14918 - Definitive measurement of WASP-17b's water abundance in preparation for JWST

Cycle: 24, Proposal Category: GO

(JWST Initative)

(Availability Mode: SUPPORTED)

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) WASP-17	WFC3/IR	5	27-Jun-2017 21:05:04.0	yes
02	(1) WASP-17	WFC3/IR	5	27-Jun-2017 21:05:21.0	yes
32	(1) WASP-17	WFC3/IR	5	27-Jun-2017 21:05:37.0	yes

15 Total Orbits Used

ABSTRACT

In the advent of JWST, understanding of exoplanet atmospheres with current facilities will be critical. Here we propose to measure the transmission spectrum of WASP-17b in the near-infrared with both spectroscopic grisms of WFC3. Early HST and Spitzer surveys have shown WASP-17b to

have the clearest atmosphere of any measured exoplanet so far, making it an important archetype hot Jupiter. As such, WASP-17b has been selected as a Hot-Jupiter archetype for detailed study through the JWST GTO program (PI Mountain/Clampin). Higher SNR observations, made possible through spatial scanning, of this key target in the HST WFC3 wavelength range will provide critical guidance and a point for comparison for the upcoming JWST observations. The existing WFC3 data was gathered before the revolutionary spacial scanning technique, and thus the observed H2O feature suffers from extremely large errors (factor of ~5X higher) even though WASP-17b remains the very best target for transmission spectroscopy. These observations combined with previous and future observations will allow us to accurately constrain the atmospheric water amplitude and abundance to high precision.

OBSERVING DESCRIPTION

Our HST observations will proide a transmission spectrum for the transiting exoplanet WASP-17b across the 0.8-1.7 micron wavelength range. WASP-17b is a highly inflated exoplanet, and is extremely amenable to atmospheric studies with HST and JWST. These observations with the G102 and G141 grisms in spatial scan mode will allow us to constrain the H2O abundance for this clear exoplanet atmosphere and better prepare us for the planned JWST GTO observations of this primed exoplanet target.

For both WFC3 observations, we will use the forward spatial scanning mode using SPARS=25 and NSAMP=7. We will read out a subarray size of 256 pixels to reduce overheads.

G102: we will use a scan rate of 0.0264 arcsec/sec, giving individual exposure times of 134 seconds, resulting in a scan across 3.5 arcsec = 27 pixels per exposure. This will leave plenty of room on the detector to estimate the background flux.

G141: we will use a scan rate of 0.033 arcsec/sec, giving individual exposure times of 134 sec, resulting in a scan across 4.422 arcsec = 35 pixels per exposure. This will leave plenty of room on the detector to estimate the background flux.

Visit

Proposal 14918, W17 G141 (01), scheduling Wed Jun 28 01:05:40 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: Period 3.7354822692 D AND ZERO-PHASE HJD2457192.69798

Comments: WFC3 G141 IR transit of WASP-17. It is essential that the five orbits be scheduled in a coninuous block, preferably free of the SAA as the planet has a long transit.

We will use the spatial scanning mode to lengthen the spectrum along the detector during the exposures, to avoid saturation on relatively long exposures. This mode also greatly increases the efficiency.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	WASP-17	RA: 15 59 50.9470 (239.9622792d)	Proper Motion RA: -7.9 mas/yr	V=11.59	Reference Frame: SIMBAD
		Dec: -28 03 42.33 (-28.06176d)	Proper Motion Dec: -11.0 mas/yr		
		Equinox: J2000	Epoch of Position: 2000.0		

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

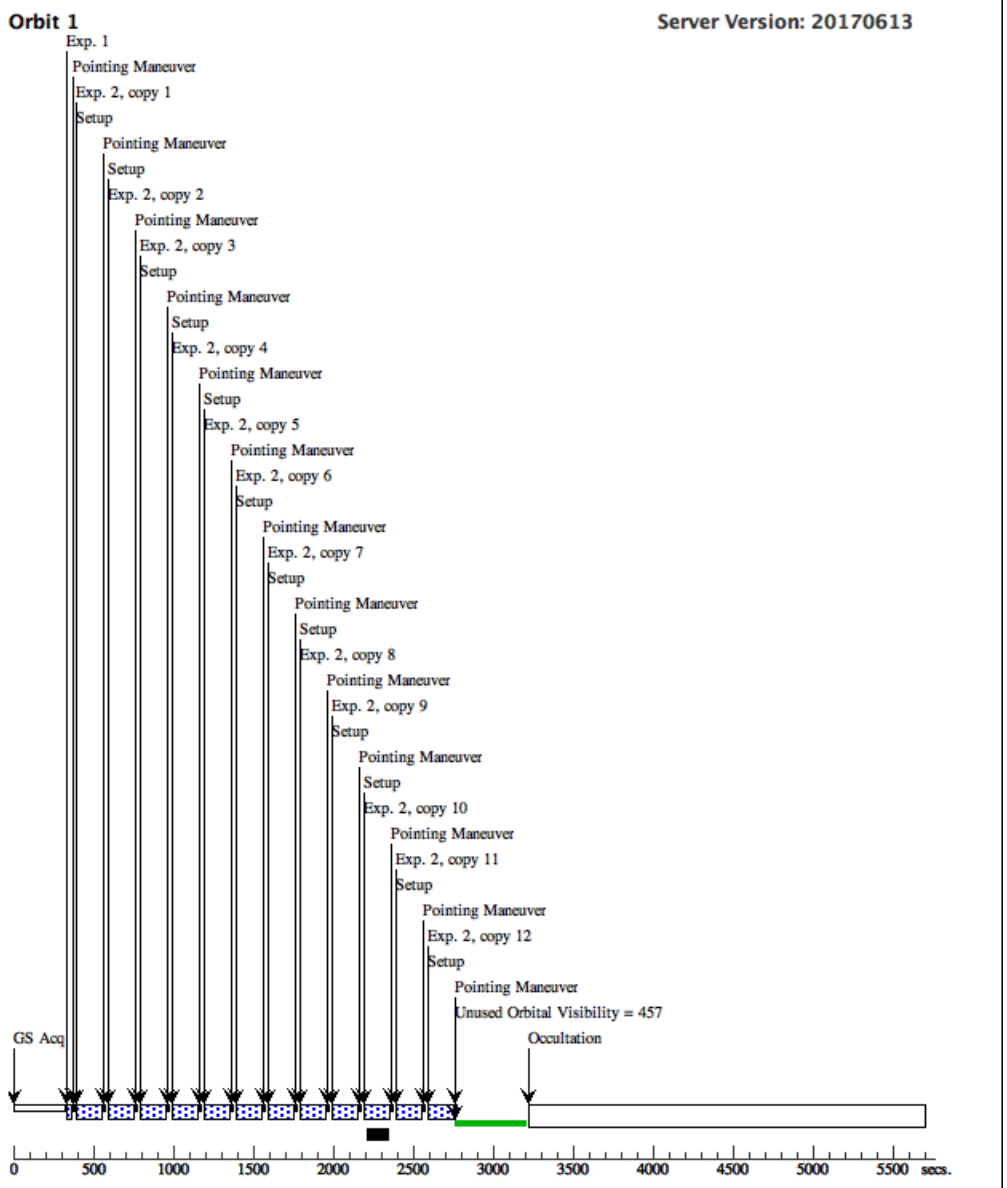
Exposures

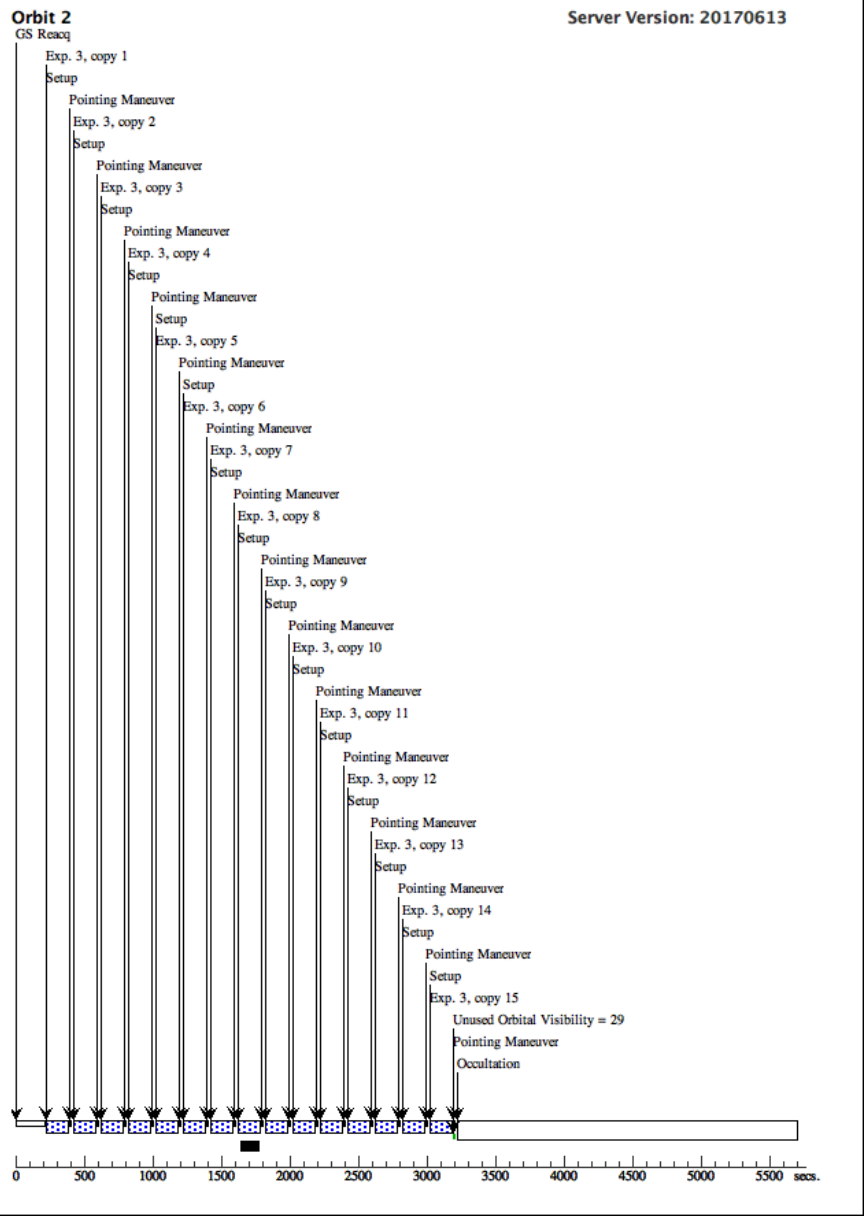
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	W17 F139M O1	(1) WASP-17	WFC3/IR, MULTIACCUM, GRISM256	F139M	SAMP-SEQ=RAPID; NSAMP=7	PHASE 0.951 TO 0.955	Sequence 1-2 Non-Int in W17 G141 (01)	1.944705 Secs (1.945 Secs)	
								[==>]	***[1]***
Comments: Direct image for wavelegnth calibration. Phase constrained so transit occurs between 2nd and 3rd contact.									
2	W17 G141 O1	(1) WASP-17	WFC3/IR, MULTIACCUM, GRISM256	G141	SAMP-SEQ=SPARS25; NSAMP=7	SPATIAL SCAN 0.033,270.0 Degrees,Forward	Sequence 1-2 Non-Int in W17 G141 (01)	134.354049 Secs X 12 (1612.249 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)]*	***[1]***
3	W17 G141 O2	(1) WASP-17	WFC3/IR, MULTIACCUM, GRISM256	G141	SAMP-SEQ=SPARS25; NSAMP=7	SPATIAL SCAN 0.033,270.0 Degrees,Forward	Sequence 3-3 Non-Int in W17 G141 (01)	134.354049 Secs X 15 (2015.311 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)]*	***[2]***

	4	W17 G141 O3	(1) WASP-17	WFC3/IR, MULTIACCUM, GRISM256	G141	SAMP-SEQ=SPARS25; NSAMP=7	SPATIAL SCAN 0.033,270.0 Degrees,Forward	Sequence 4-4 Non-Int in W17 G141 (01)	134.354049 Secs X 15 (2015.311 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)]*	***[3]***
	5	W17 G141 O4	(1) WASP-17	WFC3/IR, MULTIACCUM, GRISM256	G141	SAMP-SEQ=SPARS25; NSAMP=7	SPATIAL SCAN 0.033,270.0 Degrees,Forward	Sequence 5-5 Non-Int in W17 G141 (01)	134.354049 Secs X 15 (2015.311 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)]*	***[4]***

	6	W17 G141 O5	(1) WASP-17	WFC3/IR, MULTIACCUM, GRISM256	G141	SAMP-SEQ=SPARS 25; NSAMP=7	SPATIAL SCAN 0.0 33,270.0 Degrees,Forward	Sequence 6-6 Non-In t in W17 G141 (01)	134.354049 Secs X 13 (1746.603 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)]*	***[5]***

Orbit Structure

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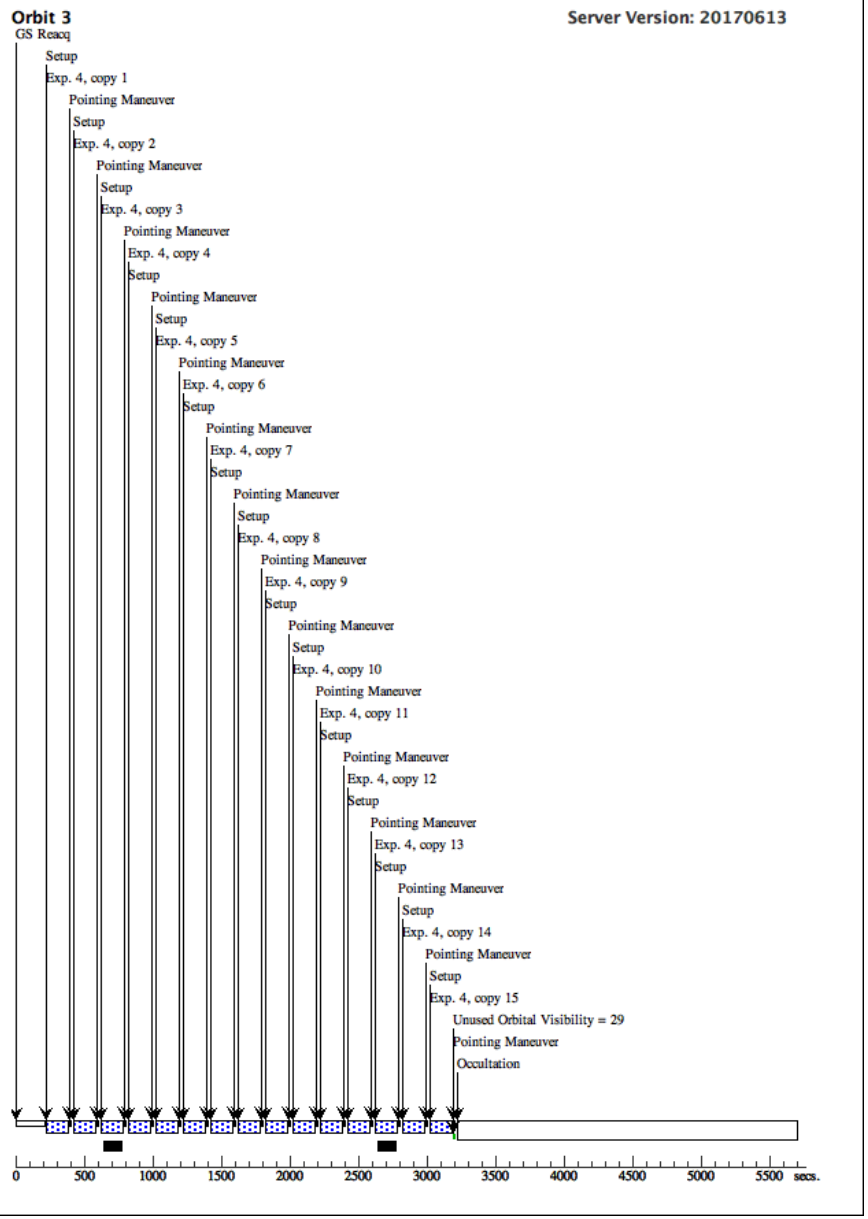
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Unused Orbital Visibility = 29
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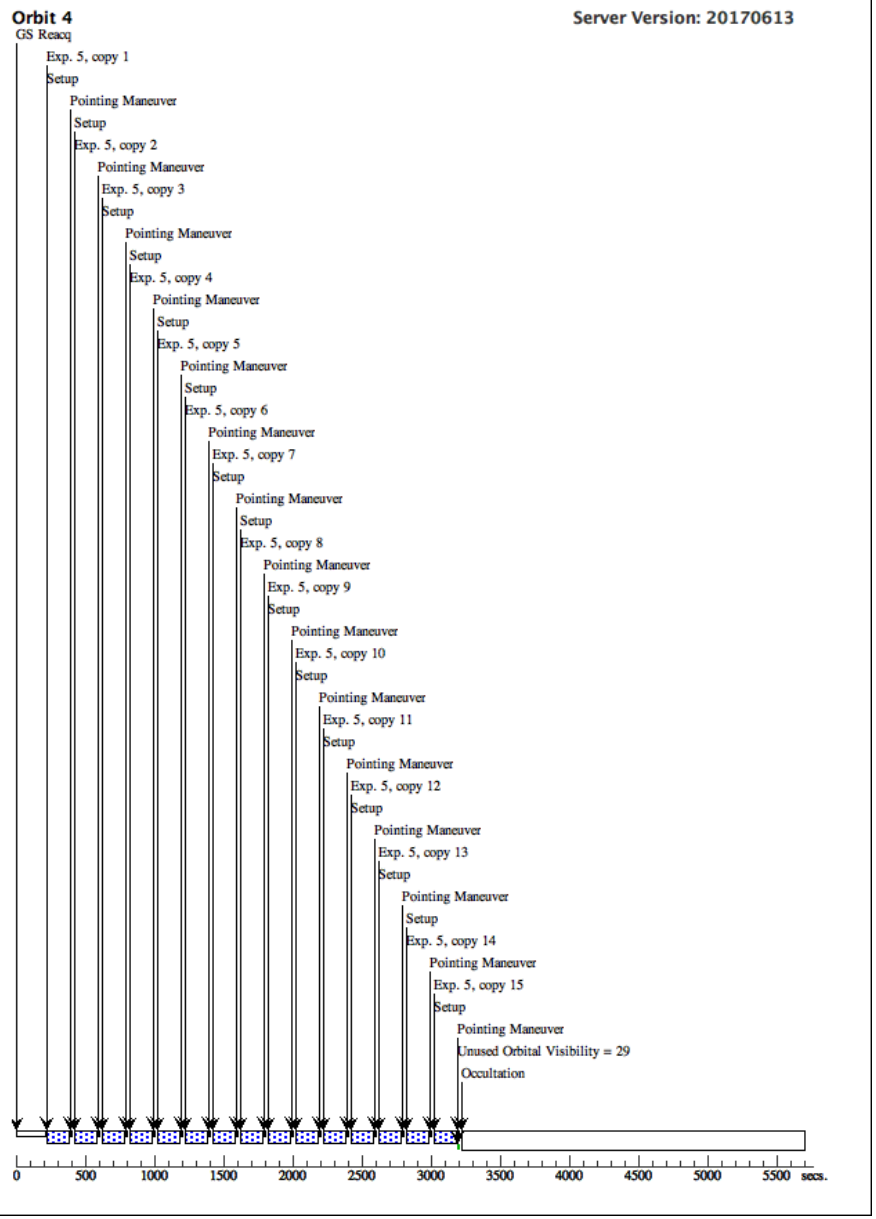
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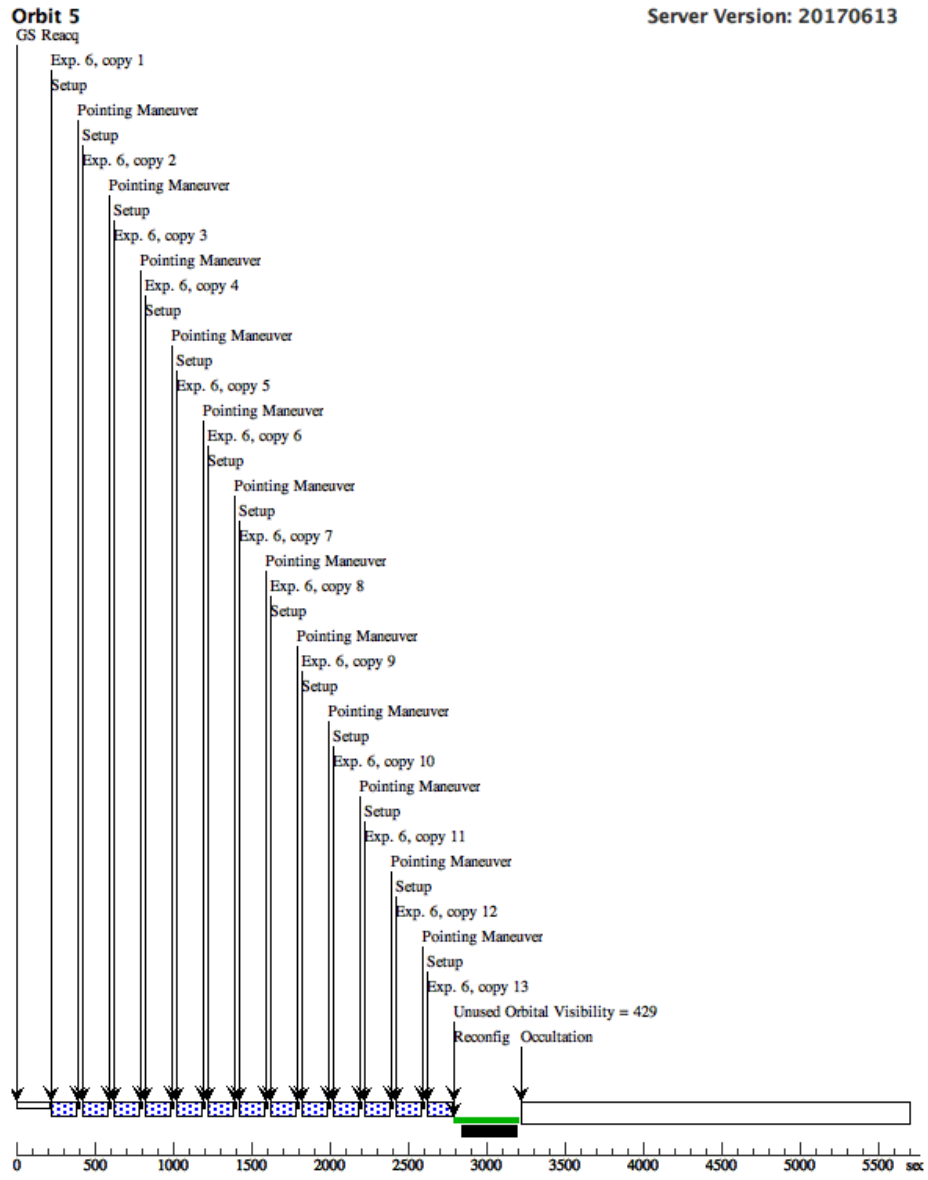
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Visit

Proposal 14918, W17 G102 (02), failed Wed Jun 28 01:05:41 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: Period 3.7354822692 D AND ZERO-PHASE HJD2457192.69798

Comments: WFC3 G102 IR transit of WASP-17. It is essential that the five orbits be scheduled in a coninuous block, preferably free of the SAA as the planet has a long transit.

We will use the spatial scanning mode to lengthen the spectrum along the detector during the exposures, to avoid saturation on relatively long exposures. This mode also greatly increases the efficiency.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
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		Dec: -28 03 42.33 (-28.06176d)	Proper Motion Dec: -11.0 mas/yr		
		Equinox: J2000	Epoch of Position: 2000.0		

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	W17 F139M O1	(1) WASP-17	WFC3/IR, MULTIACCUM, GRISM256	F139M	NSAMP=7; SAMP-SEQ=RAPID	PHASE 0.951 TO 0.955	Sequence 1-2 Non-Int in W17 G102 (02)	1.944705 Secs (1.945 Secs)	
								[==>]	***[1]***
2	W17 G102 O1	(1) WASP-17	WFC3/IR, MULTIACCUM, GRISM256	G102	SAMP-SEQ=SPARS25; NSAMP=7	SPATIAL SCAN 0.0 264,270.0 Degrees,Forward	Sequence 1-2 Non-Int in W17 G102 (02)	134.354049 Secs X 12 (1612.249 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)]*	***[1]***
3	W17 G102 O2	(1) WASP-17	WFC3/IR, MULTIACCUM, GRISM256	G102	SAMP-SEQ=SPARS25; NSAMP=7	SPATIAL SCAN 0.0 264,270.0 Degrees,Forward	Sequence 3-3 Non-Int in W17 G102 (02)	134.354049 Secs X 15 (2015.311 Secs)	
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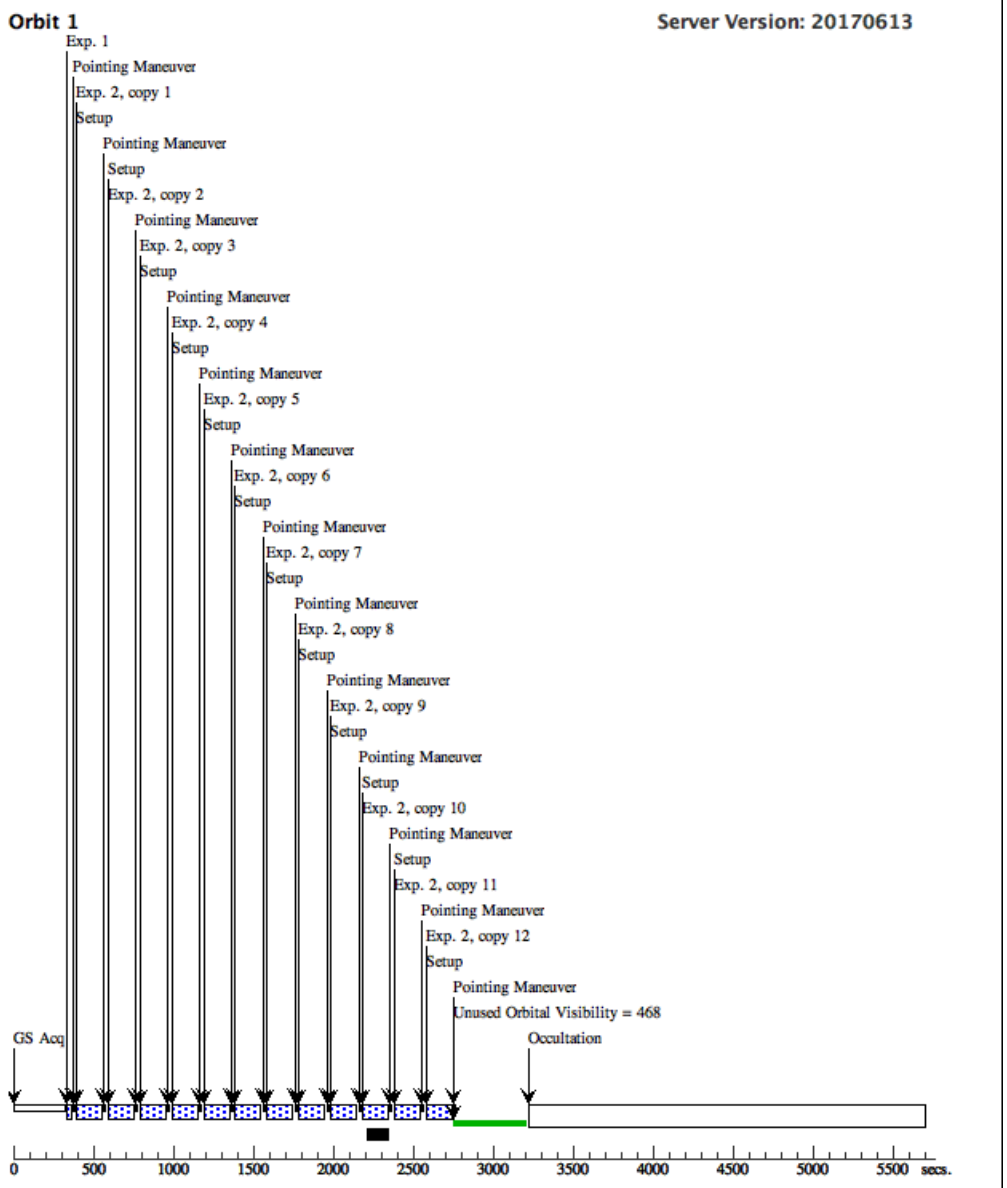
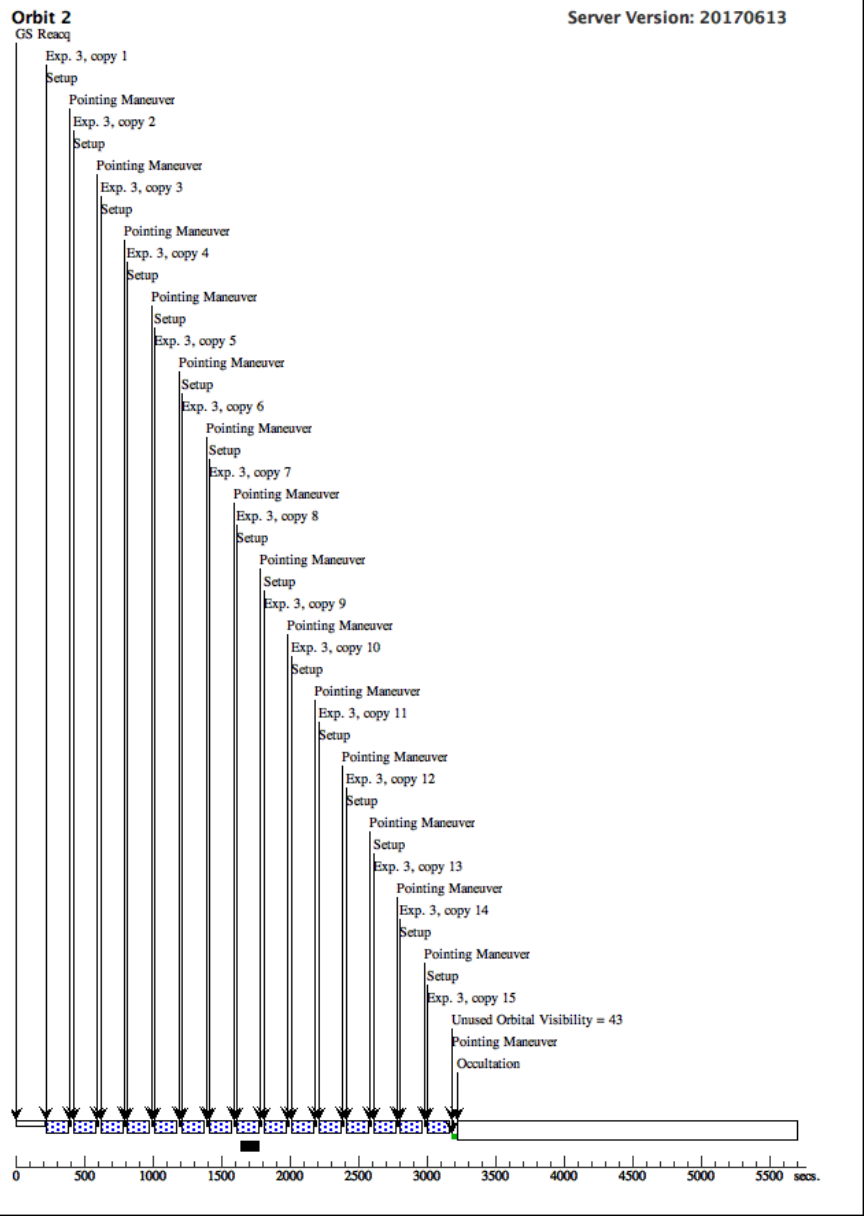
	4	W17 G102 O3	(1) WASP-17	WFC3/IR, MULTIACCUM, GRISM256	G102	SAMP-SEQ=SPARS 25; NSAMP=7	SPATIAL SCAN 0.0 264,270.0 Degrees,Forward	Sequence 4-4 Non-It in W17 G102 (02)	134.354049 Secs X 15 (2015.311 Secs) *[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]* *[==>(Copy 4)]* *[==>(Copy 5)]* *[==>(Copy 6)]* *[==>(Copy 7)]* *[==>(Copy 8)]* *[==>(Copy 9)]* *[==>(Copy 10)]* *[==>(Copy 11)]* *[==>(Copy 12)]* *[==>(Copy 13)]* *[==>(Copy 14)]* *[==>(Copy 15)]*	***[3]***
	5	W17 G102 O4	(1) WASP-17	WFC3/IR, MULTIACCUM, GRISM256	G102	SAMP-SEQ=SPARS 25; NSAMP=7	SPATIAL SCAN 0.0 264,270.0 Degrees,Forward	Sequence 5-5 Non-It in W17 G102 (02)	134.354049 Secs X 15 (2015.311 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)]*	***[4]***

	6	W17 G102 O5	(1) WASP-17	WFC3/IR, MULTIACCUM, GRISM256	G102	SAMP-SEQ=SPARS 25; NSAMP=7	SPATIAL SCAN 0.0 264,270.0 Degrees,Forward	Sequence 6-6 Non-In t in W17 G102 (02)	134.354049 Secs X 13 (1746.603 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)]*	***[5]***

Orbit Structure

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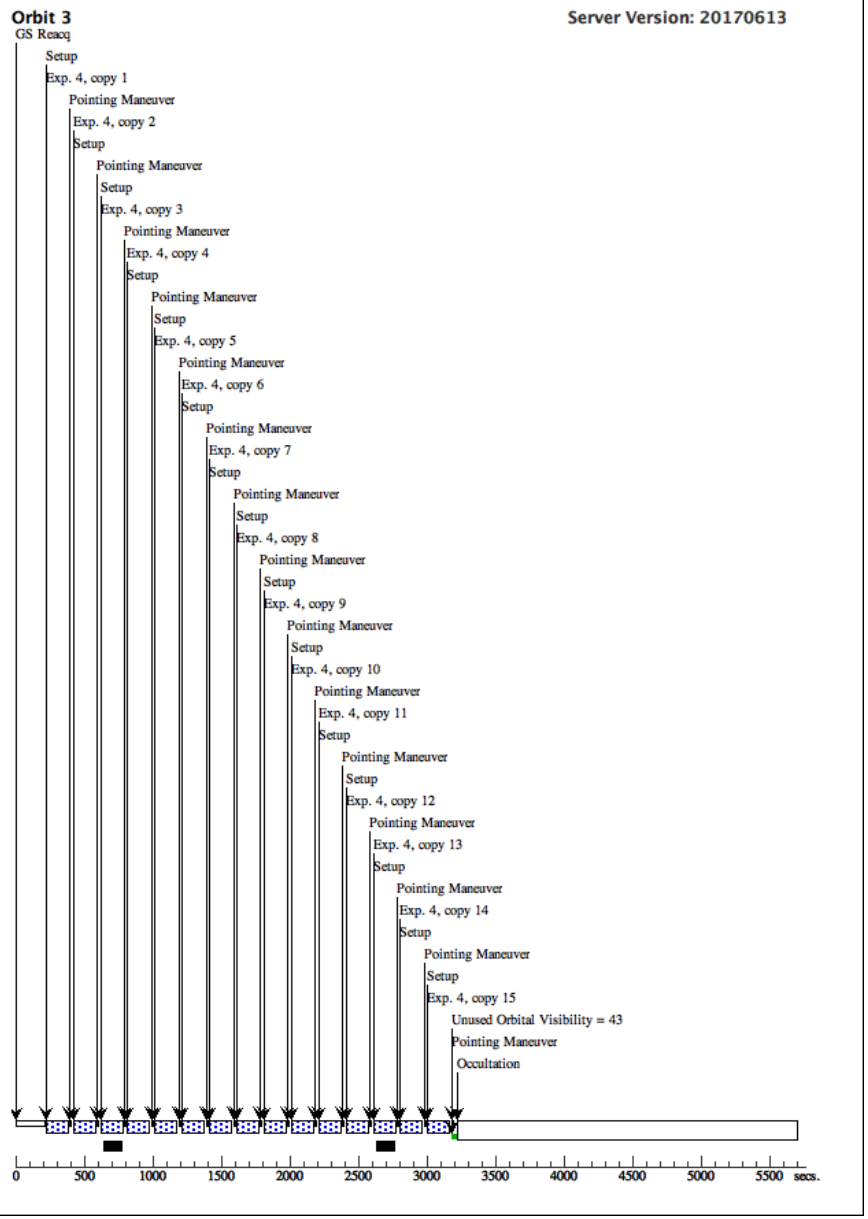
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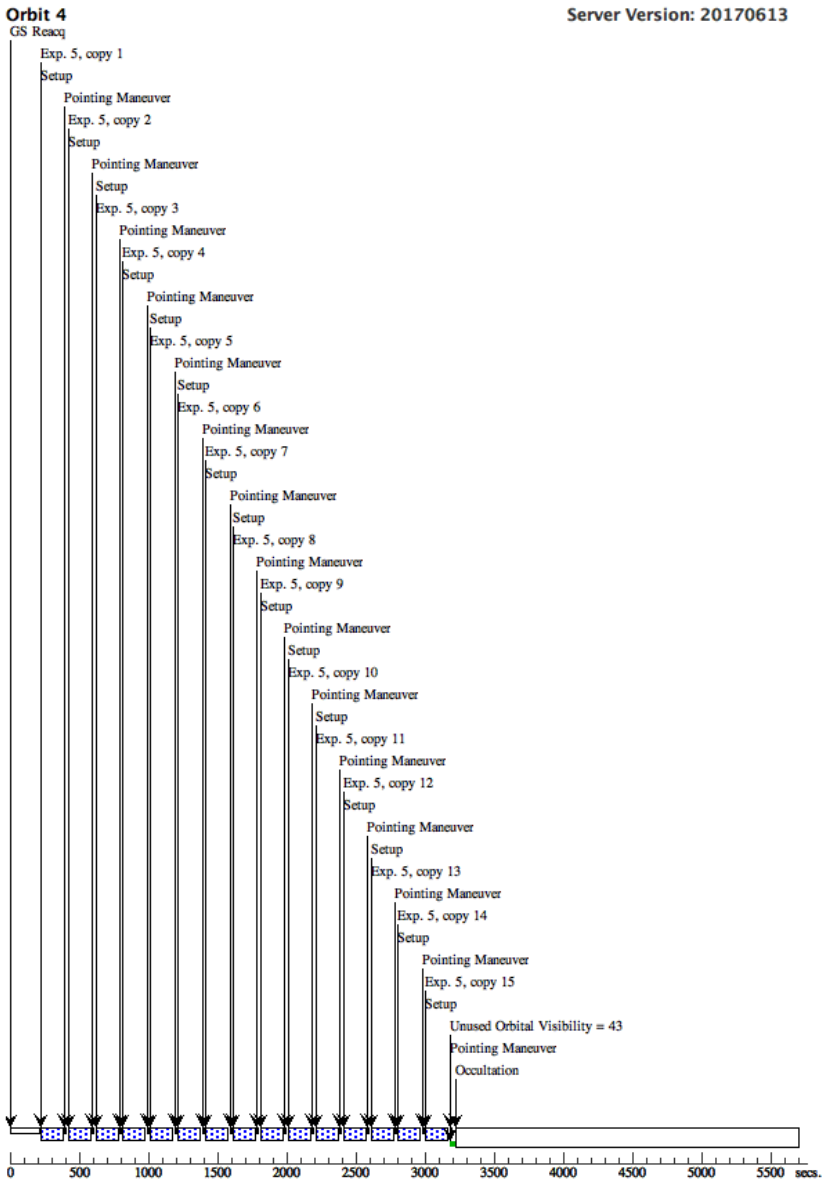
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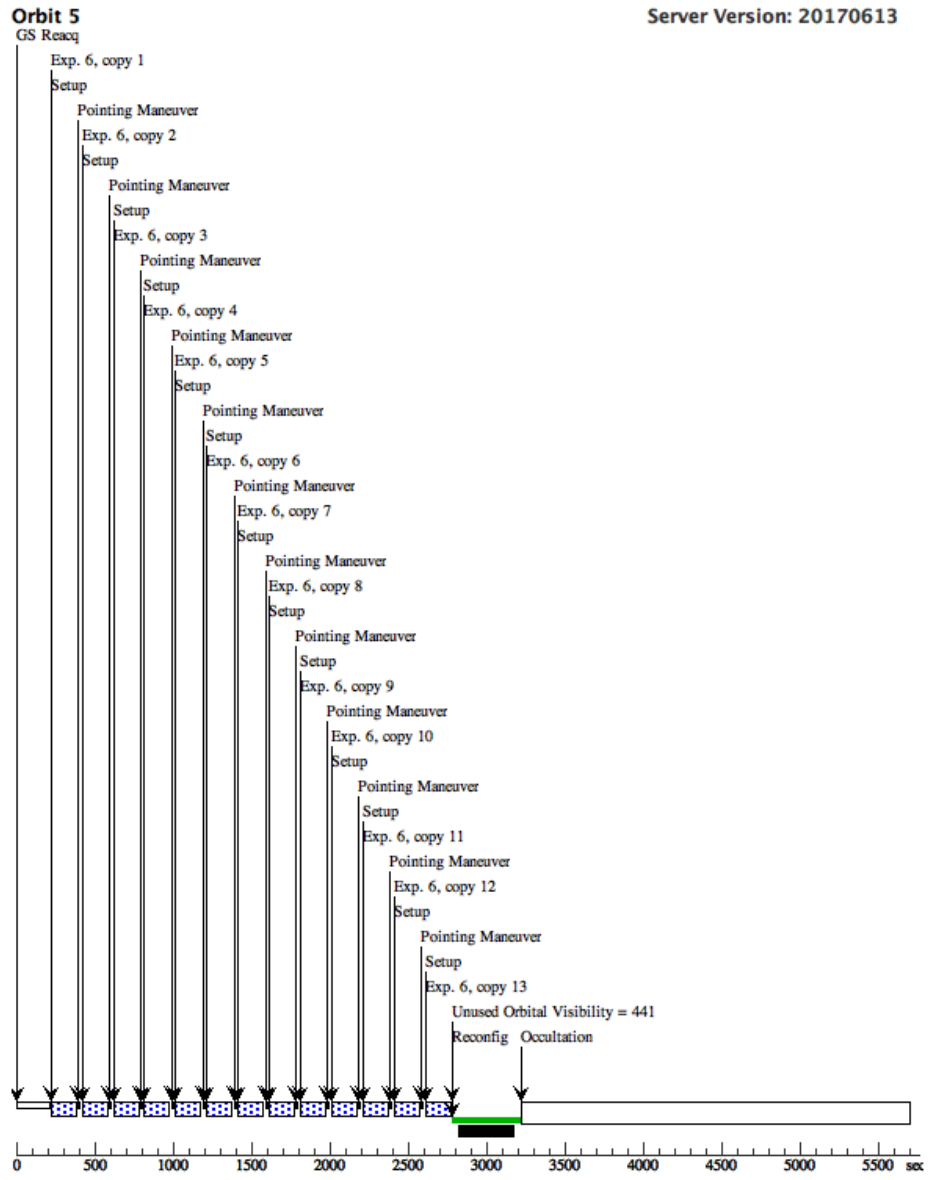
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Visit

Proposal 14918, W17 G102 (32) Wed Jun 28 01:05:42 GMT 2017

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/IR

Special Requirements: Period 3.7354822692 D AND ZERO-PHASE HJD2457192.69798

Comments: WFC3 G102 IR transit of WASP-17. It is essential that the five orbits be scheduled in a coninuous block, preferably free of the SAA as the planet has a long transit.

We will use the spatial scanning mode to lengthen the spectrum along the detector during the exposures, to avoid saturation on relatively long exposures. This mode also greatly increases the efficiency.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	WASP-17	RA: 15 59 50.9470 (239.9622792d)	Proper Motion RA: -7.9 mas/yr	V=11.59	Reference Frame: SIMBAD
		Dec: -28 03 42.33 (-28.06176d)	Proper Motion Dec: -11.0 mas/yr		
		Equinox: J2000	Epoch of Position: 2000.0		

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.

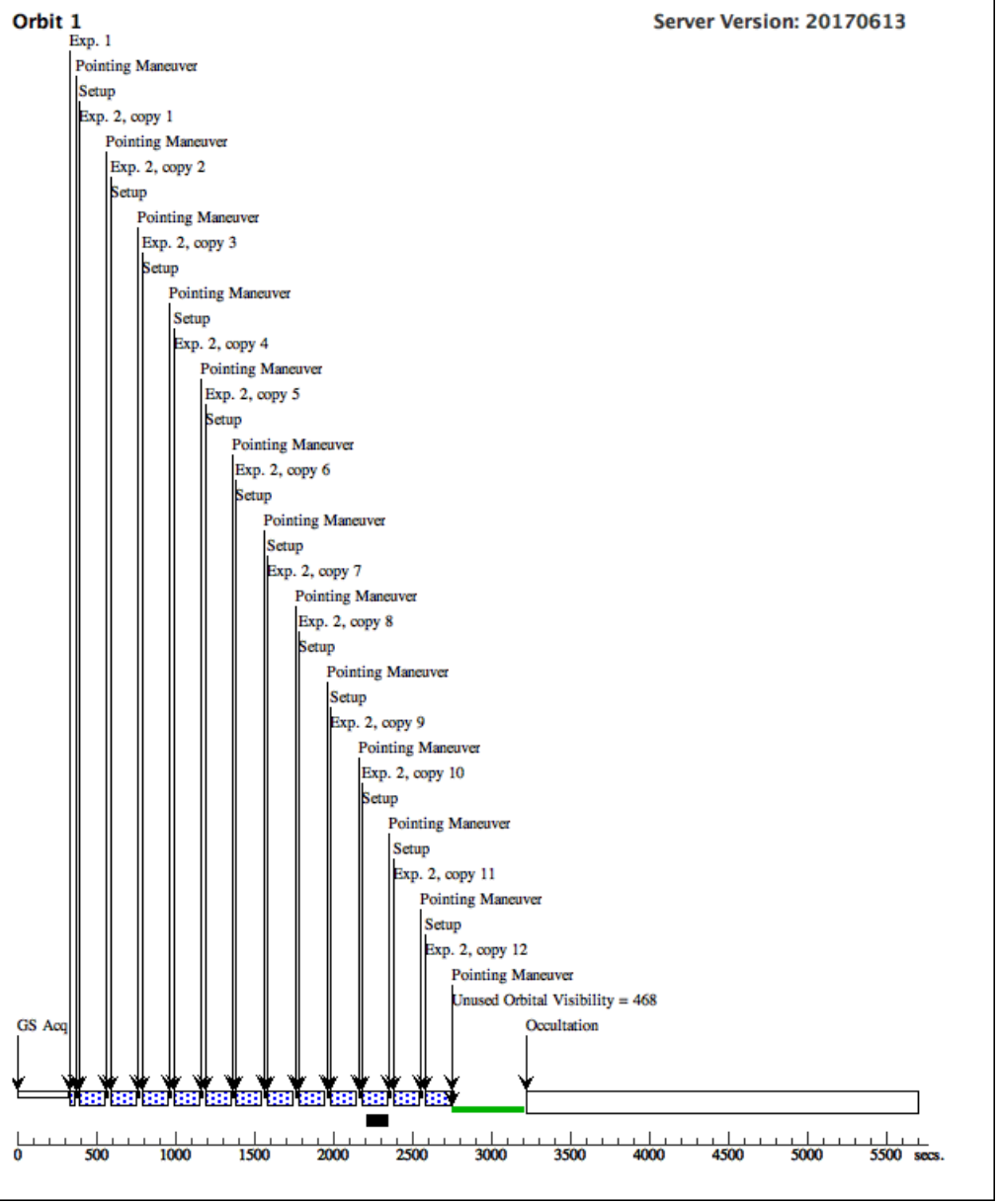
Exposures

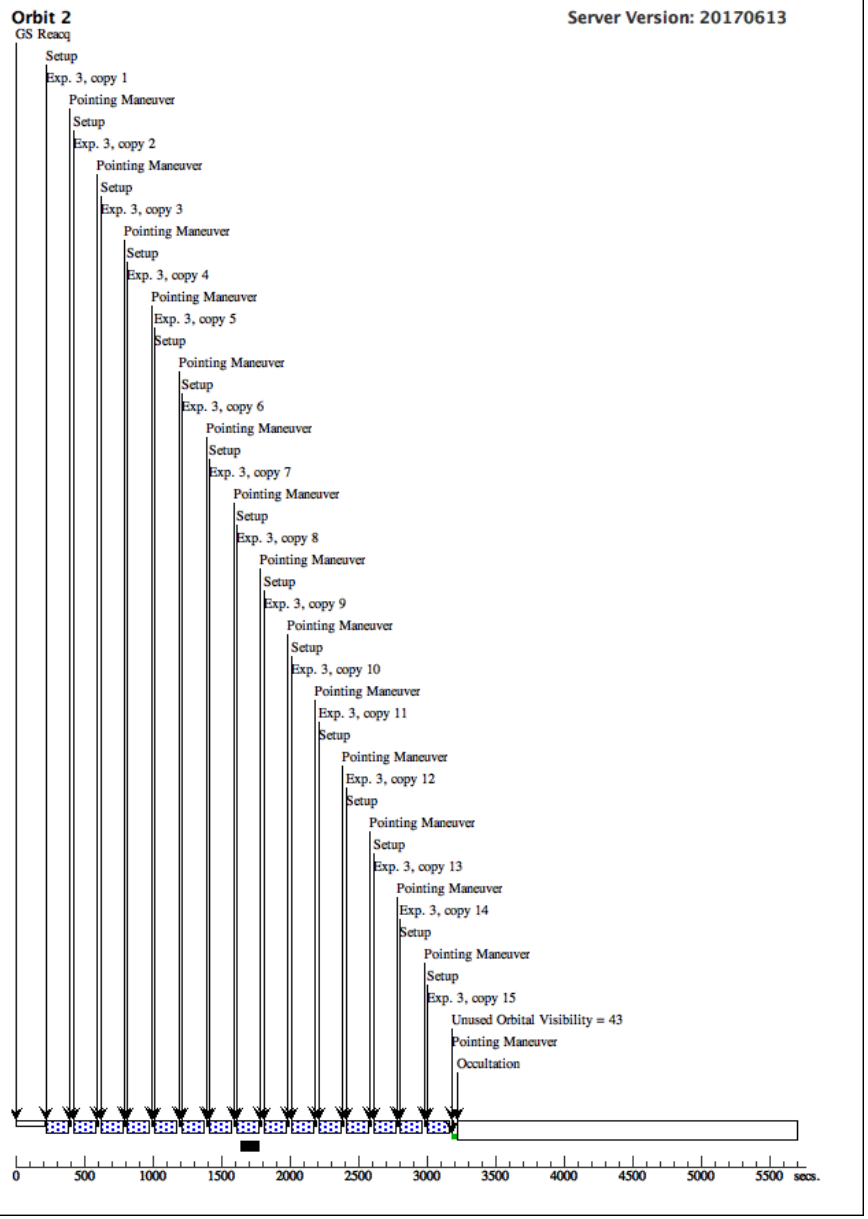
#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	W17 F139M O1	(1) WASP-17	WFC3/IR, MULTIACCUM, GRISM256	F139M	NSAMP=7; SAMP-SEQ=RAPID	PHASE 0.951 TO 0.955	Sequence 1-2 Non-Int in W17 G102 (32)	1.944705 Secs (1.945 Secs)	
								[==>]	***[1]***
2	W17 G102 O1	(1) WASP-17	WFC3/IR, MULTIACCUM, GRISM256	G102	SAMP-SEQ=SPARS25; NSAMP=7	SPATIAL SCAN 0.0 264,270.0 Degrees,Forward	Sequence 1-2 Non-Int in W17 G102 (32)	134.354049 Secs X 12 (1612.249 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)]*	***[1]***
3	W17 G102 O2	(1) WASP-17	WFC3/IR, MULTIACCUM, GRISM256	G102	SAMP-SEQ=SPARS25; NSAMP=7	SPATIAL SCAN 0.0 264,270.0 Degrees,Forward	Sequence 3-3 Non-Int in W17 G102 (32)	134.354049 Secs X 15 (2015.311 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)]*	***[2]***

	4	W17 G102 O3	(1) WASP-17	WFC3/IR, MULTIACCUM, GRISM256	G102	SAMP-SEQ=SPARS 25; NSAMP=7	SPATIAL SCAN 0.0 264,270.0 Degrees,Forward	Sequence 4-4 Non-It in W17 G102 (32)	134.354049 Secs X 15 (2015.311 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)]*	***[3]***
	5	W17 G102 O4	(1) WASP-17	WFC3/IR, MULTIACCUM, GRISM256	G102	SAMP-SEQ=SPARS 25; NSAMP=7	SPATIAL SCAN 0.0 264,270.0 Degrees,Forward	Sequence 5-5 Non-It in W17 G102 (32)	134.354049 Secs X 15 (2015.311 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)]*	***[4]***

	6	W17 G102 O5	(1) WASP-17	WFC3/IR, MULTIACCUM, GRISM256	G102	SAMP-SEQ=SPARS 25; NSAMP=7	SPATIAL SCAN 0.0 264,270.0 Degrees,Forward	Sequence 6-6 Non-In t in W17 G102 (32)	134.354049 Secs X 13 (1746.603 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)]*	***[5]***

Orbit Structure

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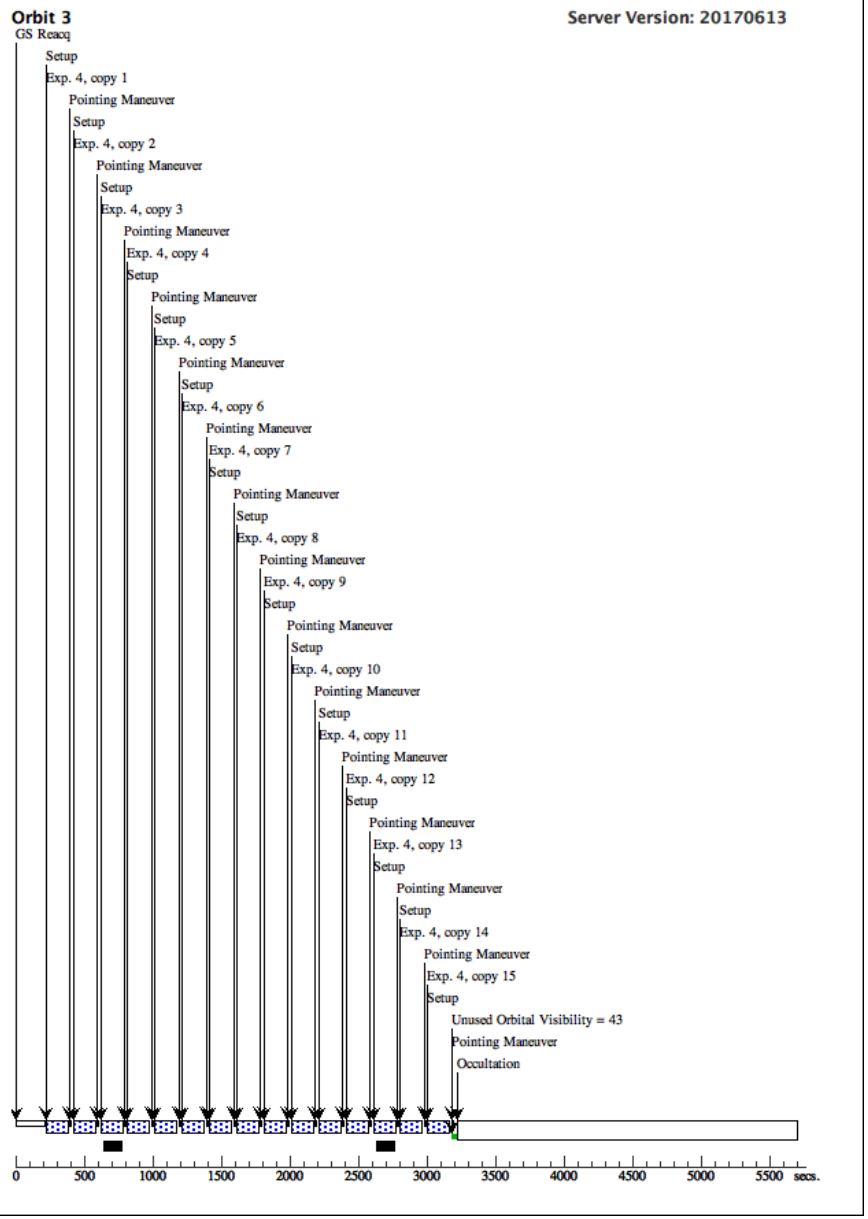
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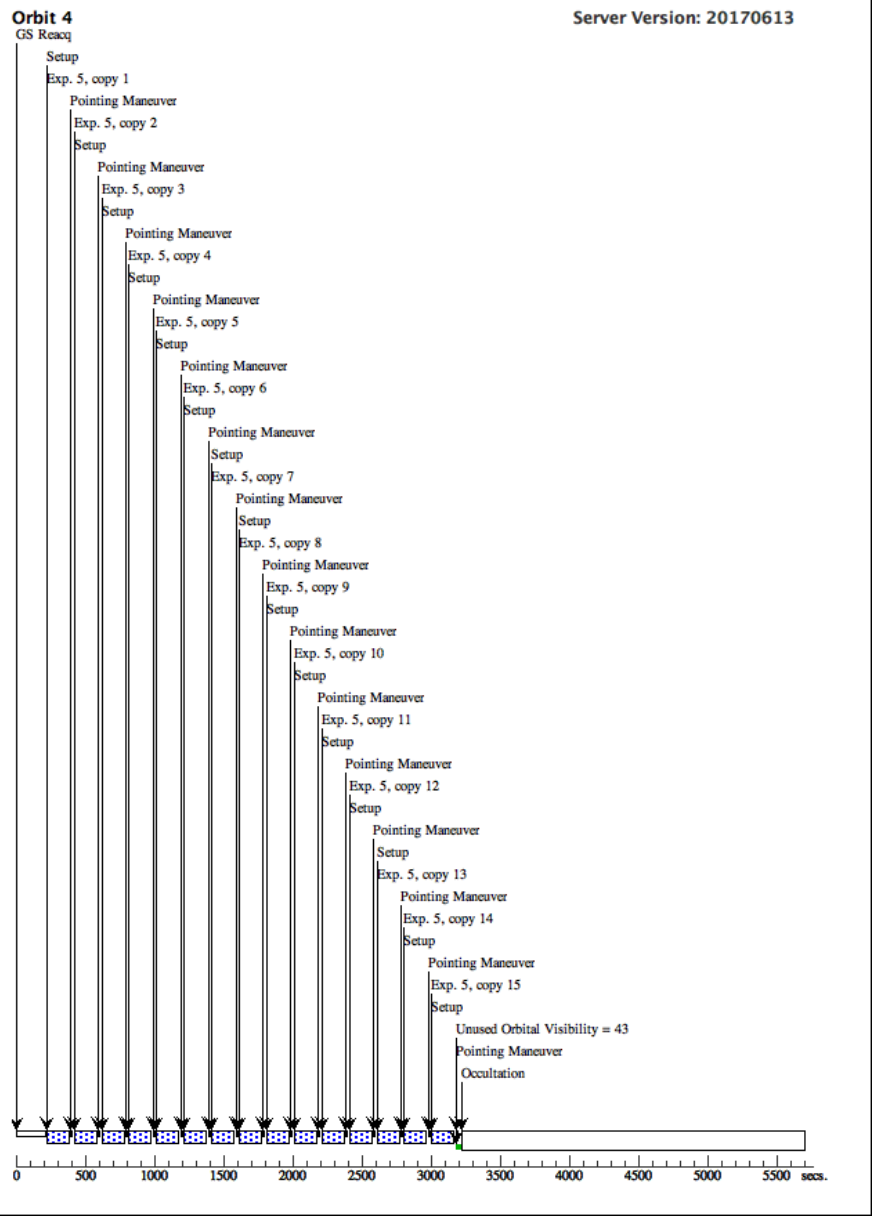
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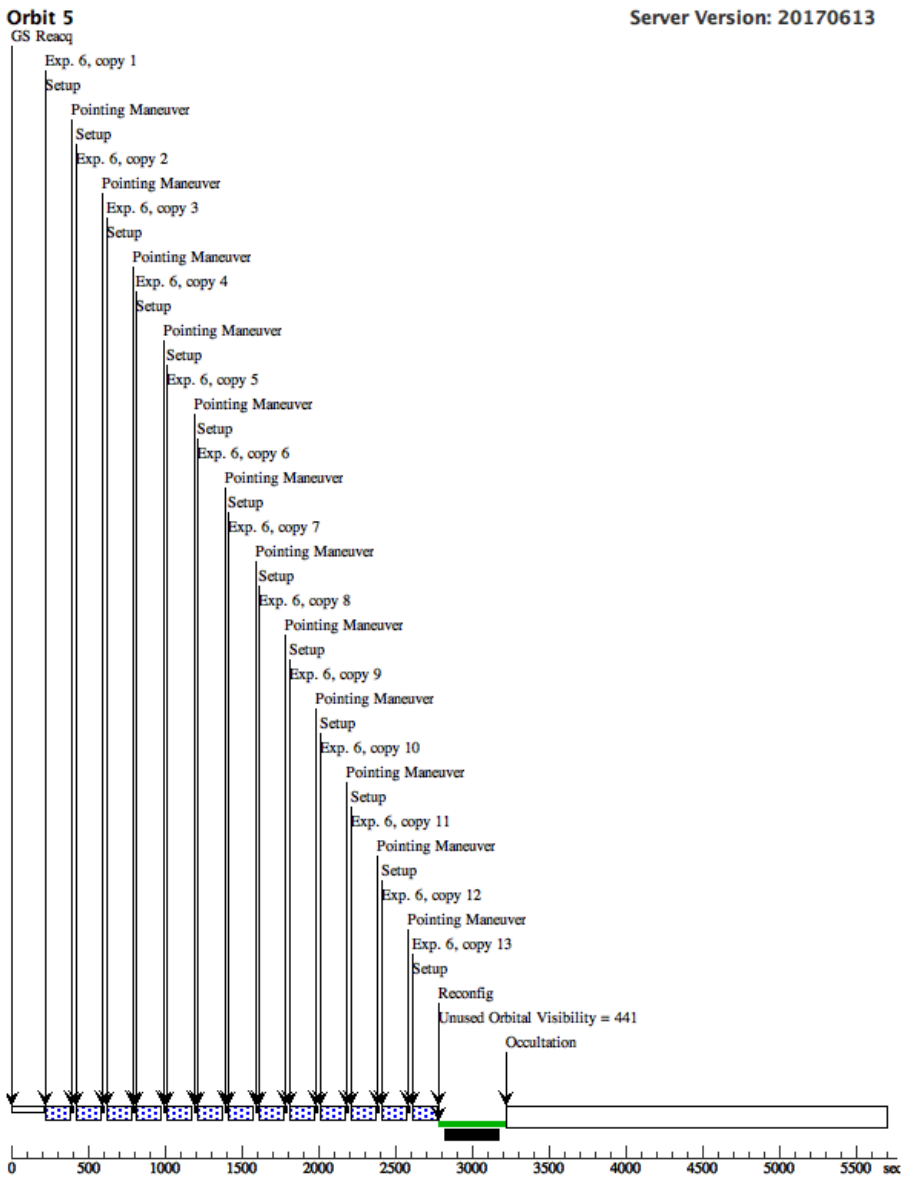
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