15820 - Measuring the first [Fe/H] of an exoplanet

Cycle: 27, Proposal Category: GO

(Availability Mode: SUPPORTED)

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) HD-195689	WFC3/IR	6	10-Jan-2020 12:00:41.0	yes
H1	(1) HD-195689	WFC3/IR	6	10-Jan-2020 12:01:11.0	yes

12 Total Orbits Used

ABSTRACT

Ultra-hot Jupiters are planets whose day-sides, hotter than 2,200 K, offer the opportunity to study the physics and chemistry of planetary atmospheres in a regime that is not accessible in the solar system or in other exoplanets. At such temperatures, molecules begin to dissociate and atoms become ionized, which gives rise to opacity sources such as H- or metal lines, that are more common in stars than planets. Indeed, recent observations at high

resolution (R>100,000) from the ground revealed lines from metals in the atmosphere of the hottest planet of this category: KELT-9b (4,000 K). The most prominent lines belong to neutral and ionized iron. However, this kind of observations suffer from the contamination of Earth atmosphere, resulting in the loss of the planetary continuum. This is what prevented previous authors from measuring [Fe/H] for this exoplanet. With 6 HST orbits, we will observe the secondary eclipse of KELT-9b to: (1) provide the first direct detection of H-, responsible for generating the continuum in UHJ spectra, and constrain the overall metal enrichment of the exoplanet through the strength of this feature; (2) use the measured continuum level to calibrate ground-based high-resolution observations and provide the first measurement of [Fe/H] in an exoplanet.

OBSERVING DESCRIPTION

We propose to collect WFC3 spectra during one eclipse of KELT-9b (Hmag = 7.492), covered with a single HST visit. To properly sample the in-transit and out-of-transit baseline requires 6 consecutive orbits. These orbits need to be consecutive in order to sample the eclipse event. Two orbits will occur before eclipse, three during eclipse/ingress/egress and one after eclipse. The star is bright, thus we will increase the duty cycle by employing bi-directional spatial scans at 0.4380 arcsecs/sec. We will use a 512x512 subarray in SPARS25 mode with NSAMP = 5. The total scan length spans 334.973 pixels leaving enough space on the detector for background correction. A total of 19 frames will be obtained in each orbit (18 for the first orbit). Each orbit will be preceeded by one F164N direct image for the wavelength calibration and as sanity check for telescope pointing. The last exposure of each sequence for obits >=2 is performed with a forward scan only, to maximize the duty cycle. We offset the telescope in the Y direction with the POS TARG keyword to accomodate the spectrum in the center of the subarray (and avoid bleeding outside of the detector). We expect peak counts of 30360 electrons. With PANDEXO, we compute that we will reach an uncertainty of 26 ppm in 15 spectral bins on the eclipse depth after discarding the first orbit, as is customary with HST WFC3 transit/eclipse observations.

Estimated impact of reduced-gyro mode: this program should not be deeply affected by the reduced-gyro mode. The period of the eclipse is short, hopefully mitigating the reduced schedulability. Our serpentine spatial scan-rate is comfortably lower than the maximum 1 arcsec/sec allowed. No roll angle constraints are set for our program.

Visit

Proposal 15820, Kelt-9b_WFC3_G141 (01), failed Fri Jan 10 17:01:14 GMT 2020

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: SCHED 100%; Period 1.4811235 D AND ZERO-PHASE HJD2457095.68572

Comments: It is essential that the 6 HST orbits are scheduled in a continuous block, to properly sample the eclipse event.

We have defined each HST orbit within a non-interruptible sequence, to ensure that all exposures defined within the sequence are taken during the same HST orbit.

We have defined phase constraints to cover the eclipse event, with the requirement that at least two orbits occur before the eclipse, and one after.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	HD-195689	RA: 20 31 26.3759 (307.8598996d) Dec: +39 56 20.10 (39.93892d) Equinox: J2000	Proper Motion RA: 0.0014544898835288454 sec of time/yr Proper Motion Dec: 0.021478 arcsec/yr Epoch of Position: 2015.5	V=7.56 Hmag = 7.492	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=STAR
Description=[A0-A3 V-IV, EXTRA-SOLAR PLANET, EXTRA-SOLAR PLANETARY SYSTEM]

Exposures

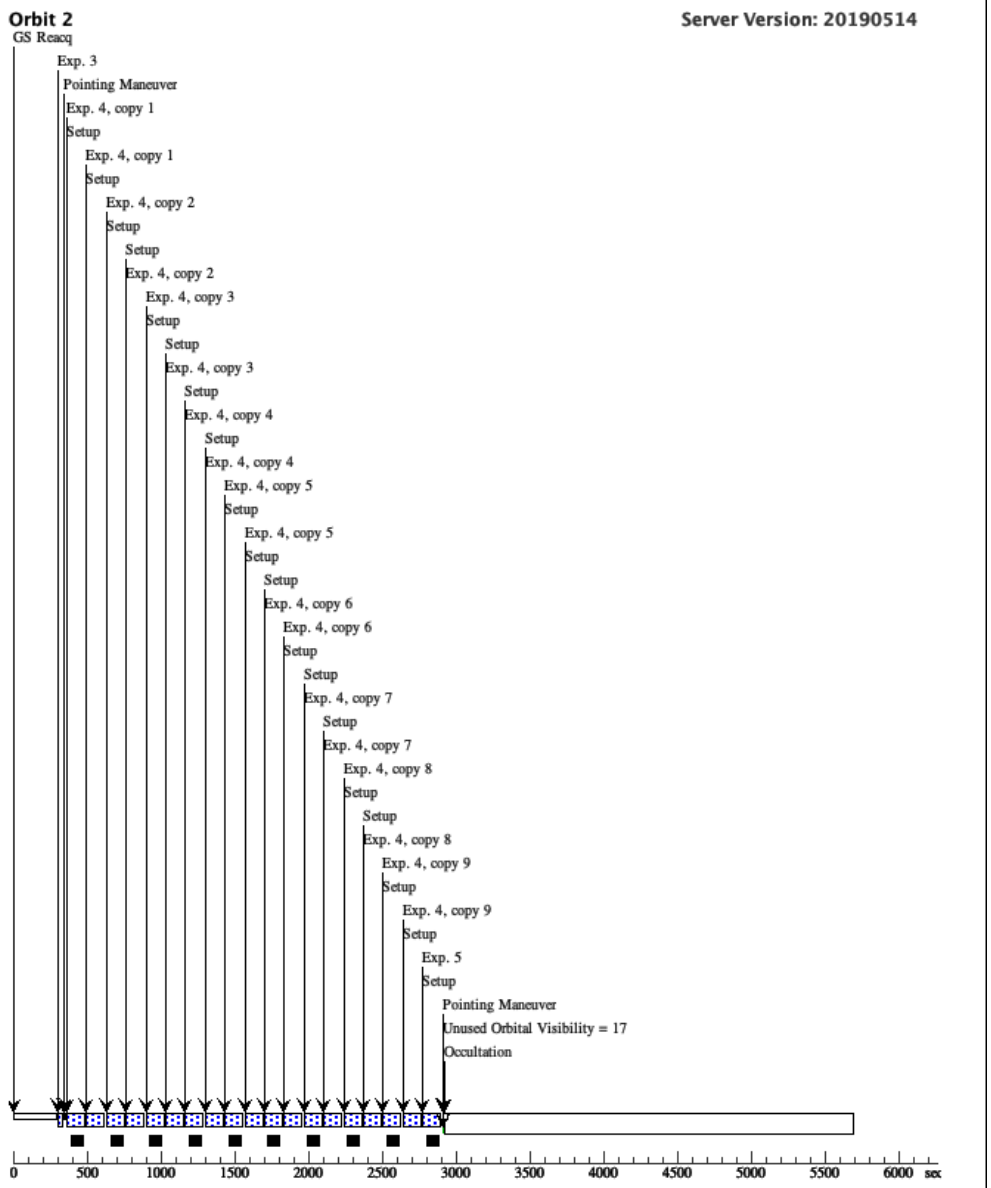
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	F164N	NSAMP=2; SAMP-SEQ=RAPID	POS TARG null,-20; PHASE 0.340 TO 0.363	Sequence 1-2 Non-Int in Kelt-9b_WFC3_G141 (01)	1.706054 Secs (1.706 Secs) *[==>]*	***[1]***
2		(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=SPARS25; NSAMP=5	POS TARG null,-20; SPATIAL SCAN 0.438,90.0 Degrees,Round trip	Sequence 1-2 Non-Int in Kelt-9b_WFC3_G141 (01)	92.538031 Secs X 9 (1665.685 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)]*	***[1]***
3		(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	F164N	NSAMP=2; SAMP-SEQ=RAPID	POS TARG null,-20	Sequence 3-5 Non-Int in Kelt-9b_WFC3_G141 (01)	1.706054 Secs (1.706 Secs) *[==>]*	***[2]***
4		(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=SPARS25; NSAMP=5	POS TARG null,-20; SPATIAL SCAN 0.438,90.0 Degrees,Round trip	Sequence 3-5 Non-Int in Kelt-9b_WFC3_G141 (01)	92.538031 Secs X 9 (1665.685 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)]*	***[2]***

5	(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=SPARS25; NSAMP=5	POS TARG null,-20; SPATIAL SCAN 0.4 38,90.0 Degrees,Forward	Sequence 3-5 Non-Int in Kelt-9b_WFC3_G141 (01)	92.538031 Secs (92.538 Secs) *[==>]*	***[2]***
6	(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	F164N	NSAMP=2; SAMP-SEQ=RAPID	POS TARG null,-20	Sequence 6-8 Non-Int in Kelt-9b_WFC3_G141 (01)	1.706054 Secs (1.706 Secs) *[==>]*	***[3]***
7	(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=SPARS25; NSAMP=5	POS TARG null,-20; SPATIAL SCAN 0.4 38,90.0 Degrees,Round trip	Sequence 6-8 Non-Int in Kelt-9b_WFC3_G141 (01)	92.538031 Secs X 9 (1665.685 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)]*	***[3]***
8	(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=SPARS25; NSAMP=5	POS TARG null,-20; SPATIAL SCAN 0.4 38,90.0 Degrees,Forward	Sequence 6-8 Non-Int in Kelt-9b_WFC3_G141 (01)	92.538031 Secs (92.538 Secs) *[==>]*	***[3]***
9	(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	F164N	NSAMP=2; SAMP-SEQ=RAPID	POS TARG null,-20	Sequence 9-11 Non-Int in Kelt-9b_WFC3_G141 (01)	1.706054 Secs (1.706 Secs) *[==>]*	***[4]***

	10	(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=SPARS25; NSAMP=5	POS TARG null,-20; SPATIAL SCAN 0.4 38,90.0 Degrees,Round trip	Sequence 9-11 Non-Int in Kelt-9b_WFC3_G141 (01)	92.538031 Secs X 9 (1665.685 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)]*	***[4]***
	11	(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=SPARS25; NSAMP=5	POS TARG null,-20; SPATIAL SCAN 0.4 38,90.0 Degrees,Forward	Sequence 9-11 Non-Int in Kelt-9b_WFC3_G141 (01)	92.538031 Secs (92.538 Secs) *[==>]*	***[4]***
	12	(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	F164N	NSAMP=2; SAMP-SEQ=RAPID	POS TARG null,-20	Sequence 12-14 Non-Int in Kelt-9b_WFC3_G141 (01)	1.706054 Secs (1.706 Secs) *[==>]*	***[5]***
	13	(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=SPARS25; NSAMP=5	POS TARG null,-20; SPATIAL SCAN 0.4 38,90.0 Degrees,Round trip	Sequence 12-14 Non-Int in Kelt-9b_WFC3_G141 (01)	92.538031 Secs X 9 (1665.685 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)]*	***[5]***

	14	(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=SPARS 25; NSAMP=5	POS TARG null,-20; SPATIAL SCAN 0.4 38,90.0 Degrees,Forward	Sequence 12-14 Non-Int in Kelt-9b_WFC3_G141 (01)	92.538031 Secs (92.538 Secs) *[==>]*	 ***[5]***
	15	(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	F164N	NSAMP=2; SAMP-SEQ=RAPID	POS TARG null,-20	Sequence 15-17 Non-Int in Kelt-9b_WFC3_G141 (01)	1.706054 Secs (1.706 Secs) *[==>]*	 ***[6]***
	16	(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=SPARS 25; NSAMP=5	POS TARG null,-20; SPATIAL SCAN 0.4 38,90.0 Degrees,Round trip	Sequence 15-17 Non-Int in Kelt-9b_WFC3_G141 (01)	92.538031 Secs X 9 (1665.685 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)]*	 ***[6]***
	17	(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=SPARS 25; NSAMP=5	POS TARG null,-20; SPATIAL SCAN 0.4 38,90.0 Degrees,Forward	Sequence 15-17 Non-Int in Kelt-9b_WFC3_G141 (01)	92.538031 Secs (92.538 Secs) *[==>]*	 ***[6]***

Orbit Structure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Exp. 4, copy 8
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Exp. 5
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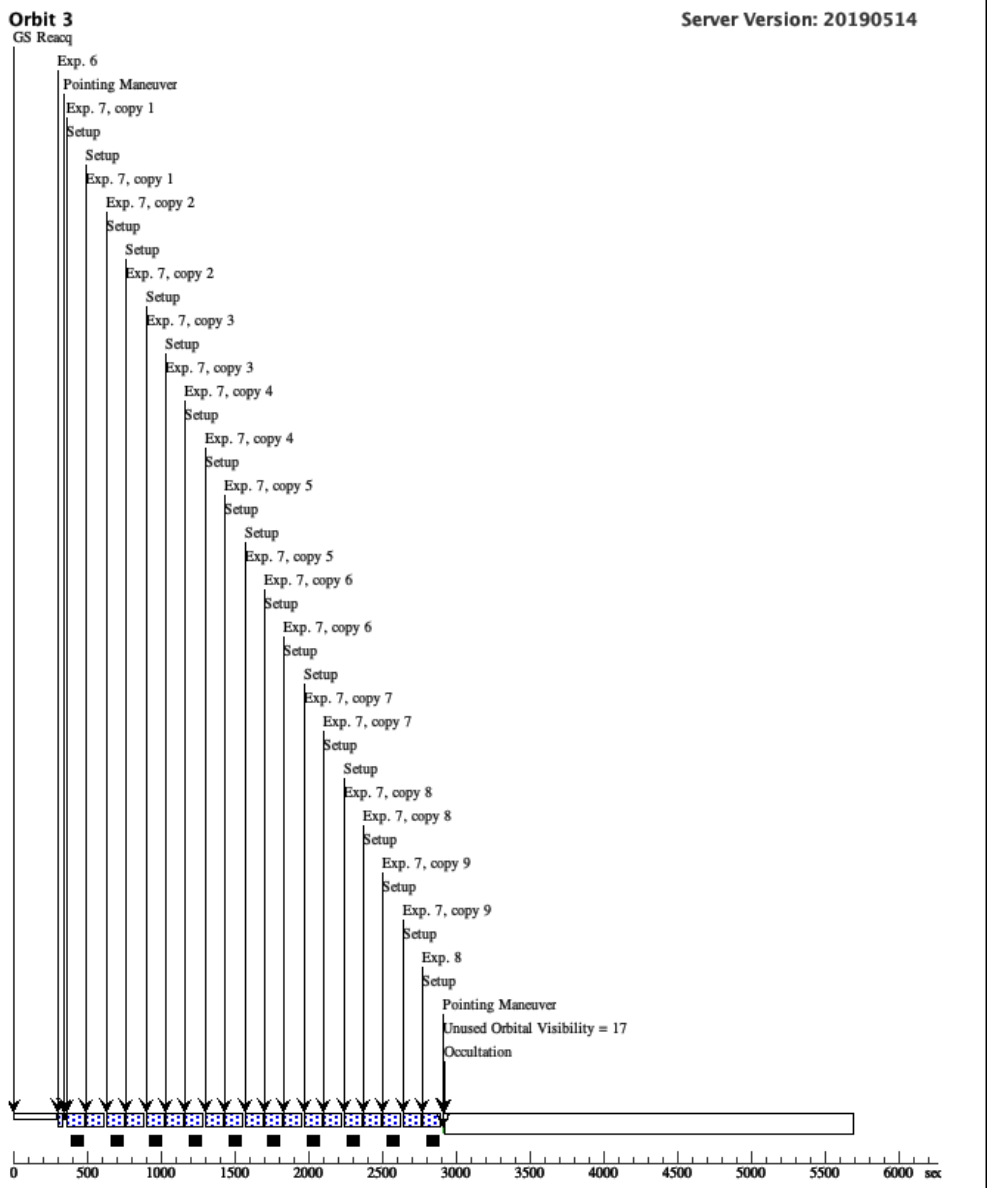
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Exp. 8
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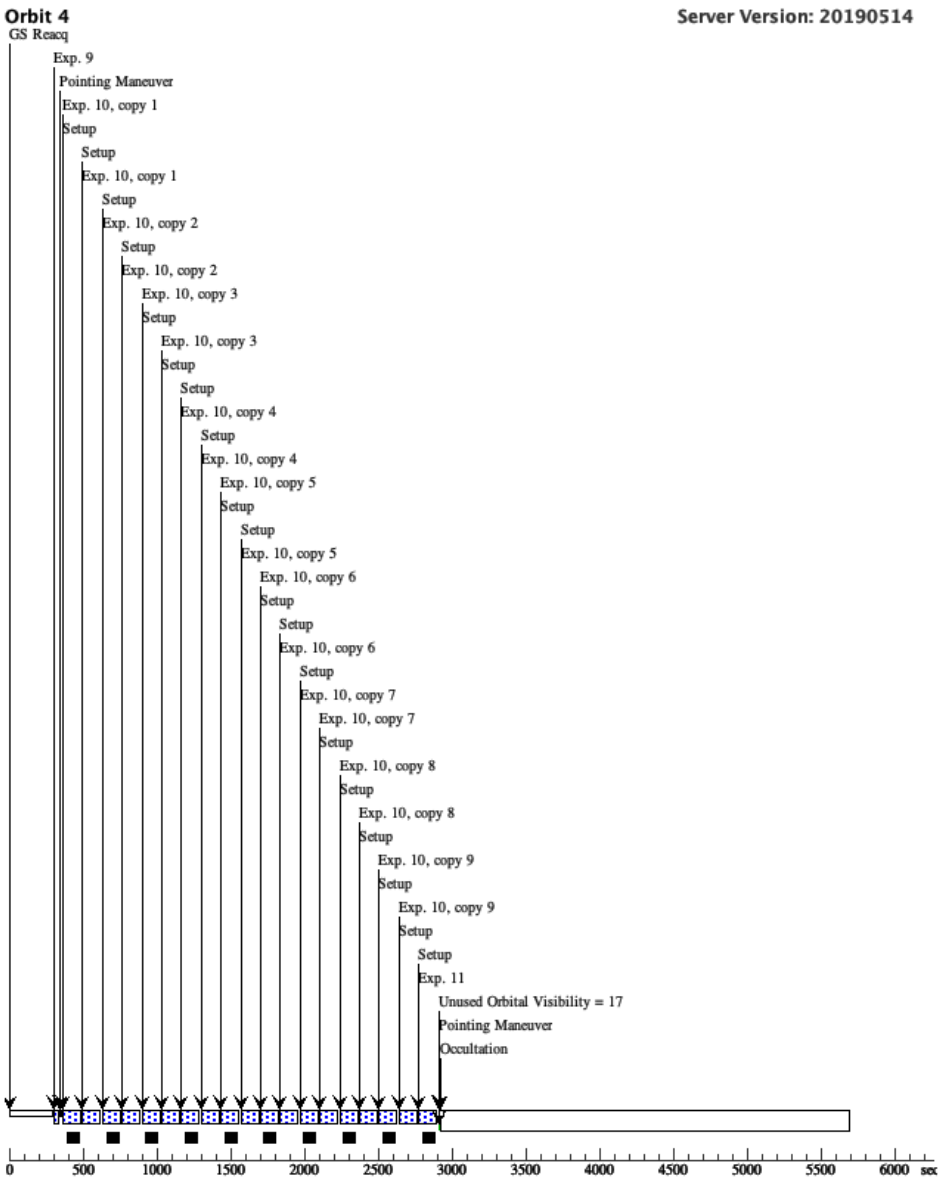
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Exp. 11
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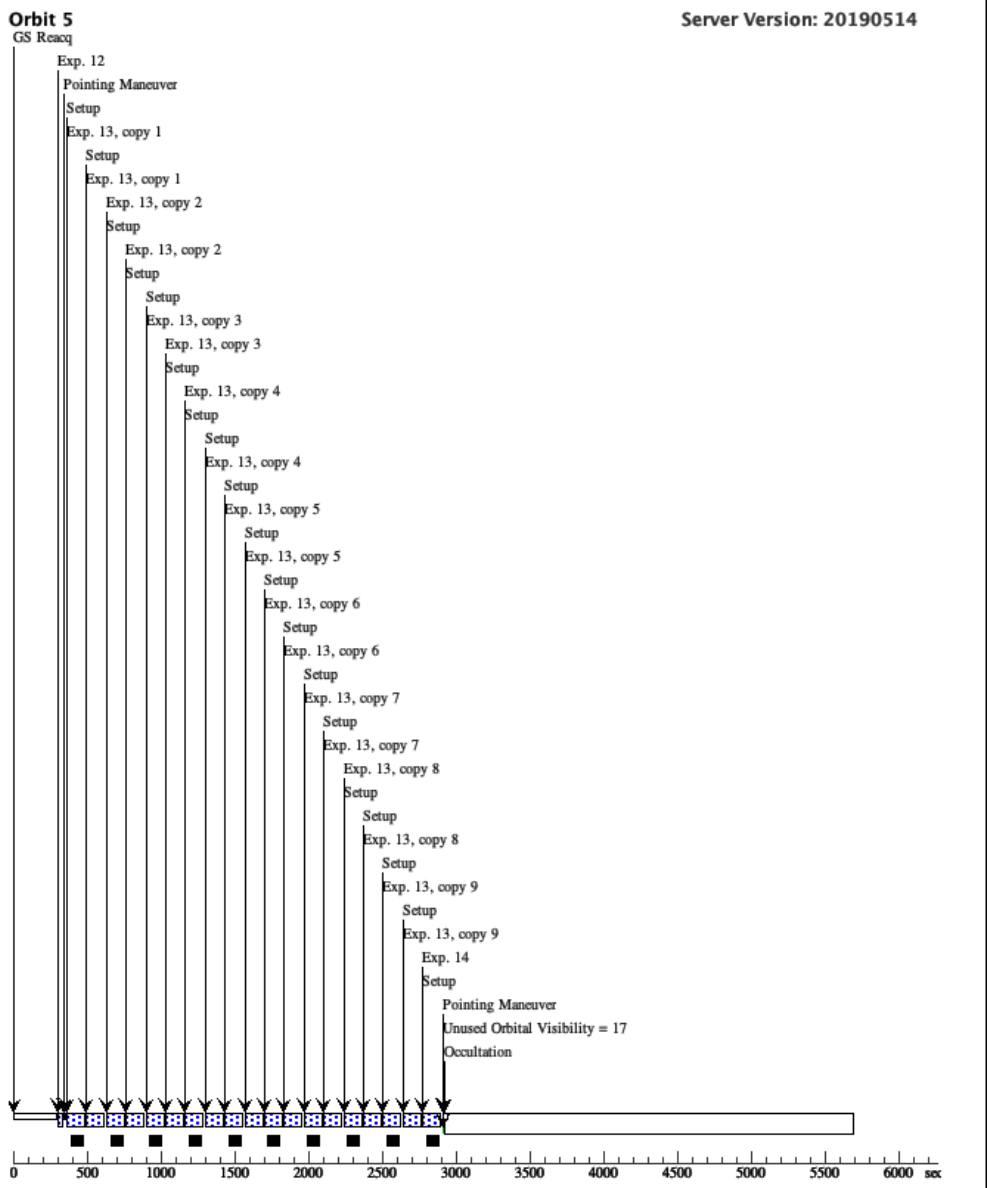
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Exp. 14
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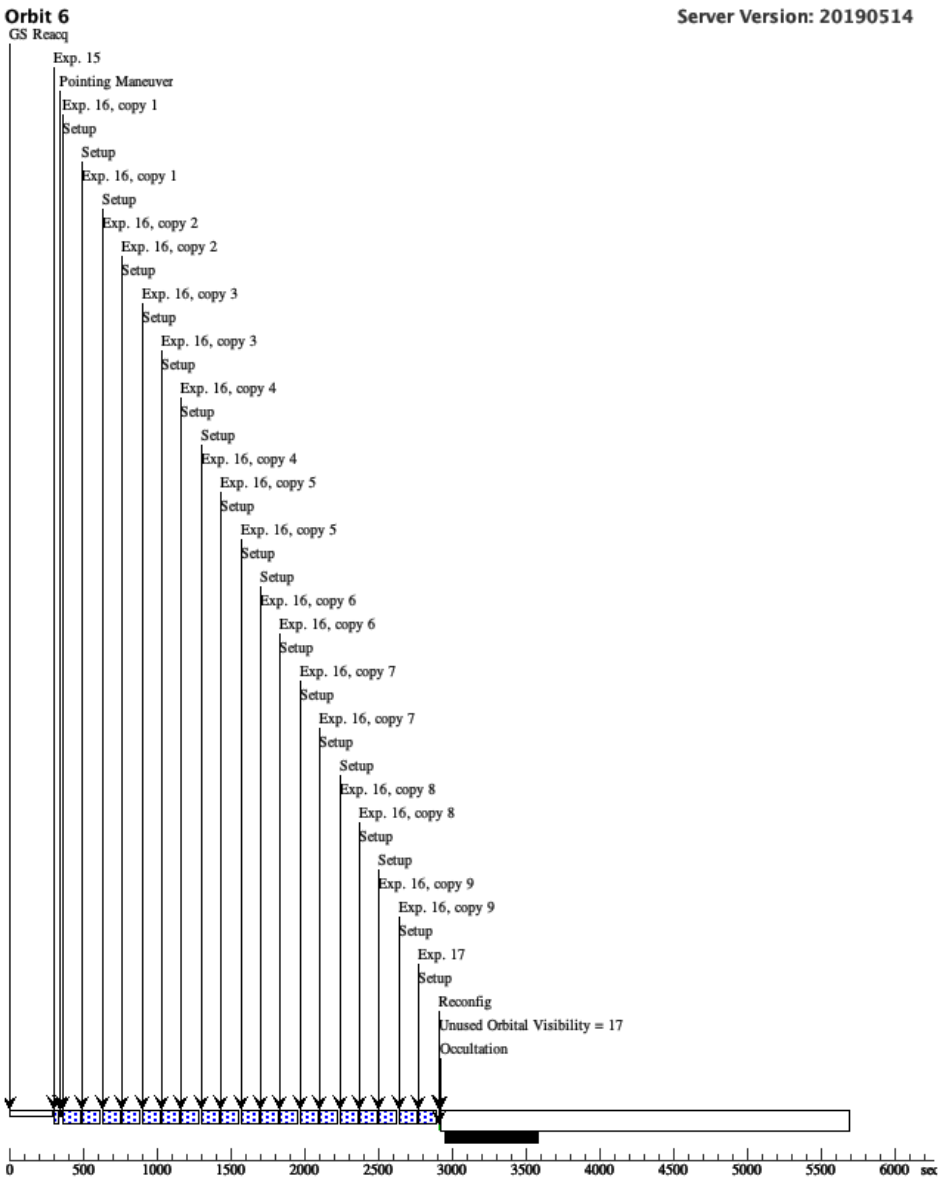
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GS Reacq
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Exp. 16, copy 9
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Exp. 17
Setup
Reconfig
Unused Orbital Visibility = 17
Occultation
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500
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2500
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5500
6000
sec

Visit

Proposal 15820, HOPR for failed 01 (H1), scheduling Fri Jan 10 17:01:15 GMT 2020

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: SCHED 100%; Period 1.4811235 D AND ZERO-PHASE HJD2457095.68572

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Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
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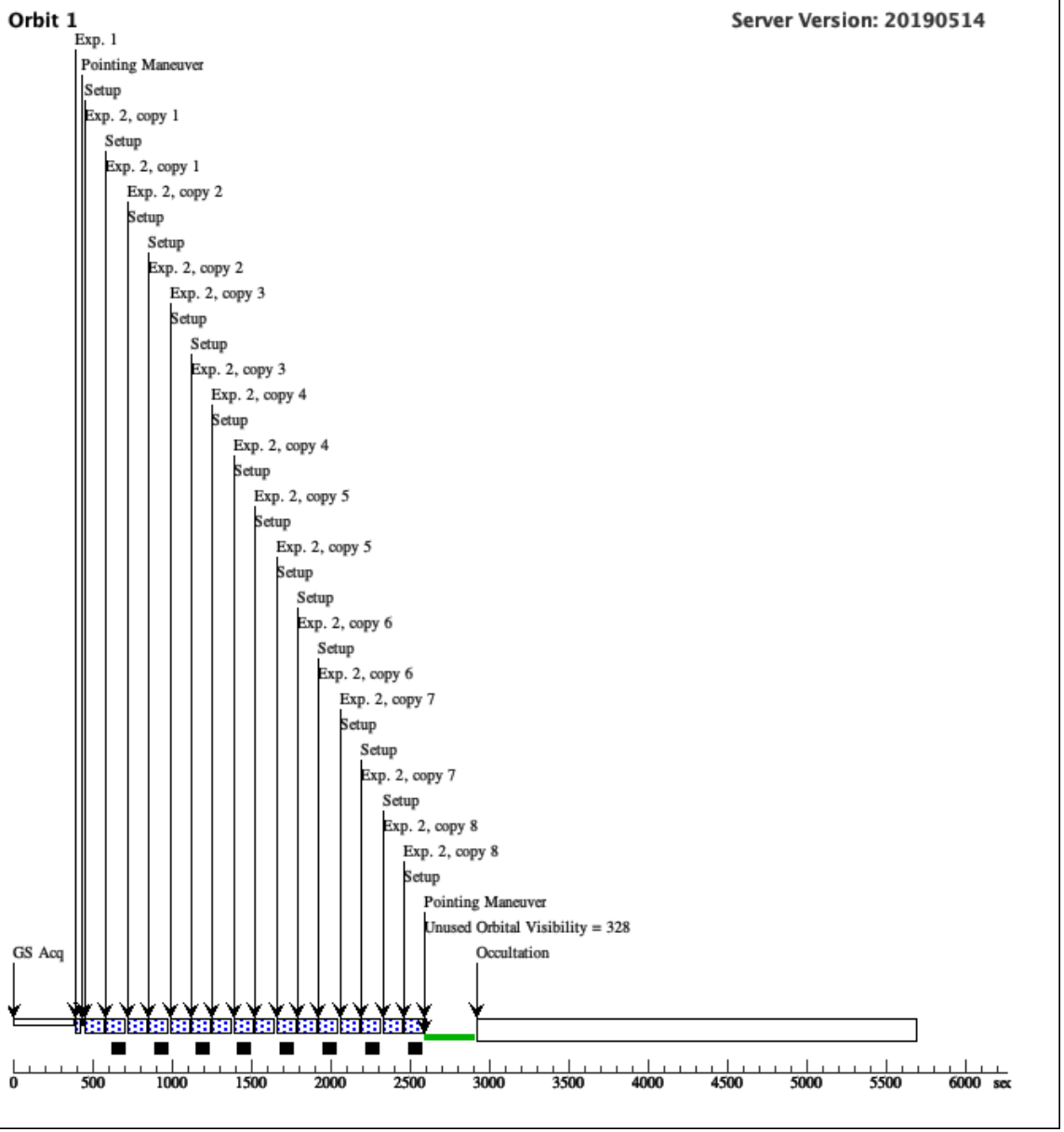
2		(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=SPARS25; NSAMP=5	POS TARG null,-20; SPATIAL SCAN 0.4 38,90.0 Degrees,Round trip	Sequence 1-2 Non-Int in HOPR for failed 01 (H1)	92.538031 Secs X 8 (1480.608 Secs) *[==>(Copy 1, Forward)]* *[==>(Copy 1, Reverse)]* *[==>(Copy 2, Forward)]* *[==>(Copy 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)]*	***[1]***
3		(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	F164N	NSAMP=2; SAMP-SEQ=RAPID	POS TARG null,-20	Sequence 3-5 Non-Int in HOPR for failed 01 (H1)	1.706054 Secs (1.706 Secs) *[==>]*	***[2]***
4		(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=SPARS25; NSAMP=5	POS TARG null,-20; SPATIAL SCAN 0.4 38,90.0 Degrees,Round trip	Sequence 3-5 Non-Int in HOPR for failed 01 (H1)	92.538031 Secs X 8 (1480.608 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)]*	***[2]***
5		(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=SPARS25; NSAMP=5	POS TARG null,-20; SPATIAL SCAN 0.4 38,90.0 Degrees,Forward	Sequence 3-5 Non-Int in HOPR for failed 01 (H1)	92.538031 Secs (92.538 Secs) *[==>]*	***[2]***

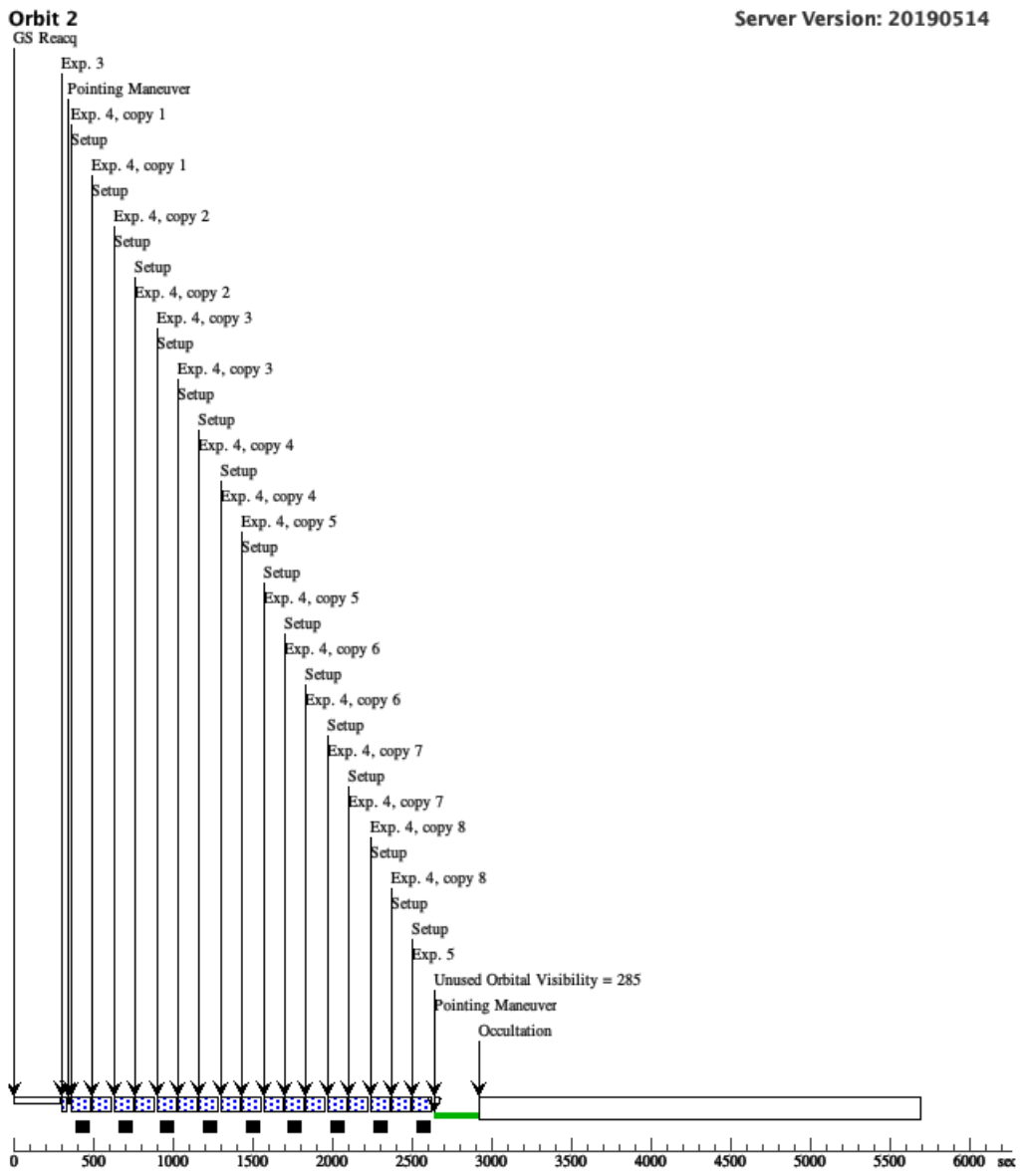
6	(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	F164N	NSAMP=2; SAMP-SEQ=RAPID	POS TARG null,-20	Sequence 6-8 Non-Int in HOPR for failed 01 (H1)	1.706054 Secs (1.706 Secs) *[==>]*	 ***[3]***
7	(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=SPARS25; NSAMP=5	POS TARG null,-20; SPATIAL SCAN 0.4 38,90.0 Degrees,Round trip	Sequence 6-8 Non-Int in HOPR for failed 01 (H1)	92.538031 Secs X 8 (1480.608 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)]*	 ***[3]***
8	(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=SPARS25; NSAMP=5	POS TARG null,-20; SPATIAL SCAN 0.4 38,90.0 Degrees,Forward	Sequence 6-8 Non-Int in HOPR for failed 01 (H1)	92.538031 Secs (92.538 Secs) *[==>]*	 ***[3]***
9	(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	F164N	NSAMP=2; SAMP-SEQ=RAPID	POS TARG null,-20	Sequence 9-11 Non-Int in HOPR for failed 01 (H1)	1.706054 Secs (1.706 Secs) *[==>]*	 ***[4]***
10	(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=SPARS25; NSAMP=5	POS TARG null,-20; SPATIAL SCAN 0.4 38,90.0 Degrees,Round trip	Sequence 9-11 Non-Int in HOPR for failed 01 (H1)	92.538031 Secs X 8 (1480.608 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)]*	 ***[4]***

11	(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=SPARS25; NSAMP=5	POS TARG null,-20; SPATIAL SCAN 0.4 38,90.0 Degrees,Forward	Sequence 9-11 Non-Int in HOPR for failed 01 (H1)	92.538031 Secs (92.538 Secs) *[==>]*	 ***[4]***
12	(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	F164N	NSAMP=2; SAMP-SEQ=RAPID	POS TARG null,-20	Sequence 12-14 Non-Int in HOPR for failed 01 (H1)	1.706054 Secs (1.706 Secs) *[==>]*	 ***[5]***
13	(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=SPARS25; NSAMP=5	POS TARG null,-20; SPATIAL SCAN 0.4 38,90.0 Degrees,Round trip	Sequence 12-14 Non-Int in HOPR for failed 01 (H1)	92.538031 Secs X 8 (1480.608 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)]*	 ***[5]***
14	(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=SPARS25; NSAMP=5	POS TARG null,-20; SPATIAL SCAN 0.4 38,90.0 Degrees,Forward	Sequence 12-14 Non-Int in HOPR for failed 01 (H1)	92.538031 Secs (92.538 Secs) *[==>]*	 ***[5]***
15	(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	F164N	NSAMP=2; SAMP-SEQ=RAPID	POS TARG null,-20	Sequence 15-17 Non-Int in HOPR for failed 01 (H1)	1.706054 Secs (1.706 Secs) *[==>]*	 ***[6]***

	16	(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=SPARS 25; NSAMP=5	POS TARG null,-20; SPATIAL SCAN 0.4 38,90.0 Degrees,Round trip	Sequence 15-17 Non-Int in HOPR for failed 01 (H1)	92.538031 Secs X 8 (1480.608 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)]*	***[6]***
	17	(1) HD-195689	WFC3/IR, MULTIACCUM, GRISM512	G141	SAMP-SEQ=SPARS 25; NSAMP=5	POS TARG null,-20; SPATIAL SCAN 0.4 38,90.0 Degrees,Forward	Sequence 15-17 Non-Int in HOPR for failed 01 (H1)	92.538031 Secs (92.538 Secs) *[==>]*	***[6]***

Orbit Structure

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Exp. 4, copy 8
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Setup
Setup
Exp. 5
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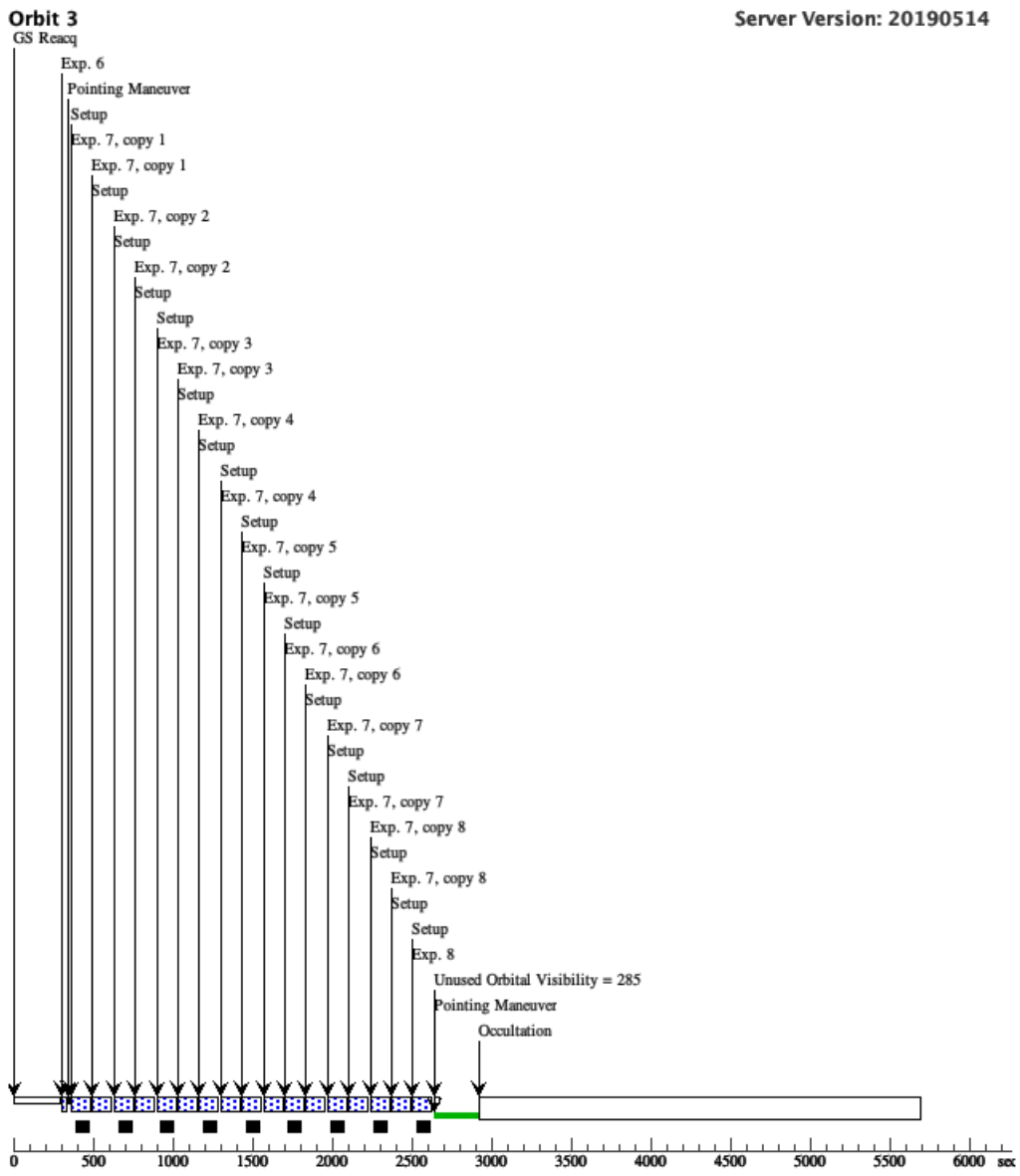
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Exp. 7, copy 8
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Setup
Exp. 8
Unused Orbital Visibility = 285
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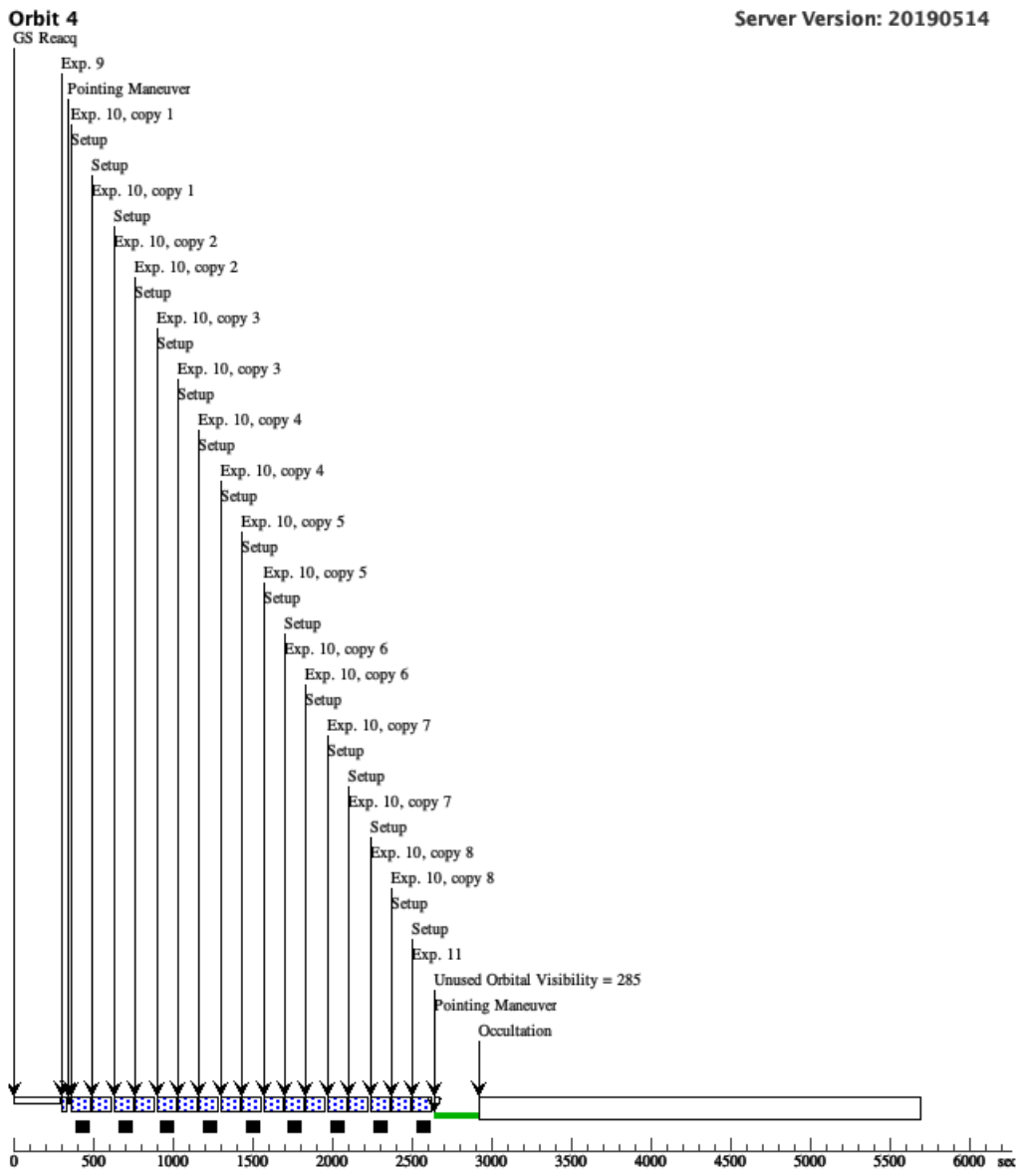
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GS Reacq
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Exp. 10, copy 7
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Exp. 10, copy 8
Setup
Setup
Exp. 11
Unused Orbital Visibility = 285
Pointing Maneuver
Occultation
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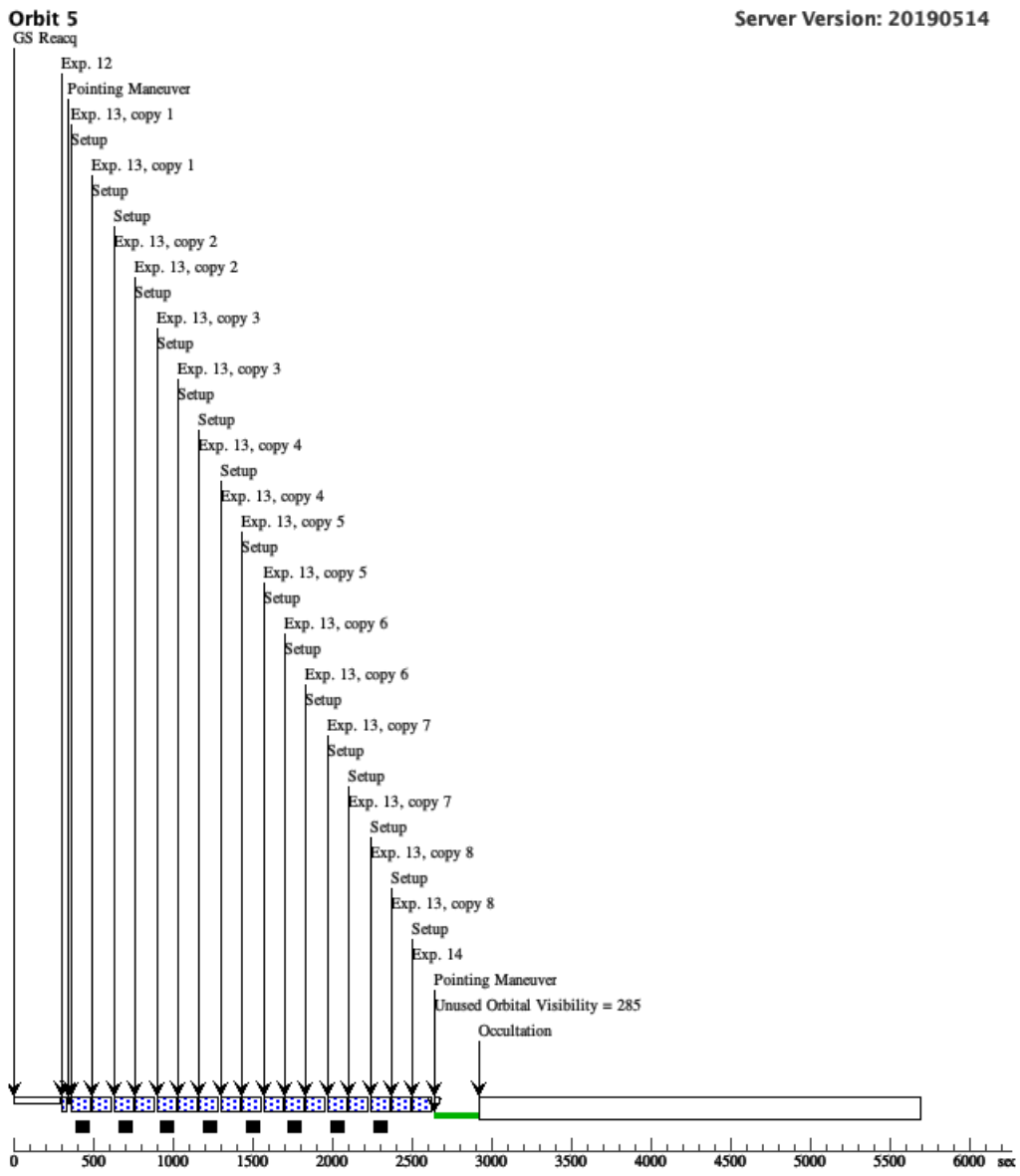
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GS Reacq
Exp. 12
Pointing Maneuver
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Exp. 13, copy 6
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Exp. 13, copy 7
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Exp. 13, copy 7
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Exp. 13, copy 8
Setup
Exp. 13, copy 8
Setup
Exp. 14
Pointing Maneuver
Unused Orbital Visibility = 285
Occultation
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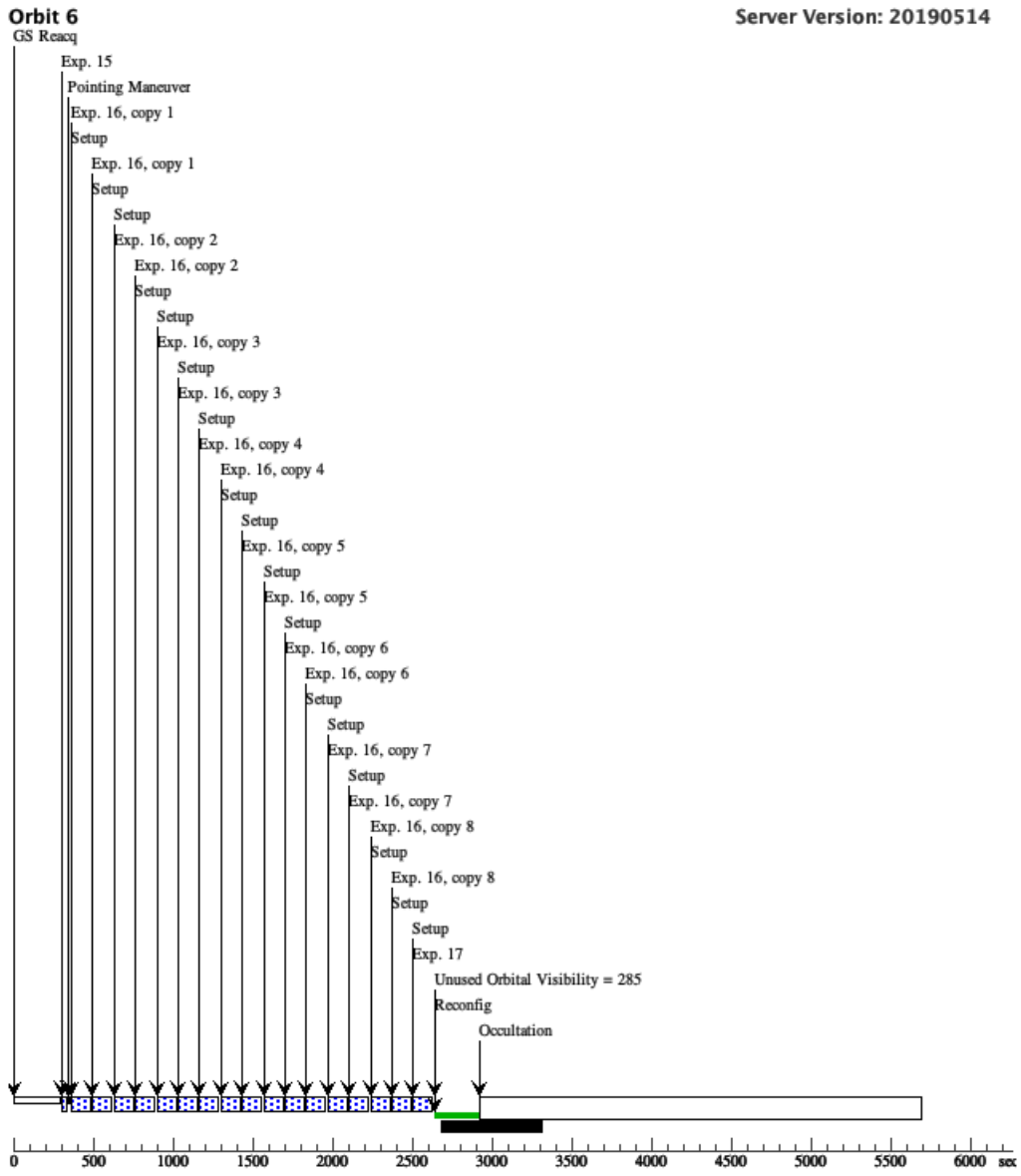
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GS Reacq
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Exp. 16, copy 8
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Setup
Exp. 17
Unused Orbital Visibility = 285
Reconfig
Occultation
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sec