------|---|----------|----------|--|--------|----|-----|---|------|---|-----|-----------|-------|
|                             | (MIRI MRS A transit (Obs 1)) Warning (Form): Exposure Duration exceeds the limit of 10000.0 seconds. Above this limit it is possible that a High Gain Antenna move may occur during the exposure.<br>(MIRI MRS A transit (Obs 1)) Warning (Form): Exposure Duration exceeds the limit of 10000.0 seconds. Above this limit it is possible that a High Gain Antenna move may occur during the exposure.<br>(Visit 1:1) Warning (Form): Data Excess over middle threshold<br>(Visit 1:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.  |   |   |                          |                 |                  |                    |                     |                  |               |                    |                     |                  |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |          |         |       |        |    |     |   |      |   |     |           |       |   |          |          |  |        |    |     |   |      |   |     |           |       |
| <b>Diagnosics</b>           |   |   |   |                          |                 |                  |                    |                     |                  |               |                    |                     |                  |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |          |         |       |        |    |     |   |      |   |     |           |       |   |          |          |  |        |    |     |   |      |   |     |           |       |
|                             |   |   |   |                          |                 |                  |                    |                     |                  |               |                    |                     |                  |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |          |         |       |        |    |     |   |      |   |     |           |       |   |          |          |  |        |    |     |   |      |   |     |           |       |
| <b>Fixed Targets</b>        | <table border="1"> <thead> <tr> <th>#</th> <th>Name</th> <th>Target Coordinates</th> <th>Targ. Coord. Corrections</th> <th>Miscellaneous</th> </tr> </thead> <tbody> <tr> <td>(1)</td> <td>HD-189733</td> <td>RA: 20 00 43.7093 (300.1821221d)<br/>Dec: +22 42 35.19 (22.70978d)<br/>Equinox: J2000</td> <td>Proper Motion RA: -2.3805594617508174E-4 sec of time/yr<br/>Proper Motion Dec: -0.25022499999067804 arcsec/yr<br/>Epoch of Position: 2015.5</td> <td></td> </tr> </tbody> </table> <p><i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i><br/> <i>Category=Star</i><br/> <i>Description=[Exoplanets]</i></p>  |   |   |                          |                 |                  |                    |                     |                  |               |                    |                     | #                | Name                 | Target Coordinates | Targ. Coord. Corrections | Miscellaneous   | (1)              | HD-189733          | RA: 20 00 43.7093 (300.1821221d)<br>Dec: +22 42 35.19 (22.70978d)<br>Equinox: J2000 | Proper Motion RA: -2.3805594617508174E-4 sec of time/yr<br>Proper Motion Dec: -0.25022499999067804 arcsec/yr<br>Epoch of Position: 2015.5 |               |                    |                     |                  |   |          |         |       |        |    |     |   |      |   |     |           |       |   |          |          |  |        |    |     |   |      |   |     |           |       |
|                             | #   | Name  | Target Coordinates  | Targ. Coord. Corrections | Miscellaneous   |                  |                    |                     |                  |               |                    |                     |                  |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |          |         |       |        |    |     |   |      |   |     |           |       |   |          |          |  |        |    |     |   |      |   |     |           |       |
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|                             |   |   |   |                          |                 |                  |                    |                     |                  |               |                    |                     |                  |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |          |         |       |        |    |     |   |      |   |     |           |       |   |          |          |  |        |    |     |   |      |   |     |           |       |
| <b>Acquisition</b>          | <table border="1"> <thead> <tr> <th>#</th> <th>Target</th> <th>Filter</th> <th>Readout Pattern</th> <th>Groups/Int</th> <th>Integrations/Exp</th> <th>Total Integrations</th> <th>Total Exposure Time</th> <th>ETC Wkbk.Calc ID</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>SAME</td> <td>FND</td> <td>FAST</td> <td>6</td> <td>1</td> <td>1</td> <td>16.65</td> <td>54189</td> </tr> </tbody> </table>   |   |   |                          |                 |                  |                    |                     |                  |               |                    |                     | #                | Target               | Filter             | Readout Pattern          | Groups/Int      | Integrations/Exp | Total Integrations | Total Exposure Time   | ETC Wkbk.Calc ID  | 1             | SAME               | FND                 | FAST             | 6 | 1        | 1       | 16.65 | 54189  |    |     |   |      |   |     |           |       |   |          |          |  |        |    |     |   |      |   |     |           |       |
|                             | #   | Target  | Filter  | Readout Pattern          | Groups/Int      | Integrations/Exp | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |               |                    |                     |                  |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |          |         |       |        |    |     |   |      |   |     |           |       |   |          |          |  |        |    |     |   |      |   |     |           |       |
| 1                           | SAME  | FND   | FAST  | 6                        | 1               | 1                | 16.65              | 54189               |                  |               |                    |                     |                  |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |          |         |       |        |    |     |   |      |   |     |           |       |   |          |          |  |        |    |     |   |      |   |     |           |       |
|                             |   |   |   |                          |                 |                  |                    |                     |                  |               |                    |                     |                  |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |          |         |       |        |    |     |   |      |   |     |           |       |   |          |          |  |        |    |     |   |      |   |     |           |       |
| <b>Template</b>             | <table border="1"> <thead> <tr> <th>Primary Channel</th> <th>Simultaneous Imaging</th> <th>Imager Subarray</th> </tr> </thead> <tbody> <tr> <td>ALL</td> <td>NO</td> <td>FULL</td> </tr> </tbody> </table>  |   |   |                          |                 |                  |                    |                     |                  |               |                    |                     | Primary Channel  | Simultaneous Imaging | Imager Subarray    | ALL                      | NO              | FULL             |                    |   |   |               |                    |                     |                  |   |          |         |       |        |    |     |   |      |   |     |           |       |   |          |          |  |        |    |     |   |      |   |     |           |       |
|                             | Primary Channel   | Simultaneous Imaging  | Imager Subarray   |                          |                 |                  |                    |                     |                  |               |                    |                     |                  |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |          |         |       |        |    |     |   |      |   |     |           |       |   |          |          |  |        |    |     |   |      |   |     |           |       |
| ALL                         | NO  | FULL  |   |                          |                 |                  |                    |                     |                  |               |                    |                     |                  |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |          |         |       |        |    |     |   |      |   |     |           |       |   |          |          |  |        |    |     |   |      |   |     |           |       |
|                             |   |   |   |                          |                 |                  |                    |                     |                  |               |                    |                     |                  |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |          |         |       |        |    |     |   |      |   |     |           |       |   |          |          |  |        |    |     |   |      |   |     |           |       |
| <b>Spectral Elements</b>    | <table border="1"> <thead> <tr> <th>#</th> <th>Wavelength Range</th> <th>Detector</th> <th>Filter</th> <th>Readout Pattern</th> <th>Groups/Int</th> <th>Integrations/Exp</th> <th>Exposures/Dith</th> <th>Dither</th> <th>Total Dithers</th> <th>Total Integrations</th> <th>Total Exposure Time</th> <th>ETC Wkbk.Calc ID</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>SHORT(A)</td> <td>MRSLONG</td> <td></td> <td>FASTR1</td> <td>30</td> <td>257</td> <td>1</td> <td>None</td> <td>1</td> <td>257</td> <td>22105.969</td> <td>54189</td> </tr> <tr> <td>1</td> <td>SHORT(A)</td> <td>MRSSHORT</td> <td></td> <td>FASTR1</td> <td>30</td> <td>257</td> <td>1</td> <td>None</td> <td>1</td> <td>257</td> <td>22105.969</td> <td>54189</td> </tr> </tbody> </table> |   |   |                          |                 |                  |                    |                     |                  |               |                    |                     | #                | Wavelength Range     | Detector           | Filter                   | Readout Pattern | Groups/Int       | Integrations/Exp   | Exposures/Dith  | Dither  | Total Dithers | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID | 1 | SHORT(A) | MRSLONG |       | FASTR1 | 30 | 257 | 1 | None | 1 | 257 | 22105.969 | 54189 | 1 | SHORT(A) | MRSSHORT |  | FASTR1 | 30 | 257 | 1 | None | 1 | 257 | 22105.969 | 54189 |
|                             | #   | Wavelength Range  | Detector  | Filter                   | Readout Pattern | Groups/Int       | Integrations/Exp   | Exposures/Dith      | Dither           | Total Dithers | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |          |         |       |        |    |     |   |      |   |     |           |       |   |          |          |  |        |    |     |   |      |   |     |           |       |
|                             | 1   | SHORT(A)  | MRSLONG   |                          | FASTR1          | 30               | 257                | 1                   | None             | 1             | 257                | 22105.969           | 54189            |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |          |         |       |        |    |     |   |      |   |     |           |       |   |          |          |  |        |    |     |   |      |   |     |           |       |
| 1                           | SHORT(A)  | MRSSHORT  |   | FASTR1                   | 30              | 257              | 1                  | None                | 1                | 257           | 22105.969          | 54189               |                  |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |          |         |       |        |    |     |   |      |   |     |           |       |   |          |          |  |        |    |     |   |      |   |     |           |       |
|                             |   |   |   |                          |                 |                  |                    |                     |                  |               |                    |                     |                  |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |          |         |       |        |    |     |   |      |   |     |           |       |   |          |          |  |        |    |     |   |      |   |     |           |       |
| <b>Special Requirements</b> | Phase 0.92591 to 0.94469 with period 2.218575200 Days and zero-phase 2453955.525551 HJD<br>Time Series Observation<br>No Parallel   |   |   |                          |                 |                  |                    |                     |                  |               |                    |                     |                  |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |          |         |       |        |    |     |   |      |   |     |           |       |   |          |          |  |        |    |     |   |      |   |     |           |       |
|                             |   |   |   |                          |                 |                  |                    |                     |                  |               |                    |                     |                  |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |          |         |       |        |    |     |   |      |   |     |           |       |   |          |          |  |        |    |     |   |      |   |     |           |       |

Proposal 1633 - Observation 2 - A Deep Molecular Survey of HD 189733b

| <b>Observation</b>       | <b>Proposal 1633, Observation 2: MIRI MRS transit B</b> <span style="float: right;">Thu Jul 15 21:00:12 GMT 2021</span><br><b>Diagnostic Status: Warning</b><br>Observing Template: MIRI Medium Resolution Spectroscopy  |   |   |                          |                 |                  |                    |                     |                  |               |                    |                     |                  |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |           |         |       |        |    |     |   |      |   |     |           |       |   |           |          |  |        |    |     |   |      |   |     |           |       |
|--------------------------|--|---|---|--------------------------|-----------------|------------------|--------------------|---------------------|------------------|---------------|--------------------|---------------------|------------------|----------------------|--------------------|--------------------------|-----------------|------------------|--------------------|---|---|---------------|--------------------|---------------------|------------------|---|-----------|---------|-------|--------|----|-----|---|------|---|-----|-----------|-------|---|-----------|----------|--|--------|----|-----|---|------|---|-----|-----------|-------|
|                          | (MIRI MRS transit B (Obs 2)) Warning (Form): Exposure Duration exceeds the limit of 10000.0 seconds. Above this limit it is possible that a High Gain Antenna move may occur during the exposure.<br>(MIRI MRS transit B (Obs 2)) Warning (Form): Exposure Duration exceeds the limit of 10000.0 seconds. Above this limit it is possible that a High Gain Antenna move may occur during the exposure.<br>(Visit 2:1) Warning (Form): Data Excess over middle threshold<br>(Visit 2:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.   |   |   |                          |                 |                  |                    |                     |                  |               |                    |                     |                  |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |           |         |       |        |    |     |   |      |   |     |           |       |   |           |          |  |        |    |     |   |      |   |     |           |       |
| <b>Diagnostics</b>       | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;">#</th> <th style="width: 20%;">Name</th> <th style="width: 25%;">Target Coordinates</th> <th style="width: 25%;">Targ. Coord. Corrections</th> <th style="width: 25%;">Miscellaneous</th> </tr> </thead> <tbody> <tr> <td>(1)</td> <td>HD-189733</td> <td>RA: 20 00 43.7093 (300.1821221d)<br/>Dec: +22 42 35.19 (22.70978d)<br/>Equinox: J2000</td> <td>Proper Motion RA: -2.3805594617508174E-4 sec of time/yr<br/>Proper Motion Dec: -0.25022499999067804 arcsec/yr<br/>Epoch of Position: 2015.5</td> <td></td> </tr> </tbody> </table> <p><i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.<br/>Category=Star<br/>Description=[Exoplanets]</i></p>  |   |   |                          |                 |                  |                    |                     |                  |               |                    |                     | #                | Name                 | Target Coordinates | Targ. Coord. Corrections | Miscellaneous   | (1)              | HD-189733          | RA: 20 00 43.7093 (300.1821221d)<br>Dec: +22 42 35.19 (22.70978d)<br>Equinox: J2000 | Proper Motion RA: -2.3805594617508174E-4 sec of time/yr<br>Proper Motion Dec: -0.25022499999067804 arcsec/yr<br>Epoch of Position: 2015.5 |               |                    |                     |                  |   |           |         |       |        |    |     |   |      |   |     |           |       |   |           |          |  |        |    |     |   |      |   |     |           |       |
|                          | #  | Name  | Target Coordinates  | Targ. Coord. Corrections | Miscellaneous   |                  |                    |                     |                  |               |                    |                     |                  |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |           |         |       |        |    |     |   |      |   |     |           |       |   |           |          |  |        |    |     |   |      |   |     |           |       |
| (1)                      | HD-189733  | RA: 20 00 43.7093 (300.1821221d)<br>Dec: +22 42 35.19 (22.70978d)<br>Equinox: J2000 | Proper Motion RA: -2.3805594617508174E-4 sec of time/yr<br>Proper Motion Dec: -0.25022499999067804 arcsec/yr<br>Epoch of Position: 2015.5 |                          |                 |                  |                    |                     |                  |               |                    |                     |                  |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |           |         |       |        |    |     |   |      |   |     |           |       |   |           |          |  |        |    |     |   |      |   |     |           |       |
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|                          | #  | Target  | Filter  | Readout Pattern          | Groups/Int      | Integrations/Exp | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |               |                    |                     |                  |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |           |         |       |        |    |     |   |      |   |     |           |       |   |           |          |  |        |    |     |   |      |   |     |           |       |
| 1                        | SAME   | FND   | FAST  | 6                        | 1               | 1                | 16.65              | 54189               |                  |               |                    |                     |                  |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |           |         |       |        |    |     |   |      |   |     |           |       |   |           |          |  |        |    |     |   |      |   |     |           |       |
| <b>Acquisition</b>       | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">Primary Channel</th> <th style="width: 40%;">Simultaneous Imaging</th> <th style="width: 30%;">Imager Subarray</th> </tr> </thead> <tbody> <tr> <td>ALL</td> <td>NO</td> <td>FULL</td> </tr> </tbody> </table>   |   |   |                          |                 |                  |                    |                     |                  |               |                    |                     | Primary Channel  | Simultaneous Imaging | Imager Subarray    | ALL                      | NO              | FULL             |                    |   |   |               |                    |                     |                  |   |           |         |       |        |    |     |   |      |   |     |           |       |   |           |          |  |        |    |     |   |      |   |     |           |       |
|                          | Primary Channel  | Simultaneous Imaging  | Imager Subarray   |                          |                 |                  |                    |                     |                  |               |                    |                     |                  |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |           |         |       |        |    |     |   |      |   |     |           |       |   |           |          |  |        |    |     |   |      |   |     |           |       |
| ALL                      | NO   | FULL  |   |                          |                 |                  |                    |                     |                  |               |                    |                     |                  |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |           |         |       |        |    |     |   |      |   |     |           |       |   |           |          |  |        |    |     |   |      |   |     |           |       |
| <b>Template</b>          | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;">#</th> <th style="width: 10%;">Wavelength Range</th> <th style="width: 10%;">Detector</th> <th style="width: 10%;">Filter</th> <th style="width: 10%;">Readout Pattern</th> <th style="width: 10%;">Groups/Int</th> <th style="width: 10%;">Integrations/Exp</th> <th style="width: 10%;">Exposures/Dith</th> <th style="width: 10%;">Dither</th> <th style="width: 10%;">Total Dithers</th> <th style="width: 10%;">Total Integrations</th> <th style="width: 10%;">Total Exposure Time</th> <th style="width: 10%;">ETC Wkbk.Calc ID</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>MEDIUM(B)</td> <td>MRSLONG</td> <td></td> <td>FASTR1</td> <td>30</td> <td>257</td> <td>1</td> <td>None</td> <td>1</td> <td>257</td> <td>22105.969</td> <td>54189</td> </tr> <tr> <td>1</td> <td>MEDIUM(B)</td> <td>MRSSHORT</td> <td></td> <td>FASTR1</td> <td>30</td> <td>257</td> <td>1</td> <td>None</td> <td>1</td> <td>257</td> <td>22105.969</td> <td>54189</td> </tr> </tbody> </table> |   |   |                          |                 |                  |                    |                     |                  |               |                    |                     | #                | Wavelength Range     | Detector           | Filter                   | Readout Pattern | Groups/Int       | Integrations/Exp   | Exposures/Dith  | Dither  | Total Dithers | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID | 1 | MEDIUM(B) | MRSLONG |       | FASTR1 | 30 | 257 | 1 | None | 1 | 257 | 22105.969 | 54189 | 1 | MEDIUM(B) | MRSSHORT |  | FASTR1 | 30 | 257 | 1 | None | 1 | 257 | 22105.969 | 54189 |
|                          | #  | Wavelength Range  | Detector  | Filter                   | Readout Pattern | Groups/Int       | Integrations/Exp   | Exposures/Dith      | Dither           | Total Dithers | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |           |         |       |        |    |     |   |      |   |     |           |       |   |           |          |  |        |    |     |   |      |   |     |           |       |
| 1                        | MEDIUM(B)  | MRSLONG   |   | FASTR1                   | 30              | 257              | 1                  | None                | 1                | 257           | 22105.969          | 54189               |                  |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |           |         |       |        |    |     |   |      |   |     |           |       |   |           |          |  |        |    |     |   |      |   |     |           |       |
| 1                        | MEDIUM(B)  | MRSSHORT  |   | FASTR1                   | 30              | 257              | 1                  | None                | 1                | 257           | 22105.969          | 54189               |                  |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |           |         |       |        |    |     |   |      |   |     |           |       |   |           |          |  |        |    |     |   |      |   |     |           |       |
| <b>Spectral Elements</b> | Phase 0.92591 to 0.94469 with period 2.2185752 Days and zero-phase 2453955.525551 HJD<br>Time Series Observation<br>No Parallel  |   |   |                          |                 |                  |                    |                     |                  |               |                    |                     |                  |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |           |         |       |        |    |     |   |      |   |     |           |       |   |           |          |  |        |    |     |   |      |   |     |           |       |
|                          |  |   |   |                          |                 |                  |                    |                     |                  |               |                    |                     |                  |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |           |         |       |        |    |     |   |      |   |     |           |       |   |           |          |  |        |    |     |   |      |   |     |           |       |

Proposal 1633 - Observation 3 - A Deep Molecular Survey of HD 189733b

Thu Jul 15 21:00:12 GMT 2021

| <b>Observation</b>          | <p><b>Proposal 1633, Observation 3: MIRI MRS transit C</b></p> <p><b>Diagnostic Status: Warning</b></p> <p>Observing Template: MIRI Medium Resolution Spectroscopy</p>  |   |   |                 |                  |                    |                     |                  |               |                    |                     |                  |                 |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |         |         |       |        |    |     |   |      |   |     |           |       |   |         |          |  |        |    |     |   |      |   |     |           |       |
|-----------------------------|---|---|---|-----------------|------------------|--------------------|---------------------|------------------|---------------|--------------------|---------------------|------------------|-----------------|----------------------|--------------------|--------------------------|-----------------|------------------|--------------------|---|---|---------------|--------------------|---------------------|------------------|---|---------|---------|-------|--------|----|-----|---|------|---|-----|-----------|-------|---|---------|----------|--|--------|----|-----|---|------|---|-----|-----------|-------|
| <b>Diagnostics</b>          | <p>(MIRI MRS transit C (Obs 3)) Warning (Form): Exposure Duration exceeds the limit of 10000.0 seconds. Above this limit it is possible that a High Gain Antenna move may occur during the exposure.</p> <p>(MIRI MRS transit C (Obs 3)) Warning (Form): Exposure Duration exceeds the limit of 10000.0 seconds. Above this limit it is possible that a High Gain Antenna move may occur during the exposure.</p> <p>(Visit 3:1) Warning (Form): Data Excess over middle threshold</p> <p>(Visit 3:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>   |   |   |                 |                  |                    |                     |                  |               |                    |                     |                  |                 |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |         |         |       |        |    |     |   |      |   |     |           |       |   |         |          |  |        |    |     |   |      |   |     |           |       |
| <b>Fixed Targets</b>        | <table border="1"> <thead> <tr> <th>#</th> <th>Name</th> <th>Target Coordinates</th> <th>Targ. Coord. Corrections</th> <th>Miscellaneous</th> </tr> </thead> <tbody> <tr> <td>(1)</td> <td>HD-189733</td> <td>RA: 20 00 43.7093 (300.1821221d)<br/>Dec: +22 42 35.19 (22.70978d)<br/>Equinox: J2000</td> <td>Proper Motion RA: -2.3805594617508174E-4 sec of time/yr<br/>Proper Motion Dec: -0.25022499999067804 arcsec/yr<br/>Epoch of Position: 2015.5</td> <td></td> </tr> </tbody> </table> <p><i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.</i><br/> <i>Category=Star</i><br/> <i>Description=[Exoplanets]</i></p>  |   |   |                 |                  |                    |                     |                  |               |                    |                     |                  | #               | Name                 | Target Coordinates | Targ. Coord. Corrections | Miscellaneous   | (1)              | HD-189733          | RA: 20 00 43.7093 (300.1821221d)<br>Dec: +22 42 35.19 (22.70978d)<br>Equinox: J2000 | Proper Motion RA: -2.3805594617508174E-4 sec of time/yr<br>Proper Motion Dec: -0.25022499999067804 arcsec/yr<br>Epoch of Position: 2015.5 |               |                    |                     |                  |   |         |         |       |        |    |     |   |      |   |     |           |       |   |         |          |  |        |    |     |   |      |   |     |           |       |
| #                           | Name  | Target Coordinates  | Targ. Coord. Corrections  | Miscellaneous   |                  |                    |                     |                  |               |                    |                     |                  |                 |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |         |         |       |        |    |     |   |      |   |     |           |       |   |         |          |  |        |    |     |   |      |   |     |           |       |
| (1)                         | HD-189733   | RA: 20 00 43.7093 (300.1821221d)<br>Dec: +22 42 35.19 (22.70978d)<br>Equinox: J2000 | Proper Motion RA: -2.3805594617508174E-4 sec of time/yr<br>Proper Motion Dec: -0.25022499999067804 arcsec/yr<br>Epoch of Position: 2015.5 |                 |                  |                    |                     |                  |               |                    |                     |                  |                 |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |         |         |       |        |    |     |   |      |   |     |           |       |   |         |          |  |        |    |     |   |      |   |     |           |       |
| <b>Acquisition</b>          | <table border="1"> <thead> <tr> <th>#</th> <th>Target</th> <th>Filter</th> <th>Readout Pattern</th> <th>Groups/Int</th> <th>Integrations/Exp</th> <th>Total Integrations</th> <th>Total Exposure Time</th> <th>ETC Wkbk.Calc ID</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>SAME</td> <td>FND</td> <td>FAST</td> <td>6</td> <td>1</td> <td>1</td> <td>16.65</td> <td>54189</td> </tr> </tbody> </table>   |   |   |                 |                  |                    |                     |                  |               |                    |                     |                  | #               | Target               | Filter             | Readout Pattern          | Groups/Int      | Integrations/Exp | Total Integrations | Total Exposure Time   | ETC Wkbk.Calc ID  | 1             | SAME               | FND                 | FAST             | 6 | 1       | 1       | 16.65 | 54189  |    |     |   |      |   |     |           |       |   |         |          |  |        |    |     |   |      |   |     |           |       |
| #                           | Target  | Filter  | Readout Pattern   | Groups/Int      | Integrations/Exp | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |               |                    |                     |                  |                 |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |         |         |       |        |    |     |   |      |   |     |           |       |   |         |          |  |        |    |     |   |      |   |     |           |       |
| 1                           | SAME  | FND   | FAST  | 6               | 1                | 1                  | 16.65               | 54189            |               |                    |                     |                  |                 |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |         |         |       |        |    |     |   |      |   |     |           |       |   |         |          |  |        |    |     |   |      |   |     |           |       |
| <b>Template</b>             | <table border="1"> <thead> <tr> <th>Primary Channel</th> <th>Simultaneous Imaging</th> <th>Imager Subarray</th> </tr> </thead> <tbody> <tr> <td>ALL</td> <td>NO</td> <td>FULL</td> </tr> </tbody> </table>  |   |   |                 |                  |                    |                     |                  |               |                    |                     |                  | Primary Channel | Simultaneous Imaging | Imager Subarray    | ALL                      | NO              | FULL             |                    |   |   |               |                    |                     |                  |   |         |         |       |        |    |     |   |      |   |     |           |       |   |         |          |  |        |    |     |   |      |   |     |           |       |
| Primary Channel             | Simultaneous Imaging  | Imager Subarray   |   |                 |                  |                    |                     |                  |               |                    |                     |                  |                 |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |         |         |       |        |    |     |   |      |   |     |           |       |   |         |          |  |        |    |     |   |      |   |     |           |       |
| ALL                         | NO  | FULL  |   |                 |                  |                    |                     |                  |               |                    |                     |                  |                 |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |         |         |       |        |    |     |   |      |   |     |           |       |   |         |          |  |        |    |     |   |      |   |     |           |       |
| <b>Spectral Elements</b>    | <table border="1"> <thead> <tr> <th>#</th> <th>Wavelength Range</th> <th>Detector</th> <th>Filter</th> <th>Readout Pattern</th> <th>Groups/Int</th> <th>Integrations/Exp</th> <th>Exposures/Dith</th> <th>Dither</th> <th>Total Dithers</th> <th>Total Integrations</th> <th>Total Exposure Time</th> <th>ETC Wkbk.Calc ID</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>LONG(C)</td> <td>MRSLONG</td> <td></td> <td>FASTR1</td> <td>30</td> <td>257</td> <td>1</td> <td>None</td> <td>1</td> <td>257</td> <td>22105.969</td> <td>54189</td> </tr> <tr> <td>1</td> <td>LONG(C)</td> <td>MRSSHORT</td> <td></td> <td>FASTR1</td> <td>30</td> <td>257</td> <td>1</td> <td>None</td> <td>1</td> <td>257</td> <td>22105.969</td> <td>54189</td> </tr> </tbody> </table> |   |   |                 |                  |                    |                     |                  |               |                    |                     |                  | #               | Wavelength Range     | Detector           | Filter                   | Readout Pattern | Groups/Int       | Integrations/Exp   | Exposures/Dith  | Dither  | Total Dithers | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID | 1 | LONG(C) | MRSLONG |       | FASTR1 | 30 | 257 | 1 | None | 1 | 257 | 22105.969 | 54189 | 1 | LONG(C) | MRSSHORT |  | FASTR1 | 30 | 257 | 1 | None | 1 | 257 | 22105.969 | 54189 |
| #                           | Wavelength Range  | Detector  | Filter  | Readout Pattern | Groups/Int       | Integrations/Exp   | Exposures/Dith      | Dither           | Total Dithers | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |                 |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |         |         |       |        |    |     |   |      |   |     |           |       |   |         |          |  |        |    |     |   |      |   |     |           |       |
| 1                           | LONG(C)   | MRSLONG   |   | FASTR1          | 30               | 257                | 1                   | None             | 1             | 257                | 22105.969           | 54189            |                 |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |         |         |       |        |    |     |   |      |   |     |           |       |   |         |          |  |        |    |     |   |      |   |     |           |       |
| 1                           | LONG(C)   | MRSSHORT  |   | FASTR1          | 30               | 257                | 1                   | None             | 1             | 257                | 22105.969           | 54189            |                 |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |         |         |       |        |    |     |   |      |   |     |           |       |   |         |          |  |        |    |     |   |      |   |     |           |       |
| <b>Special Requirements</b> | <p>Phase 0.92591 to 0.94469 with period 2.2185752 Days and zero-phase 2453955.525551 HJD</p> <p>Time Series Observation</p> <p>No Parallel</p>  |   |   |                 |                  |                    |                     |                  |               |                    |                     |                  |                 |                      |                    |                          |                 |                  |                    |   |   |               |                    |                     |                  |   |         |         |       |        |    |     |   |      |   |     |           |       |   |         |          |  |        |    |     |   |      |   |     |           |       |

Proposal 1633 - Observation 4 - A Deep Molecular Survey of HD 189733b

| <b>Observation</b>          | <p>Proposal 1633, Observation 4: NIRCam F322 transit <span style="float: right;">Thu Jul 15 21:00:12 GMT 2021</span><br/> <b>Diagnostic Status: Warning</b><br/>                 Observing Template: NIRCam Grism Time Series</p>  |   |   |                 |                  |                  |                    |                     |                  |          |                        |                    |                          |                 |                  |                  |   |   |                  |   |            |                    |             |       |       |   |       |           |         |
|-----------------------------|--|---|---|-----------------|------------------|------------------|--------------------|---------------------|------------------|----------|------------------------|--------------------|--------------------------|-----------------|------------------|------------------|---|---|------------------|---|------------|--------------------|-------------|-------|-------|---|-------|-----------|---------|
| <b>Diagnostics</b>          | <p>(NIRCam F322 transit (Obs 4)) Warning (Form): Exposure Duration exceeds the limit of 10000.0 seconds. Above this limit it is possible that a High Gain Antenna move may occur during the exposure.<br/>                 (Visit 4:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.</p>   |   |   |                 |                  |                  |                    |                     |                  |          |                        |                    |                          |                 |                  |                  |   |   |                  |   |            |                    |             |       |       |   |       |           |         |
| <b>Fixed Targets</b>        | <table border="1"> <thead> <tr> <th>#</th> <th>Name</th> <th>Target Coordinates</th> <th>Targ. Coord. Corrections</th> <th>Miscellaneous</th> </tr> </thead> <tbody> <tr> <td>(1)</td> <td>HD-189733</td> <td>RA: 20 00 43.7093 (300.1821221d)<br/>Dec: +22 42 35.19 (22.70978d)<br/>Equinox: J2000</td> <td>Proper Motion RA: -2.3805594617508174E-4 sec of time/yr<br/>Proper Motion Dec: -0.25022499999067804 arcsec/yr<br/>Epoch of Position: 2015.5</td> <td></td> </tr> </tbody> </table> <p><i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.<br/>                 Category=Star<br/>                 Description=[Exoplanets]</i></p> |   |   |                 |                  |                  |                    |                     |                  | #        | Name                   | Target Coordinates | Targ. Coord. Corrections | Miscellaneous   | (1)              | HD-189733        | RA: 20 00 43.7093 (300.1821221d)<br>Dec: +22 42 35.19 (22.70978d)<br>Equinox: J2000 | Proper Motion RA: -2.3805594617508174E-4 sec of time/yr<br>Proper Motion Dec: -0.25022499999067804 arcsec/yr<br>Epoch of Position: 2015.5 |                  |   |            |                    |             |       |       |   |       |           |         |
| #                           | Name   | Target Coordinates  | Targ. Coord. Corrections  | Miscellaneous   |                  |                  |                    |                     |                  |          |                        |                    |                          |                 |                  |                  |   |   |                  |   |            |                    |             |       |       |   |       |           |         |
| (1)                         | HD-189733  | RA: 20 00 43.7093 (300.1821221d)<br>Dec: +22 42 35.19 (22.70978d)<br>Equinox: J2000 | Proper Motion RA: -2.3805594617508174E-4 sec of time/yr<br>Proper Motion Dec: -0.25022499999067804 arcsec/yr<br>Epoch of Position: 2015.5 |                 |                  |                  |                    |                     |                  |          |                        |                    |                          |                 |                  |                  |   |   |                  |   |            |                    |             |       |       |   |       |           |         |
| <b>Acquisition</b>          | <table border="1"> <thead> <tr> <th>#</th> <th>Target</th> <th>Subarray</th> <th>Filter</th> <th>Readout Pattern</th> <th>Groups/Int</th> <th>Integrations/Exp</th> <th>Total Integrations</th> <th>Total Exposure Time</th> <th>ETC Wkbk.Calc ID</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>SAME</td> <td>SUB32TATSGRIS<br/>M</td> <td>F405N+F444W</td> <td>RAPID</td> <td>9</td> <td>1</td> <td>1</td> <td>0.152</td> <td>37665.2</td> </tr> </tbody> </table>  |   |   |                 |                  |                  |                    |                     |                  | #        | Target                 | Subarray           | Filter                   | Readout Pattern | Groups/Int       | Integrations/Exp | Total Integrations  | Total Exposure Time   | ETC Wkbk.Calc ID | 1 | SAME       | SUB32TATSGRIS<br>M | F405N+F444W | RAPID | 9     | 1 | 1     | 0.152     | 37665.2 |
| #                           | Target   | Subarray  | Filter  | Readout Pattern | Groups/Int       | Integrations/Exp | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |          |                        |                    |                          |                 |                  |                  |   |   |                  |   |            |                    |             |       |       |   |       |           |         |
| 1                           | SAME   | SUB32TATSGRIS<br>M  | F405N+F444W   | RAPID           | 9                | 1                | 1                  | 0.152               | 37665.2          |          |                        |                    |                          |                 |                  |                  |   |   |                  |   |            |                    |             |       |       |   |       |           |         |
| <b>Template</b>             | <table border="1"> <thead> <tr> <th>Subarray</th> <th>No. of Output Channels</th> </tr> </thead> <tbody> <tr> <td>SUBGRISM64</td> <td>4</td> </tr> </tbody> </table>   |   |   |                 |                  |                  |                    |                     |                  | Subarray | No. of Output Channels | SUBGRISM64         | 4                        |                 |                  |                  |   |   |                  |   |            |                    |             |       |       |   |       |           |         |
| Subarray                    | No. of Output Channels   |   |   |                 |                  |                  |                    |                     |                  |          |                        |                    |                          |                 |                  |                  |   |   |                  |   |            |                    |             |       |       |   |       |           |         |
| SUBGRISM64                  | 4  |   |   |                 |                  |                  |                    |                     |                  |          |                        |                    |                          |                 |                  |                  |   |   |                  |   |            |                    |             |       |       |   |       |           |         |
| <b>Spectral Elements</b>    | <table border="1"> <thead> <tr> <th>#</th> <th>Short Pupil+Filter</th> <th>Long Pupil+Filter</th> <th>Readout Pattern</th> <th>Groups/Int</th> <th>Integrations/Exp</th> <th>Exposures/Dith</th> <th>Total Integrations</th> <th>Total Exposure Time</th> <th>ETC Wkbk.Calc ID</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>CLEAR+WLP4</td> <td>GRISMR+F322W2</td> <td>BRIGHT1</td> <td>3</td> <td>10437</td> <td>1</td> <td>10437</td> <td>21383.117</td> <td>82167</td> </tr> </tbody> </table>   |   |   |                 |                  |                  |                    |                     |                  | #        | Short Pupil+Filter     | Long Pupil+Filter  | Readout Pattern          | Groups/Int      | Integrations/Exp | Exposures/Dith   | Total Integrations  | Total Exposure Time   | ETC Wkbk.Calc ID | 1 | CLEAR+WLP4 | GRISMR+F322W2      | BRIGHT1     | 3     | 10437 | 1 | 10437 | 21383.117 | 82167   |
| #                           | Short Pupil+Filter   | Long Pupil+Filter   | Readout Pattern   | Groups/Int      | Integrations/Exp | Exposures/Dith   | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |          |                        |                    |                          |                 |                  |                  |   |   |                  |   |            |                    |             |       |       |   |       |           |         |
| 1                           | CLEAR+WLP4   | GRISMR+F322W2   | BRIGHT1   | 3               | 10437            | 1                | 10437              | 21383.117           | 82167            |          |                        |                    |                          |                 |                  |                  |   |   |                  |   |            |                    |             |       |       |   |       |           |         |
| <b>Special Requirements</b> | <p>Phase 0.92748 to 0.94626 with period 2.2185752 Days and zero-phase 2453955.525551 HJD<br/>                 Aperture PA Range 82 to 94 Degrees (V3 81.77419611 to 93.77419611)<br/>                 Aperture PA Range 111 to 127 Degrees (V3 110.77419611 to 126.77419611)<br/>                 Aperture PA Range 214 to 227 Degrees (V3 213.77419611 to 226.77419611)<br/>                 Aperture PA Range 246 to 253 Degrees (V3 245.77419611 to 252.77419611)<br/>                 Time Series Observation<br/>                 No Parallel</p>   |   |   |                 |                  |                  |                    |                     |                  |          |                        |                    |                          |                 |                  |                  |   |   |                  |   |            |                    |             |       |       |   |       |           |         |

# Proposal 1633 - Observation 5 - A Deep Molecular Survey of HD 189733b

| <b>Observation</b>          | <b>Proposal 1633, Observation 5: INIRCam F444 transit</b> <span style="float: right;">Thu Jul 15 21:00:12 GMT 2021</span><br><b>Diagnostic Status: Warning</b><br>Observing Template: NIRCam Grism Time Series   |   |   |                 |                  |                  |                    |                     |                  |          |                        |                    |                          |                 |                  |                  |   |   |                  |   |            |                    |             |       |      |   |      |          |         |
|-----------------------------|--|---|---|-----------------|------------------|------------------|--------------------|---------------------|------------------|----------|------------------------|--------------------|--------------------------|-----------------|------------------|------------------|---|---|------------------|---|------------|--------------------|-------------|-------|------|---|------|----------|---------|
| <b>Diagnostics</b>          | (INIRCam F444 transit (Obs 5)) Warning (Form): Exposure Duration exceeds the limit of 10000.0 seconds. Above this limit it is possible that a High Gain Antenna move may occur during the exposure.<br>(Visit 5:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.   |   |   |                 |                  |                  |                    |                     |                  |          |                        |                    |                          |                 |                  |                  |   |   |                  |   |            |                    |             |       |      |   |      |          |         |
| <b>Fixed Targets</b>        | <table border="1"> <thead> <tr> <th>#</th> <th>Name</th> <th>Target Coordinates</th> <th>Targ. Coord. Corrections</th> <th>Miscellaneous</th> </tr> </thead> <tbody> <tr> <td>(1)</td> <td>HD-189733</td> <td>RA: 20 00 43.7093 (300.1821221d)<br/>Dec: +22 42 35.19 (22.70978d)<br/>Equinox: J2000</td> <td>Proper Motion RA: -2.3805594617508174E-4 sec of time/yr<br/>Proper Motion Dec: -0.25022499999067804 arcsec/yr<br/>Epoch of Position: 2015.5</td> <td></td> </tr> </tbody> </table> <p><i>Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.<br/>Category=Star<br/>Description=[Exoplanets]</i></p> |   |   |                 |                  |                  |                    |                     |                  | #        | Name                   | Target Coordinates | Targ. Coord. Corrections | Miscellaneous   | (1)              | HD-189733        | RA: 20 00 43.7093 (300.1821221d)<br>Dec: +22 42 35.19 (22.70978d)<br>Equinox: J2000 | Proper Motion RA: -2.3805594617508174E-4 sec of time/yr<br>Proper Motion Dec: -0.25022499999067804 arcsec/yr<br>Epoch of Position: 2015.5 |                  |   |            |                    |             |       |      |   |      |          |         |
| #                           | Name   | Target Coordinates  | Targ. Coord. Corrections  | Miscellaneous   |                  |                  |                    |                     |                  |          |                        |                    |                          |                 |                  |                  |   |   |                  |   |            |                    |             |       |      |   |      |          |         |
| (1)                         | HD-189733  | RA: 20 00 43.7093 (300.1821221d)<br>Dec: +22 42 35.19 (22.70978d)<br>Equinox: J2000 | Proper Motion RA: -2.3805594617508174E-4 sec of time/yr<br>Proper Motion Dec: -0.25022499999067804 arcsec/yr<br>Epoch of Position: 2015.5 |                 |                  |                  |                    |                     |                  |          |                        |                    |                          |                 |                  |                  |   |   |                  |   |            |                    |             |       |      |   |      |          |         |
| <b>Acquisition</b>          | <table border="1"> <thead> <tr> <th>#</th> <th>Target</th> <th>Subarray</th> <th>Filter</th> <th>Readout Pattern</th> <th>Groups/Int</th> <th>Integrations/Exp</th> <th>Total Integrations</th> <th>Total Exposure Time</th> <th>ETC Wkbk.Calc ID</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>SAME</td> <td>SUB32TATSGRIS<br/>M</td> <td>F405N+F444W</td> <td>RAPID</td> <td>9</td> <td>1</td> <td>1</td> <td>0.152</td> <td>37665.2</td> </tr> </tbody> </table>  |   |   |                 |                  |                  |                    |                     |                  | #        | Target                 | Subarray           | Filter                   | Readout Pattern | Groups/Int       | Integrations/Exp | Total Integrations  | Total Exposure Time   | ETC Wkbk.Calc ID | 1 | SAME       | SUB32TATSGRIS<br>M | F405N+F444W | RAPID | 9    | 1 | 1    | 0.152    | 37665.2 |
| #                           | Target   | Subarray  | Filter  | Readout Pattern | Groups/Int       | Integrations/Exp | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |          |                        |                    |                          |                 |                  |                  |   |   |                  |   |            |                    |             |       |      |   |      |          |         |
| 1                           | SAME   | SUB32TATSGRIS<br>M  | F405N+F444W   | RAPID           | 9                | 1                | 1                  | 0.152               | 37665.2          |          |                        |                    |                          |                 |                  |                  |   |   |                  |   |            |                    |             |       |      |   |      |          |         |
| <b>Template</b>             | <table border="1"> <thead> <tr> <th>Subarray</th> <th>No. of Output Channels</th> </tr> </thead> <tbody> <tr> <td>SUBGRISM64</td> <td>4</td> </tr> </tbody> </table>   |   |   |                 |                  |                  |                    |                     |                  | Subarray | No. of Output Channels | SUBGRISM64         | 4                        |                 |                  |                  |   |   |                  |   |            |                    |             |       |      |   |      |          |         |
| Subarray                    | No. of Output Channels   |   |   |                 |                  |                  |                    |                     |                  |          |                        |                    |                          |                 |                  |                  |   |   |                  |   |            |                    |             |       |      |   |      |          |         |
| SUBGRISM64                  | 4  |   |   |                 |                  |                  |                    |                     |                  |          |                        |                    |                          |                 |                  |                  |   |   |                  |   |            |                    |             |       |      |   |      |          |         |
| <b>Spectral Elements</b>    | <table border="1"> <thead> <tr> <th>#</th> <th>Short Pupil+Filter</th> <th>Long Pupil+Filter</th> <th>Readout Pattern</th> <th>Groups/Int</th> <th>Integrations/Exp</th> <th>Exposures/Dith</th> <th>Total Integrations</th> <th>Total Exposure Time</th> <th>ETC Wkbk.Calc ID</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>CLEAR+WLP4</td> <td>GRISMR+F444W</td> <td>BRIGHT1</td> <td>4</td> <td>7877</td> <td>1</td> <td>7877</td> <td>21504.21</td> <td>82167</td> </tr> </tbody> </table>   |   |   |                 |                  |                  |                    |                     |                  | #        | Short Pupil+Filter     | Long Pupil+Filter  | Readout Pattern          | Groups/Int      | Integrations/Exp | Exposures/Dith   | Total Integrations  | Total Exposure Time   | ETC Wkbk.Calc ID | 1 | CLEAR+WLP4 | GRISMR+F444W       | BRIGHT1     | 4     | 7877 | 1 | 7877 | 21504.21 | 82167   |
| #                           | Short Pupil+Filter   | Long Pupil+Filter   | Readout Pattern   | Groups/Int      | Integrations/Exp | Exposures/Dith   | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |          |                        |                    |                          |                 |                  |                  |   |   |                  |   |            |                    |             |       |      |   |      |          |         |
| 1                           | CLEAR+WLP4   | GRISMR+F444W  | BRIGHT1   | 4               | 7877             | 1                | 7877               | 21504.21            | 82167            |          |                        |                    |                          |                 |                  |                  |   |   |                  |   |            |                    |             |       |      |   |      |          |         |
| <b>Special Requirements</b> | Phase 0.92779 to 0.94657 with period 2.2185752 Days and zero-phase 2453955.525551 HJD<br>Aperture PA Range 5 to 25 Degrees (V3 5.30737728 to 25.30737728)<br>Aperture PA Range 81.69262272 to 93.69262272 Degrees (V3 82.0 to 94.0)<br>Aperture PA Range 110.692 to 131 Degrees (V3 110.99937728 to 131.30737728)<br>Aperture PA Range 185 to 205 Degrees (V3 185.30737728 to 205.30737728)<br>Aperture PA Range 251 to 280 Degrees (V3 251.30737728 to 280.30737728)<br>Aperture PA Range 300 to 310 Degrees (V3 300.30737728 to 310.30737728)<br>Time Series Observation<br>No Parallel  |   |   |                 |                  |                  |                    |                     |                  |          |                        |                    |                          |                 |                  |                  |   |   |                  |   |            |                    |             |       |      |   |      |          |         |