18244 - A Definitive Transmission Survey of the Atmosphere of 55 Cnc e

Cycle: 33, Proposal Category: GO

(Availability Mode: AVAILABLE)

INVESTIGATORS

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VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) -RHO01-CNC	WFC3/IR	4	11-Aug-2026 16:00:40.0	yes

4 Total Orbits Used

ABSTRACT

We propose simultaneous observations of one transit of 55 Cnc e through JWST NIRISS/SOSS and HST WFC3/IR G141 to resolve inconsistencies in its atmospheric spectrum. JWST dayside emission studies have claimed detection of a high mean molecular weight (mmw) atmosphere rich in CO/CO2, at odds with HST transmission study claims of a low mmw atmosphere rich in H2 and HCN. Systematic differences between these instruments may be to blame, complicating efforts to interpret exoplanet atmospheres through multi-observatory studies. However, 55 Cnc e is a tidally-locked lava world with evidence for dayside variability, possibily originating from volcanic super-plumes or cloud condensation cycles. As a result, the contrasting results between JWST and HST may be astrophysical, and could yield the first evidence of spatial atmosphere variations due to extreme thermal and wind gradients, or the first evidence of transmission variability due to atmospheric and/or geologic activity. Our study leverages the observing power of both JWST and HST to confidently distinguish between all three of these scenarios, definitively revealing the true nature of this standout tidally-locked ultra-short-period super-Earth.

OBSERVING DESCRIPTION

We will observe the transiting lava world 55 Cnc e using the WFC3/IR G141. Our observation will consist of 4 HST orbits scheduled in a contiguous block. These observations should be scheduled to avoid the SAA and are phase constrained such that one HST orbit occurs during 55 Cnc e's transit, with two orbits pre-transit and one post-transit to measure the stellar baseline flux as well as characterize HST systematics so they may be corrected for. These observations are phase-constrained to start when 55 Cnc e is between orbital phases 0.7869-0.8278. These constraints are designed to capture one full orbit of in-transit flux while also maximizing the size of the starting window to facilitate scheduling.

Per JWST-GO 12237, these observations must also be taken simultaneously with Visit 1 of JWST-GO 12237, which is phase-constrained to start slightly after HST-GO 18244 Visit 1 begins to account for the differences between HST and JWST detector settling timescales. The simultaneity of these observations will enable us to benchmark the performance of the new JWST NIRISS/SOSS multistripe readout mode against the performance of HST WFC3/IR G141, and detect or rule out spatial and/or temporal variability in the atmosphere of 55 Cnc e.

Some adjustments have been made to the observing strategy of Visit 19 to accommodate the restrictions of reduced gyro mode. In particular, one iteration has been trimmed from the G141 spatial scans in Orbits 2, 3, and 4 to prevent orbital visibility overruns that would otherwise occur as a result of the increased time to reacquire the guide star in RGM. We have also adjusted the phase constraints based on updated ephemerides information and based on the requirements of our program to maximize in-transit flux.

All four orbits include a "dummy exposure" at the end of the orbit, which use a different sampling sequence than our science exposures and which would incur orbital visibility overruns if executed. These exposures are not to be taken in practice and exist solely to force APT to trigger a buffer

dump of the WFC3/IR during occultation of the target star, when it will have no impact on observations. We do request that the scheduled buffer dump occur in occultation as shown in the Orbit Planner.

Visit

Proposal 18244, 55-CNC-e_G141_Transit (01), implementation Tue Aug 11 20:00:43 GMT 2026

Diagnostic Status: Warning

Scientific Instruments: WFC3/IR

Special Requirements: SCHED 100%; BETWEEN 2026.332 AND 2026.332:12:00:00; Period 0.7365474 D AND ZERO-PHASE HJD2457063.2096

Comments: Per JWST-GO 12237, this observation is a duplication of Visit 19 in HST-GO 13665 and is requested to be taken simultaneously with Visit 1 of JWST-GO 12237. We require all four orbits in this visit to be taken contiguously with no interruptions, and to be scheduled to avoid the SAA. These observations are phase-constrained to begin when 55 Cnc e is between orbital phases 0.7869-0.8278 to ensure that Orbit 3 captures the maximal amount of in-transit flux.

Some adjustments have been made to the observing strategy of Visit 19 to accommodate the restrictions of reduced gyro mode. In particular, one iteration has been trimmed from each 55-CNC-e Science exposure in Orbits 2, 3, and 4 to prevent orbital visibility overruns that would otherwise occur as a result of the increased time to reacquire the guide star in RGM.

All four orbits include a "dummy exposure" at the end of the orbit. These exposures, labelled "Buffer Dump Trigger", contain a RAPID exposure containing the minimum number of samples needed to trigger a buffer dump to occur during occultation of the target. These exposures would incur 17 s of orbital visibility overrun in Orbit 1, and 144 s of overrun in Orbits 2, 3, and 4. In execution, we do not request these RAPID exposures actually be taken. We only include these to trigger APT to schedule a buffer dump during occultation. We do request that the in-occultation buffer dumps occur as scheduled to minimize the impact of the buffer dumps on the observations.

Diagnostics

(55-CNC-e_G141_Transit (01)) Warning (Orbit Planner): MERGING RULE VIOLATED DURING AUTOMATIC MERGING
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Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	-RHO01-CNC	RA: 08 52 35.8111 (133.1492129d)	Proper Motion RA: -485.681 mas/yr	V=5.95084+/-0.02300	Reference Frame: ICRS
	Alt Name1: 55-CNC-A	Dec: +28 19 50.95 (28.33082d)	Proper Motion Dec: -233.517 mas/yr		
	Alt Name2: GJ-324	Equinox: J2000	Parallax: 0.0794482"		
			Epoch of Position: 2000		
			Radial Velocity: 26.6 km/sec		

Comments: This star is in a binary system with the second component (55 Cancri B) being an M4 dwarf star with V-magnitude 13, separated by 1.4 arcminutes. Both components share proper motion. The star 53 Cancri is also nearby at 4.6 arcminutes away, with similar V-magnitude (6.3) to our target star.
Category=STAR
Description=[EXTRA-SOLAR PLANET, EXTRA-SOLAR PLANETARY SYSTEM, K V-IV]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	55-CNC, ACQ, phase constrained	(1) -RHO01-CNC	WFC3/IR, MULTIACCUM, IRSUB512	F132N	NSAMP=14; SAMP-SEQ=RAPID	PHASE 0.7869 TO 0.8278; GS ACQ SCENARIO SINGLE	Same Guide Stars in 55-CNC-e_G141_Transit (01) Sequence 1-3 Non-Int in Same Guide Stars in 55-CNC-e_G141_Transit (01) Same Obset in Sequence 1-3 Non-Int in Same Guide Stars in 55-CNC-e_G141_Transit (01)	11.942378 Secs (11.942 Secs) *[==>]*	***[1]***
2	55-CNC-e Science	(1) -RHO01-CNC	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=2; SAMP-SEQ=SPARS10	POS TARG -13.5,-36; SPATIAL SCAN 4.8,90.0 Degrees,Round trip	Same Guide Stars in 55-CNC-e_G141_Transit (01) Sequence 1-3 Non-Int in Same Guide Stars in 55-CNC-e_G141_Transit (01) Same Obset in Sequence 1-3 Non-Int in Same Guide Stars in 55-CNC-e_G141_Transit (01)	8.774726 Secs X 15 (263.242 Secs) *[==>(Copy 1, Forward)]* *[==>(Copy 1, Reverse)]* *[==>(Copy 2, Forward)]* *[==>(Copy 2, Reverse)]* *[==>(Copy 3, Forward)]* *[==>(Copy 3, Reverse)]* *[==>(Copy 4, Forward)]* *[==>(Copy 4, Reverse)]* *[==>(Copy 5, Forward)]* *[==>(Copy 5, Reverse)]* *[==>(Copy 6, Forward)]* *[==>(Copy 6, Reverse)]* *[==>(Copy 7, Forward)]* *[==>(Copy 7, Reverse)]* *[==>(Copy 8, Forward)]* *[==>(Copy 8, Reverse)]* *[==>(Copy 9, Forward)]* *[==>(Copy 9, Reverse)]* *[==>(Copy 10, Forward)]* *[==>(Copy 10, Reverse)]* *[==>(Copy 11, Forward)]* *[==>(Copy 11, Reverse)]* *[==>(Copy 12, Forward)]* *[==>(Copy 12, Reverse)]* *[==>(Copy 13, Forward)]* *[==>(Copy 13, Reverse)]* *[==>(Copy 14, Forward)]* *[==>(Copy 14, Reverse)]* *[==>(Copy 15, Forward)]* *[==>(Copy 15, Reverse)]*	***[1]***

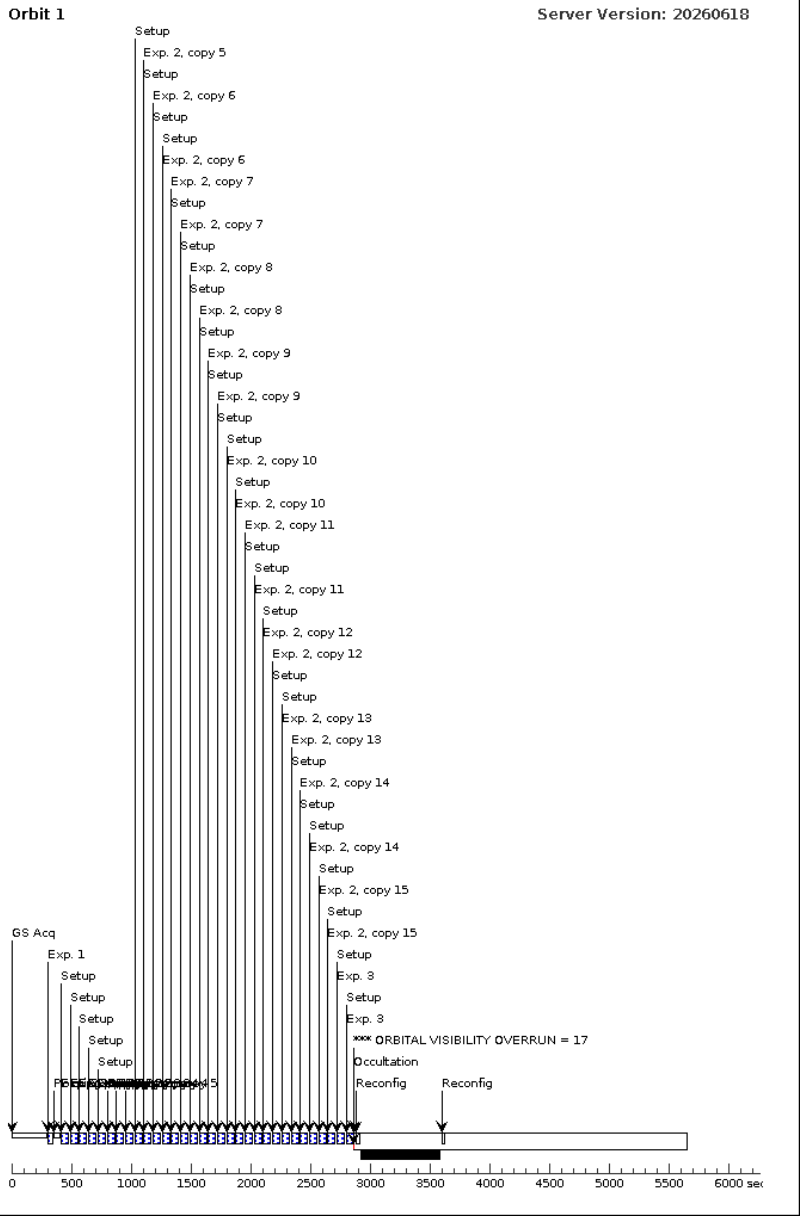
3	Buffer Dump Trigger	(1) -RHO01-CNC	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=11; SAMP-SEQ=RAPID	POS TARG -13.5,-36; SPATIAL SCAN 4.8 ,90.0 Degrees,Round trip	Same Guide Stars in 55-CNC-e_G141_Transit (01) Sequence 1-3 Non-Int in Same Guide Stars in 55-CNC-e_G141_Transit (01) Same Obset in Sequence 1-3 Non-Int in Same Guide Stars in 55-CNC-e_G141_Transit (01)	9.383297 Secs (18.767 Secs) *[==>(Forward)]* *[==>(Reverse)]*	***[1]***
Comments: This is a dummy exposure that is not to be taken in execution. It is included here to force APT to trigger a WFC3/IR buffer dump during the occultation of the target star, so as to prevent loss of observing time due to buffer dumps. In practice, we request that the in-occultation buffer dump occur as scheduled but that this exposure be skipped.									
4	55-CNC-e Science	(1) -RHO01-CNC	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=2; SAMP-SEQ=SPARS10	POS TARG -13.5,-36; SPATIAL SCAN 4.8 ,90.0 Degrees,Round trip	Same Guide Stars in 55-CNC-e_G141_Transit (01) Sequence 4-5 Non-Int in Same Guide Stars in 55-CNC-e_G141_Transit (01) Same Obset in Sequence 4-5 Non-Int in Same Guide Stars in 55-CNC-e_G141_Transit (01)	8.774726 Secs X 16 (280.791 Secs) *[==>(Copy 1, Forward)]* *[==>(Copy 1, Reverse)]* *[==>(Copy 2, Forward)]* *[==>(Copy 2, Reverse)]* *[==>(Copy 3, Forward)]* *[==>(Copy 3, Reverse)]* *[==>(Copy 4, Forward)]* *[==>(Copy 4, Reverse)]* *[==>(Copy 5, Forward)]* *[==>(Copy 5, Reverse)]* *[==>(Copy 6, Forward)]* *[==>(Copy 6, Reverse)]* *[==>(Copy 7, Forward)]* *[==>(Copy 7, Reverse)]* *[==>(Copy 8, Forward)]* *[==>(Copy 8, Reverse)]* *[==>(Copy 9, Forward)]* *[==>(Copy 9, Reverse)]* *[==>(Copy 10, Forward)]* *[==>(Copy 10, Reverse)]* *[==>(Copy 11, Forward)]* *[==>(Copy 11, Reverse)]* *[==>(Copy 12, Forward)]* *[==>(Copy 12, Reverse)]* *[==>(Copy 13, Forward)]* *[==>(Copy 13, Reverse)]* *[==>(Copy 14, Forward)]* *[==>(Copy 14, Reverse)]* *[==>(Copy 15, Forward)]* *[==>(Copy 15, Reverse)]* *[==>(Copy 16, Forward)]* *[==>(Copy 16, Reverse)]*	***[2]***

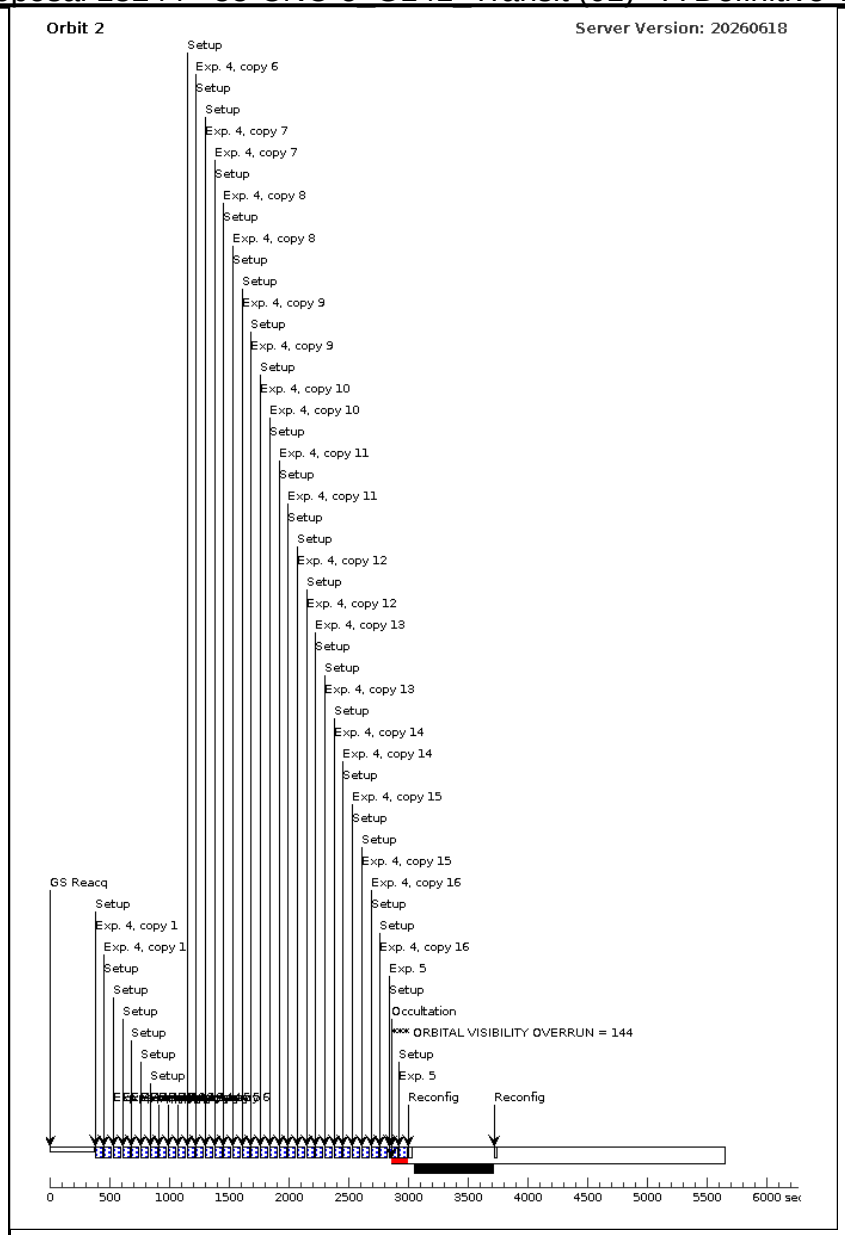
5	Buffer Dump Trigger	(1) -RHO01-CNC	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=RAPID	POS TARG -13.5,-36; SPATIAL SCAN 4.8 ,90.0 Degrees,Round trip	Same Guide Stars in 55-CNC-e_G141_Transit (01) Sequence 4-5 Non-Int in Same Guide Stars in 55-CNC-e_G141_Transit (01) Same Obset in Sequence 4-5 Non-Int in Same Guide Stars in 55-CNC-e_G141_Transit (01)	12.795405 Secs (25.591 Secs) *[==>(Forward)]* *[==>(Reverse)]*	***[2]***
Comments: This is a dummy exposure that is not to be taken in execution. It is included here to force APT to trigger a WFC3/IR buffer dump during the occultation of the target star, so as to prevent loss of observing time due to buffer dumps. In practice, we request that the in-occultation buffer dump occur as scheduled but that this exposure be skipped.									
6	55-CNC-e Science	(1) -RHO01-CNC	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=2; SAMP-SEQ=SPARS10	POS TARG -13.5,-36; SPATIAL SCAN 4.8 ,90.0 Degrees,Round trip	Same Guide Stars in 55-CNC-e_G141_Transit (01) Sequence 6-7 Non-Int in Same Guide Stars in 55-CNC-e_G141_Transit (01) Same Obset in Sequence 6-7 Non-Int in Same Guide Stars in 55-CNC-e_G141_Transit (01)	8.774726 Secs X 16 (280.791 Secs) *[==>(Copy 1, Forward)]* *[==>(Copy 1, Reverse)]* *[==>(Copy 2, Forward)]* *[==>(Copy 2, Reverse)]* *[==>(Copy 3, Forward)]* *[==>(Copy 3, Reverse)]* *[==>(Copy 4, Forward)]* *[==>(Copy 4, Reverse)]* *[==>(Copy 5, Forward)]* *[==>(Copy 5, Reverse)]* *[==>(Copy 6, Forward)]* *[==>(Copy 6, Reverse)]* *[==>(Copy 7, Forward)]* *[==>(Copy 7, Reverse)]* *[==>(Copy 8, Forward)]* *[==>(Copy 8, Reverse)]* *[==>(Copy 9, Forward)]* *[==>(Copy 9, Reverse)]* *[==>(Copy 10, Forward)]* *[==>(Copy 10, Reverse)]* *[==>(Copy 11, Forward)]* *[==>(Copy 11, Reverse)]* *[==>(Copy 12, Forward)]* *[==>(Copy 12, Reverse)]* *[==>(Copy 13, Forward)]* *[==>(Copy 13, Reverse)]* *[==>(Copy 14, Forward)]* *[==>(Copy 14, Reverse)]* *[==>(Copy 15, Forward)]* *[==>(Copy 15, Reverse)]* *[==>(Copy 16, Forward)]* *[==>(Copy 16, Reverse)]*	***[3]***

7	Buffer Dump Trigger	(1) -RHO01-CNC	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=RAPID	POS TARG -13.5,-36; SPATIAL SCAN 4.8 ,90.0 Degrees,Round trip	Same Guide Stars in 55-CNC-e_G141_Transit (01) Sequence 6-7 Non-Int in Same Guide Stars in 55-CNC-e_G141_Transit (01) Same Obset in Sequence 6-7 Non-Int in Same Guide Stars in 55-CNC-e_G141_Transit (01)	12.795405 Secs (25.591 Secs) *[==>(Forward)]* *[==>(Reverse)]*	***[3]***
Comments: This is a dummy exposure that is not to be taken in execution. It is included here to force APT to trigger a WFC3/IR buffer dump during the occultation of the target star, so as to prevent loss of observing time due to buffer dumps. In practice, we request that the in-occultation buffer dump occur as scheduled but that this exposure be skipped.									
8	55-CNC-e Science	(1) -RHO01-CNC	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=2; SAMP-SEQ=SPARS10	POS TARG -13.5,-36; SPATIAL SCAN 4.8 ,90.0 Degrees,Round trip	Same Guide Stars in 55-CNC-e_G141_Transit (01) Sequence 8-9 Non-Int in Same Guide Stars in 55-CNC-e_G141_Transit (01) Same Obset in Sequence 8-9 Non-Int in Same Guide Stars in 55-CNC-e_G141_Transit (01)	8.774726 Secs X 16 (280.791 Secs) *[==>(Copy 1, Forward)]* *[==>(Copy 1, Reverse)]* *[==>(Copy 2, Forward)]* *[==>(Copy 2, Reverse)]* *[==>(Copy 3, Forward)]* *[==>(Copy 3, Reverse)]* *[==>(Copy 4, Forward)]* *[==>(Copy 4, Reverse)]* *[==>(Copy 5, Forward)]* *[==>(Copy 5, Reverse)]* *[==>(Copy 6, Forward)]* *[==>(Copy 6, Reverse)]* *[==>(Copy 7, Forward)]* *[==>(Copy 7, Reverse)]* *[==>(Copy 8, Forward)]* *[==>(Copy 8, Reverse)]* *[==>(Copy 9, Forward)]* *[==>(Copy 9, Reverse)]* *[==>(Copy 10, Forward)]* *[==>(Copy 10, Reverse)]* *[==>(Copy 11, Forward)]* *[==>(Copy 11, Reverse)]* *[==>(Copy 12, Forward)]* *[==>(Copy 12, Reverse)]* *[==>(Copy 13, Forward)]* *[==>(Copy 13, Reverse)]* *[==>(Copy 14, Forward)]* *[==>(Copy 14, Reverse)]* *[==>(Copy 15, Forward)]* *[==>(Copy 15, Reverse)]* *[==>(Copy 16, Forward)]* *[==>(Copy 16, Reverse)]*	***[4]***

	9	Buffer Dump Trigger	(1) -RHO01-CNC	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=RAPID	POS TARG -13.5,-36; SPATIAL SCAN 4.8 ,90.0 Degrees,Round trip	Same Guide Stars in 55-CNC-e_G141_Transit (01) Sequence 8-9 Non-Int in Same Guide Stars in 55-CNC-e_G141_Transit (01) Same Obset in Sequence 8-9 Non-Int in Same Guide Stars in 55-CNC-e_G141_Transit (01)	12.795405 Secs (25.591 Secs) *[==>(Forward)]* *[==>(Reverse)]*	***[4]***
	Comments: This is a dummy exposure that is not to be taken in execution. It is included here to force APT to trigger a WFC3/IR buffer dump during the occultation of the target star, so as to prevent loss of observing time due to buffer dumps. In practice, we request that the in-occultation buffer dump occur as scheduled but that this exposure be skipped.									

Orbit Structure

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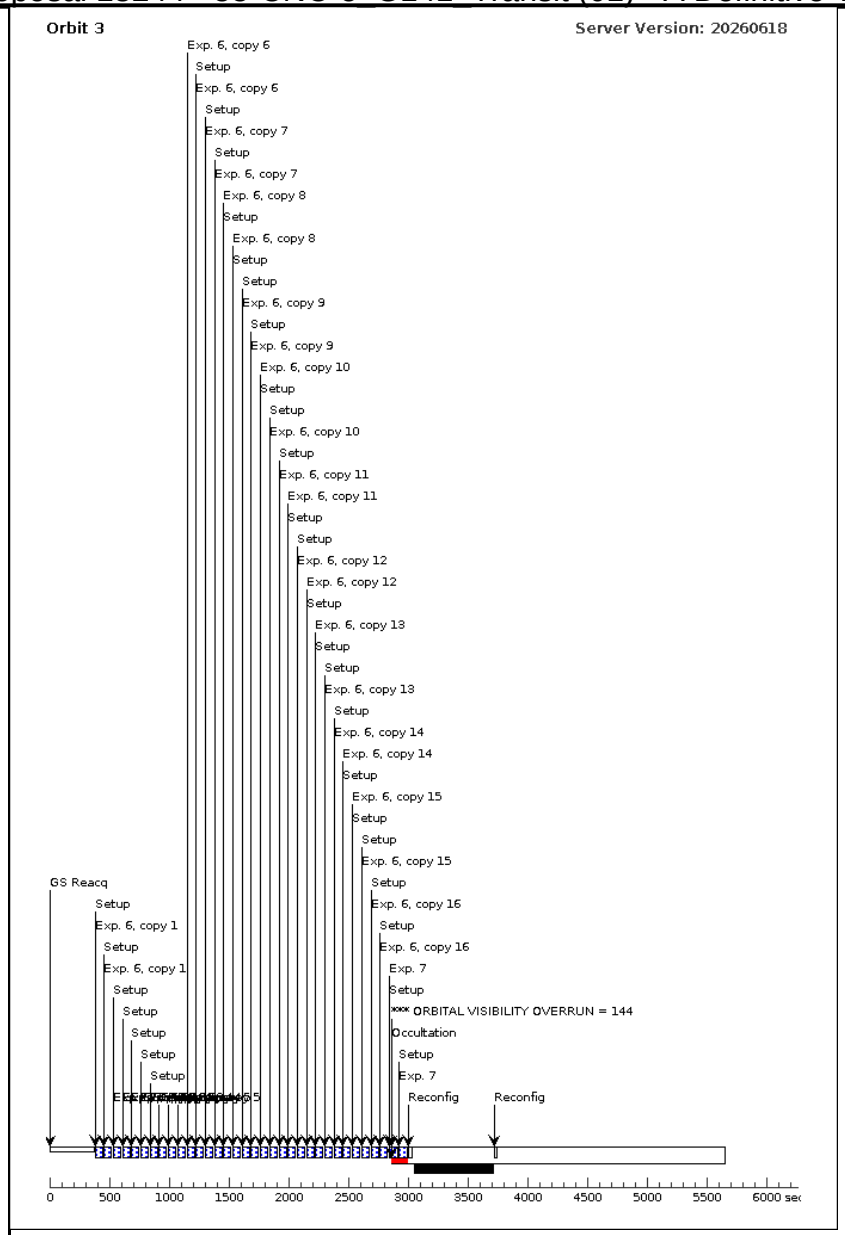
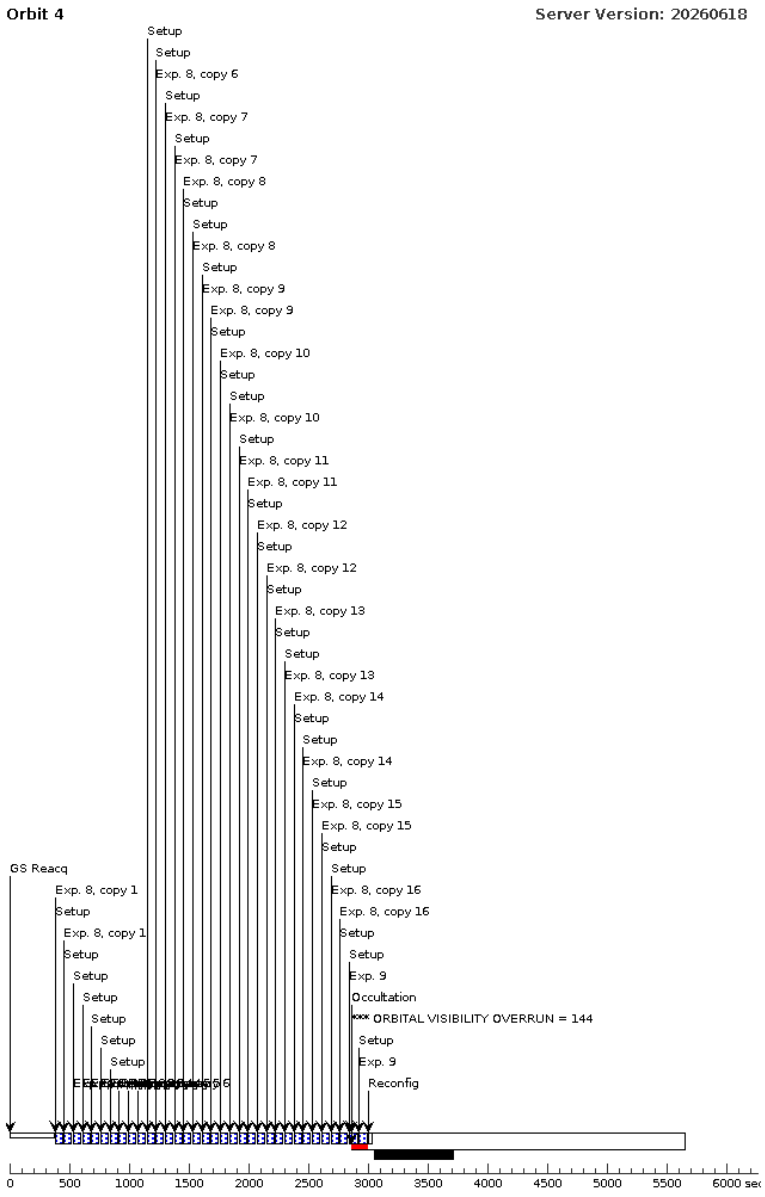
Exp. 4, copy 8
Exp. 4, copy 9
Exp. 4, copy 10
Exp. 4, copy 11
Exp. 4, copy 12
Exp. 4, copy 13
Exp. 4, copy 14
Exp. 4, copy 15
Exp. 4, copy 16
GS Reacq
Exp. 4, copy 1
Exp. 5
Occultation
*** ORBITAL VISIBILITY OVERRUN = 144
Reconfig
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec


Orbit 3
Server Version: 20260618
Exp. 6, copy 6
Setup
Exp. 6, copy 6
Setup
Exp. 6, copy 7
Setup
Exp. 6, copy 7
Exp. 6, copy 8
Setup
Exp. 6, copy 8
Setup
Setup
Exp. 6, copy 9
Setup
Exp. 6, copy 9
Exp. 6, copy 10
Setup
Setup
Exp. 6, copy 10
Setup
Exp. 6, copy 11
Exp. 6, copy 11
Setup
Setup
Exp. 6, copy 12
Exp. 6, copy 12
Setup
Exp. 6, copy 13
Setup
Setup
Exp. 6, copy 13
Setup
Exp. 6, copy 14
Exp. 6, copy 14
Setup
Exp. 6, copy 15
Setup
Setup
Exp. 6, copy 15
Setup
GS Reacq
Setup
Exp. 6, copy 16
Exp. 6, copy 1
Setup
Setup
Exp. 6, copy 16
Exp. 6, copy 1
Exp. 7
Setup
Setup
*** ORBITAL VISIBILITY OVERRUN = 144
Setup
Occultation
Setup
Setup
Exp. 7
Reconfig
Reconfig
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec


Orbit 4
Server Version: 20260618
Setup
Exp. 8, copy 6
Exp. 8, copy 7
Exp. 8, copy 8
Exp. 8, copy 9
Exp. 8, copy 10
Exp. 8, copy 11
Exp. 8, copy 12
Exp. 8, copy 13
Exp. 8, copy 14
Exp. 8, copy 15
Exp. 8, copy 16
GS Reacq
Exp. 8, copy 1
Exp. 9
Occultation
*** ORBITAL VISIBILITY OVERRUN = 144
Reconfig
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec