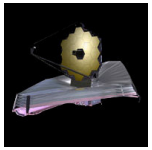

# 5311 - Continuing the Legacy of AU Mic: Simultaneous FUV and NIR Observations of AU Mic b

Cycle: 3, Proposal Category: GO

**INVESTIGATORS**


| *Name* | *Institution* |
|---|---|
| **Dr. Adina Feinstein (PI)** | **Michigan State University** |
| Dr. Luis Welbanks (CoI) (CoPI) | Arizona State University |
| Dr. Eva-Maria Ahrer (CoI) (ESA Member) | Max Planck Institute for Astronomy |
| Dr. Lili Alderson (CoI) | Cornell University |
| Prof. Jacob L. Bean (CoI) | University of Chicago |
| Dr. Zach K. Berta-Thompson (CoI) | University of Colorado at Boulder |
| Alastair Claringbold (CoI) (ESA Member) | University of Warwick |
| Prof. Kevin France (CoI) | University of Colorado at Boulder |
| Dr. Nikole Lewis (CoI) | Cornell University |
| Dr. Andrew Withycombe Mann (CoI) | University of North Carolina at Chapel Hill |
| Dr. Annabella Meech (CoI) | Smithsonian Institution Astrophysical Observatory |
| Dr. Catriona Anne Murray (CoI) | University of Colorado at Boulder |
| Dr. Benjamin Rackham (CoI) | Massachusetts Institute of Technology |
| Dr. Paul Rimmer (CoI) (ESA Member) | University of Cambridge |
| Dr. Keighley Elizabeth Rockcliffe (CoI) | University of Maryland, Baltimore County |
| Dr. Everett Schlawin (CoI) | University of Arizona |
| Darryl Seligman (CoI) | Michigan State University |
| Pa Chia Thao (CoI) | University of North Carolina at Chapel Hill |
| Dr. Hannah Wakeford (CoI) (ESA Member) | University of Bristol |
| Prof. Peter J. Wheatley (CoI) (ESA Member) | University of Warwick |
| Michael Zhang (CoI) | University of Chicago |

| *Name* | *Institution* |
|---|---|
| Prof. Monika Lendl (CoI) (ESA Member) | University of Geneva, Department of Astronomy |
| Dr. Girish M. Duvvuri (CoI) | Vanderbilt University |
| Dr. David John Wilson (CoI) | University of Colorado at Boulder |


**OBSERVATIONS**

| *Folder* | *Observation* | *Label* | *Observing Template* | *Science Target* |
|---|---|---|---|---|
| Observation Folder | | | | |
| | 1 | | NIRCam Grism Time Series | (1) AU-MIC |
| | 4 | | NIRCam Grism Time Series | (1) AU-MIC |
| | 2 | | NIRCam Grism Time Series | (1) AU-MIC |
| | 3 | | NIRCam Grism Time Series | (1) AU-MIC |


**ABSTRACT**

The 23 Myr M star AU Mic and its transiting planets are an ideal laboratory for understanding the impact of stellar activity on young exoplanet atmospheres. Young planetary systems offer a unique advantage in that their spectral signatures are representative of primordial formation conditions. This is significantly advantageous when compared with more evolved planets which have experienced significant stellar irradiation, processing and pollution. The formation mechanism and subsequent evolution of massive, short-period planets is not currently well understood. For example, these planets may have formed at large distances and migrated inwards or alternatively formed in situ. Here, we propose to obtain spectra during 4 transits of AU Mic b, the innermost Neptune-sized planet in the system (Teq = 820K), with NIRCam F322W2/F444W (2.4 - 5 micron). Our primary objective is to measure atmospheric C/O and metallicity to constrain the formation location of the planet.

We propose for simultaneous JWST + HST observations. The chemistry in the atmosphere of AU Mic b will be dictated by the environmental ultraviolet flux. Because AU Mic is both young and a flare-active star, we require FUV observations to (i) identify and remove stellar flares from our transmission spectrum and (ii) characterize the FUV environment, which will be crucial for interpreting our planet spectrum. These observations will also provide unique FUV - NIR measurements of flare events, furthering our understanding of stellar magnetism. These spectra will provide an important legacy for understanding young stars, planetary atmospheres, and combining NIR + FUV to mitigate stellar contamination.


**OBSERVING DESCRIPTION**

Transit observations of AU Mic b with NIRCam F322W2 and F444W.

The transit duration AU Mic b is 3.5 hours. We want an out-of-transit baseline of at least equivalent to the transit duration, with an additional minimum 0.5 hour burn-in time. Therefore, we request observations start 3.5 hours before the transit, go through the transit, and observe for an additional 3 hours post-transit. The total duration should be 10 hours = 36,000 seconds per transit.

We request the same set-up for all four transits we requested.

# Proposal 5311 - Targets - Continuing the Legacy of AU Mic: Simultaneous FUV and NIR Observations of AU Mic b

**Fixed Targets**

| # | Name | Target Coordinates | Targ. Coord. Corrections | Miscellaneous |
|---|---|---|---|---|
| (1) | AU-MIC | RA: 20 45 9.8838 (311.2911825d) | Proper Motion RA: 281.31903 mas/yr | |
| | | Dec: -31 20 33.00 (-31.34250d) | Proper Motion Dec: -360.14772 mas/yr | |
| | | Equinox: J2000 | Epoch of Position: 2015.5 | |

*Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.*
*Category=Star*
*Description=[Exoplanet Systems, Exoplanets, M stars]*
*Extended=NO*

## Observation

**Proposal 5311, Observation 1**

Wed Apr 16 21:00:23 GMT 2025

**Diagnostic Status: Warning**

Observing Template: NIRCam Grism Time Series

## Diagnostics

(Observation 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): Data Excess over lower threshold

(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) | AU-MIC | RA: 20 45 9.8838 (311.2911825d) | Proper Motion RA: 281.31903 mas/yr | |
| | | Dec: -31 20 33.00 (-31.34250d) | Proper Motion Dec: -360.14772 mas/yr | |
| | | Equinox: J2000 | Epoch of Position: 2015.5 | |

*Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.*
*Category=Star*
*Description=[Exoplanet Systems, Exoplanets, M stars]*
*Extended=NO*

## Acquisition

| # | Target | Subarray | Filter | Readout Pattern | Groups/Int | Integrations/Exp | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |
|---|---|---|---|---|---|---|---|---|---|
| 1 | SAME | SUB32TATSGRISM | F405N+F444W | RAPID | 3 | 1 | 1 | 0.062 | 177474 |

## Template

| Subarray | No. of Output Channels | SW Channel Mode |
|---|---|---|
| SUBGRISM64 | 4 | IMAGING |

## Spectral Elements

| # | 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 | 2 | 26324 | 1 | 26324 | 35999.649 | 177474 |

## Special Requirements

Between Dates 27-APR-2025:00:00:00 and 10-JUN-2025:00:00:00
Phase 0.97475 to 0.97980 with period 8.46314280 Days and zero-phase 2460200.7339 HJD
Time Series Observation
No Parallel Attachments

## Observation

**Proposal 5311, Observation 4**

Wed Apr 16 21:00:23 GMT 2025

**Diagnostic Status: Warning**

Observing Template: NIRCam Grism Time Series

## Diagnostics

(Observation 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.

(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.

(Visit 4:1) 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) | AU-MIC | RA: 20 45 9.8838 (311.2911825d) | Proper Motion RA: 281.31903 mas/yr | |
| | | Dec: -31 20 33.00 (-31.34250d) | Proper Motion Dec: -360.14772 mas/yr | |
| | | Equinox: J2000 | Epoch of Position: 2015.5 | |

*Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.*
*Category=Star*
*Description=[Exoplanet Systems, Exoplanets, M stars]*
*Extended=NO*

## Acquisition

| # | Target | Subarray | Filter | Readout Pattern | Groups/Int | Integrations/Exp | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |
|---|---|---|---|---|---|---|---|---|---|
| 1 | SAME | SUB32TATSGRISM | F405N+F444W | RAPID | 3 | 1 | 1 | 0.062 | 177474 |

## Template

| Subarray | No. of Output Channels | SW Channel Mode |
|---|---|---|
| SUBGRISM64 | 4 | IMAGING |

## Spectral Elements

| # | 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 | 2 | 26324 | 1 | 26324 | 35999.649 | 177474 |

## Special Requirements

Between Dates 27-APR-2025:00:00:00 and 10-JUN-2025:00:00:00
Phase 0.97475 to 0.97980 with period 8.46314280 Days and zero-phase 2460200.7339 HJD
Time Series Observation
No Parallel Attachments

## Observation

**Proposal 5311, Observation 2** Wed Apr 16 21:00:23 GMT 2025

**Diagnostic Status: Warning**

Observing Template: NIRCam Grism Time Series

## Diagnostics

(Observation 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): Data Excess over middle threshold

(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) | AU-MIC | RA: 20 45 9.8838 (311.2911825d) | Proper Motion RA: 281.31903 mas/yr | |
| | | Dec: -31 20 33.00 (-31.34250d) | Proper Motion Dec: -360.14772 mas/yr | |
| | | Equinox: J2000 | Epoch of Position: 2015.5 | |

*Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.*
*Category=Star*
*Description=[Exoplanet Systems, Exoplanets, M stars]*
*Extended=NO*

## Acquisition

| # | Target | Subarray | Filter | Readout Pattern | Groups/Int | Integrations/Exp | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |
|---|---|---|---|---|---|---|---|---|---|
| 1 | SAME | SUB32TATSGRISM | F405N+F444W | RAPID | 3 | 1 | 1 | 0.062 | 177474 |

## Template

| Subarray | No. of Output Channels | SW Channel Mode |
|---|---|---|
| SUBGRISM64 | 4 | IMAGING |

## Spectral Elements

| # | 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 | RAPID | 2 | 35055 | 1 | 35055 | 35999.732 | 177474 |

## Special Requirements

Between Dates 27-APR-2025:00:00:00 and 10-JUN-2025:00:00:00
Phase 0.97475 to 0.97980 with period 8.46314280 Days and zero-phase 2460200.7339 HJD
Time Series Observation
No Parallel Attachments

## Observation

**Proposal 5311, Observation 3**

Wed Apr 16 21:00:23 GMT 2025

**Diagnostic Status: Warning**

Observing Template: NIRCam Grism Time Series

## Diagnostics

(Observation 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.

(Visit 3:1) Warning (Form): Data Excess over middle threshold

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

(Visit 3:1) 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) | AU-MIC | RA: 20 45 9.8838 (311.2911825d) | Proper Motion RA: 281.31903 mas/yr | |
| | | Dec: -31 20 33.00 (-31.34250d) | Proper Motion Dec: -360.14772 mas/yr | |
| | | Equinox: J2000 | Epoch of Position: 2015.5 | |

*Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.*
*Category=Star*
*Description=[Exoplanet Systems, Exoplanets, M stars]*
*Extended=NO*

## Acquisition

| # | Target | Subarray | Filter | Readout Pattern | Groups/Int | Integrations/Exp | Total Integrations | Total Exposure Time | ETC Wkbk.Calc ID |
|---|---|---|---|---|---|---|---|---|---|
| 1 | SAME | SUB32TATSGRISM | F405N+F444W | RAPID | 3 | 1 | 1 | 0.062 | 177474 |

## Template

| Subarray | No. of Output Channels | SW Channel Mode |
|---|---|---|
| SUBGRISM64 | 4 | IMAGING |

## Spectral Elements

| # | 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 | RAPID | 2 | 35055 | 1 | 35055 | 35999.732 | 177474 |

## Special Requirements

Between Dates 27-APR-2025:00:00:00 and 10-JUN-2025:00:00:00
Phase 0.97475 to 0.97980 with period 8.46314280 Days and zero-phase 2460200.7339 HJD
Time Series Observation
No Parallel Attachments