



14887 - Spectroscopic Characterization of a Newborn Neptune-Sized Planet

Cycle: 24, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

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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) USCO-161014.75-191909.3	WFC3/IR	6	04-May-2017 21:02:24.0	yes
02	(1) USCO-161014.75-191909.3	STIS/CCD STIS/FUV-MAMA	1	04-May-2017 21:02:31.0	yes
03	(1) USCO-161014.75-191909.3	STIS/CCD STIS/FUV-MAMA	1	04-May-2017 21:02:32.0	yes
04	(1) USCO-161014.75-191909.3	STIS/CCD STIS/FUV-MAMA	1	04-May-2017 21:02:32.0	yes
05	(1) USCO-161014.75-191909.3	STIS/CCD STIS/FUV-MAMA	1	04-May-2017 21:02:33.0	yes

10 Total Orbits Used

ABSTRACT

The study of planet formation as it occurs has remained an elusive frontier, until now. Our team recently identified a newly-born planet orbiting a young, 5-10 Myr old, pre-main-sequence M star in the Upper Scorpius star-forming region. In its early stage, the close-in planet is about 50% larger than Neptune. Models predict that it will contract over the coming 100-1000 Myr to become a member of the intriguingly abundant class of close-in sub-Neptunes. Spectroscopic observations of this newborn planet will give us the unprecedented opportunity to probe the formation and evolution of low-mass, close-in planets at this early stage. Here, we propose to a reconnaissance study to probe the adolescent state of the gravitationally-bound atmosphere using near-infrared transit spectroscopy and the planet's hydrogen loss rate using far-UV transit spectroscopy. Together, our observations will give us unparalleled insights into the initial state of a young close-in planet as well as into the competing timescales of Kelvin-Helmholtz contraction and envelope mass-loss involved in the early evolution of close-in sub-Neptunes and Neptunes. If the proposed reconnaissance observations detect that molecular absorption in the atmosphere of USco 1610-1919b, then USco 1610-1919b will be one of the prime targets for the 200-hour JWST/NIRISS GTO program to probe the formation and evolution of exoplanets. Mid-cycle observations are required because the final target list for JWST/GTO programs must be locked in by June 2017 before the beginning of HST Cycle 25.

OBSERVING DESCRIPTION

The program consists of one WFC3/G141 transit visit and four individual UV orbits of the young exoplanet USco-1610-1919.

It is essential for the orbits of WFC3/G141 visit to be scheduled in a contiguous block.

Proposal 14887 - Visit 01 - Spectroscopic Characterization of a Newborn Neptune-Sized Planet

Visit	Proposal 14887, Visit 01, implementation Fri May 05 01:02:34 GMT 2017				
	Diagnostic Status: No Diagnostics Scientific Instruments: WFC3/IR Special Requirements: Period 5.424865 D AND ZERO-PHASE HJD2457544.253 <i>Comments: WFC3/G141 transit visit of USco1610-1919b. It is essential for the orbits in this visit to be scheduled in a contiguous block.</i>				
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes
	(1)	USCO-161014.75-191909.3	RA: 16 10 14.7500 (242.5614583d) Dec: -19 19 9.30 (-19.31925d) Equinox: J2000	Proper Motion RA: -9.8 mas/yr Proper Motion Dec: -24.2 mas/yr Epoch of Position: 2000	V=14.4 H=10.3
					Miscellaneous
					Reference Frame: ICRS

Proposal 14887 - Visit 01 - Spectroscopic Characterization of a Newborn Neptune-Sized Planet

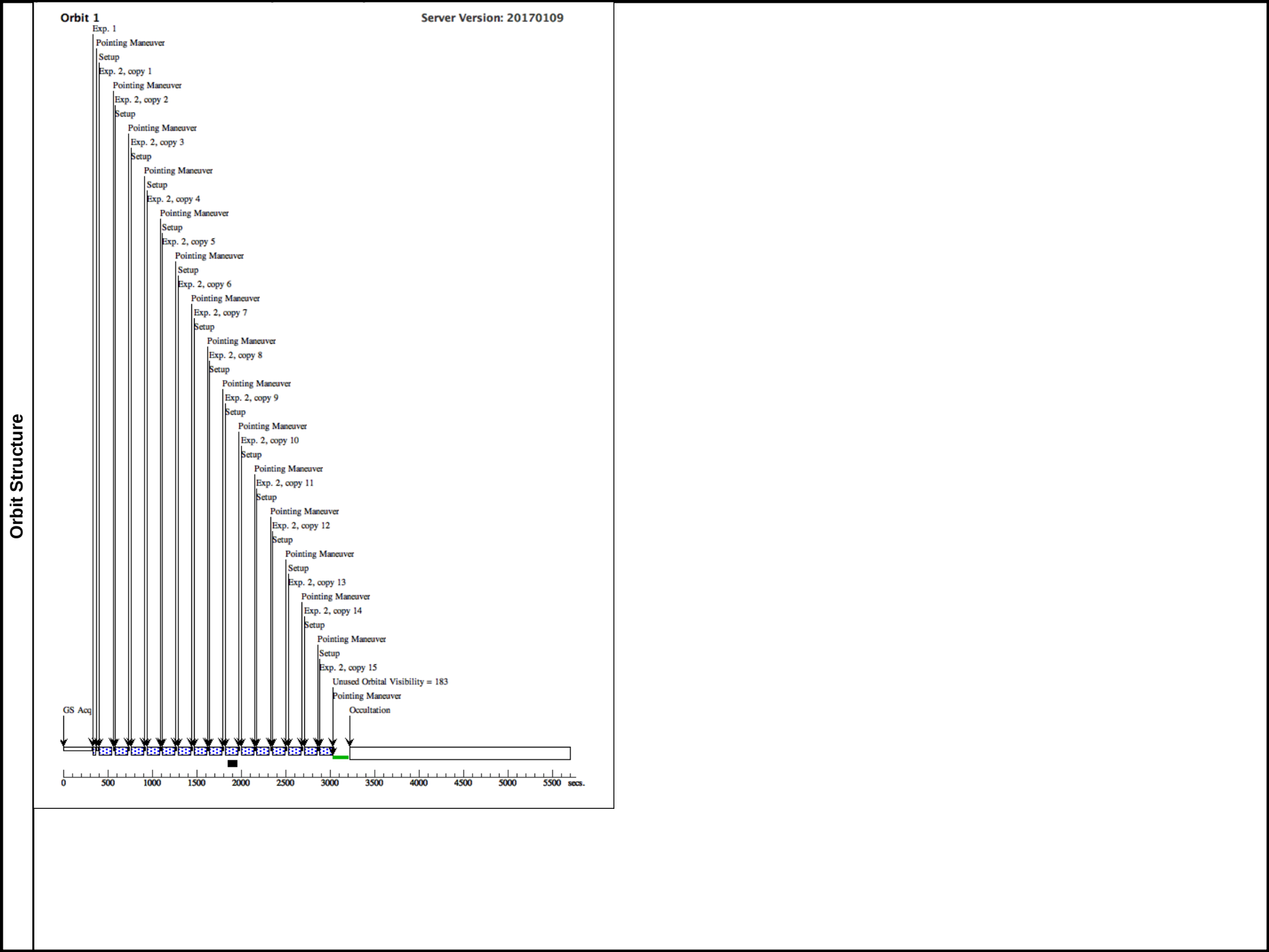
Exposures	#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1		(1) USCO-161014.7 5-191909.3	WFC3/IR, MULTIACCUM, IRSUB256	F139M	SAMP-SEQ=RAPID ; NSAMP=5	POS TARG 0.0,0.0; PHASE 0.95609 TO 0.96377	Sequence 1-2 Non-In t in Visit 01	1.389075 Secs (1.389 Secs) [==>]	[1]
	2		(1) USCO-161014.7 5-191909.3	WFC3/IR, MULTIACCUM, GRISM256	G141	SAMP-SEQ=SPARS 25; NSAMP=6	POS TARG 0.0,-12; SPATIAL SCAN 0.0 37,90.0 Degrees,For ward	Sequence 1-2 Non-In t in Visit 01	112.00801 Secs X 15 (1680.12 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)]	[1]
	3		(1) USCO-161014.7 5-191909.3	WFC3/IR, MULTIACCUM, GRISM256	G141	SAMP-SEQ=SPARS 25; NSAMP=6	POS TARG 0.0,-12; SPATIAL SCAN 0.0 37,90.0 Degrees,For ward	Sequence 3-3 Non-In t in Visit 01	112.00801 Secs X 16 (1792.128 Sec s) [==>(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)]	[2]

Proposal 14887 - Visit 01 - Spectroscopic Characterization of a Newborn Neptune-Sized Planet

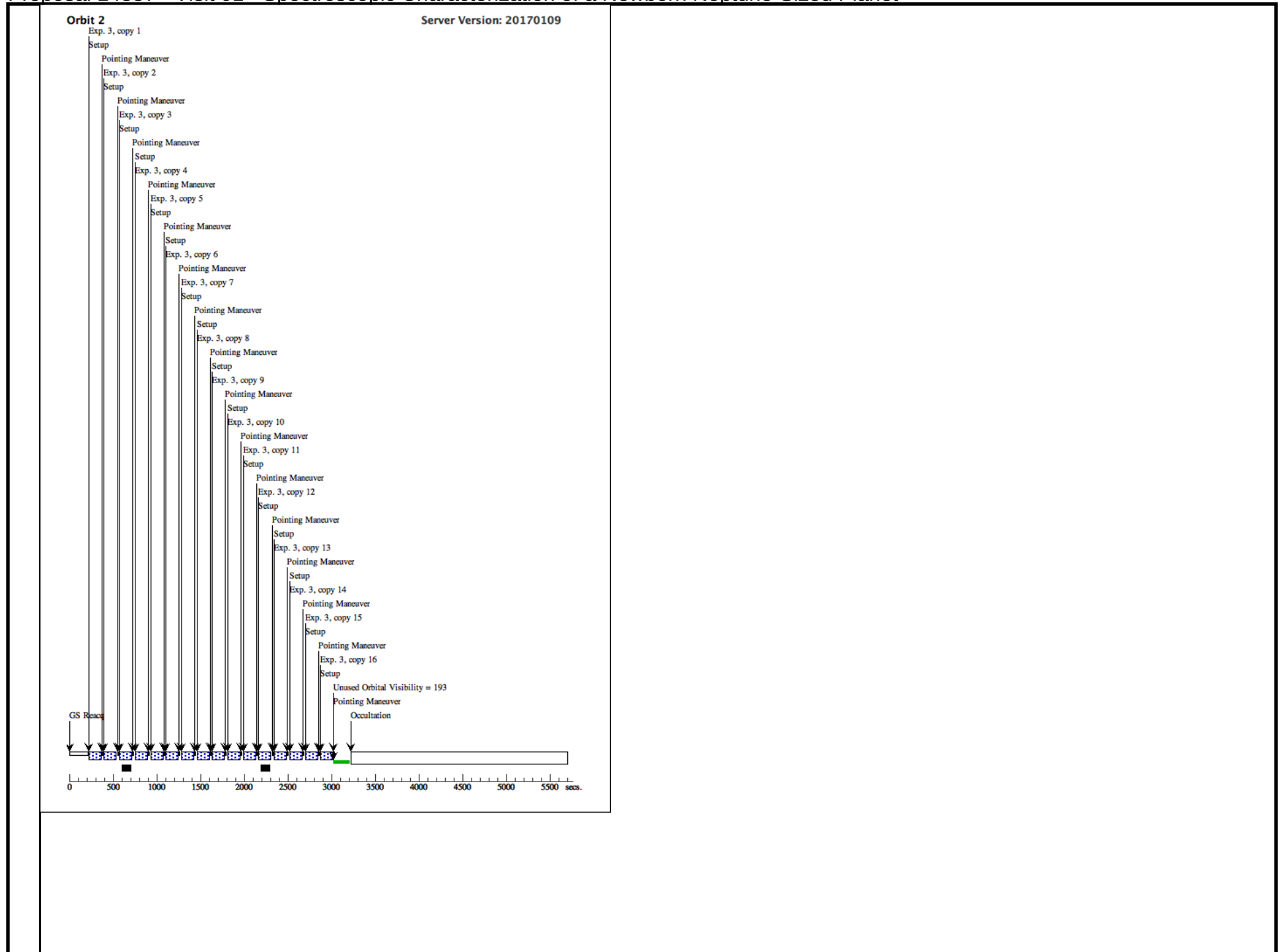
4	(1) USCO-161014.7 5-191909.3	WFC3/IR, MULTIACCUM, GRISM256	G141	SAMP-SEQ=SPARS 25; NSAMP=6	POS TARG 0.0,-12; SPATIAL SCAN 0.0 37,90.0 Degrees,Forward	Sequence 4-4 Non-Int in Visit 01	112.00801 Secs X 16 (1792.128 Secs)	[3]
							[==>(Copy 1)] [==>(Copy 2)] [==>(Copy 3)] [==>(Copy 4)] [==>(Copy 5)] [==>(Copy 6)] [==>(Copy 7)] [==>(Copy 8)] [==>(Copy 9)] [==>(Copy 10)] [==>(Copy 11)] [==>(Copy 12)] [==>(Copy 13)] [==>(Copy 14)] [==>(Copy 15)] [==>(Copy 16)]	
5	(1) USCO-161014.7 5-191909.3	WFC3/IR, MULTIACCUM, GRISM256	G141	SAMP-SEQ=SPARS 25; NSAMP=6	POS TARG 0.0,-12; SPATIAL SCAN 0.0 37,90.0 Degrees,Forward	Sequence 5-5 Non-Int in Visit 01	112.00801 Secs X 16 (1792.128 Secs)	[4]
							[==>(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)]	

Proposal 14887 - Visit 01 - Spectroscopic Characterization of a Newborn Neptune-Sized Planet

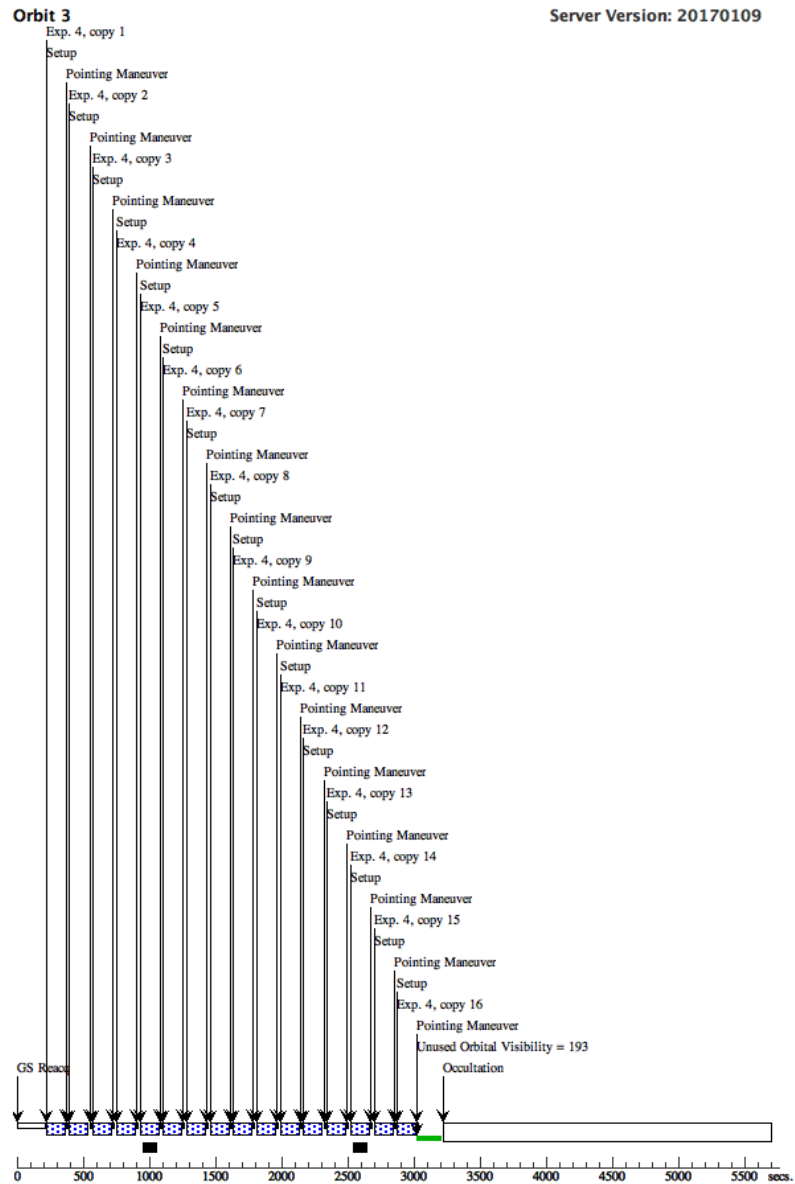
6	(1) USCO-161014.7 5-191909.3	WFC3/IR, MULTIACCUM, GRISM256	G141	SAMP-SEQ=SPARS 25; NSAMP=6	POS TARG 0.0,-12; SPATIAL SCAN 0.0 37,90.0 Degrees,Forward	Sequence 6-6 Non-Int in Visit 01	112.00801 Secs X 16 (1792.128 Secs)	[5]
							[==>(Copy 1)] [==>(Copy 2)] [==>(Copy 3)] [==>(Copy 4)] [==>(Copy 5)] [==>(Copy 6)] [==>(Copy 7)] [==>(Copy 8)] [==>(Copy 9)] [==>(Copy 10)] [==>(Copy 11)] [==>(Copy 12)] [==>(Copy 13)] [==>(Copy 14)] [==>(Copy 15)] [==>(Copy 16)]	
7	(1) USCO-161014.7 5-191909.3	WFC3/IR, MULTIACCUM, GRISM256	G141	SAMP-SEQ=SPARS 25; NSAMP=6	POS TARG 0.0,-12; SPATIAL SCAN 0.0 37,90.0 Degrees,Forward	Sequence 7-7 Non-Int in Visit 01	112.00801 Secs X 16 (1792.128 Secs)	[6]
							[==>(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)]	

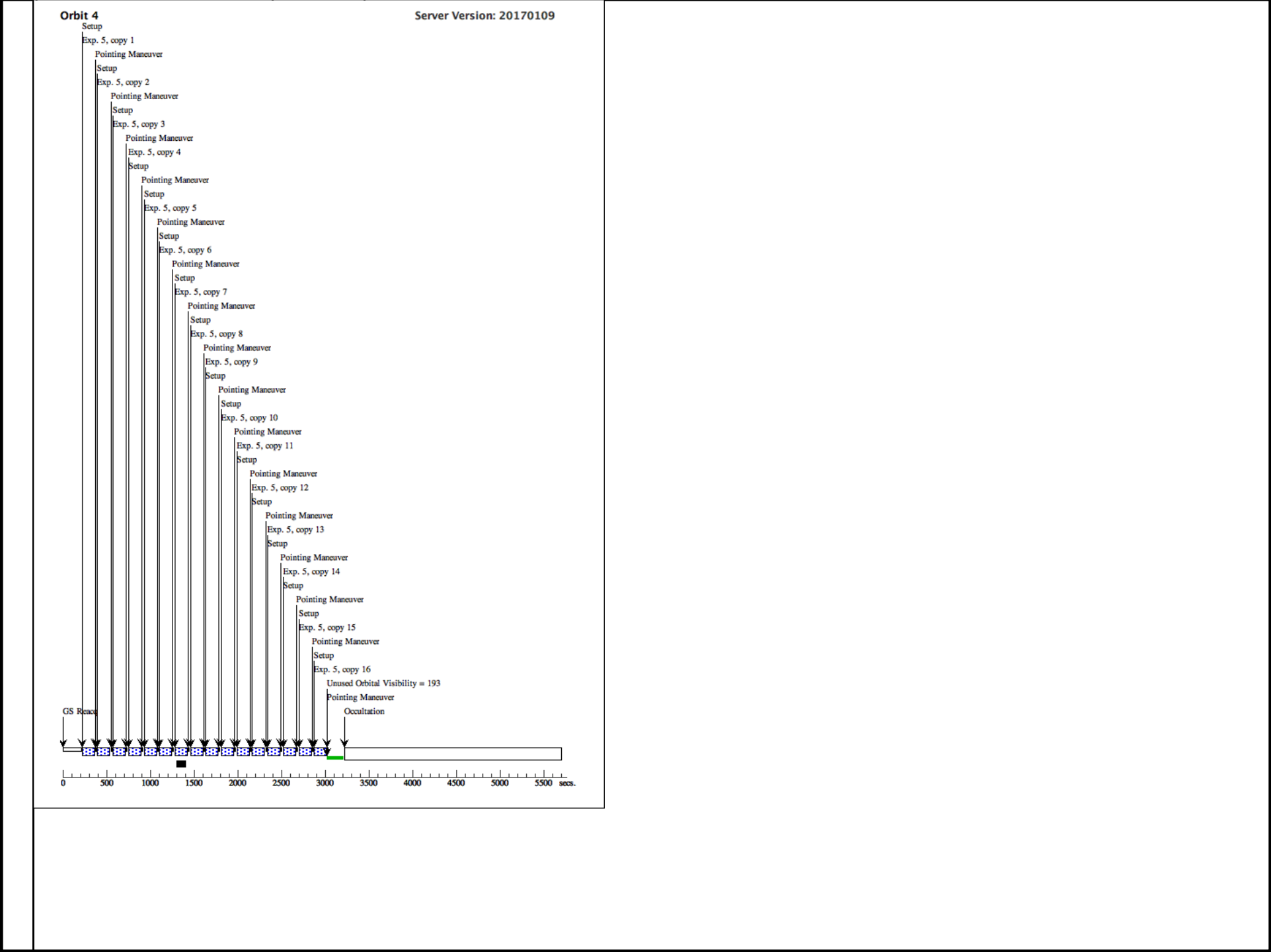


Proposal 14887 - Visit 01 - Spectroscopic Characterization of a Newborn Neptune-Sized Planet

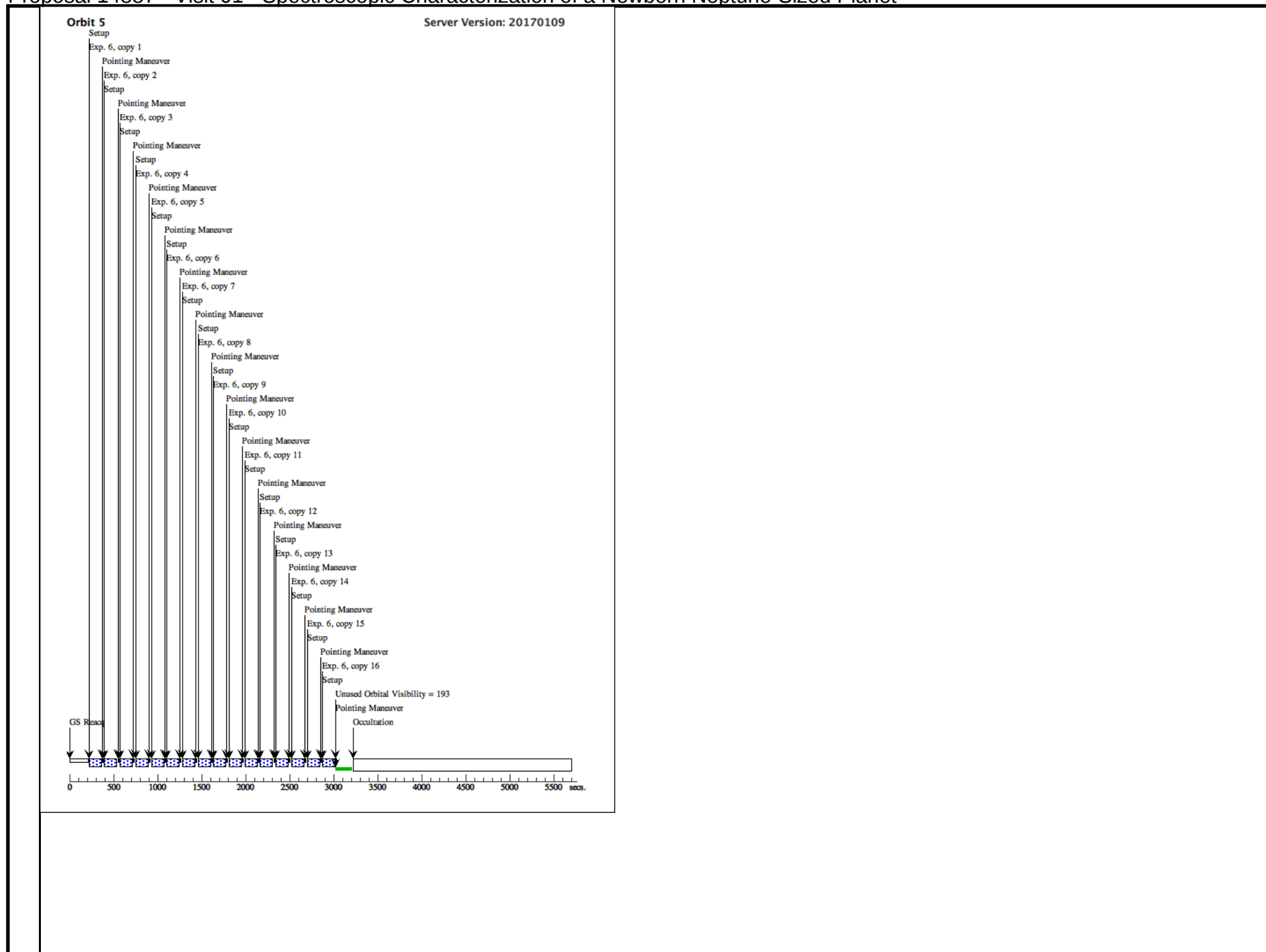


Proposal 14887 - Visit 01 - Spectroscopic Characterization of a Newborn Neptune-Sized Planet

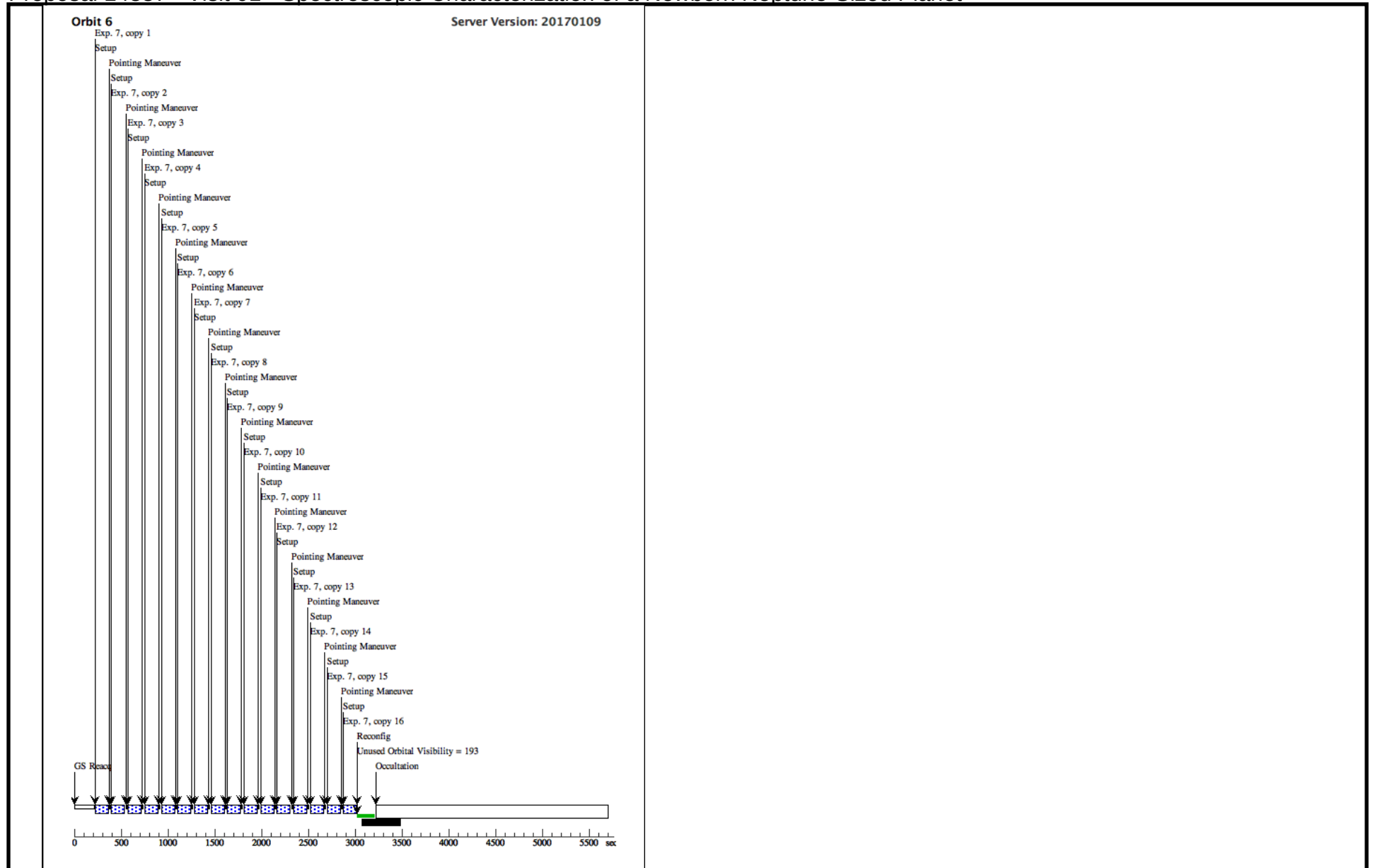




Proposal 14887 - Visit 01 - Spectroscopic Characterization of a Newborn Neptune-Sized Planet



Proposal 14887 - Visit 01 - Spectroscopic Characterization of a Newborn Neptune-Sized Planet



Proposal 14887 - Visit 02 - Spectroscopic Characterization of a Newborn Neptune-Sized Planet

Fri May 05 01:02:35 GMT 2017

Visit	Proposal 14887, Visit 02, implementation Diagnostic Status: No Diagnostics Scientific Instruments: STIS/CCD, STIS/FUV-MAMA Special Requirements: AFTER 01; Period 5.424865 D AND ZERO-PHASE HJD2457544.253										Fri May 05 01:02:35 GMT 2017
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections		Fluxes	Miscellaneous				
	(1)	USCO-161014.75-191909.3	RA: 16 10 14.7500 (242.5614583d) Dec: -19 19 9.30 (-19.31925d) Equinox: J2000	Proper Motion RA: -9.8 mas/yr Proper Motion Dec: -24.2 mas/yr Epoch of Position: 2000		V=14.4 H=10.3	Reference Frame: ICRS				
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit	
	1	Acquisition (STIS.im.75 7956)	(1) USCO-161014.7 5-191909.3	STIS/CCD, ACQ, F25ND3	MIRROR		PHASE 0.4 TO 0.6		5 Secs (5 Secs) [==>]	 [1]	
	2	Acquisition/ Peak (STIS.sp.75 7958)	(1) USCO-161014.7 5-191909.3	STIS/CCD, ACQ/PEAK, 52X0.05	G750L 7751 A				13 Secs (13 Secs) [==>]	 [1]	
	3	Science Data (STIS.sp.75 7964)	(1) USCO-161014.7 5-191909.3	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140L 1425 A	BUFFER-TIME=10 00			1634 Secs (1634 Secs) [==>]	 [1]	
Orbit Structure	Orbit 1 Server Version: 20170109 Timeline (seconds): 0, 500, 1000, 1500, 2000, 2500, 3000, 3500, 4000, 4500, 5000, 5500 sec										

Proposal 14887 - Visit 03 - Spectroscopic Characterization of a Newborn Neptune-Sized Planet

Fri May 05 01:02:35 GMT 2017

Visit

Proposal 14887, Visit 03, implementation

Diagnostic Status: No Diagnostics

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

Special Requirements: AFTER 02; Period 5.424865 D AND ZERO-PHASE HJD2457544.253

Comments: Visits 3, 4, and 5 need to be executed in series within the same orbital period of the planet. Together they form one transit observation (before transit baseline, in-transit, after transit baseline). The Hubble Space Telescope can observe two orbits for a different program in between the visits.

The pattern would be as follows:

orbit 1: our Visit 3 (before the transit)

orbit 2: other science from a different PI

orbit 3: other science from a different PI
orbit 4: our Visit 4 in transit

orbit 4: our Visit 4 in-transit
orbit 5: other science from a

orbit 6: other science from a different PI

orbit 7: our visit 5 after the transit

Orbit 7: Ear visit 5 after the transit

The phase requirement are set to make this possible.

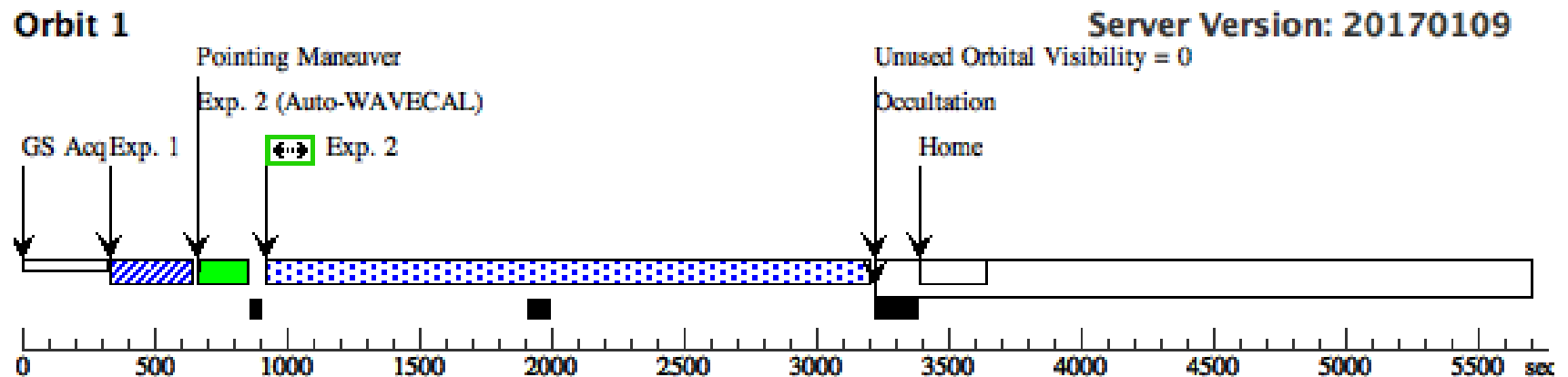
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	USCO-161014.75-191909.3	RA: 16 10 14.7500 (242.5614583d) Dec: -19 19 9.30 (-19.31925d) Equinox: J2000	Proper Motion RA: -9.8 mas/yr Proper Motion Dec: -24.2 mas/yr Epoch of Position: 2000	V=14.4 H=10.3	Reference Frame: ICRS

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	Acquisition (STIS.im.75 7956)	(1) USCO-161014.7 5-191909.3	STIS/CCD, ACQ, F25ND3	MIRROR		PHASE 0.95933272 TO 0.96693272		5 Secs (5 Secs) [>=>]	 [1]
2	Science Data (STIS.sp.75 7964)	(1) USCO-161014.7 5-191909.3	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140L 1425 A	BUFFER-TIME=10 00			2271 Secs (2271 Secs) [>=>]	 [1]

Orbit Structure



Proposal 14887 - Visit 04 - Spectroscopic Characterization of a Newborn Neptune-Sized Planet

Fri May 05 01:02:35 GMT 2017

Visit	Proposal 14887, Visit 04, implementation Diagnostic Status: No Diagnostics Scientific Instruments: STIS/CCD, STIS/FUV-MAMA Special Requirements: AFTER 03 BY 1.9 Orbits TO 3.1 Orbits; Period 5.424865 D AND ZERO-PHASE HJD2457544.253 Comments: Visits 3, 4, and 5 need to be executed in series within the same orbital period of the planet. Together they form one transit observation (before transit baseline, in-transit, after transit baseline). The Hubble Space Telescope can observe two orbits for a different program in between the visits. The pattern would be as follows: orbit 1: our Visit 3 (before the transit) orbit 2: other science from a different PI orbit 3: other science from a different PI orbit 4: our Visit 4 in-transit orbit 5: other science from a different PI orbit 6: other science from a different PI orbit 7: our visit 5 after the transit The phase requirement are set to make this possible.									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	USCO-161014.75-191909.3	RA: 16 10 14.7500 (242.5614583d) Dec: -19 19 9.30 (-19.31925d) Equinox: J2000	Proper Motion RA: -9.8 mas/yr Proper Motion Dec: -24.2 mas/yr Epoch of Position: 2000	V=14.4 H=10.3	Reference Frame: ICRS				
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	Acquisition (STIS.im.75 7956)	(1) USCO-161014.7 5-191909.3	STIS/CCD, ACQ, F25ND3	MIRROR		PHASE 0.9962 TO 0 .0038		5 Secs (5 Secs) [==>]	[1]
	2	Science Data (STIS.sp.75 7964)	(1) USCO-161014.7 5-191909.3	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140L 1425 A	BUFFER-TIME=10 00			2271 Secs (2271 Secs) [==>]	[1]
Orbit Structure	Orbit 1									
	Server Version: 20170109 Unused Orbital Visibility = 0 Occultation Home Exp. 2 (Auto-WAVECAL) Pointing Maneuver Exp. 2 GS Acq Exp. 1									

Proposal 14887 - Visit 05 - Spectroscopic Characterization of a Newborn Neptune-Sized Planet

Fri May 05 01:02:35 GMT 2017

Visit	Proposal 14887, Visit 05, implementation									
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: STIS/CCD, STIS/FUV-MAMA									
	Special Requirements: AFTER 04 BY 1.9 Orbits TO 3.1 Orbits; Period 5.424865 D AND ZERO-PHASE HJD2457544.253									
	Comments: Visits 3, 4, and 5 need to be executed in series within the same orbital period of the planet. Together they form one transit observation (before transit baseline, in-transit, after transit baseline). The Hubble Space Telescope can observe two orbits for a different program in between the visits. The pattern would be as follows: orbit 1: our Visit 3 (before the transit) orbit 2: other science from a different PI orbit 3: other science from a different PI orbit 4: our Visit 4 in-transit orbit 5: other science from a different PI orbit 6: other science from a different PI orbit 7: our visit 5 after the transit The phase requirement are set to make this possible.									
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(1)	USCO-161014.75-191909.3	RA: 16 10 14.7500 (242.5614583d) Dec: -19 19 9.30 (-19.31925d) Equinox: J2000	Proper Motion RA: -9.8 mas/yr Proper Motion Dec: -24.2 mas/yr Epoch of Position: 2000		V=14.4 H=10.3		Reference Frame: ICRS		
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	Acquisition (STIS.im.75 7956)	(1) USCO-161014.7 5-191909.3	STIS/CCD, ACQ, F25ND3	MIRROR		PHASE 0.03306728 TO 0.04066728		5 Secs (5 Secs) [==>]	[1]
	2	Science Data (STIS.sp.75 7964)	(1) USCO-161014.7 5-191909.3	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140L 1425 A	BUFFER-TIME=10 00			2271 Secs (2271 Secs) [==>]	[1]
Orbit Structure	Orbit 1 Server Version: 20170109									