16086 - Comparing Escaping Metals and Heat Deposition in Ultra-hot Jupiters

Cycle: 27, Proposal Category: GO

(UV Initiative)

(Availability Mode: AVAILABLE)

INVESTIGATORS

Name	*Institution*	*E-Mail*
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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) HD-134004 WAVE	STIS/CCD STIS/NUV-MAMA	5	29-Jun-2020 12:00:15.0	yes
02	(1) HD-134004 BIAS	WFC3/UVIS	5	29-Jun-2020 12:00:22.0	yes

10 Total Orbits Used

ABSTRACT

Ultra-hot Jupiters (UHJs), Jovian exoplanets with equilibrium temperatures greater than 2250 K, have quickly become recognized as unique laboratories for understanding the effect of irradiation on planetary atmospheres. To properly understand atmospheric heating and escape on exoplanets, we must observe how exoplanets respond to the irradiation they receive by measuring atmospheric mass loss and by detecting the opacity

sources that determine the atmosphere's energy balance. We propose to observe the entire near-ultraviolet and optical transmission spectrum of a new high signal-to-noise ultra-hot Jupiter, WASP-178b. This planet shares many characteristics with the well-studied WASP-121b, but orbits the second hottest know exoplanet host star, allowing us to test the effects of host star irradiation spectrum on the atmosphere. By observing a transit in the UV at high spectral resolution with STIS/E230M, we will search for escaping metals, including Fe II and Mg II, and constrain the Roche lobe filling factor of the atmosphere. We can directly compare these results with recent observations of WASP-121b, providing insight into atmospheric escape mechanisms. We will also observe the entire NUV and optical transit spectrum at low spectral resolution with WFC3/UVIS/G280, allowing us to infer the presence of species like Fe, TiO, and VO while contributing necessary context to interpret the high resolution observations. This program will be the first comparative study of escaping metals and heat deposition in UHJs, some of the highest signal-to-noise exoplanet targets.

OBSERVING DESCRIPTION

All observations (STIS, COS, WFC3) observe an exoplanet transit or eclipse event. The spirit of exoplanet transit/eclipse observations is to attempt to gather as many spectra as possible before, during, and after a transit event with each image as identical as possible. As a transit observation consists of measuring a differential drop in stellar flux during the event, identical exposures are resistant to uncertainties in flat-fielding and very high photometric precisions are achievable. The STIS/E230M and WFC3/G280 observations require 5 orbit visits, as the baseline stellar flux and instrument systematics need to be measured before and after the transit/eclipse event, with the transit/eclipse event taking about 2.5 orbits orbits and is phase constrained to occur mid-way through the visit.

Visit

Proposal 16086, WASP-178b STIS/E230M (01), implementation Mon Jun 29 16:00:25 GMT 2020

Diagnostic Status: Warning

Scientific Instruments: STIS/NUV-MAMA, STIS/CCD

Special Requirements: Period 3.3448285 D AND ZERO-PHASE HJD2456927.06839

Comments: It is essential that all 5 orbits be scheduled in a continuous block. We have chosen WAVECAL=NO to avoid autowavecals at non-optimal times in the orbit and have scheduled wavecals manually, at the beginning of the visit and at the end of each orbit.

Diagnostics

(WASP-178b STIS/E230M (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(WASP-178b STIS/E230M (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(WASP-178b STIS/E230M (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(WASP-178b STIS/E230M (01)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	HD-134004 Alt Name1: WASP-178	RA: 15 09 4.8930 (227.2703875d) Dec: -42 42 17.79 (-42.70494d) Equinox: J2000	Proper Motion RA: -10.011395514612298 mas/yr Proper Motion Dec: -5.652962186847488 mas/yr Epoch of Position: 2000	V=9.95	Reference Frame: ICRS

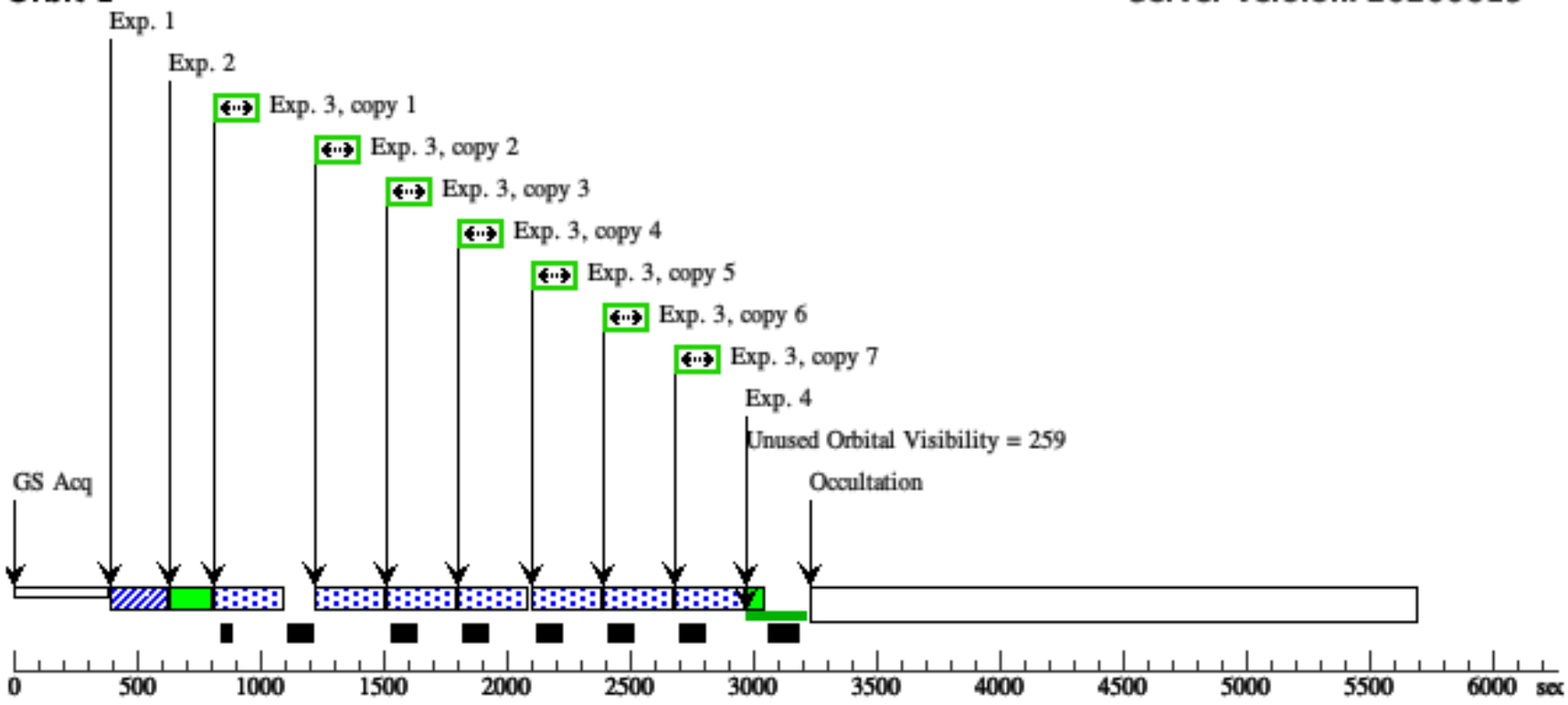
Comments: Position and Proper motion from GAIA DR2
Category=STAR
Description=[A0-A3 V-IV, EXTRA-SOLAR PLANET, EXTRA-SOLAR PLANETARY SYSTEM]
Extended=NO

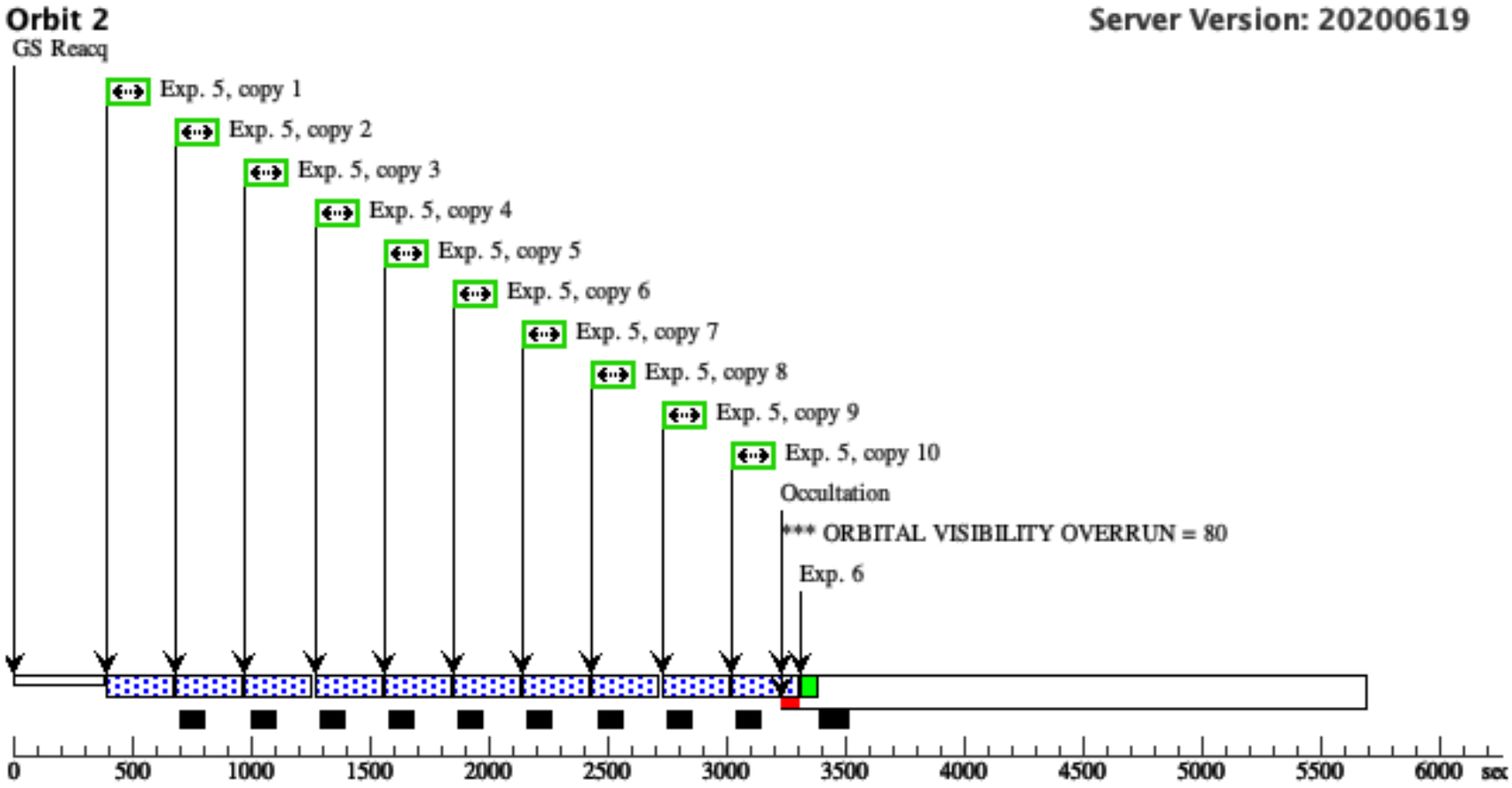
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ, phase constrained (STIS.ta.143 1312)	(1) HD-134004	STIS/CCD, ACQ, F28X50LP	MIRROR		PHASE 0.952 TO 0. 956	Sequence 1-4 Non-In t in WASP-178b STI S/E230M (01)	0.3 Secs (0.3 Secs) *[==>]*	***[1]***
	Comments: ETC gives saturation in 0.6 seconds. 0.3 seconds gives SNR 386.								
2	WAVECAL	WAVE	STIS/NUV-MAMA, ACCUM, 0.2X0.2	E230M 2707 A			Sequence 1-4 Non-In t in WASP-178b STI S/E230M (01)	*[==>]*	***[1]***
	Comments: Auto-wavecal=NO, but we manually request wavecals at the beginning of the visit and then at the end of each orbit.								
3	Orbit #1 (STIS.sp.14 31631)	(1) HD-134004	STIS/NUV-MAMA, ACCUM, 0.2X0.2	E230M 2707 A	WAVECAL=NO		Sequence 1-4 Non-In t in WASP-178b STI S/E230M (01)	268 Secs X 7 (1876 Secs) *[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]* *[==>(Copy 7)]*	***[1]***
	Comments: Exposure time calculated to get 10 frames per orbit (except the first orbit because of target acq) to obtain enough time fidelity to model the systemics and transit time series'. This results in an SNR of ~15 p er frame at 2707 angstrom.								
4	WAVECAL	WAVE	STIS/NUV-MAMA, ACCUM, 0.2X0.2	E230M 2707 A			Sequence 1-4 Non-In t in WASP-178b STI S/E230M (01)	*[==>]*	***[1]***
5	Orbit #2 (STIS.sp.14 31631)	(1) HD-134004	STIS/NUV-MAMA, ACCUM, 0.2X0.2	E230M 2707 A	WAVECAL=NO		Sequence 5-6 Non-In t in WASP-178b STI S/E230M (01)	268 Secs X 10 (2680 Secs) *[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]* *[==>(Copy 7)]* *[==>(Copy 8)]* *[==>(Copy 9)]* *[==>(Copy 10)]*	***[2]***
6	WAVECAL	WAVE	STIS/NUV-MAMA, ACCUM, 0.2X0.2	E230M 2707 A			Sequence 5-6 Non-In t in WASP-178b STI S/E230M (01)	*[==>]*	***[2]***

	7	Orbit #2 (STIS.sp.14 31631)	(1) HD-134004	STIS/NUV-MAMA, ACCUM, 0.2X0.2	E230M 2707 A	WAVECAL=NO	Sequence 7-8 Non-Int in WASP-178b STIS/E230M (01)	268 Secs X 10 (2680 Secs) *[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]* *[==>(Copy 7)]* *[==>(Copy 8)]* *[==>(Copy 9)]* *[==>(Copy 10)]*	***[3]***
	8	WAVECAL	WAVE	STIS/NUV-MAMA, ACCUM, 0.2X0.2	E230M 2707 A		Sequence 7-8 Non-Int in WASP-178b STIS/E230M (01)	*[==>]*	***[3]***
	9	Orbit #2 (STIS.sp.14 31631)	(1) HD-134004	STIS/NUV-MAMA, ACCUM, 0.2X0.2	E230M 2707 A	WAVECAL=NO	Sequence 9-10 Non-Int in WASP-178b STIS/E230M (01)	268 Secs X 10 (2680 Secs) *[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]* *[==>(Copy 7)]* *[==>(Copy 8)]* *[==>(Copy 9)]* *[==>(Copy 10)]*	***[4]***
	10	WAVECAL	WAVE	STIS/NUV-MAMA, ACCUM, 0.2X0.2	E230M 2707 A		Sequence 9-10 Non-Int in WASP-178b STIS/E230M (01)	*[==>]*	***[4]***
	11	Orbit #2 (STIS.sp.14 31631)	(1) HD-134004	STIS/NUV-MAMA, ACCUM, 0.2X0.2	E230M 2707 A	WAVECAL=NO	Sequence 11-12 Non-Int in WASP-178b STIS/E230M (01)	268 Secs X 10 (2680 Secs) *[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]* *[==>(Copy 7)]* *[==>(Copy 8)]* *[==>(Copy 9)]* *[==>(Copy 10)]*	***[5]***
	12	WAVECAL	WAVE	STIS/NUV-MAMA, ACCUM, 0.2X0.2	E230M 2707 A		Sequence 11-12 Non-Int in WASP-178b STIS/E230M (01)	*[==>]*	***[5]***

Orbit Structure

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Exp. 5, copy 3
Exp. 5, copy 4
Exp. 5, copy 5
Exp. 5, copy 6
Exp. 5, copy 7
Exp. 5, copy 8
Exp. 5, copy 9
Exp. 5, copy 10
Occultation
*** ORBITAL VISIBILITY OVERRUN = 80
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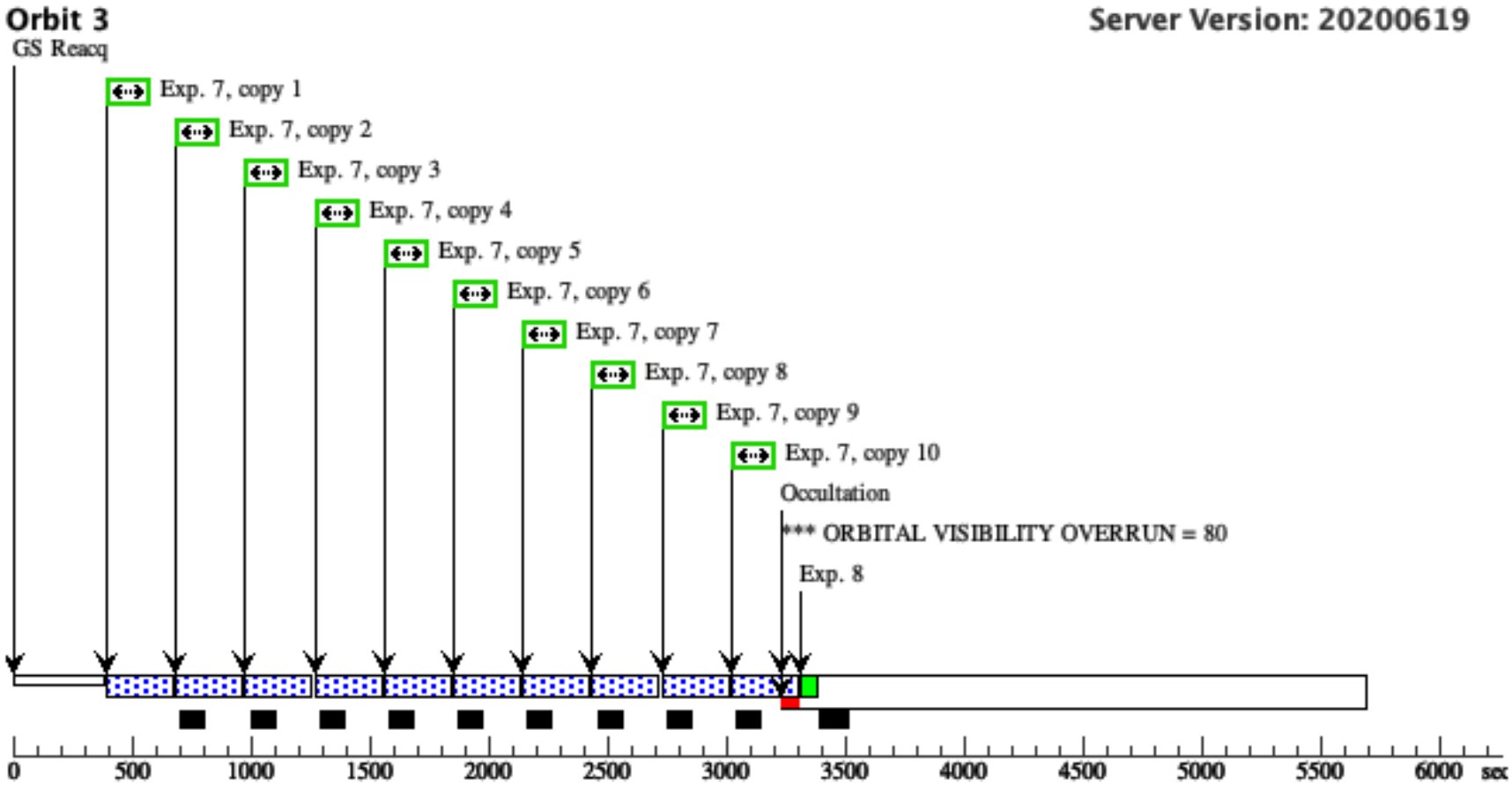
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec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Exp. 7, copy 3
Exp. 7, copy 4
Exp. 7, copy 5
Exp. 7, copy 6
Exp. 7, copy 7
Exp. 7, copy 8
Exp. 7, copy 9
Exp. 7, copy 10
Occultation
*** ORBITAL VISIBILITY OVERRUN = 80
Exp. 8
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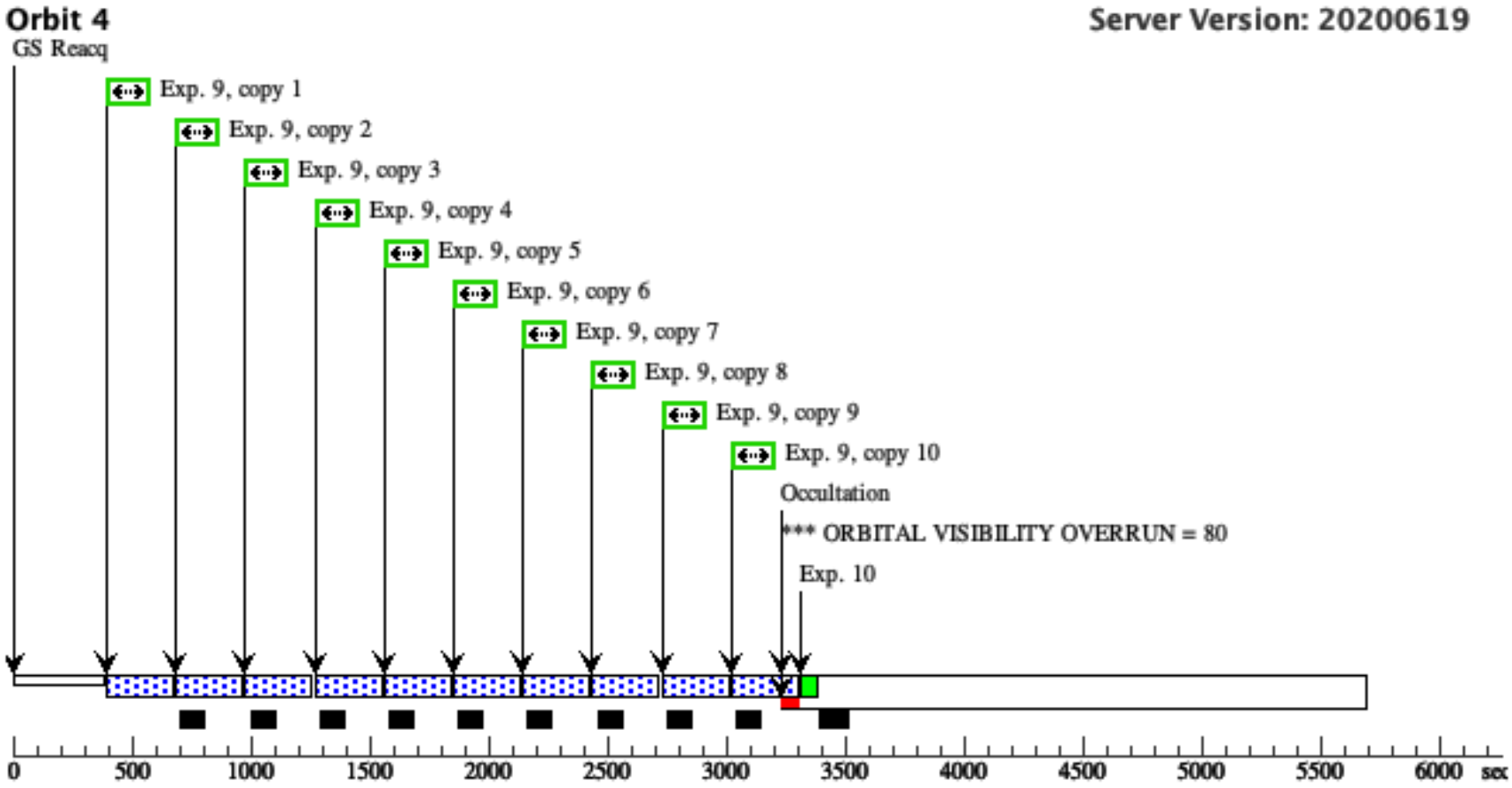
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec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GS Reacq
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Exp. 9, copy 2
Exp. 9, copy 3
Exp. 9, copy 4
Exp. 9, copy 5
Exp. 9, copy 6
Exp. 9, copy 7
Exp. 9, copy 8
Exp. 9, copy 9
Exp. 9, copy 10
Occultation
*** ORBITAL VISIBILITY OVERRUN = 80
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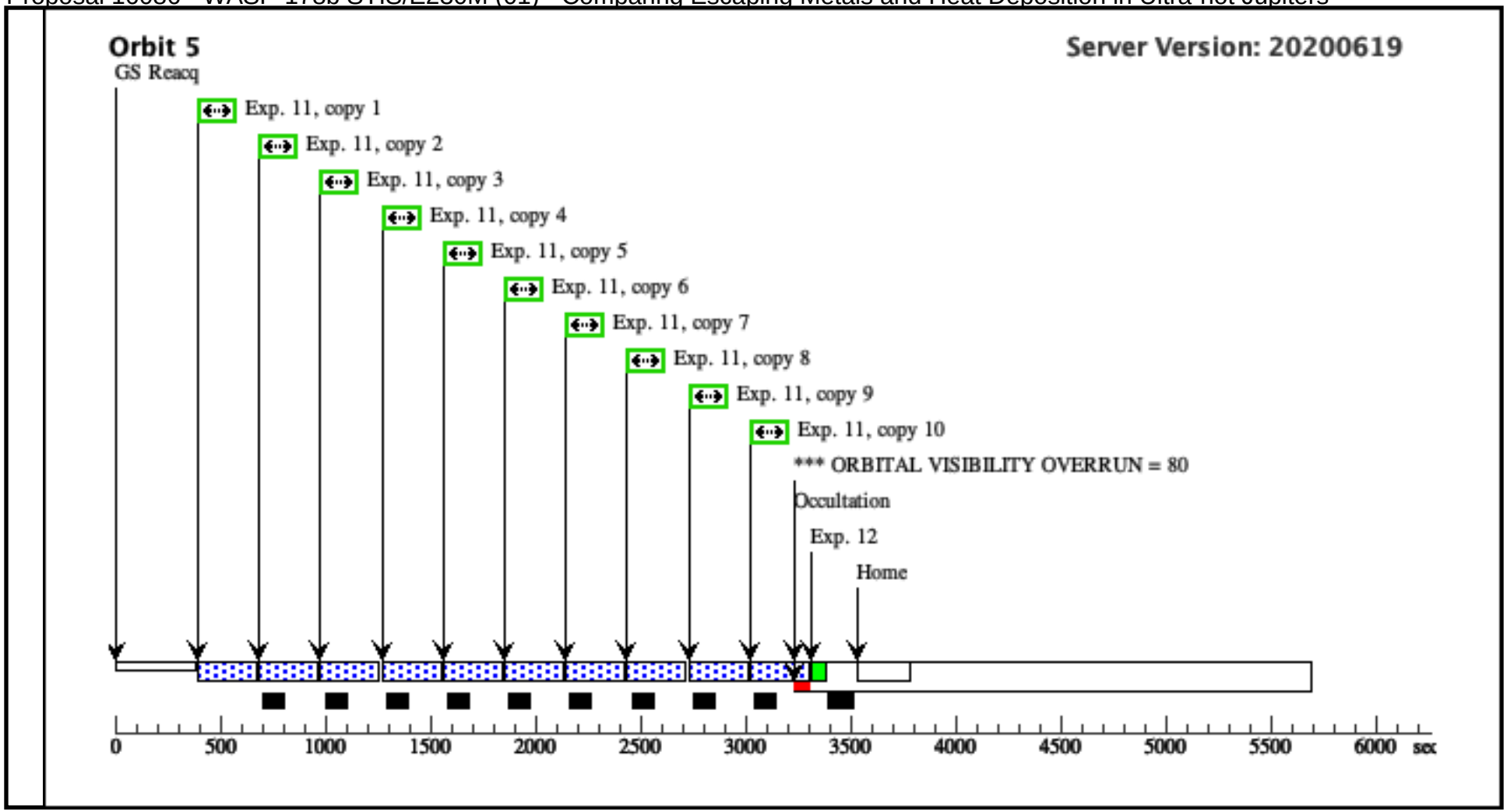
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec


Orbit 5
Server Version: 20200619
GS Reacq
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Exp. 11, copy 2
Exp. 11, copy 3
Exp. 11, copy 4
Exp. 11, copy 5
Exp. 11, copy 6
Exp. 11, copy 7
Exp. 11, copy 8
Exp. 11, copy 9
Exp. 11, copy 10
*** ORBITAL VISIBILITY OVERRUN = 80
Occultation
Exp. 12
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec

Visit

Proposal 16086, WASP-178b WFC3/UVIS (02), implementation Mon Jun 29 16:00:26 GMT 2020

Diagnostic Status: Warning

Scientific Instruments: WFC3/UVIS

Special Requirements: ORIENT 7D TO 19 D; ORIENT 31D TO 33 D; ORIENT 51D TO 199 D; ORIENT 211D TO 215 D; ORIENT 231D TO 258 D; ORIENT 329D TO 347 D; Period 3.3448285 D AND ZERO-PHASE HJD2456927.06839

Comments: The optional parameters SIZEAXIS1=2250 and SIZEAXIS2=590 are used for all exposures to minimize the data volume and hence time lost to buffer dumps. This is fine for the data that needs to be obtained because the spectum of WASP-178 will occupy only a narrow swath of pixel rows within the field. This also requires the use of optional parameters CENTERAXIS1 and CENTERAXIS2 in order to "steer" the location of the subarray readout so that it is centered on the target spectrum. If we were positioning on chip 1 we could set CENTERAXIS2=TARGET. However, for the field center (nominal "UVIS" aperture) location on chip 2, we cannot center the subarray on the target because this would cause the subarray to extend into the chip gap, so we hardwire CENTERAXIS1=2136 and CENTERAXIS2=1216, which is intended to put the vertical center of the subarray on the zeroth order of the target spectrum.

Chip 2 biases are taken at the end of the visit because the grism exposures use custom subarrays, which will not have matching biases from the WFC3 bias calibration program.

For each visit we have phase constraints around the event of the planetary transit, both the orbital period of the planet and the phasing needed are placed on the target acq exposure.

To avoid any contamination by several dim, nearby stars, we have placed Orient Ranges for the observations to reach our science goals. This results in ~15 transit opportunities for the UVIS observations in the coming months.

Diagnostics

(WASP-178b WFC3/UVIS (02)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(WASP-178b WFC3/UVIS (02)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(WASP-178b WFC3/UVIS (02)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(WASP-178b WFC3/UVIS (02)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	HD-134004 Alt Name1: WASP-178	RA: 15 09 4.8930 (227.2703875d) Dec: -42 42 17.79 (-42.70494d) Equinox: J2000	Proper Motion RA: -10.011395514612298 mas/yr Proper Motion Dec: -5.652962186847488 mas/yr Epoch of Position: 2000	V=9.95	Reference Frame: ICRS

Comments: Position and Proper motion from GAIA DR2
Category=STAR
Description=[A0-A3 V-IV, EXTRA-SOLAR PLANET, EXTRA-SOLAR PLANETARY SYSTEM]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Filter ACQ (WFC3UVIS.im.1431601)	(1) HD-134004	WFC3/UVIS, ACCUM, G280-REF	F467M	FLASH=12; CENTERAXIS1=2136; CENTERAXIS2=1216; SIZEAXIS1=2250; SIZEAXIS2=590	POS TARG null,-50; PHASE 0.94896 TO 0.95804	Sequence 1-2 Non-Int in WASP-178b WFC3/UVIS (02)	0.5 Secs (0.5 Secs) *[==>]*	***[1]***

Comments: For target acq, saturation in 0.99 seconds. 0.5 seconds gives SNR of 391.

Nominal "UVIS" aperture is ~10" above the chip gap on chip 1; a Y-postarg of about -50" places the target near the center of subarray on chip 2.

SIZEAXIS1=2250 and SIZEAXIS2=590 are used to minimize data volume, while CENTERAXIS1 and CENTERAXIS2 are used to center the subarray readout on the zeroth order of G280 spectrum. These parameters are based upon similar observations obtained successfully in GOs 13574 & 15288 but have been adjusted to better center the zeroth order spectrum on the sub-array.

We use FLASH=12 to meet the nominal count level. These parameters are based upon similar observations obtained successfully in GOs 13574 & 15288.

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
2	Orbit 1 (WFC3UVIS.sp.1432540)	(1) HD-134004	WFC3/UVIS, ACCUM, UVIS	G280	CENTERAXIS1=2136; CENTERAXIS2=1216; SIZEAXIS1=2250; SIZEAXIS2=590; FLASH=9	POS TARG null,-50	Sequence 1-2 Non-Int in WASP-178b WFC3/UVIS (02)	40 Secs X 23 (920 Secs) *[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]* *[==>(Copy 7)]* *[==>(Copy 8)]* *[==>(Copy 9)]* *[==>(Copy 10)]* *[==>(Copy 11)]* *[==>(Copy 12)]* *[==>(Copy 13)]* *[==>(Copy 14)]* *[==>(Copy 15)]* *[==>(Copy 16)]* *[==>(Copy 17)]* *[==>(Copy 18)]* *[==>(Copy 19)]* *[==>(Copy 20)]* *[==>(Copy 21)]* *[==>(Copy 22)]* *[==>(Copy 23)]*	***[1]***

Comments: With exposure time of 40 seconds, a few pixels will be slightly saturated in order to improve the duty cycle (since overhead > exposure time). The -1 order will contain complementary, non-saturated information for any region saturated. Additionally, for the few saturated pixels this spectra can be recovered in the +1 order by summation over pixels that have been bled into as a result of over-saturation (ISR WFC3 2010-10).

We also add a FLASH of 9, which when combined with the natural background of about 4 e- per exposure will result in >12 e- and better CTE.

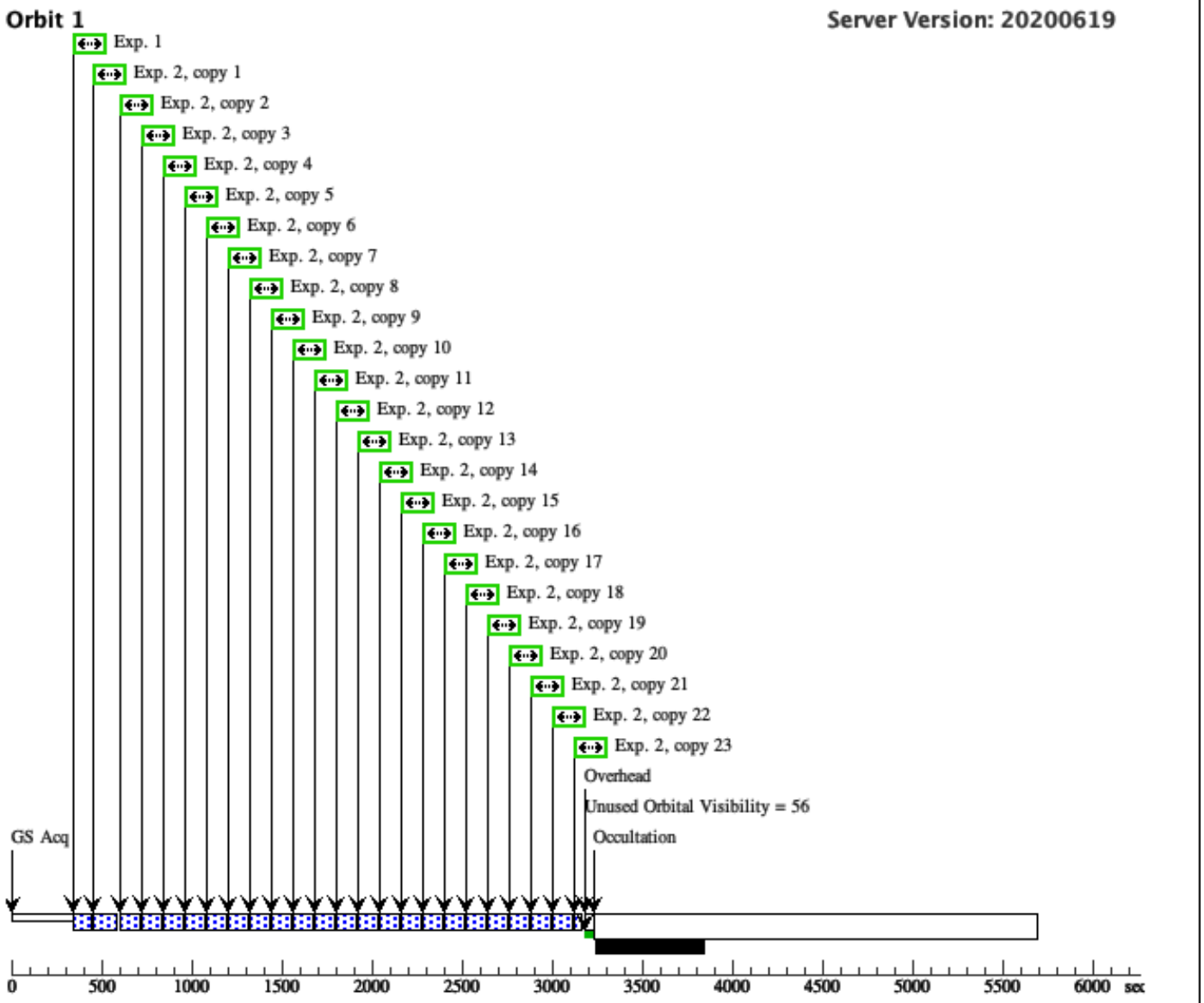
	3	Orbit 2 (WFC3UVIS.sp.1431612)	(1) HD-134004	WFC3/UVIS, ACCUM, UVIS	G280	CENTERAXIS1=2136; CENTERAXIS2=1216; SIZEAXIS2=590; SIZEAXIS1=2250; FLASH=9	POS TARG null,-50	Sequence 3-3 Non-Int in WASP-178b WFC3/UVIS (02)	40 Secs X 25 (1000 Secs) *[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]* *[==>(Copy 7)]* *[==>(Copy 8)]* *[==>(Copy 9)]* *[==>(Copy 10)]* *[==>(Copy 11)]* *[==>(Copy 12)]* *[==>(Copy 13)]* *[==>(Copy 14)]* *[==>(Copy 15)]* *[==>(Copy 16)]* *[==>(Copy 17)]* *[==>(Copy 18)]* *[==>(Copy 19)]* *[==>(Copy 20)]* *[==>(Copy 21)]* *[==>(Copy 22)]* *[==>(Copy 23)]* *[==>(Copy 24)]* *[==>(Copy 25)]*	***[2]***

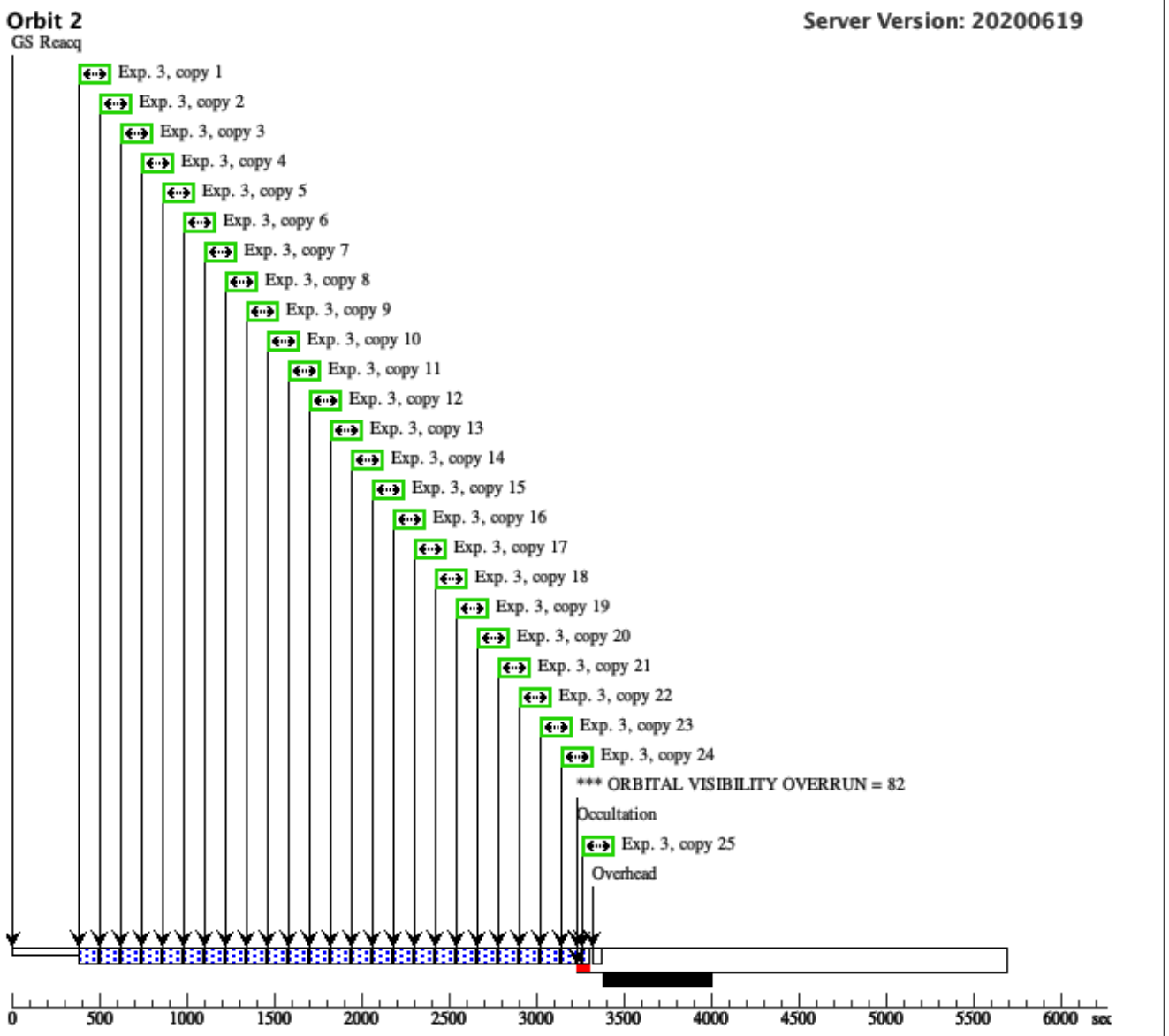
	4	Orbit 3 (WFC3UVIS.sp.1431612)	(1) HD-134004	WFC3/UVIS, ACCUM, UVIS	G280	CENTERAXIS1=2136; CENTERAXIS2=1216; SIZEAXIS2=590; SIZEAXIS1=2250; FLASH=9	POS TARG null,-50	Sequence 4-4 Non-Int in WASP-178b WFC3/UVIS (02)	40 Secs X 25 (1000 Secs) *[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]* *[==>(Copy 7)]* *[==>(Copy 8)]* *[==>(Copy 9)]* *[==>(Copy 10)]* *[==>(Copy 11)]* *[==>(Copy 12)]* *[==>(Copy 13)]* *[==>(Copy 14)]* *[==>(Copy 15)]* *[==>(Copy 16)]* *[==>(Copy 17)]* *[==>(Copy 18)]* *[==>(Copy 19)]* *[==>(Copy 20)]* *[==>(Copy 21)]* *[==>(Copy 22)]* *[==>(Copy 23)]* *[==>(Copy 24)]* *[==>(Copy 25)]*	***[3]***

	5	Orbit 4 (WFC3UVIS.sp.1431612)	(1) HD-134004	WFC3/UVIS, ACCUM, UVIS	G280	CENTERAXIS1=2136; CENTERAXIS2=1216; SIZEAXIS2=590; SIZEAXIS1=2250; FLASH=9	POS TARG null,-50	Sequence 5-5 Non-Int in WASP-178b WFC3/UVIS (02)	40 Secs X 25 (1000 Secs) *[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]* *[==>(Copy 7)]* *[==>(Copy 8)]* *[==>(Copy 9)]* *[==>(Copy 10)]* *[==>(Copy 11)]* *[==>(Copy 12)]* *[==>(Copy 13)]* *[==>(Copy 14)]* *[==>(Copy 15)]* *[==>(Copy 16)]* *[==>(Copy 17)]* *[==>(Copy 18)]* *[==>(Copy 19)]* *[==>(Copy 20)]* *[==>(Copy 21)]* *[==>(Copy 22)]* *[==>(Copy 23)]* *[==>(Copy 24)]* *[==>(Copy 25)]*	***[4]***

	6	Orbit 5 (WFC3UVIS.sp.1431612)	(1) HD-134004	WFC3/UVIS, ACCUM, UVIS	G280	CENTERAXIS1=2136; CENTERAXIS2=1216; SIZEAXIS2=590; SIZEAXIS1=2250; FLASH=9	POS TARG null,-50	Sequence 6-7 Non-Int in WASP-178b WFC3/UVIS (02)	40 Secs X 25 (1000 Secs) *[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]* *[==>(Copy 7)]* *[==>(Copy 8)]* *[==>(Copy 9)]* *[==>(Copy 10)]* *[==>(Copy 11)]* *[==>(Copy 12)]* *[==>(Copy 13)]* *[==>(Copy 14)]* *[==>(Copy 15)]* *[==>(Copy 16)]* *[==>(Copy 17)]* *[==>(Copy 18)]* *[==>(Copy 19)]* *[==>(Copy 20)]* *[==>(Copy 21)]* *[==>(Copy 22)]* *[==>(Copy 23)]* *[==>(Copy 24)]* *[==>(Copy 25)]*	***[5]***
	7	Bias	BIAS	WFC3/UVIS, ACCUM, UVIS	DEF	CENTERAXIS1=2136; CENTERAXIS2=1216; SIZEAXIS1=2250; SIZEAXIS2=590		Sequence 6-7 Non-Int in WASP-178b WFC3/UVIS (02)	0.0 Secs (0 Secs) *[==>]*	***[5]***

Orbit Structure

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Exp. 3, copy 18
Exp. 3, copy 19
Exp. 3, copy 20
Exp. 3, copy 21
Exp. 3, copy 22
Exp. 3, copy 23
Exp. 3, copy 24
*** ORBITAL VISIBILITY OVERRUN = 82
Occultation
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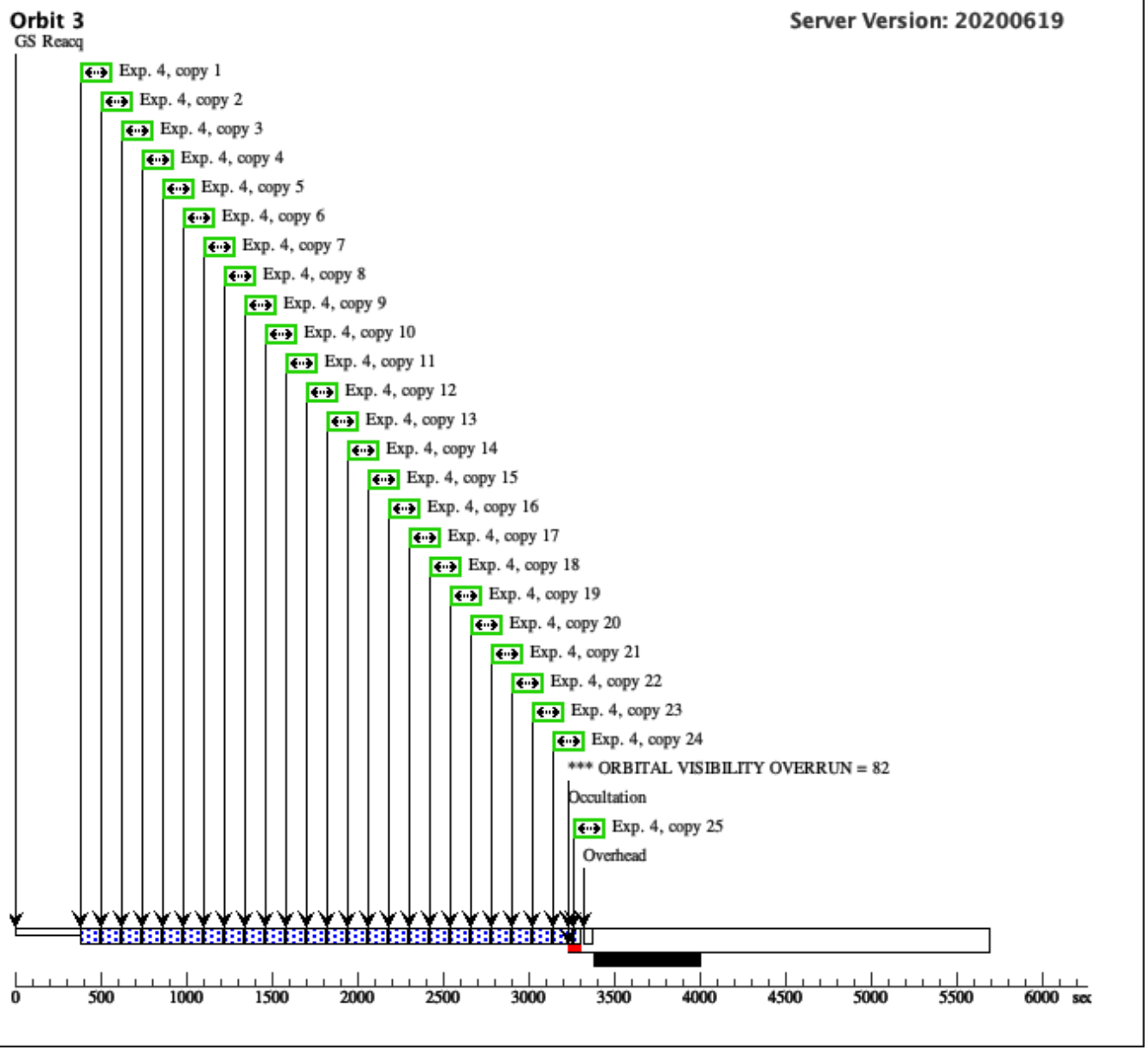
4000
4500
5000
5500
6000
sec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GS Reacq
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*** ORBITAL VISIBILITY OVERRUN = 82
Occultation
Exp. 4, copy 25
Overhead
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1500
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2500
3000
3500
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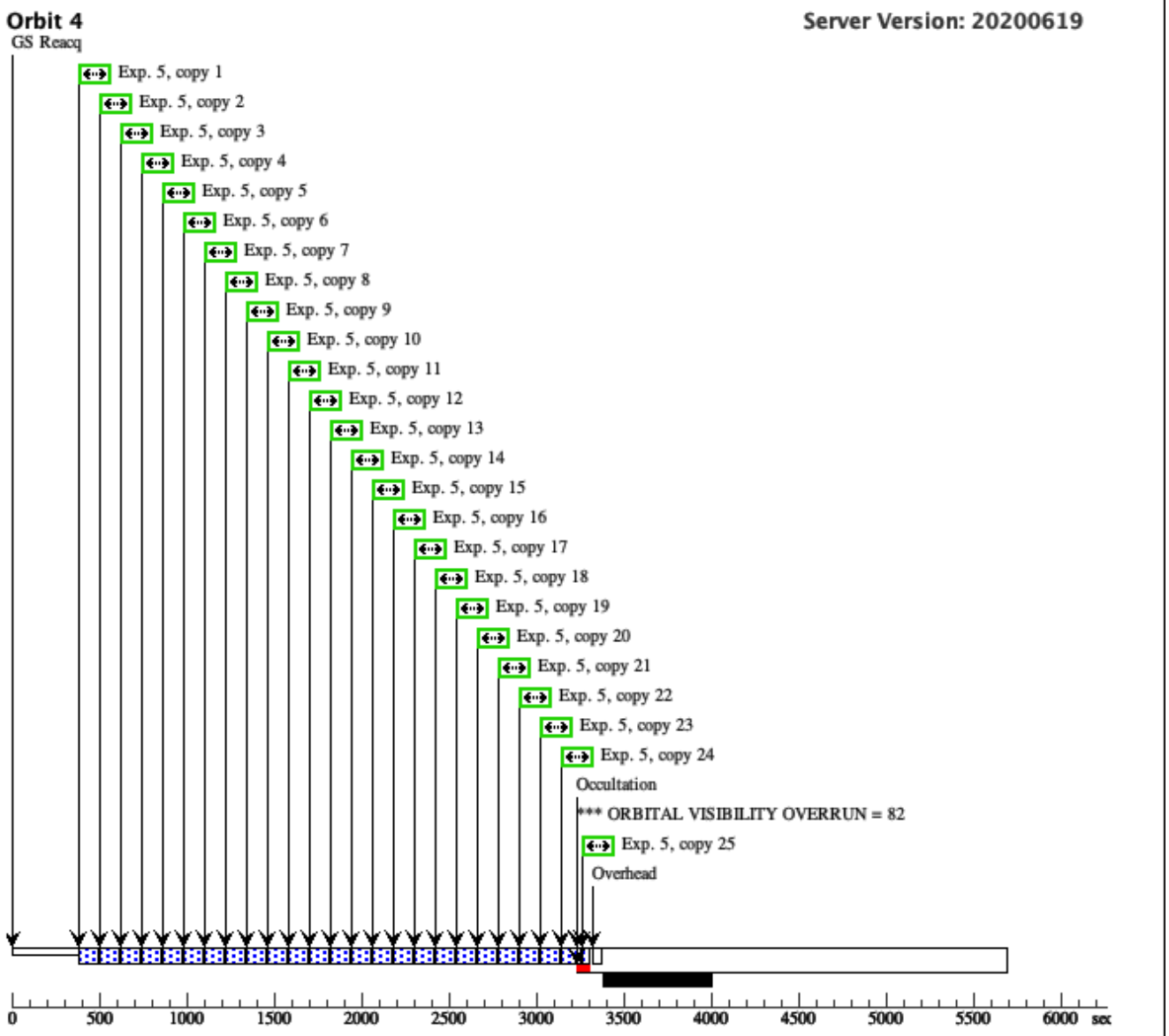
6000
sec


Orbit 4
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GS Reacq
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Exp. 5, copy 7
Exp. 5, copy 8
Exp. 5, copy 9
Exp. 5, copy 10
Exp. 5, copy 11
Exp. 5, copy 12
Exp. 5, copy 13
Exp. 5, copy 14
Exp. 5, copy 15
Exp. 5, copy 16
Exp. 5, copy 17
Exp. 5, copy 18
Exp. 5, copy 19
Exp. 5, copy 20
Exp. 5, copy 21
Exp. 5, copy 22
Exp. 5, copy 23
Exp. 5, copy 24
Occultation
*** ORBITAL VISIBILITY OVERRUN = 82
Exp. 5, copy 25
Overhead
0
500
1000
1500
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3500
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4500
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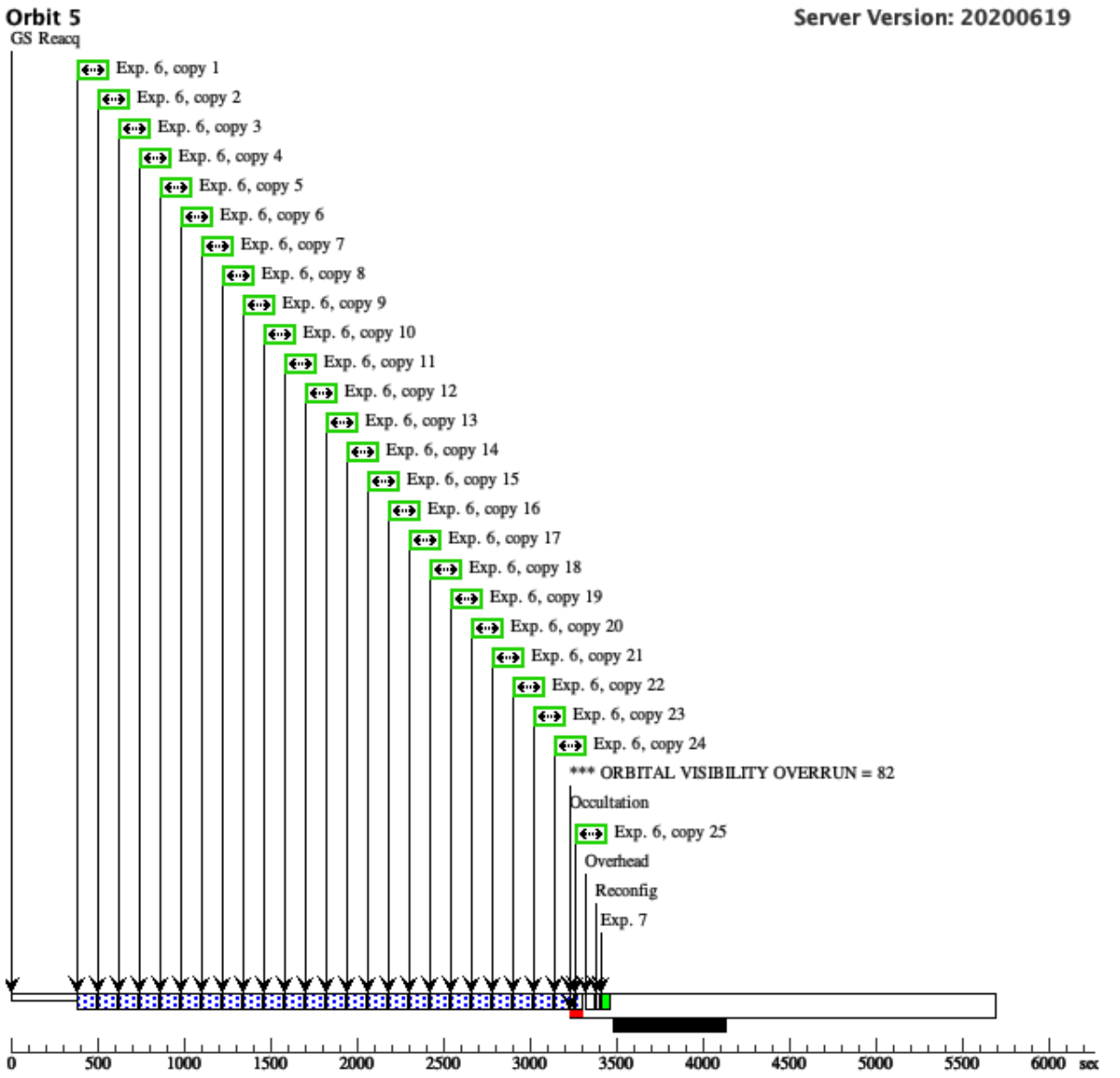
6000
sec


Orbit 5
Server Version: 20200619
GS Reacq
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Exp. 6, copy 2
Exp. 6, copy 3
Exp. 6, copy 4
Exp. 6, copy 5
Exp. 6, copy 6
Exp. 6, copy 7
Exp. 6, copy 8
Exp. 6, copy 9
Exp. 6, copy 10
Exp. 6, copy 11
Exp. 6, copy 12
Exp. 6, copy 13
Exp. 6, copy 14
Exp. 6, copy 15
Exp. 6, copy 16
Exp. 6, copy 17
Exp. 6, copy 18
Exp. 6, copy 19
Exp. 6, copy 20
Exp. 6, copy 21
Exp. 6, copy 22
Exp. 6, copy 23
Exp. 6, copy 24
*** ORBITAL VISIBILITY OVERRUN = 82
Occultation
Exp. 6, copy 25
Overhead
Reconfig
Exp. 7
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec