



17219 - The evaporating atmosphere of a planet in the young bright multiplanet system AU Mic

Cycle: 30, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

<i>Name</i>	<i>Institution</i>
Keighley Elizabeth Rockcliffe (PI) (Contact)	Dartmouth College
Dr. Elisabeth R. Newton (CoI)	Dartmouth College
Dr. Allison Youngblood (CoI)	NASA Goddard Space Flight Center
Dr. Hans-Reinhard Mueller (CoI)	Dartmouth College
Dr. Paul Wilson Cauley (CoI)	University of Colorado at Boulder
Dr. Emily Gilbert (CoI)	Jet Propulsion Laboratory
Dr. Peter Plavchan (CoI)	Missouri State University
Mr. Girish Duvvuri (CoI)	University of Colorado at Boulder
Dr. Peter Gao (CoI)	Carnegie Institution of Washington
Dr. Thomas Barclay (CoI)	Eureka Scientific Inc.
Dr. Eric David Lopez (CoI)	NASA Goddard Space Flight Center

VISITS

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
01	(1) V-AU-MIC WAVE	STIS/CCD STIS/FUV-MAMA	2	08-Jun-2023 12:00:14.0	yes
02	(1) V-AU-MIC WAVE	STIS/CCD STIS/FUV-MAMA	5	08-Jun-2023 12:00:18.0	yes

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
03	(2) V-AU-MIC2 WAVE	STIS/CCD STIS/FUV-MAMA	2	08-Jun-2023 12:00:21.0	yes
53	(2) V-AU-MIC2 WAVE	STIS/CCD STIS/FUV-MAMA	2	08-Jun-2023 12:00:23.0	yes
04	(2) V-AU-MIC2 WAVE	STIS/CCD STIS/FUV-MAMA	5	08-Jun-2023 12:00:26.0	yes

16 Total Orbits Used

ABSTRACT

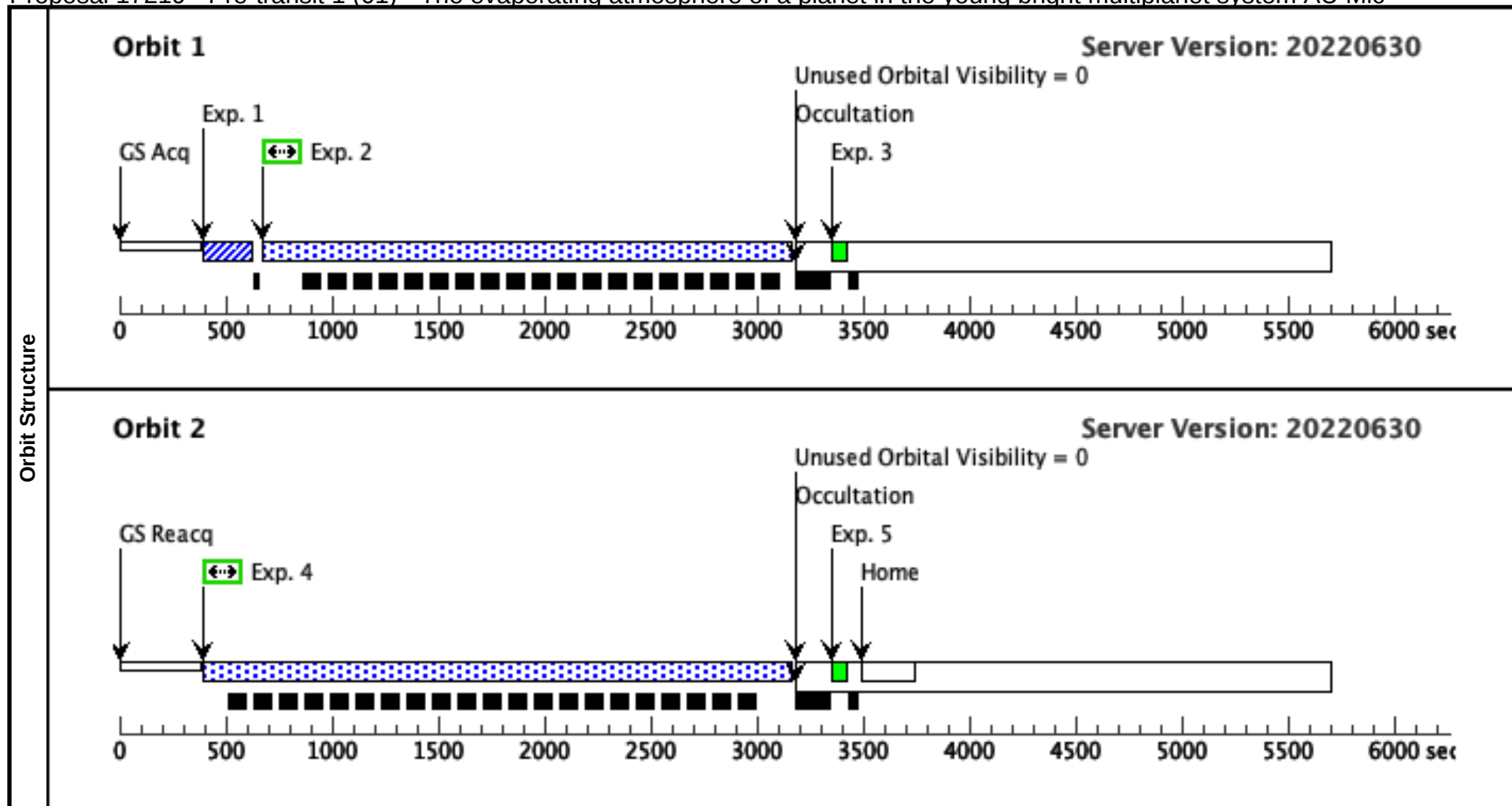
Two planets have been detected around the 23 Myr pre-main sequence M dwarf AU Mic; their known age makes them good probes for early stages of exoplanet evolution. AU Mic c is the 2.56 Earth radius outer planet orbiting with a period of 18.9 days. It has a mass of about 20 Earth masses. The planet's relatively low density, high levels of X-ray and UV radiation, proximity to its bright host, and its youth indicate this planet is likely experiencing atmospheric mass loss. This makes it an excellent target for STIS UV observations to look for escaping neutral hydrogen during transit at Lyman-alpha. AU Mic b, even closer to its host, already has similar observations, so observations of AU Mic c will provide the opportunity to explore atmospheric escape process for multiple planets in the same system. With STIS observations of AU mic c, we can constrain the planet's mass loss rate and potentially the dynamics of the upper atmosphere. Observations of AU Mic c will provide much needed additional data to test atmospheric escape models.

OBSERVING DESCRIPTION

This program aims to detect the transit of AU Mic c in the Lyman-alpha emission line of its host using HST/STIS. We will observe 2 transits, each comprised of a single visit of 5 orbits (10 orbits total) using STIS FUV-MAMA E140M. The 5 back-to-back orbits in a single visit can be scheduled to avoid crossings of the South Atlantic Anomaly. Both 5-orbit visits will probe the same regions of the planet transit: 2 orbits capturing before and after the white-light transit, with 1 orbit at the transit midpoint. With this observing strategy, we will have a full view of the exosphere transit. Two orbits per transit are loosely scheduled between 5 to 24 hours before each transit (4 orbits total). This will provide a baseline observation of the unocculted host star.

Proposal 17219 - Pre-transit 1 (01) - The evaporating atmosphere of a planet in the young bright multiplanet system AU Mic

Visit	Proposal 17219, Pre-transit 1 (01), completed								Thu Jun 08 16:00:28 GMT 2023	
	Diagnostic Status: Warning									
	Scientific Instruments: STIS/CCD, STIS/FUV-MAMA									
	Special Requirements: (none)									
Comments: 2 orbits (5 -24 hours) before AU Mic c transit to obtain baseline from unocculted AU Mic. 1 of 2 visits to capture the first transit of AU Mic c.										
Diagnostics	(Pre-transit 1 (01)) Warning (Orbit Planner): STIS TIME-TAG EXPOSURE GENERATES HEAVY DATA VOLUME									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	V-AU-MIC	RA: 20 45 9.5325 (311.2897188d) Dec: -31 20 27.24 (-31.34090d) Equinox: J2000	Proper Motion RA: 281.319 mas/yr Proper Motion Dec: -360.148 mas/yr Epoch of Position: 2016	V=8.627	Reference Frame: ICRS				
	Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.									
	Category=STAR Description=[EXTRA-SOLAR PLANET, EXTRA-SOLAR PLANETARY SYSTEM, PRE-MAIN SEQUENCE STAR]									
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	ACQ (STIS.ta.144 3364)	(1) V-AU-MIC	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT		Sequence 1-3 Non-Int in Pre-transit 1 (01)	0.1 Secs (0.1 Secs) [==>]	[1]
	2	SCIENCE (STIS.sp.13 30912)	(1) V-AU-MIC	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=12 0; WAVECAL=NO		Sequence 1-3 Non-Int in Pre-transit 1 (01)	3000 Secs (2406 Secs) [==>2406.0 Secs]	[1]
	3	GO-WAVE CAL	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A			Sequence 1-3 Non-Int in Pre-transit 1 (01)	[==>]	[1]
	4	SCIENCE (STIS.sp.13 30912)	(1) V-AU-MIC	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=12 0; WAVECAL=NO		Sequence 4-5 Non-Int in Pre-transit 1 (01)	3000 Secs (2758 Secs) [==>2758.0 Secs]	[2]
	5	GO-WAVE CAL	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A			Sequence 4-5 Non-Int in Pre-transit 1 (01)	[==>]	[2]

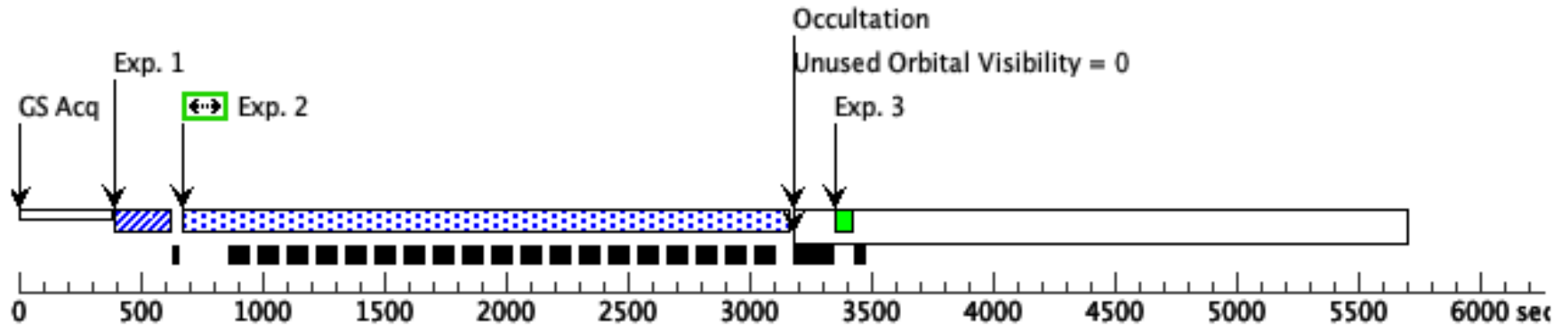


Proposal 17219 - In-transit 1 (02) - The evaporating atmosphere of a planet in the young bright multiplanet system AU Mic

Visit	Proposal 17219, In-transit 1 (02), completed									Thu Jun 08 16:00:28 GMT 2023
	Diagnostic Status: Warning									
	Scientific Instruments: STIS/CCD, STIS/FUV-MAMA									
	Special Requirements: AFTER 01 BY 5 H TO 24 H; Period 18.859019 D AND ZERO-PHASE HJD2458342.2223									
Comments: 5 orbits surrounding white-light transit of AU Mic c. 2 of 2 visits to capture the first transit of AU Mic c.										
Diagnostics	(In-transit 1 (02)) Warning (Orbit Planner): STIS TIME-TAG EXPOSURE GENERATES HEAVY DATA VOLUME									
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes	Miscellaneous		
	(1)	V-AU-MIC	RA: 20 45 9.5325 (311.2897188d)		Proper Motion RA: 281.319 mas/yr		V=8.627	Reference Frame: ICRS		
			Dec: -31 20 27.24 (-31.34090d)		Proper Motion Dec: -360.148 mas/yr					
			Equinox: J2000		Epoch of Position: 2016					
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.										
Category=STAR										
Description=[EXTRA-SOLAR PLANET, EXTRA-SOLAR PLANETARY SYSTEM, PRE-MAIN SEQUENCE STAR]										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	ACQ (STIS.ta.144 3364)	(1) V-AU-MIC	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT	PHASE 0.993 TO 0.997	Sequence 1-3 Non-Int in In-transit 1 (02)	0.1 Secs (0.1 Secs)	
									[==>]	[1]
	2	SCIENCE (STIS.sp.13 30912)	(1) V-AU-MIC	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=12 0;		Sequence 1-3 Non-Int in In-transit 1 (02)	3000 Secs (2406 Secs)	
							WAVECAL=NO		[==>2406.0 Secs]	[1]
	3	GO-WAVE CAL	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A			Sequence 1-3 Non-Int in In-transit 1 (02)	[==>]	[1]
	4	SCIENCE (STIS.sp.13 30912)	(1) V-AU-MIC	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=12 0;		Sequence 4-5 Non-Int in In-transit 1 (02)	3000 Secs (2758 Secs)	
							WAVECAL=NO		[==>2758.0 Secs]	[2]
	5	GO-WAVE CAL	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A			Sequence 4-5 Non-Int in In-transit 1 (02)	[==>]	[2]
	6	SCIENCE (STIS.sp.13 30912)	(1) V-AU-MIC	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=12 0;		Sequence 6-7 Non-Int in In-transit 1 (02)	3000 Secs (2758 Secs)	
						WAVECAL=NO		[==>2758.0 Secs]	[3]	
7	GO-WAVE CAL	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A			Sequence 6-7 Non-Int in In-transit 1 (02)	[==>]	[3]	
8	SCIENCE (STIS.sp.13 30912)	(1) V-AU-MIC	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=12 0;		Sequence 8-9 Non-Int in In-transit 1 (02)	3000 Secs (2758 Secs)		
						WAVECAL=NO		[==>2758.0 Secs]	[4]	
9	GO-WAVE CAL	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A			Sequence 8-9 Non-Int in In-transit 1 (02)	[==>]	[4]	
10	SCIENCE (STIS.sp.13 30912)	(1) V-AU-MIC	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=12 0;		Sequence 10-11 Non-Int in In-transit 1 (0 2)	3000 Secs (2758 Secs)		
						WAVECAL=NO		[==>2758.0 Secs]	[5]	
11	GO-WAVE CAL	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A			Sequence 10-11 Non-Int in In-transit 1 (0 2)	[==>]	[5]	

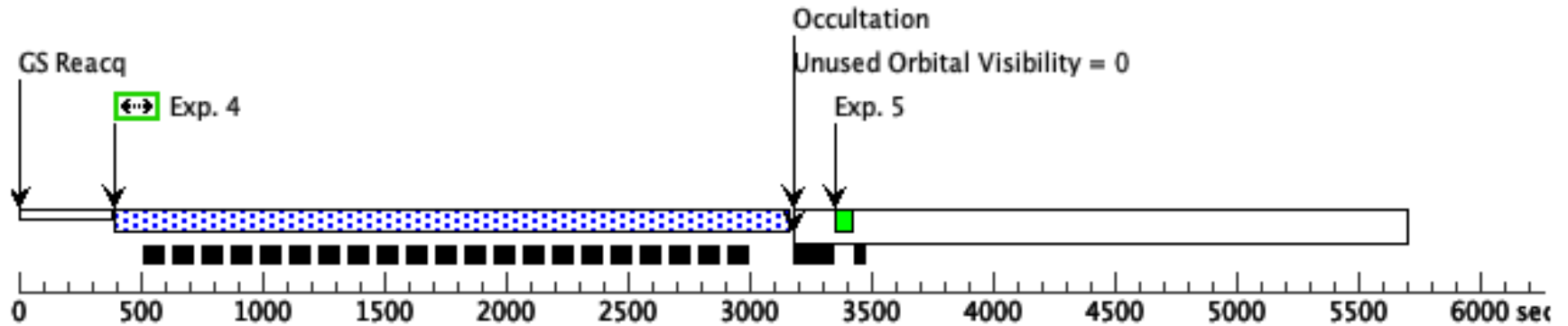
Orbit 1

Server Version: 20220630



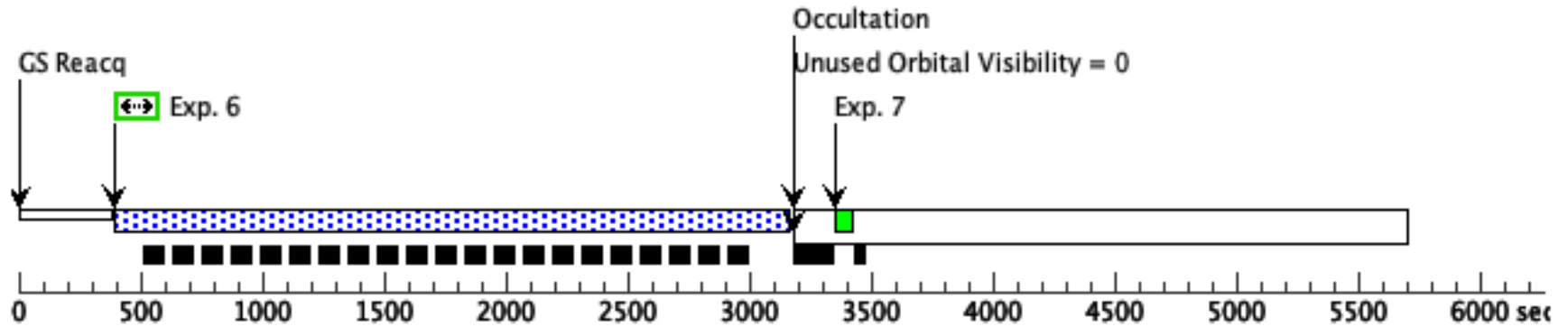
Orbit 2

Server Version: 20220630



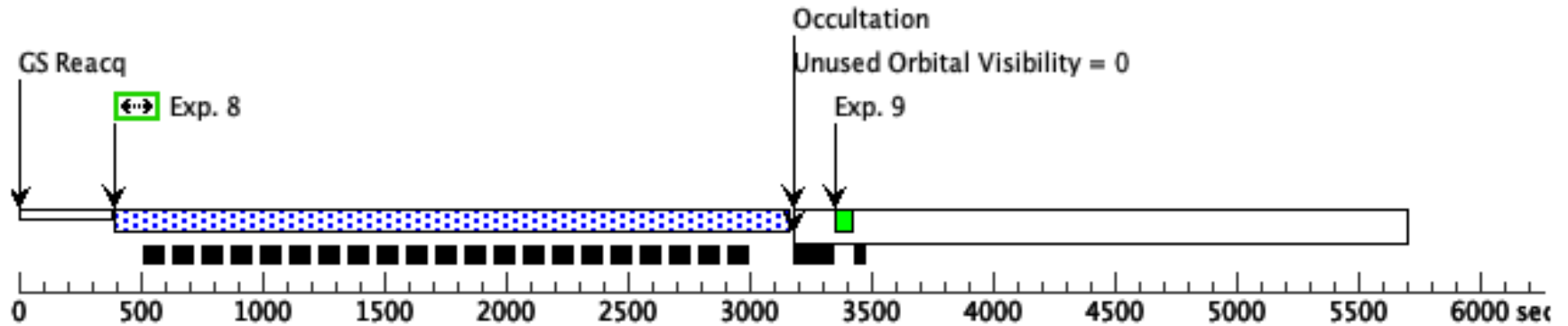
Orbit 3

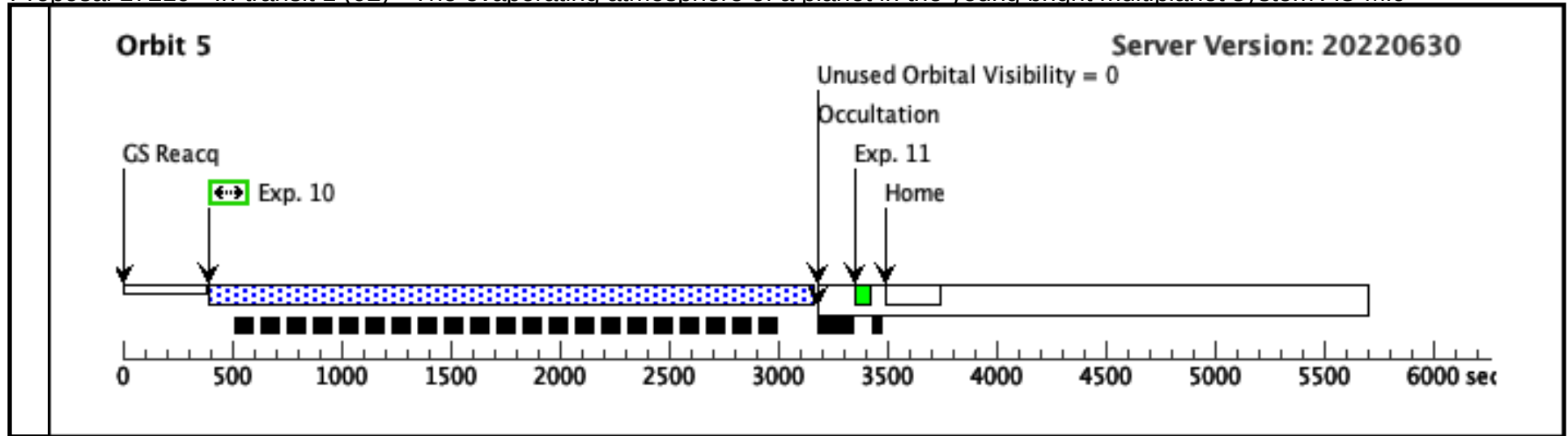
Server Version: 20220630



Orbit 4

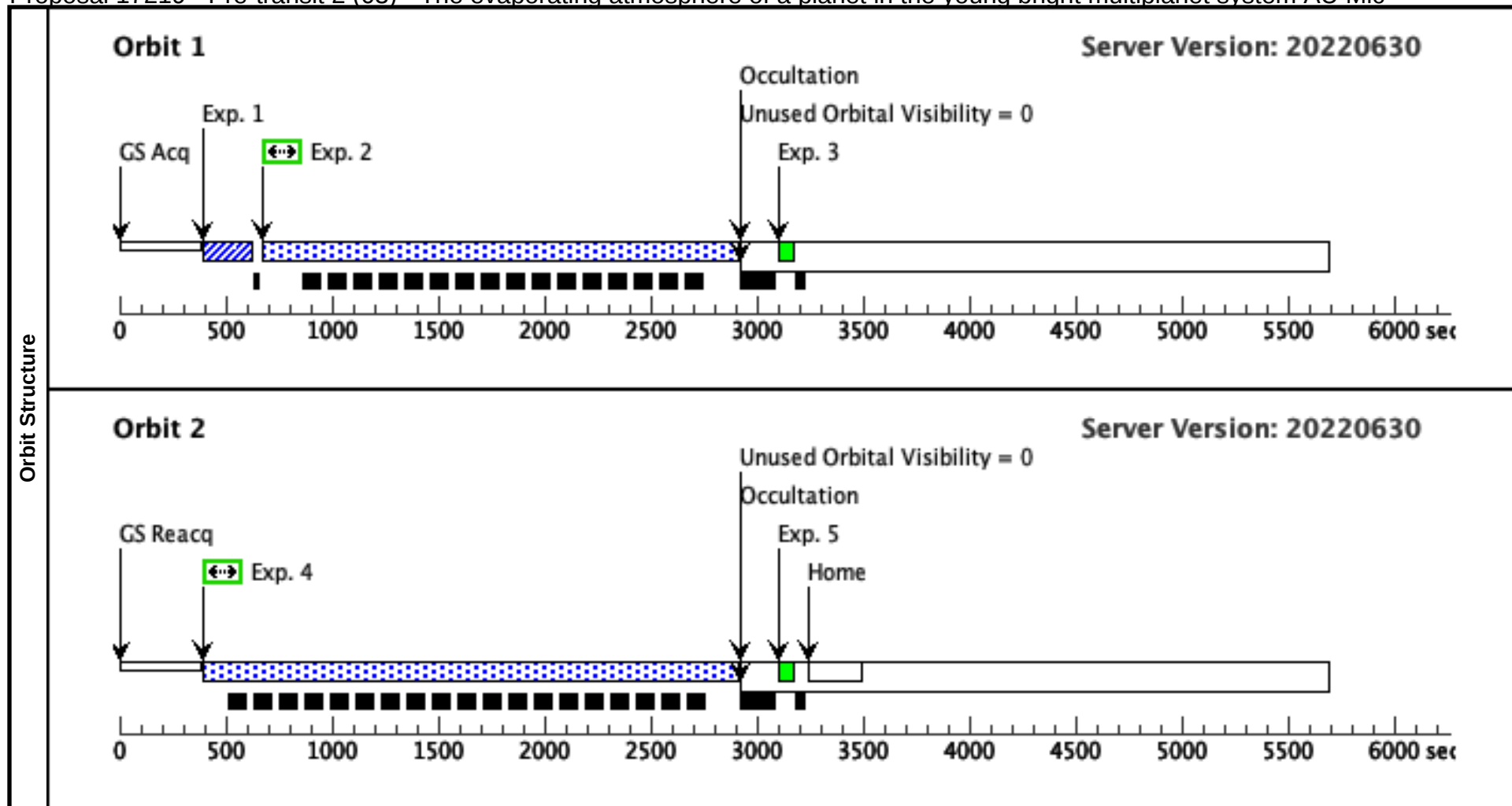
Server Version: 20220630





Proposal 17219 - Pre-transit 2 (03) - The evaporating atmosphere of a planet in the young bright multiplanet system AU Mic

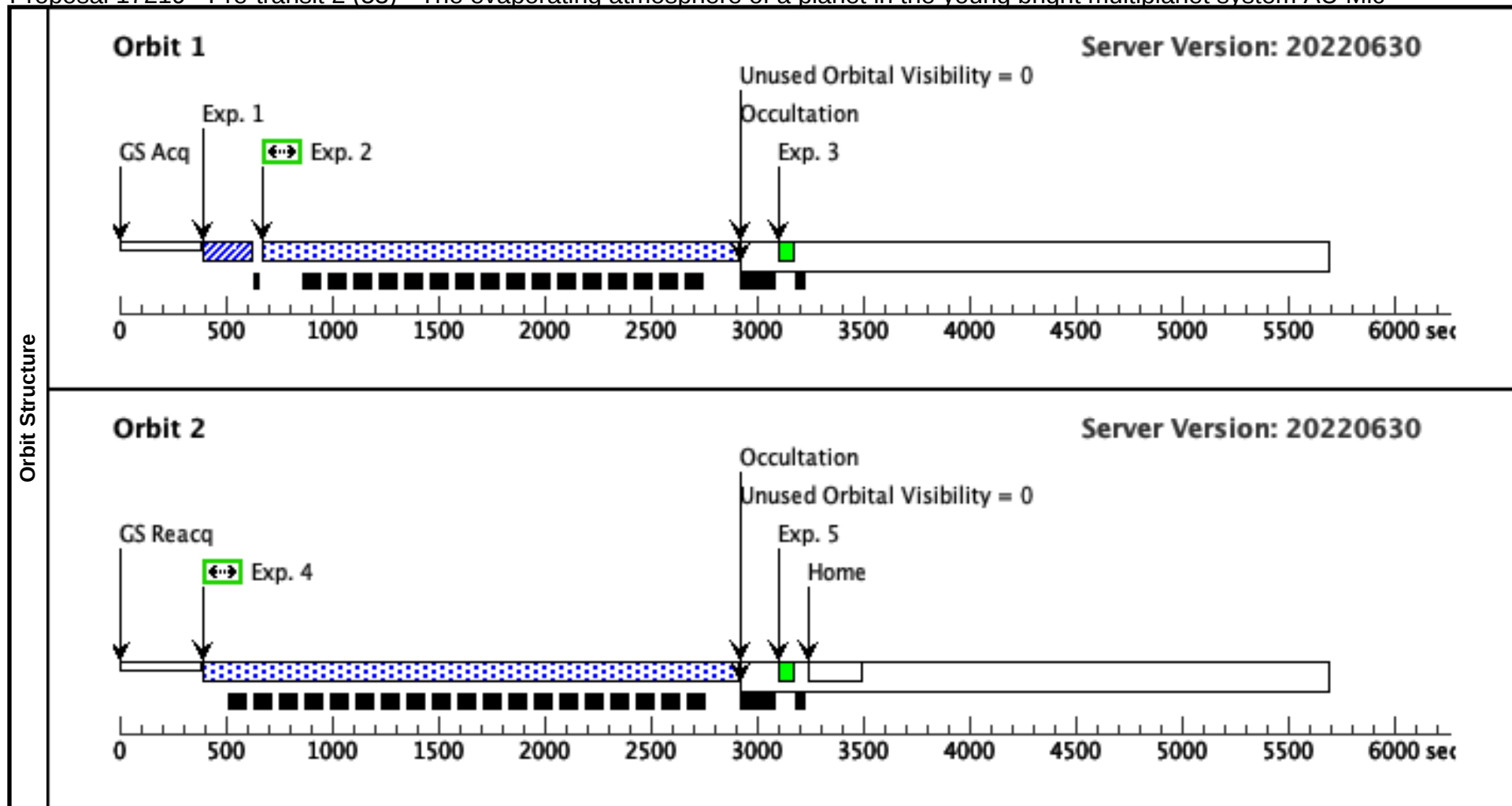
Visit	Proposal 17219, Pre-transit 2 (03), failed								Thu Jun 08 16:00:28 GMT 2023		
	Diagnostic Status: Warning										
	Scientific Instruments: STIS/CCD, STIS/FUV-MAMA										
	Special Requirements: SCHED 100%										
Comments: 2 orbits (5 - 24 hours) before AU Mic c transit to obtain baseline from unocculted AU Mic. 1 of 2 visits to capture the second transit of AU Mic c.											
Diagnostics	(Pre-transit 2 (03)) Warning (Orbit Planner): STIS TIME-TAG EXPOSURE GENERATES HEAVY DATA VOLUME										
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(2)	V-AU-MIC2	RA: 20 45 9.5325 (311.2897188d) Dec: -31 20 27.24 (-31.34090d) Equinox: J2000		Proper Motion RA: 281.319 mas/yr Proper Motion Dec: -360.148 mas/yr Epoch of Position: 2000		V=8.627		Reference Frame: ICRS		
	Comments: Category=STAR Description=[EXTRA-SOLAR PLANET, EXTRA-SOLAR PLANETARY SYSTEM, PRE-MAIN SEQUENCE STAR]										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	ACQ (STIS.ta.144 3364)	(2) V-AU-MIC2	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT		Sequence 1-3 Non-Int in Pre-transit 2 (03)	0.1 Secs (0.1 Secs) [==>]		[1]
	2	SCIENCE (STIS.sp.13 30912)	(2) V-AU-MIC2	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=12 0; WAVECAL=NO		Sequence 1-3 Non-Int in Pre-transit 2 (03)	3000 Secs (2153 Secs) [==>2153.0 Secs]		[1]
	3	GO-WAVE CAL	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A			Sequence 1-3 Non-Int in Pre-transit 2 (03)	[==>]		[1]
	4	SCIENCE (STIS.sp.13 30912)	(2) V-AU-MIC2	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=12 0; WAVECAL=NO		Sequence 4-5 Non-Int in Pre-transit 2 (03)	3000 Secs (2505 Secs) [==>2505.0 Secs]		[2]
	5	GO-WAVE CAL	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A			Sequence 4-5 Non-Int in Pre-transit 2 (03)	[==>]		[2]



Proposal 17219 - Pre-transit 2 (53) - The evaporating atmosphere of a planet in the young bright multiplanet system AU Mic

Thu Jun 08 16:00:28 GMT 2023

Visit	Proposal 17219, Pre-transit 2 (53)										Thu Jun 08 16:00:28 GMT 2023	
	Diagnostic Status: Warning											
	Scientific Instruments: STIS/CCD, STIS/FUV-MAMA											
	Special Requirements: SCHED 100%											
	Comments: 2 orbits (5 - 24 hours) before AU Mic c transit to obtain baseline from unocculted AU Mic. 1 of 2 visits to capture the second transit of AU Mic c. HOPR copy of obs. 3 (no link)											
Diagnostics	(Pre-transit 2 (53)) Warning (Orbit Planner): STIS TIME-TAG EXPOSURE GENERATES HEAVY DATA VOLUME											
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections		Fluxes	Miscellaneous			
	(2)	V-AU-MIC2	RA: 20 45 9.5325 (311.2897188d) Dec: -31 20 27.24 (-31.34090d) Equinox: J2000			Proper Motion RA: 281.319 mas/yr Proper Motion Dec: -360.148 mas/yr Epoch of Position: 2000		V=8.627	Reference Frame: ICRS			
	Comments: Category=STAR Description=[EXTRA-SOLAR PLANET, EXTRA-SOLAR PLANETARY SYSTEM, PRE-MAIN SEQUENCE STAR]											
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture		Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	ACQ (STIS.ta.144 3364)	(2) V-AU-MIC2	STIS/CCD, ACQ, F28X50LP		MIRROR	ACQTYPE=POINT		Sequence 1-3 Non-Int in Pre-transit 2 (53)	0.1 Secs (0.1 Secs)		
									[==>]		[1]	
	2	SCIENCE (STIS.sp.13 30912)	(2) V-AU-MIC2	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2		E140M 1425 A	BUFFER-TIME=120; WAVECAL=NO		Sequence 1-3 Non-Int in Pre-transit 2 (53)	3000 Secs (2153 Secs)		
									[==>2153.0 Secs]		[1]	
	3	GO-WAVE CAL	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2		E140M 1425 A			Sequence 1-3 Non-Int in Pre-transit 2 (53)	[==>]	[1]	
	4	SCIENCE (STIS.sp.13 30912)	(2) V-AU-MIC2	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2		E140M 1425 A	BUFFER-TIME=120; WAVECAL=NO		Sequence 4-5 Non-Int in Pre-transit 2 (53)	3000 Secs (2505 Secs)		
								[==>2505.0 Secs]		[2]		
5	GO-WAVE CAL	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2		E140M 1425 A			Sequence 4-5 Non-Int in Pre-transit 2 (53)	[==>]	[2]		

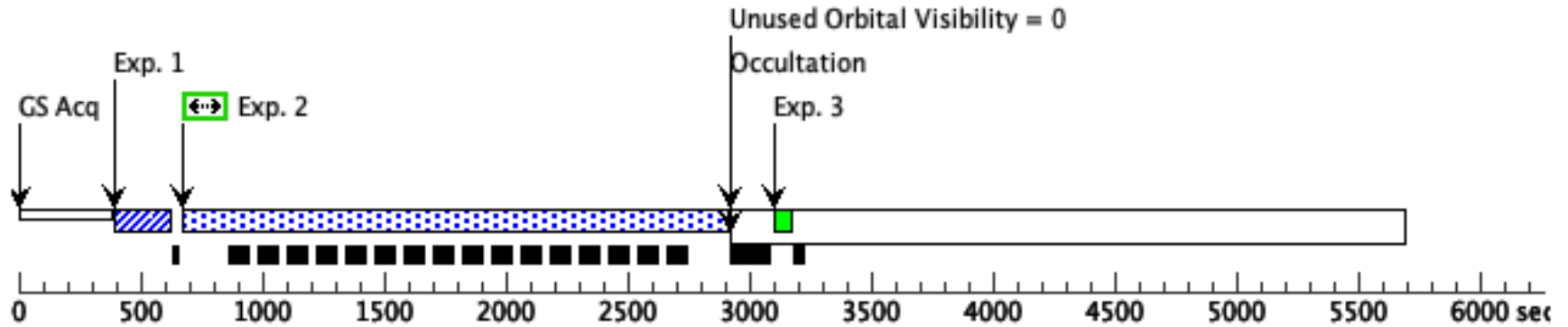


Proposal 17219 - In-transit 2 (04) - The evaporating atmosphere of a planet in the young bright multiplanet system AU Mic

Visit	Proposal 17219, In-transit 2 (04), completed									Thu Jun 08 16:00:28 GMT 2023
	Diagnostic Status: Warning									
	Scientific Instruments: STIS/CCD, STIS/FUV-MAMA									
	Special Requirements: SCHED 100%; AFTER 03 BY 5 H TO 24 H; Period 18.859019 D AND ZERO-PHASE HJD2458342.2223									
Comments: 5 orbits surrounding white-light transit of AU Mic c. 2 of 2 visits to capture the second transit of AU Mic c.										
Diagnostics	(In-transit 2 (04)) Warning (Orbit Planner): STIS TIME-TAG EXPOSURE GENERATES HEAVY DATA VOLUME									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(2)	V-AU-MIC2	RA: 20 45 9.5325 (311.2897188d) Dec: -31 20 27.24 (-31.34090d) Equinox: J2000	Proper Motion RA: 281.319 mas/yr Proper Motion Dec: -360.148 mas/yr Epoch of Position: 2000	V=8.627	Reference Frame: ICRS				
	Comments: Category=STAR Description=[EXTRA-SOLAR PLANET, EXTRA-SOLAR PLANETARY SYSTEM, PRE-MAIN SEQUENCE STAR]									
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	ACQ (STIS.ta.144 3364)	(2) V-AU-MIC2	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=POINT	PHASE 0.993 TO 0.997	Sequence 1-3 Non-Int in In-transit 2 (04)	0.1 Secs (0.1 Secs) [==>]	[1]
	2	SCIENCE (STIS.sp.13 30912)	(2) V-AU-MIC2	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=12 0; WAVECAL=NO		Sequence 1-3 Non-Int in In-transit 2 (04)	3000 Secs (2153 Secs) [==>2153.0 Secs]	[1]
	3	GO-WAVE CAL	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A			Sequence 1-3 Non-Int in In-transit 2 (04)	[==>]	[1]
	4	SCIENCE (STIS.sp.13 30912)	(2) V-AU-MIC2	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=12 0; WAVECAL=NO		Sequence 4-5 Non-Int in In-transit 2 (04)	3000 Secs (2505 Secs) [==>2505.0 Secs]	[2]
	5	GO-WAVE CAL	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A			Sequence 4-5 Non-Int in In-transit 2 (04)	[==>]	[2]
	6	SCIENCE (STIS.sp.13 30912)	(2) V-AU-MIC2	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=12 0; WAVECAL=NO		Sequence 6-7 Non-Int in In-transit 2 (04)	3000 Secs (2505 Secs) [==>2505.0 Secs]	[3]
	7	GO-WAVE CAL	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A			Sequence 6-7 Non-Int in In-transit 2 (04)	[==>]	[3]
	8	SCIENCE (STIS.sp.13 30912)	(2) V-AU-MIC2	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=12 0; WAVECAL=NO		Sequence 8-9 Non-Int in In-transit 2 (04)	3000 Secs (2505 Secs) [==>2505.0 Secs]	[4]
	9	GO-WAVE CAL	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A			Sequence 8-9 Non-Int in In-transit 2 (04)	[==>]	[4]
	10	SCIENCE (STIS.sp.13 30912)	(2) V-AU-MIC2	STIS/FUV-MAMA, TIME-TAG, 0.2X0.2	E140M 1425 A	BUFFER-TIME=12 0; WAVECAL=NO		Sequence 10-11 Non-Int in In-transit 2 (04)	3000 Secs (2505 Secs) [==>2505.0 Secs]	[5]
	11	GO-WAVE CAL	WAVE	STIS/FUV-MAMA, ACCUM, 0.2X0.2	E140M 1425 A			Sequence 10-11 Non-Int in In-transit 2 (04)	[==>]	[5]

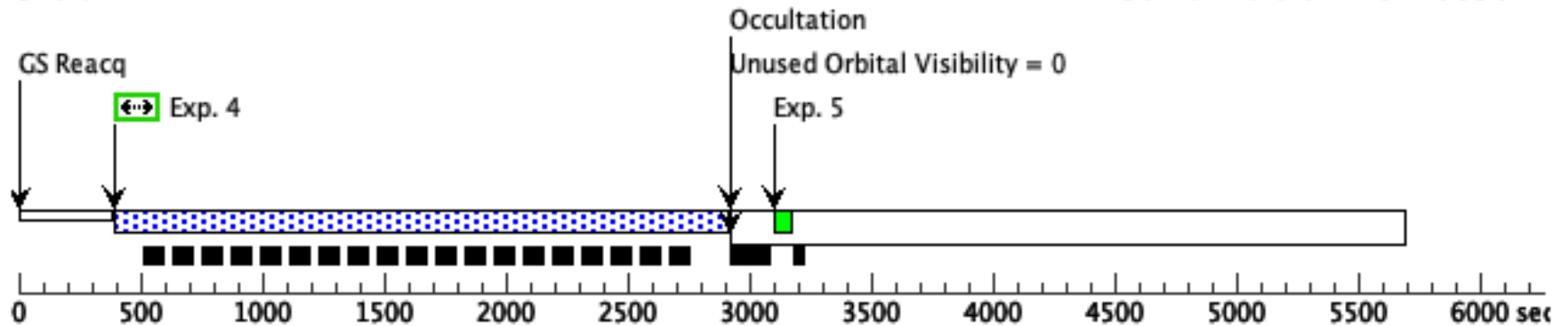
Orbit 1

Server Version: 20220630



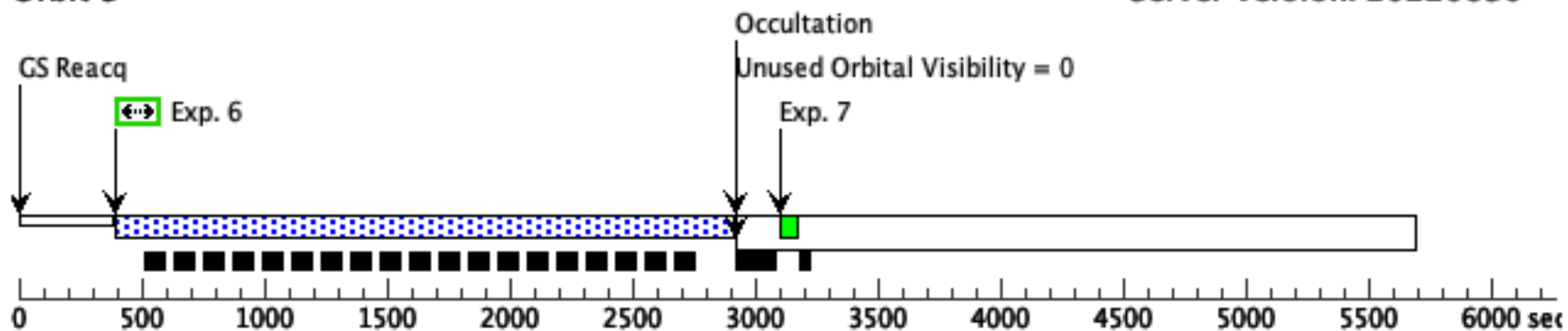
Orbit 2

Server Version: 20220630



Orbit 3

Server Version: 20220630



Orbit 4

Server Version: 20220630

