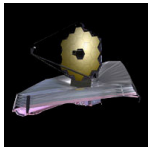

# 8597 - Measuring the Bulk Properties of a 3 Myr Transiting Exoplanet and its Original Protoplanetary Disk

Cycle: 4, Proposal Category: GO

**INVESTIGATORS**



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**OBSERVATIONS**

| *Folder* | *Observation* | *Label* | *Observing Template* | *Science Target* |
|---|---|---|---|---|
| Observation Folder | | | | |
| | 1 | planet_niriss | NIRISS Single-Object Slitless Spectroscopy | (1) IRAS-04125+2902 |
| | 2 | planet_nirspec | NIRSpec Bright Object Time Series | (1) IRAS-04125+2902 |
| | 4 | disk_miri | MIRI Medium Resolution Spectroscopy | (3) IRAS-04125+2902_miri |
| | 5 | disk_miri_bg | MIRI Medium Resolution Spectroscopy | (2) IRAS-04125+2902_bg |

**ABSTRACT**

The usage of exoplanetary atmospheric abundances as chemical tracers of their disk formation and migration is complicated by the fact that planets are typically discovered after their progenitor disk has dissipated. For example, the atmospheric carbon-to-oxygen (C/O) ratio of an exoplanet is typically used to infer its initial formation location However, this method of identification of formation location is inherently not self-consistent without a clear understanding of (i) the volatile inventory of the original protoplanetary disk and (ii) atmospheric compositional evolution. The gold standard for testing where, when, and how a planet forms would be to measure its volatile composition in conjunction with that of its parent disk. The recently discovered target of this proposal presents the first opportunity to perform such an experiment.

We propose to fully characterize the IRAS 04125+2902 system with JWST and ALMA. IRAS 04125+2902 is a 3 Myr 0.7 MSun pre-main sequence star in the Taurus Molecular Cloud which hosts a transiting 0.96 RJup planet. IRAS 04125+2902 also hosts a transitional disk that is misaligned with the planetary orbital plane. With this small program, we will use (i) NIRISS/SOSS and NIRSpec/G395M to measure the bulk C/O and metallicity of IRAS 04125+2902 b's atmosphere, (ii) MIRI/MRS to determine the C/O and water-enrichment in the the inner disk, and (iii) ALMA to determine the C/O/N/H ratios in the outer disk.

Our joint interdisciplinary program will measure the formation location and migration history of an exoplanet for first time. The results of this study will make IRAS 04125+2902 the gold standard for understanding planet formation.

**OBSERVING DESCRIPTION**

We are requesting transit observations of IRAS 04125+2902 b with NIRISS/SOSS and NIRSpec/G395M. The planet transits every 8.834978 days. We request our NIRISS/SOSS and NIRSpec/G395M observations be taken during consecutive transit. This will help us obtain observations within the same XUV environment and ensure robust atmospheric observations.

**Fixed Targets**

| # | Name | Target Coordinates | Targ. Coord. Corrections | Miscellaneous |
|---|---|---|---|---|
| (1) | IRAS-04125+2902 | RA: 04 15 42.8019 (63.9283412d)<br>Dec: +29 09 59.54 (29.16654d)<br>Equinox: J2000 | Proper Motion RA: 12.103513145729982 mas/yr<br>Proper Motion Dec: -18.14499992178753 mas/yr<br>Parallax: 0.0062474"<br>Epoch of Position: 2016 | |
| | *Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.*<br><br>*SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.*<br>*Category=Star*<br>*Description=[Exoplanet Systems, K stars, Pre-main sequence stars, T Tauri stars]*<br>*Extended=NO* | | | |
| (2) | IRAS-04125+2902_bg | RA: 04 15 42.8019 (63.9283412d)<br>Dec: +29 09 59.54 (29.16654d)<br>Equinox: J2000 | Proper Motion RA: 12.103513145729982 mas/yr<br>Proper Motion Dec: -18.14499992178753 mas/yr<br>Parallax: 0.0062474"<br>Epoch of Position: 2016 | |
| | *Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.*<br><br>*SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.*<br>*Category=Calibration*<br>*Description=[Telescope/sky background]*<br>*Extended=YES* | | | |
| (3) | IRAS-04125+2902_miri | RA: 04 15 42.8019 (63.9283412d)<br>Dec: +29 09 59.54 (29.16654d)<br>Equinox: J2000 | Proper Motion RA: 12.103513145729982 mas/yr<br>Proper Motion Dec: -18.14499992178753 mas/yr<br>Parallax: 0.0062474"<br>Epoch of Position: 2016 | |
| | *Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.*<br><br>*SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.*<br>*Category=Star*<br>*Description=[Exoplanet Systems, K stars, Pre-main sequence stars, T Tauri stars]* | | | |

## Observation

**Proposal 8597, Observation 1: planet_niriss** Thu Jun 11 18:56:37 GMT 2026

**Diagnostic Status: Warning**

Observing Template: NIRISS Single-Object Slitless Spectroscopy

## Diagnostics

(planet_niriss (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.

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

(Visit 1:1) Informational (Form): Visit schedulable, but most scheduling windows are when JWST is pointed in direction of greatest micrometeoroid impact risk. This is likely due to scheduling special requirements.

## Fixed Targets

| # | Name | Target Coordinates | Targ. Coord. Corrections | Miscellaneous |
|---|---|---|---|---|
| (1) | IRAS-04125+2902 | RA: 04 15 42.8019 (63.9283412d)<br>Dec: +29 09 59.54 (29.16654d)<br>Equinox: J2000 | Proper Motion RA: 12.103513145729982 mas/yr<br>Proper Motion Dec: -18.14499992178753 mas/yr<br>Parallax: 0.0062474"<br>Epoch of Position: 2016 | |

*Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.*

*SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.*
*Category=Star*
*Description=[Exoplanet Systems, K stars, Pre-main sequence stars, T Tauri stars]*
*Extended=NO*

## Acquisition

| # | Target | Acquisition Mode | Filter | Readout Pattern | Groups/Int | Integrations/Exp | Total Integrations | Total Exposure Time | Optional ETC ID |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 IRAS-04125+2902 | SOSSFAINT | F480M | NISRAPID | 9 | 1 | 1 | 0.475 | 308051 |

## Template

| Subarray | Include Short First Exposure and F277W Exposure? |
|---|---|
| SUBSTRIP256 | true |

## Spectral Elements

| # | Readout Pattern | Groups/Int | Integrations/Exp | Exposures/Dith | Total Dithers | Total Integrations | Total Exposure Time | Optional ETC ID |
|---|---|---|---|---|---|---|---|---|
| 1 | NISRAPID | 1 | 1 | 1 | 1 | 1 | 11.008 | |
| 2 | NISRAPID | 16 | 636 | 1 | 1 | 636 | 59414.153 | 308051 |
| 3 | NISRAPID | 16 | 10 | 1 | 1 | 10 | 934.185 | 223850 |

| Special Requirements | |
|---|---|
| | Phase 0.9589699 to 0.9613279 with period 8.834978 Days and zero-phase 2458821.8251 HJD<br>Aperture PA Range 73 to 74 Degrees (V3 72.43873283 to 73.43873283)<br>Aperture PA Range 244 to 251 Degrees (V3 243.43873283 to 250.43873283)<br>Time Series Observation<br>No Parallel Attachments<br><br>Group Observations 1, 2 within 35.21 Days |

## Observation

**Proposal 8597, Observation 2: planet_nirspec** Thu Jun 11 18:56:37 GMT 2026

**Diagnostic Status: Warning**

Observing Template: NIRSpec Bright Object Time Series

## Diagnostics

(planet_nirspec (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.

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

(Visit 2:1) Informational (Form): Visit schedulable, but most scheduling windows are when JWST is pointed in direction of greatest micrometeoroid impact risk. This is likely due to scheduling special requirements.

## Fixed Targets

| # | Name | Target Coordinates | Targ. Coord. Corrections | Miscellaneous |
|---|---|---|---|---|
| (1) | IRAS-04125+2902 | RA: 04 15 42.8019 (63.9283412d)<br>Dec: +29 09 59.54 (29.16654d)<br>Equinox: J2000 | Proper Motion RA: 12.103513145729982 mas/yr<br>Proper Motion Dec: -18.14499992178753 mas/yr<br>Parallax: 0.0062474"<br>Epoch of Position: 2016 | |

*Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.*

*SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.*
*Category=Star*
*Description=[Exoplanet Systems, K stars, Pre-main sequence stars, T Tauri stars]*
*Extended=NO*

## Acquisition

| # | Target | TA Method | Subarray | Filter | Readout Pattern | Groups/Int | Integrations/Exp | Total Integrations | Total Exposure Time | Optional ETC ID |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 IRAS-04125+2902 | WATA | SUB32 | F110W | NRSRAPIDD6 | 3 | 1 | 1 | 0.26 | 308051 |

## Template

| Subarray |
|---|
| SUB2048 |

## Spectral Elements

| # | Grating/Filter | Readout Pattern | Groups/Int | Integrations/Exp | Exposures/Dith | Total Dithers | Total Integrations | Total Exposure Time | Optional ETC ID |
|---|---|---|---|---|---|---|---|---|---|
| 1 | G395M/F290LP | NRSRAPID | 27 | 2350 | 1 | 1 | 2350 | 59399.728 | 308051 |

| Special Requirements | |
|---|---|
| | Phase 0.9589699 to 0.9613279 with period 8.834978 Days and zero-phase 2458821.8251 HJD<br>Time Series Observation<br>No Parallel Attachments<br><br>Group Observations 1, 2 within 35.21 Days |

## Observation

**Proposal 8597, Observation 4: disk_miri** Thu Jun 11 18:56:37 GMT 2026

**Diagnostic Status: Warning**

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observations:[disk_miri_bg (Obs 5)]

## Diagnostics

(Visit 4:1) Warning (Form): Data Excess over lower threshold

(Visit 4:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.

## Fixed Targets

| # | Name | Target Coordinates | Targ. Coord. Corrections | Miscellaneous |
|---|---|---|---|---|
| (3) | IRAS-04125+2902_miri | RA: 04 15 42.8019 (63.9283412d)<br>Dec: +29 09 59.54 (29.16654d)<br>Equinox: J2000 | Proper Motion RA: 12.103513145729982 mas/yr<br>Proper Motion Dec: -18.14499992178753 mas/yr<br>Parallax: 0.0062474"<br>Epoch of Position: 2016 | |

*Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.*

*SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.*
*Category=Star*
*Description=[Exoplanet Systems, K stars, Pre-main sequence stars, T Tauri stars]*

## Acquisition

| # | Target | Filter | Readout Pattern | Groups/Int | Integrations/Exp | Total Integrations | Total Exposure Time | Optional ETC ID |
|---|---|---|---|---|---|---|---|---|
| 1 | SAME | FND | FAST | 10 | 1 | 1 | 27.75 | 218310 |

## Template

| Primary Channel | Simultaneous Imaging | Imager Subarray | Grating Wheel Direction |
|---|---|---|---|
| All MRS | YES | FULL | Allow Auto Reorder |

## Dithers

| # | Dither Type | Optimized For | Direction |
|---|---|---|---|
| 1 | 4-Point | POINT SOURCE | NEGATIVE |

## Spectral Elements

| # | Wavelength Range | Detector | Filter | Readout Pattern | Groups/Int | Integrations/Exp | Exposures/Dith | Dither | Total Dithers | Total Integrations | Total Exposure Time | Optional ETC ID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | IMAGER | F770W | FASTR1 | 5 | 1 | 1 | Dither 1 | 4 | 4 | 55.501 | |
| 1 | SHORT(A) | MRSLONG | | FASTR1 | 65 | 4 | 1 | Dither 1 | 4 | 16 | 2919.342 | |
| 1 | SHORT(A) | MRSSHORT | | FASTR1 | 65 | 4 | 1 | Dither 1 | 4 | 16 | 2919.342 | |
| 2 | | IMAGER | F1000W | FASTR1 | 5 | 1 | 1 | Dither 1 | 4 | 4 | 55.501 | |
| 2 | MEDIUM(B) | MRSLONG | | FASTR1 | 65 | 4 | 1 | Dither 1 | 4 | 16 | 2919.342 | |
| 2 | MEDIUM(B) | MRSSHORT | | FASTR1 | 65 | 4 | 1 | Dither 1 | 4 | 16 | 2919.342 | |
| 3 | | IMAGER | F1130W | FASTR1 | 5 | 1 | 1 | Dither 1 | 4 | 4 | 55.501 | |
| 3 | LONG(C) | MRSLONG | | FASTR1 | 65 | 4 | 1 | Dither 1 | 4 | 16 | 2919.342 | |
| 3 | LONG(C) | MRSSHORT | | FASTR1 | 65 | 4 | 1 | Dither 1 | 4 | 16 | 2919.342 | |

| Special Requirements | Sequence Observations 4, 5, Non-interruptible |
|---|---|

## Observation

**Proposal 8597, Observation 5: disk_miri_bg**

Thu Jun 11 18:56:37 GMT 2026

**Diagnostic Status: Warning**

Observing Template: MIRI Medium Resolution Spectroscopy

Background Observation For: [disk_miri (Obs 4)]

## 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 |
|---|---|---|---|---|
| (2) | IRAS-04125+2902_bg | RA: 04 15 42.8019 (63.9283412d)<br>Dec: +29 09 59.54 (29.16654d)<br>Equinox: J2000 | Proper Motion RA: 12.103513145729982 mas/yr<br>Proper Motion Dec: -18.14499992178753 mas/yr<br>Parallax: 0.0062474"<br>Epoch of Position: 2016 | |

*Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.*

*SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.*
*Category=Calibration*
*Description=[Telescope/sky background]*
*Extended=YES*

## Acquisition

| # | Target |
|---|---|
| 1 | NONE |

## Template

| AcqFilter | Primary Channel | Simultaneous Imaging | Imager Subarray | Grating Wheel Direction |
|---|---|---|---|---|
| FND | Imager | YES | FULL | Allow Auto Reorder |

## Dithers

| # | Dither Type | Optimized For | Direction |
|---|---|---|---|
| 1 | 2-Point | BACKGROUND | NEGATIVE |

## Spectral Elements

| # | Wavelength Range | Detector | Filter | Readout Pattern | Groups/Int | Integrations/Exp | Exposures/Dith | Dither | Total Dithers | Total Integrations | Total Exposure Time | Optional ETC ID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | IMAGER | F770W | FASTR1 | 5 | 1 | 1 | Dither 1 | 2 | 2 | 27.75 | |
| 1 | SHORT(A) | MRSLONG | | FASTR1 | 65 | 1 | 1 | Dither 1 | 2 | 2 | 360.755 | |
| 1 | SHORT(A) | MRSSHORT | | FASTR1 | 65 | 1 | 1 | Dither 1 | 2 | 2 | 360.755 | |
| 2 | | IMAGER | F1000W | FASTR1 | 5 | 1 | 1 | Dither 1 | 2 | 2 | 27.75 | |
| 2 | MEDIUM(B) | MRSLONG | | FASTR1 | 65 | 1 | 1 | Dither 1 | 2 | 2 | 360.755 | |
| 2 | MEDIUM(B) | MRSSHORT | | FASTR1 | 65 | 1 | 1 | Dither 1 | 2 | 2 | 360.755 | |
| 3 | | IMAGER | F1130W | FASTR1 | 5 | 1 | 1 | Dither 1 | 2 | 2 | 27.75 | |
| 3 | LONG(C) | MRSLONG | | FASTR1 | 65 | 1 | 1 | Dither 1 | 2 | 2 | 360.755 | |
| 3 | LONG(C) | MRSSHORT | | FASTR1 | 65 | 1 | 1 | Dither 1 | 2 | 2 | 360.755 | |

| Special Requirements | |
|---|---|
| | Aperture PA Range 237.63544897 to 320.33544897 Degrees (V3 232.8 to 315.5)<br>Aperture PA Range 338.23544897 to 227.23544897 Degrees (V3 333.4 to 222.4)<br><br>Sequence Observations 4, 5, Non-interruptible |