



13653 - Elementary Abundances of Planetary Systems

Cycle: 22, 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) XO-2	WFC3/IR	1	22-Dec-2015 21:09:39.0	yes
02	(1) XO-2	WFC3/IR	1	22-Dec-2015 21:09:41.0	yes
03	(1) XO-2	WFC3/IR	1	22-Dec-2015 21:09:42.0	yes
04	(1) XO-2	WFC3/IR	1	22-Dec-2015 21:09:44.0	yes
05	(1) XO-2	WFC3/IR	1	22-Dec-2015 21:09:45.0	yes
06	(1) XO-2	WFC3/IR	1	22-Dec-2015 21:09:47.0	yes

<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>
07	(1) XO-2	WFC3/IR	1	22-Dec-2015 21:09:48.0	yes
08	(1) XO-2	WFC3/IR	1	22-Dec-2015 21:09:49.0	yes
09	(1) XO-2	WFC3/IR	1	22-Dec-2015 21:09:51.0	yes
10	(1) XO-2	WFC3/IR	1	22-Dec-2015 21:09:53.0	yes
11	(1) XO-2	WFC3/IR	1	22-Dec-2015 21:09:55.0	yes
12	(1) XO-2	WFC3/IR	1	22-Dec-2015 21:09:56.0	yes

12 Total Orbits Used

ABSTRACT

Close-orbiting Hot Jupiter exoplanets were not predicted because the ices needed to build their large cores would have accreted in the outer stellar system where temperatures are cool enough for ices to condense. Their existence suggests more substantial planet migration than indicated in the Solar System, or perhaps different formation mechanisms. To probe the formation environment of Hot Jupiters, we propose measurements of the elemental abundances of oxygen and carbon, which derive from icy (H₂O, CO₂ and CO) planetismals that condensed in different parts of the disk. To determine the water abundance at the precision needed to detect ice-derived material in Jupiter's atmosphere, we propose a coordinated ground-based and space-based study. We target the exoplanet XO-2b, which has an ideal reference star (the host star's binary companion of similar stellar type and brightness), allowing us to remove atmospheric effects from the ground-based measurements. We propose to measure XO-2b's water bands with HST/WFC3 1.1-1.7 micron spectra, which enables a retrieval of CO from the already measured Spitzer transit and eclipse photometry. Simultaneous Gemini optical measurements constrain XO-2b's 10-bar radius and the cloud coverage, which allow us to constrain the degenerate solution set and decrease uncertainties in retrieved water abundances from current values of a factor of 100 to our expected uncertainty of a factor of 3 in the derived abundance. The aim of this study is to derive strategies for measuring accurate exoplanetary compositions, as needed to pursue statistically significant studies.

OBSERVING DESCRIPTION

Observational architecture:

The cycle 22 program 13653, entitled "Elementary Abundances of Planetary Systems", probes the formation environment of Hot Jupiters through precise measurements of the elemental abundances of oxygen and carbon, which derive originally from icy (H₂O, CO₂ and CO) planetismals that

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condensed in different parts of the disk. We focus on one exoplanetary system consisting of the exoplanet XO-2b, its host star (XO-2N also known as XO-2B and TYC 3413-5-1), which has an ideal reference star, the host star's binary companion of similar stellar type and brightness (XO-2S, also known as XO-2A and TYC 3413-210-1). The reference star allows us to remove atmospheric effects from the ground-based measurements and better understand systematic errors in HST near-IR spectroscopy and ground-based measurements (e.g. wavelength-dependent systematic error sources such as HST/WFC3's well-documented ramp effect). We conduct specific coordinated Gemini/GMOSN optical spectroscopy measurements of the planet's 10 bar radius and HST/WFC3 (G141) measurements of XO-2b's 1.1-1.7 micron spectrum. These coordinated observations eliminate degeneracies in the derived gas abundances that occur from the uncertainties in the 10 bar radius of the planet. In addition the simultaneity of the observations eliminate uncertainties in the interpretation of the data due to the inherent variability of the system. Our theoretical studies and past observations indicate that the strategy proposed here will lead to the derivation of accurate exoplanetary compositions, as needed to pursue statistically significant studies on the origin of the C and O material in exoplanetary atmospheres. The observations include 12 orbits that cover two transits of XO-2b, which will be recorded simultaneously with 2 nights of Gemini North (Mauna Kea) optical spectroscopy. Additional supporting optical observations (not included in the HST proposal) will be recorded in California and Arizona (on nearby nights) in case of bad weather in Hawaii.

The observations are extremely time sensitive (as discussed below) because they occur when XO-2b transits its host star XO-2N, and because the HST observations will be recorded simultaneously with the Gemini North; therefore only Hawaii viewable transits are viable.

Observing Strategy:

We propose to use a 512x512 subarray to capture the full first order of the spectrum of both the target star XO-2N (spectral type = G9V; H-mag = 9.340) and its binary companion XO-2S, which is 31.21 arcsec or 240 WFC3 pixels away. We used the WFC3 Exposure Time Calculator (ETC) to determine that an integration time of 1.88 seconds per pixel provides a maximum count of 17,332.66 electrons per pixel, which is well within the linear response of the detector array. To maximize the duty cycle, we propose to execute our observations in the well-established spatial scan mode. We propose to execute our observations in SPARS 25 mode with NSAMP = 15 which allows 322 sec integrations. We propose to scan 172 pixels, which provides a buffer of 68.5 pixels between the scanned spectra of XO-2S and XO-2N (Fig. 1). This translates in a scan rate of 0.069 arcsec/sec, which is easily achieved under FGS control (max = 4.8 arcsec/sec). It also ensures that we stay well below the linearity limit since we sweep the detector at a rate of about 1.88 sec per pixel.

To keep the cadence of the exposures high, we will adopt a scan mode in which we scan from the bottom of the array to the top in one image, then from the top to the bottom in the next, and so on. Using the ETC, we determine a sensitivity of about 100 ppm per orbit per spectral channel using the

proposed spatial scan mode.

Orientation:

For the XO-2 system, the two stars are separated by 31.21 arcseconds with a position angle of 153 degrees. Since an orient of 135 degrees aligns the y-axis of the detector with North, the ideal orient for our observations = $135 + 153 = 288$ degrees (or 108 degrees) to align the y-axis of the detector with the vector drawn between the binary stars of XO-2.

To prevent the two scanned spectra from overlapping, we adopt a half-angle uncertainty of 29 degrees. Using a total length of scan of 22.3 arcsec (= Scan Rate (0.07 arcsec/sec) x Exposure Time (322 sec)) and a telescope roll orient of 108 degrees, then the two spectra will be separated by at best 8.91 arcsec = 68.5 pixels. Assuming an "at worst" alignment of 108 ± 29 degrees, then the two spectra will be separated by at worst 4.97 arcsec = 38 pixels between the spectra of XO-2N and XO-2S. Therefore, the ideal orient is 288 ± 29 degrees or 108 ± 29 degrees. However, based on the roll restrictions for HST during our observations, we are limited to 108 ± 29 degrees. We have implemented this in the APT.

Special Requirements (Time Critical):

Our observations are time critical. We have identified only 2 transits this year that allow for simultaneous HST and Gemini observations for which both the host star and reference star can be recorded. As our observations are centered on the transit of the planet XO-2b, timing is crucial. The ephemeris for XO-2b is known to adequate precision to schedule these observations. We are imposing a constraint of ± 30 minutes on the start time for each individual visit to ensure that we acquire sufficient baseline out-of-transit data both before and after the transit. Further time restrictions arise because the HST observations will be recorded simultaneously with the Gemini North observations. This year, there are only 5 nights in which XO-2b's transit can be observed from Hawaii with sufficient out-of-transit baseline to interpret the data. As discussed below, these UT dates are: 7 Dec 2014, 28 Dec 2014, 18 Jan 2015, 31 Jan 2015, 21 Feb 2015. HST also imposes constraints on these observations. We find that XO-2b is not observable by HST on 7 Dec 2014. Additional constraints are imposed by the "Orient" or roll angle needed to place both XO-2N and its companion star (XO-2S) on the detector to conduct a spatial scan. This constraint affects observations on 28 Dec 2014 and 18 Jan 2015; on these nights we can observe XO-2b's transit across XO-2N, but not the reference binary companion (XO-2S) which is critical to our science objective. Therefore the two preferred transits occur on UT 31 Jan 2015 and 21 Feb 2015. On these nights, the Gemini and HST observations can be conducted simultaneously, which is necessary for the success of the program. In addition, the reference binary companion can be measured simultaneously with the host star to eliminate systematic errors.

Coordinated Observations

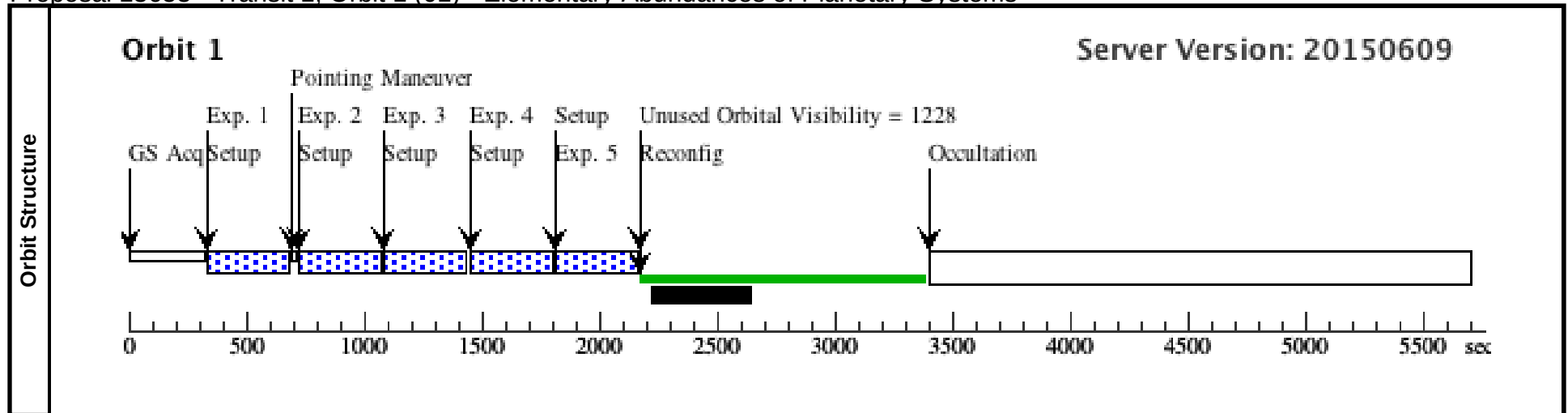
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In order to interpret the WFC3 observations of XO-2b, we request simultaneous on Gemini/GMOS in MOS mode for both transits, using the B600 grating, G5303 grating number, centered at 0.43 microns, to provide with a g filter a wavelength coverage of 0.4-0.55 microns. As XO-2b has a declination of 50 deg, there are only 4 nights in which the source is above 35 deg altitude for sufficient time to obtain 1-2 hours of out-of-transit measurements both before and after the transit. These UT dates are 7 Dec 2014, 28 Dec 2014, 18 Jan 2015, 31 Jan 2015 and 21 Feb 2015. (In Hawaii time, these are 06 Dec 2014, 27 Dec 2014, 17 Jan 2015, 30 Jan 2015, and 20 Feb 2015. We require the 2" slit to minimize slit losses. We do not nod in order to mitigate the migration of the source on the array for stability purposes (e.g., inter-pixel variations, residual flat fielding effects, etc.). According to the GMOS-N Integration Time Calculator, we estimate that a 70 second integration time of XO-2B yields 15,000-80,000 electrons per exposure per spectral pixel and a SNR range of 100-280. Assuming a readout time of 20 sec in subarray mode, there is a overhead of $20/90 = 22\%$. We will be able to take 100 images during the 2.5 hours of in-transit time, corresponding with a binned SNR of $100-280 \times \sqrt{128}$ images) which yields an error in the light curve depth of $3.6-10E-4$. Spectra will be binned in sets of 300 pixels in the spectral direction allowing us to sample the entire 0.4-0.55 micron region with roughly 20 bins and obtain a 1sigma binned uncertainty of $2-6E-5$ in the light curve depth and thus after two transits a minimum photon noise of $1.4-4.2E-5$. Assuming 1.5x the photon noise limit, the final error in the light curve depth is $2-6E-5$.

Because of the time critical nature of the observations and the need to monitor the sky and optimize the timing of the observations, we prefer that the observations be conducted in Classical mode.

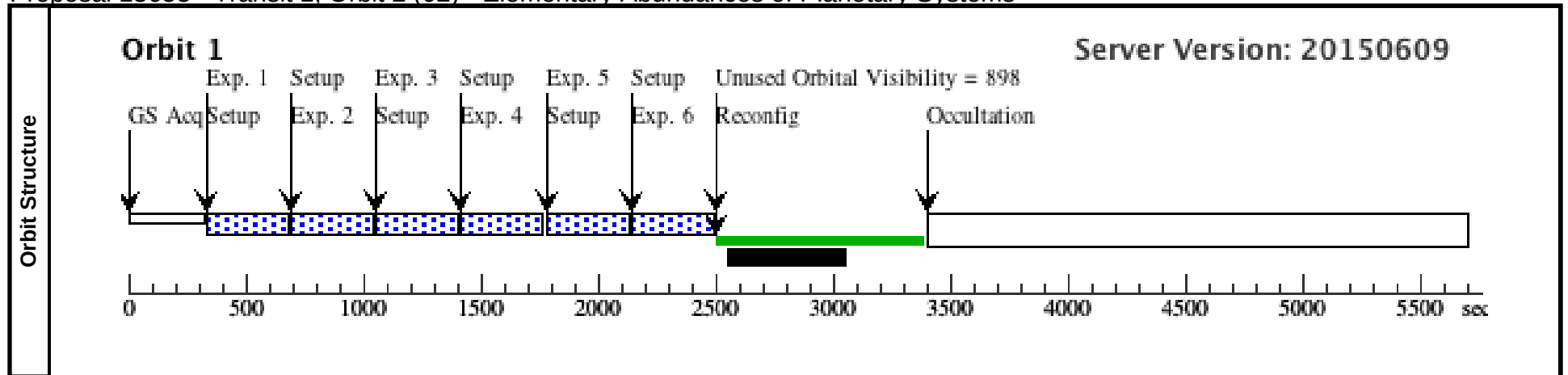
Proposal 13653 - Transit 1, Orbit 1 (01) - Elementary Abundances of Planetary Systems

Visit	Proposal 13653, Transit 1, Orbit 1 (01), implementation								Wed Dec 23 02:09:58 GMT 2015	
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: WFC3/IR									
	Special Requirements: ORIENT 3D TO 213 D; Period 2.61586178 D AND ZERO-PHASE HJD2454508.73829; GROUP 01,02,03,04,05,06 WITHIN 6 Orbits; SEQ 01,02,03,04,05,06 WITHIN 6 Orbits									
Comments: Our observations must occur simuleatously with observations of XO-2b's transit on two nights with the Gemini telescope in Hawaii.										
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous	
	(1)	XO-2	RA: 07 48 6.9725 (117.0290521d)		Proper Motion RA: -34.7 mas/yr		V=11.25		Reference Frame: SIMBAD	
			Dec: +50 13 18.12 (50.22170d)		Proper Motion Dec: -153.6 mas/yr		H = 9.340			
			Equinox: J2000		Epoch of Position: 2000					
Comments: This object was calculated by the targetselector and retrieved from the SIMBAD database.										
The RA and Dec supplied here is the midpoint between the two binary stars, XO-2N (our exoplanet host star) and XO-2S (the binary companion).										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	Wavelength Calibration (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	F132N	SAMP-SEQ=SPARS 25; NSAMP=15	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 Degrees,Forward; PHASE 0.896465 T O 0.912393; GS ACQ SCENARI O BASE1B3		321.750541 Secs (321.751 Secs) [==>]	[1]
	2	1 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 Degrees,Forward		321.750541 Secs (321.751 Secs) [==>]	[1]
	3	2 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 Degrees,Reverse		321.750541 Secs (321.751 Secs) [==>]	[1]
	4	3 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 Degrees,Forward		321.750541 Secs (321.751 Secs) [==>]	[1]
	5	4 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 Degrees,Reverse		321.750541 Secs (321.751 Secs) [==>]	[1]



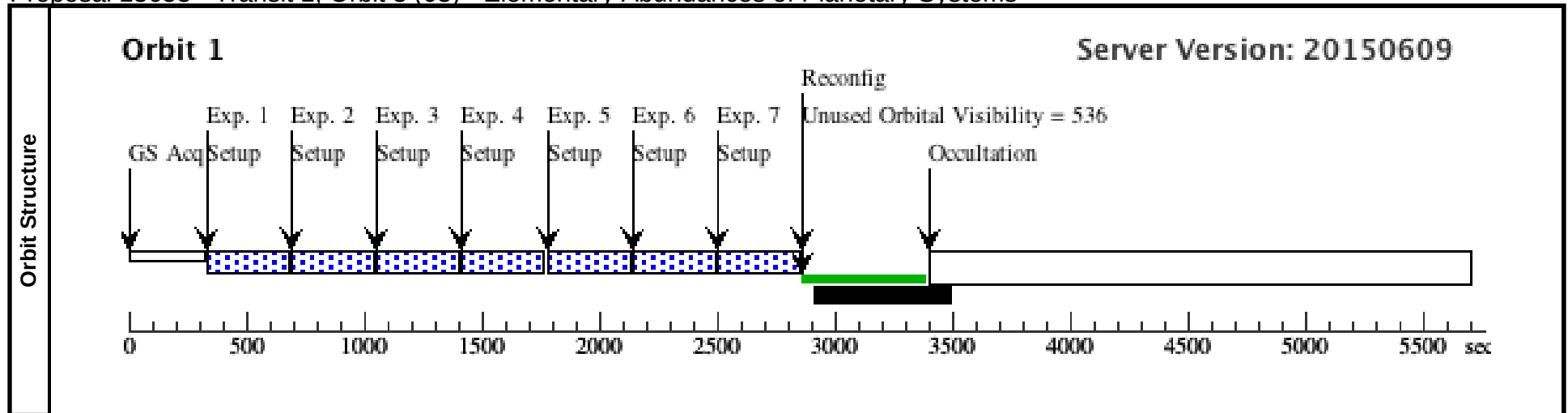
Proposal 13653 - Transit 1, Orbit 2 (02) - Elementary Abundances of Planetary Systems

Visit	Proposal 13653, Transit 1, Orbit 2 (02), implementation										Wed Dec 23 02:09:58 GMT 2015
	Diagnostic Status: No Diagnostics										
	Scientific Instruments: WFC3/IR										
	Special Requirements: SAME ORIENT AS 01										
Comments: Our observations must occur simulatiously with observations of XO-2b's transit on two nights with the Gemini telescope in Hawaii.											
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(1)	XO-2	RA: 07 48 6.9725 (117.0290521d)		Proper Motion RA: -34.7 mas/yr		V=11.25		Reference Frame: SIMBAD		
			Dec: +50 13 18.12 (50.22170d)		Proper Motion Dec: -153.6 mas/yr		H = 9.340				
			Equinox: J2000		Epoch of Position: 2000						
Comments: This object was calculated by the targetselector and retrieved from the SIMBAD database.											
The RA and Dec supplied here is the midpoint between the two binary stars, XO-2N (our exoplanet host star) and XO-2S (the binary companion).											
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	1 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Forward; GS ACQ SCENARI O BASE1B3		321.750541 Secs (321.751 Secs) [==>]		[1]
	2	2 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Reverse		321.750541 Secs (321.751 Secs) [==>]		[1]
	3	3 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Forward		321.750541 Secs (321.751 Secs) [==>]		[1]
	4	4 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Reverse		321.750541 Secs (321.751 Secs) [==>]		[1]
	5	5 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Forward		321.750541 Secs (321.751 Secs) [==>]		[1]
	6	6 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Reverse		321.750541 Secs (321.751 Secs) [==>]		[1]



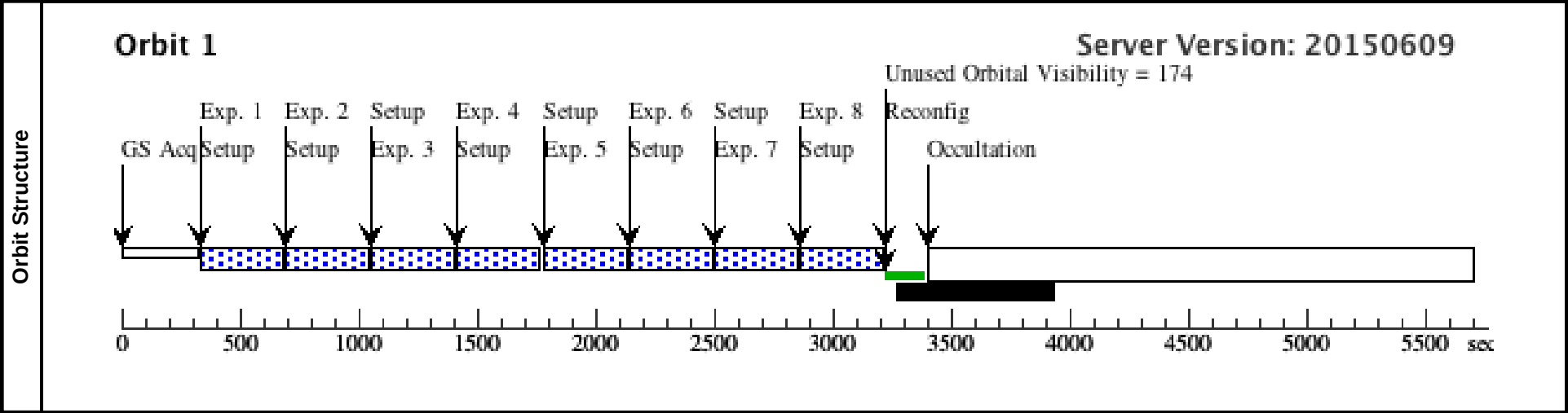
Proposal 13653 - Transit 1, Orbit 3 (03) - Elementary Abundances of Planetary Systems

Visit	Proposal 13653, Transit 1, Orbit 3 (03), implementation								Wed Dec 23 02:09:58 GMT 2015	
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: WFC3/IR									
	Special Requirements: SAME ORIENT AS 01									
Comments: Our observations must occur simuleatously with observations of XO-2b's transit on two nights with the Gemini telescope in Hawaii.										
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous	
	(1)	XO-2	RA: 07 48 6.9725 (117.0290521d)		Proper Motion RA: -34.7 mas/yr		V=11.25		Reference Frame: SIMBAD	
			Dec: +50 13 18.12 (50.22170d)		Proper Motion Dec: -153.6 mas/yr		H = 9.340			
			Equinox: J2000		Epoch of Position: 2000					
Comments: This object was calculated by the targetselector and retrieved from the SIMBAD database.										
The RA and Dec supplied here is the midpoint between the two binary stars, XO-2N (our exoplanet host star) and XO-2S (the binary companion).										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	1 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 Degrees,Forward; GS ACQ SCENARIO BASE1B3		321.750541 Secs (321.751 Secs) [==>]	[1]
	2	2 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 Degrees,Reverse		321.750541 Secs (321.751 Secs) [==>]	[1]
	3	3 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 Degrees,Forward		321.750541 Secs (321.751 Secs) [==>]	[1]
	4	4 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 Degrees,Reverse		321.750541 Secs (321.751 Secs) [==>]	[1]
	5	5 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 Degrees,Forward		321.750541 Secs (321.751 Secs) [==>]	[1]
	6	6 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 Degrees,Reverse		321.750541 Secs (321.751 Secs) [==>]	[1]
	7	7 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 Degrees,Forward		321.750541 Secs (321.751 Secs) [==>]	[1]



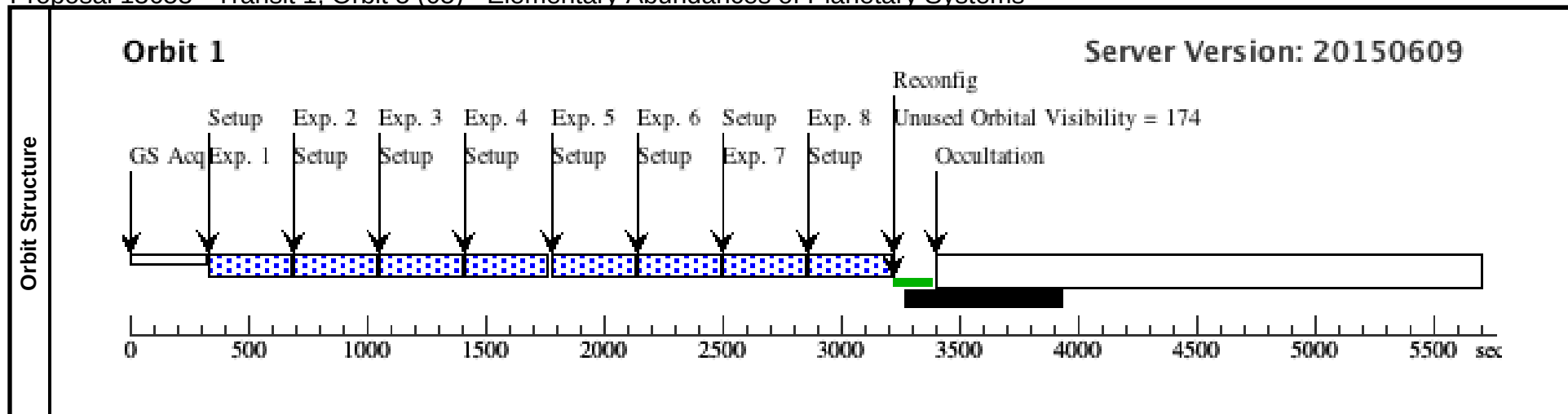
Proposal 13653 - Transit 1, Orbit 4 (04) - Elementary Abundances of Planetary Systems

Visit	Proposal 13653, Transit 1, Orbit 4 (04), implementation										Wed Dec 23 02:09:58 GMT 2015
	Diagnostic Status: No Diagnostics										
	Scientific Instruments: WFC3/IR										
	Special Requirements: SAME ORIENT AS 01										
Comments: Our observations must occur simluateously with observations of XO-2b's transit on two nights with the Gemini telescope in Hawaii.											
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections		Fluxes		Miscellaneous	
	(1)	XO-2	RA: 07 48 6.9725 (117.0290521d)			Proper Motion RA: -34.7 mas/yr		V=11.25		Reference Frame: SIMBAD	
			Dec: +50 13 18.12 (50.22170d)			Proper Motion Dec: -153.6 mas/yr		H = 9.340			
			Equinox: J2000			Epoch of Position: 2000					
Comments: This object was calculated by the targetselector and retrieved from the SIMBAD database.											
The RA and Dec supplied here is the midpoint between the two binary stars, XO-2N (our exoplanet host star) and XO-2S (the binary companion).											
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	1 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Forward; GS ACQ SCENARI O BASE1B3		321.750541 Secs (321.751 Secs) [==>]		[1]
	2	2 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Reverse		321.750541 Secs (321.751 Secs) [==>]		[1]
	3	3 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Forward		321.750541 Secs (321.751 Secs) [==>]		[1]
	4	4 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Reverse		321.750541 Secs (321.751 Secs) [==>]		[1]
	5	5 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Forward		321.750541 Secs (321.751 Secs) [==>]		[1]
	6	6 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Reverse		321.750541 Secs (321.751 Secs) [==>]		[1]
	7	7 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Forward		321.750541 Secs (321.751 Secs) [==>]		[1]
	8	8 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Reverse		321.750541 Secs (321.751 Secs) [==>]		[1]



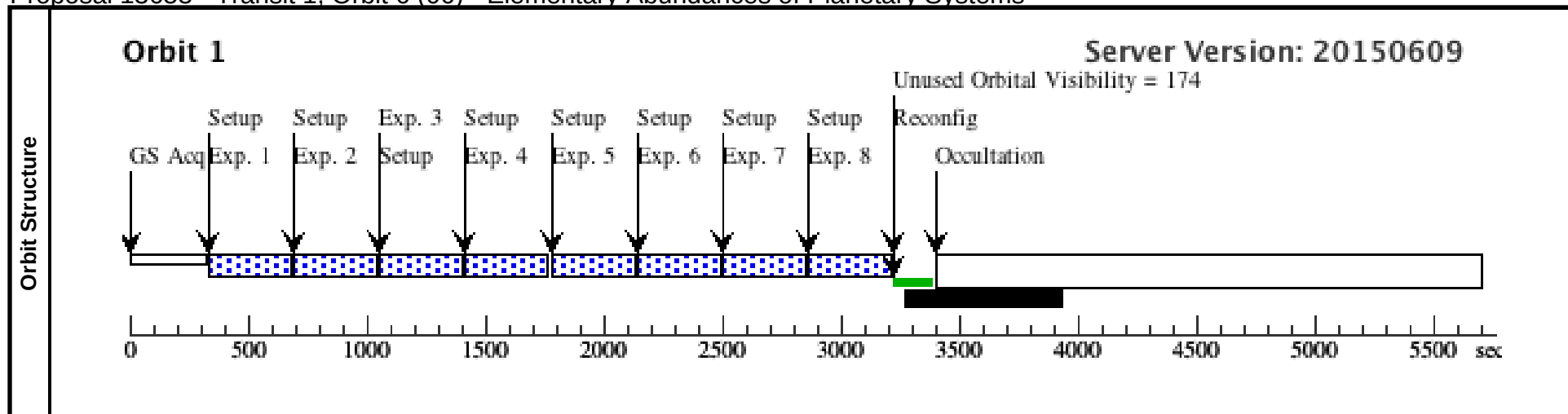
Proposal 13653 - Transit 1, Orbit 5 (05) - Elementary Abundances of Planetary Systems

Visit	Proposal 13653, Transit 1, Orbit 5 (05), implementation										Wed Dec 23 02:09:59 GMT 2015
	Diagnostic Status: No Diagnostics										
	Scientific Instruments: WFC3/IR										
	Special Requirements: SAME ORIENT AS 01										
Comments: Our observations must occur simuleatiously with observations of XO-2b's transit on two nights with the Gemini telescope in Hawaii.											
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous		
	(1)	XO-2	RA: 07 48 6.9725 (117.0290521d)		Proper Motion RA: -34.7 mas/yr		V=11.25		Reference Frame: SIMBAD		
			Dec: +50 13 18.12 (50.22170d)		Proper Motion Dec: -153.6 mas/yr		H = 9.340				
			Equinox: J2000		Epoch of Position: 2000						
Comments: This object was calculated by the targetselector and retrieved from the SIMBAD database.											
The RA and Dec supplied here is the midpoint between the two binary stars, XO-2N (our exoplanet host star) and XO-2S (the binary companion).											
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]		Orbit
	1	1 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Forward; GS ACQ SCENARI O BASE1B3		321.750541 Secs (321.751 Secs) [==>]		[1]
	2	2 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Reverse		321.750541 Secs (321.751 Secs) [==>]		[1]
	3	3 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Forward		321.750541 Secs (321.751 Secs) [==>]		[1]
	4	4 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Reverse		321.750541 Secs (321.751 Secs) [==>]		[1]
	5	5 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Forward		321.750541 Secs (321.751 Secs) [==>]		[1]
	6	6 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Reverse		321.750541 Secs (321.751 Secs) [==>]		[1]
	7	7 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Forward		321.750541 Secs (321.751 Secs) [==>]		[1]
	8	8 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Reverse		321.750541 Secs (321.751 Secs) [==>]		[1]



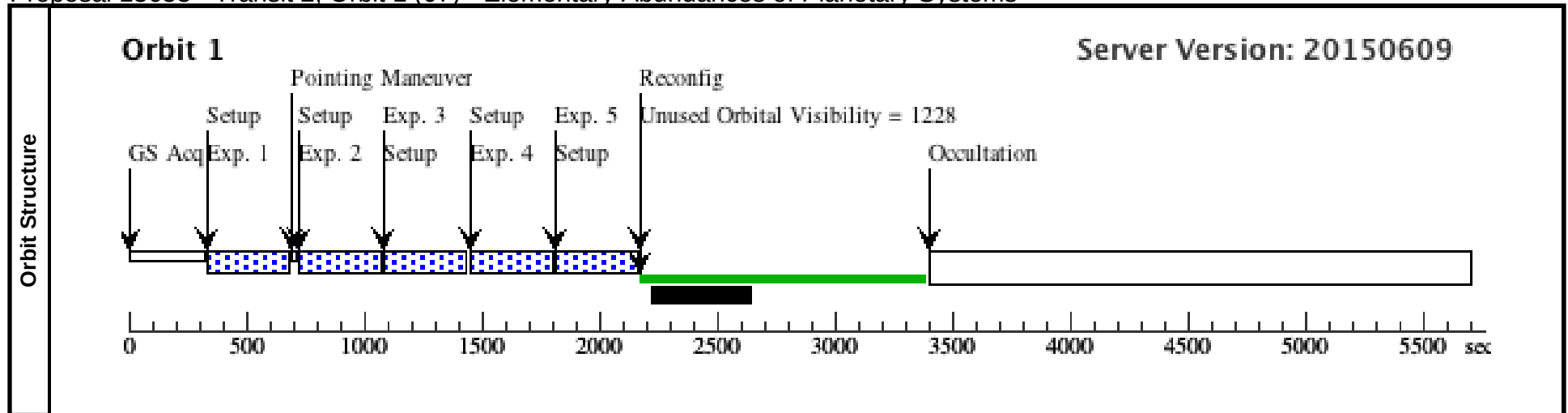
Proposal 13653 - Transit 1, Orbit 6 (06) - Elementary Abundances of Planetary Systems

Visit	Proposal 13653, Transit 1, Orbit 6 (06), implementation									Wed Dec 23 02:09:59 GMT 2015
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: WFC3/IR									
	Special Requirements: SAME ORIENT AS 01									
Comments: Our observations must occur simluateously with observations of XO-2b's transit on two nights with the Gemini telescope in Hawaii.										
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous	
	(1)	XO-2	RA: 07 48 6.9725 (117.0290521d)		Proper Motion RA: -34.7 mas/yr		V=11.25		Reference Frame: SIMBAD	
			Dec: +50 13 18.12 (50.22170d)		Proper Motion Dec: -153.6 mas/yr		H = 9.340			
			Equinox: J2000		Epoch of Position: 2000					
Comments: This object was calculated by the targetselector and retrieved from the SIMBAD database.										
The RA and Dec supplied here is the midpoint between the two binary stars, XO-2N (our exoplanet host star) and XO-2S (the binary companion).										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	1 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Forward; GS ACQ SCENARI O BASE1B3		321.750541 Secs (321.751 Secs) [==>]	 <



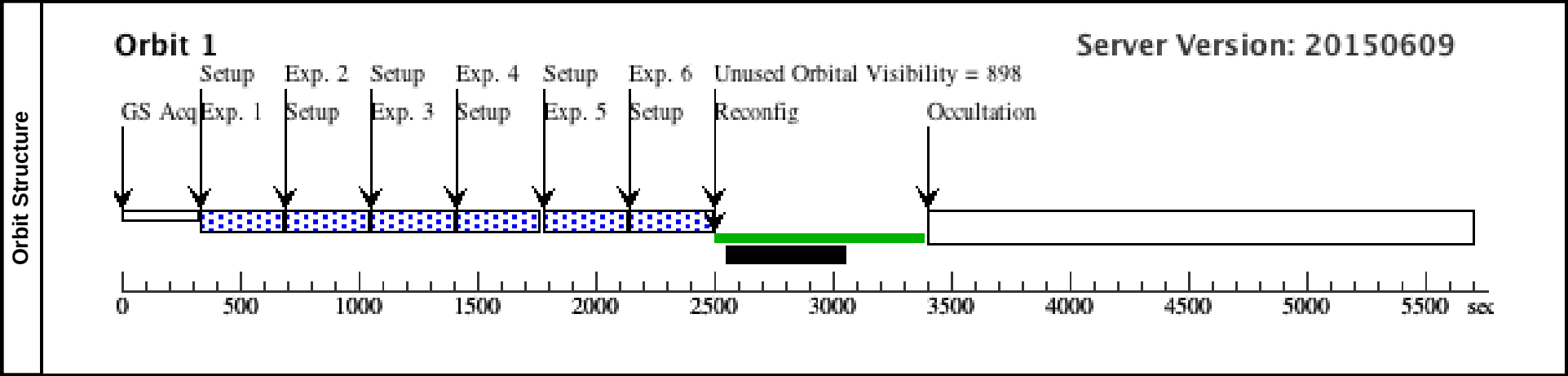
Proposal 13653 - Transit 2, Orbit 1 (07) - Elementary Abundances of Planetary Systems

Visit	Proposal 13653, Transit 2, Orbit 1 (07), completed								Wed Dec 23 02:09:59 GMT 2015	
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: WFC3/IR									
	Special Requirements: ORIENT 3D TO 213 D; BETWEEN 21-FEB-2015:02:15 AND 21-FEB-2015:03:55:51; SEQ 07,08,09,10,11,12 WITHIN 6 Orbits									
Comments: Our observations must occur simulatiously with observations of XO-2b's transit on two nights with the Gemini telescope in Hawaii.										
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous	
	(1)	XO-2	RA: 07 48 6.9725 (117.0290521d)		Proper Motion RA: -34.7 mas/yr		V=11.25		Reference Frame: SIMBAD	
			Dec: +50 13 18.12 (50.22170d)		Proper Motion Dec: -153.6 mas/yr		H = 9.340			
			Equinox: J2000		Epoch of Position: 2000					
Comments: This object was calculated by the targetselector and retrieved from the SIMBAD database.										
The RA and Dec supplied here is the midpoint between the two binary stars, XO-2N (our exoplanet host star) and XO-2S (the binary companion).										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	Wavelength Calibration (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	F132N	SAMP-SEQ=SPARS 25; NSAMP=15	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 Degrees,Forward; GS ACQ SCENARIO BASE1B3		321.750541 Secs (321.751 Secs) [==>]	[1]
	2	1 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPARS25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 Degrees,Forward		321.750541 Secs (321.751 Secs) [==>]	[1]
	3	2 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPARS25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 Degrees,Reverse		321.750541 Secs (321.751 Secs) [==>]	[1]
	4	3 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPARS25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 Degrees,Forward		321.750541 Secs (321.751 Secs) [==>]	[1]
	5	4 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPARS25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 Degrees,Reverse		321.750541 Secs (321.751 Secs) [==>]	[1]



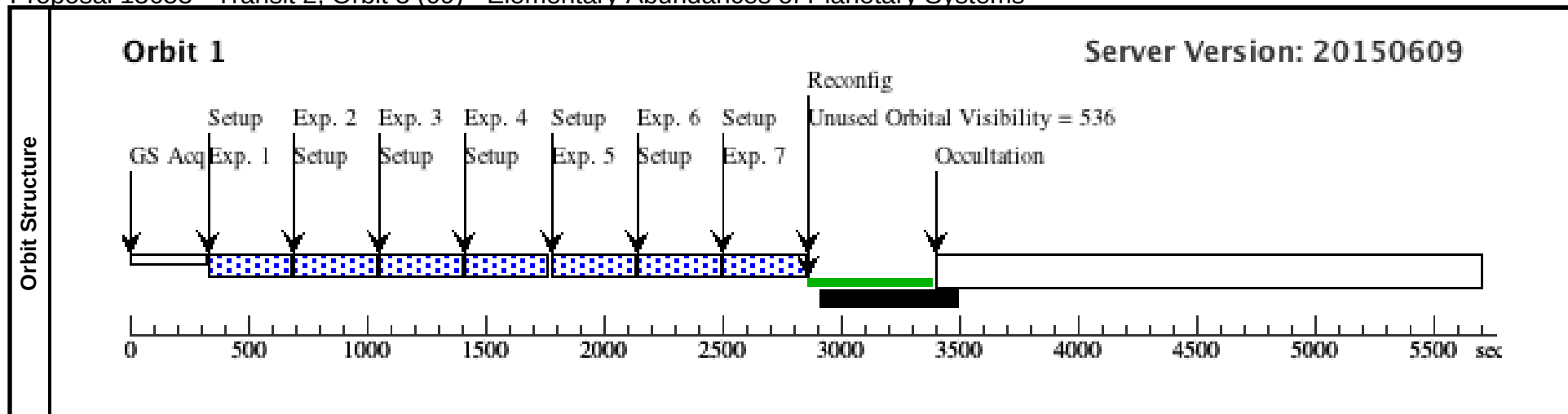
Proposal 13653 - Transit 2, Orbit 2 (08) - Elementary Abundances of Planetary Systems

Visit	Proposal 13653, Transit 2, Orbit 2 (08), completed								Wed Dec 23 02:09:59 GMT 2015	
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: WFC3/IR									
	Special Requirements: SAME ORIENT AS 07									
Comments: Our observations must occur simulatiously with observations of XO-2b's transit on two nights with the Gemini telescope in Hawaii.										
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous				
	(1)	XO-2	RA: 07 48 6.9725 (117.0290521d) Dec: +50 13 18.12 (50.22170d) Equinox: J2000	Proper Motion RA: -34.7 mas/yr Proper Motion Dec: -153.6 mas/yr Epoch of Position: 2000	V=11.25 H = 9.340	Reference Frame: SIMBAD				
	Comments: This object was calculated by the targetselector and retrieved from the SIMBAD database.									
	The RA and Dec supplied here is the midpoint between the two binary stars, XO-2N (our exoplanet host star) and XO-2S (the binary companion).									
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	1 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 Degrees,Forward; GS ACQ SCENARIO BASE1B3		321.750541 Secs (321.751 Secs) [==>]	[1]
	2	2 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 Degrees,Reverse		321.750541 Secs (321.751 Secs) [==>]	[1]
	3	3 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 Degrees,Forward		321.750541 Secs (321.751 Secs) [==>]	[1]
	4	4 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 Degrees,Reverse		321.750541 Secs (321.751 Secs) [==>]	[1]
	5	5 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 Degrees,Forward		321.750541 Secs (321.751 Secs) [==>]	[1]
	6	6 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 Degrees,Reverse		321.750541 Secs (321.751 Secs) [==>]	[1]



Proposal 13653 - Transit 2, Orbit 3 (09) - Elementary Abundances of Planetary Systems

Visit	Proposal 13653, Transit 2, Orbit 3 (09), completed								Wed Dec 23 02:09:59 GMT 2015	
	Diagnostic Status: No Diagnostics									
	Scientific Instruments: WFC3/IR									
	Special Requirements: SAME ORIENT AS 07									
Comments: Our observations must occur simuleatiously with observations of XO-2b's transit on two nights with the Gemini telescope in Hawaii.										
Fixed Targets	#	Name	Target Coordinates		Targ. Coord. Corrections		Fluxes		Miscellaneous	
	(1)	XO-2	RA: 07 48 6.9725 (117.0290521d)		Proper Motion RA: -34.7 mas/yr		V=11.25		Reference Frame: SIMBAD	
			Dec: +50 13 18.12 (50.22170d)		Proper Motion Dec: -153.6 mas/yr		H = 9.340			
			Equinox: J2000		Epoch of Position: 2000					
Comments: This object was calculated by the targetselector and retrieved from the SIMBAD database.										
The RA and Dec supplied here is the midpoint between the two binary stars, XO-2N (our exoplanet host star) and XO-2S (the binary companion).										
Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	1 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 Degrees,Forward; GS ACQ SCENARIO BASE1B3		321.750541 Secs (321.751 Secs) [==>]	[1]
	2	2 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 Degrees,Reverse		321.750541 Secs (321.751 Secs) [==>]	[1]
	3	3 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 Degrees,Forward		321.750541 Secs (321.751 Secs) [==>]	[1]
	4	4 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 Degrees,Reverse		321.750541 Secs (321.751 Secs) [==>]	[1]
	5	5 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 Degrees,Forward		321.750541 Secs (321.751 Secs) [==>]	[1]
	6	6 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 Degrees,Reverse		321.750541 Secs (321.751 Secs) [==>]	[1]
	7	7 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 Degrees,Forward		321.750541 Secs (321.751 Secs) [==>]	[1]

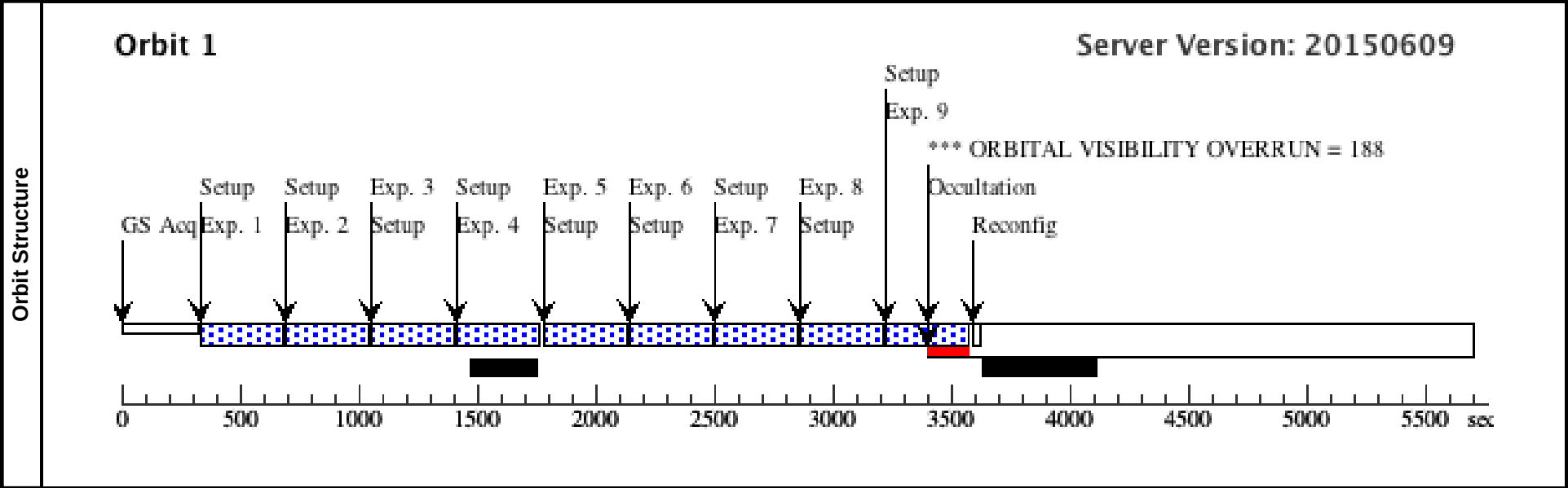


Proposal 13653 - Transit 2, Orbit 4 (10) - Elementary Abundances of Planetary Systems

Visit	Proposal 13653, Transit 2, Orbit 4 (10), completed					Wed Dec 23 02:09:59 GMT 2015
	Diagnostic Status: Warning					
	Scientific Instruments: WFC3/IR					
	Special Requirements: SAME ORIENT AS 07					
	Comments: Our observations must occur simulateously with observations of XO-2b's transit on two nights with the Gemini telescope in Hawaii.					
Diagnostics	(Transit 2, Orbit 4 (10)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN					
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	XO-2	RA: 07 48 6.9725 (117.0290521d)	Proper Motion RA: -34.7 mas/yr	V=11.25	Reference Frame: SIMBAD
			Dec: +50 13 18.12 (50.22170d)	Proper Motion Dec: -153.6 mas/yr	H = 9.340	
			Equinox: J2000	Epoch of Position: 2000		
	Comments: This object was calculated by the targetselector and retrieved from the SIMBAD database.					
	The RA and Dec supplied here is the midpoint between the two binary stars, XO-2N (our exoplanet host star) and XO-2S (the binary companion).					

Proposal 13653 - Transit 2, Orbit 4 (10) - Elementary Abundances of Planetary Systems

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	1 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Forward; GS ACQ SCENARI O BASE1B3		321.750541 Secs (321.751 Secs) [==>]	[1]
	2	2 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Reverse		321.750541 Secs (321.751 Secs) [==>]	[1]
	3	3 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Forward		321.750541 Secs (321.751 Secs) [==>]	[1]
	4	4 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Reverse		321.750541 Secs (321.751 Secs) [==>]	[1]
	5	5 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Forward		321.750541 Secs (321.751 Secs) [==>]	[1]
	6	6 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Reverse		321.750541 Secs (321.751 Secs) [==>]	[1]
	7	7 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Forward		321.750541 Secs (321.751 Secs) [==>]	[1]
	8	8 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Reverse		321.750541 Secs (321.751 Secs) [==>]	[1]
	9	9 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Forward		321.750541 Secs (321.751 Secs) [==>]	[1]

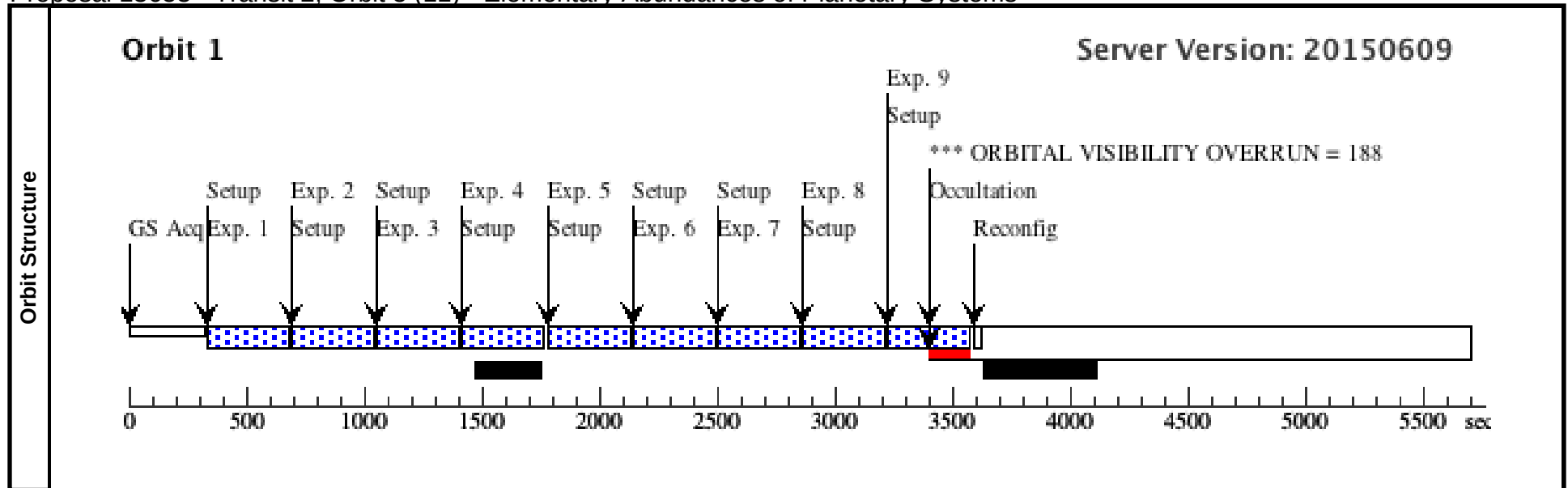


Proposal 13653 - Transit 2, Orbit 5 (11) - Elementary Abundances of Planetary Systems

Visit	Proposal 13653, Transit 2, Orbit 5 (11), completed					Wed Dec 23 02:09:59 GMT 2015
	Diagnostic Status: Warning					
	Scientific Instruments: WFC3/IR					
	Special Requirements: SAME ORIENT AS 07					
	Comments: Our observations must occur simulateously with observations of XO-2b's transit on two nights with the Gemini telescope in Hawaii.					
Diagnostics	(Transit 2, Orbit 5 (11)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN					
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	XO-2	RA: 07 48 6.9725 (117.0290521d)	Proper Motion RA: -34.7 mas/yr	V=11.25	Reference Frame: SIMBAD
			Dec: +50 13 18.12 (50.22170d)	Proper Motion Dec: -153.6 mas/yr	H = 9.340	
			Equinox: J2000	Epoch of Position: 2000		
	Comments: This object was calculated by the targetselector and retrieved from the SIMBAD database.					
The RA and Dec supplied here is the midpoint between the two binary stars, XO-2N (our exoplanet host star) and XO-2S (the binary companion).						

Proposal 13653 - Transit 2, Orbit 5 (11) - Elementary Abundances of Planetary Systems

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	1 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Forward; GS ACQ SCENARI O BASE1B3		321.750541 Secs (321.751 Secs) [==>]	[1]
	2	2 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Reverse		321.750541 Secs (321.751 Secs) [==>]	[1]
	3	3 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Forward		321.750541 Secs (321.751 Secs) [==>]	[1]
	4	4 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Reverse		321.750541 Secs (321.751 Secs) [==>]	[1]
	5	5 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Forward		321.750541 Secs (321.751 Secs) [==>]	[1]
	6	6 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Reverse		321.750541 Secs (321.751 Secs) [==>]	[1]
	7	7 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Forward		321.750541 Secs (321.751 Secs) [==>]	[1]
	8	8 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Reverse		321.750541 Secs (321.751 Secs) [==>]	[1]
	9	9 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Forward		321.750541 Secs (321.751 Secs) [==>]	[1]



Proposal 13653 - Transit 2, Orbit 6 (12) - Elementary Abundances of Planetary Systems

Visit	Proposal 13653, Transit 2, Orbit 6 (12), completed					Wed Dec 23 02:09:59 GMT 2015
	Diagnostic Status: Warning					
	Scientific Instruments: WFC3/IR					
	Special Requirements: SAME ORIENT AS 07					
	Comments: Our observations must occur simulateously with observations of XO-2b's transit on two nights with the Gemini telescope in Hawaii.					
Diagnostics	(Transit 2, Orbit 6 (12)) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN					
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	XO-2	RA: 07 48 6.9725 (117.0290521d)	Proper Motion RA: -34.7 mas/yr	V=11.25	Reference Frame: SIMBAD
			Dec: +50 13 18.12 (50.22170d)	Proper Motion Dec: -153.6 mas/yr	H = 9.340	
			Equinox: J2000	Epoch of Position: 2000		
	Comments: This object was calculated by the targetselector and retrieved from the SIMBAD database.					
The RA and Dec supplied here is the midpoint between the two binary stars, XO-2N (our exoplanet host star) and XO-2S (the binary companion).						

Proposal 13653 - Transit 2, Orbit 6 (12) - Elementary Abundances of Planetary Systems

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	1 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Forward; GS ACQ SCENARI O BASE1B3		321.750541 Secs (321.751 Secs) [==>]	[1]
	2	2 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Reverse		321.750541 Secs (321.751 Secs) [==>]	[1]
	3	3 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Forward		321.750541 Secs (321.751 Secs) [==>]	[1]
	4	4 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Reverse		321.750541 Secs (321.751 Secs) [==>]	[1]
	5	5 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Forward		321.750541 Secs (321.751 Secs) [==>]	[1]
	6	6 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Reverse		321.750541 Secs (321.751 Secs) [==>]	[1]
	7	7 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Forward		321.750541 Secs (321.751 Secs) [==>]	[1]
	8	8 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=15; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Reverse		321.750541 Secs (321.751 Secs) [==>]	[1]
	9	9 (WFC3IR.sp .641486)	(1) XO-2	WFC3/IR, MULTIACCUM, GRISM512	G141	NSAMP=7; SAMP-SEQ=SPAR S25	POS TARG 0,0; SPATIAL SCAN 0.0 3459574535,90.0 De grees,Forward		138.380533 Secs (138.381 Secs) [==>]	[1]

