14493 - UV exploration of two Earth-sized planets with temperate atmospheres

Cycle: 23, Proposal Category: GO

(UV Initiative)

(Availability Mode: AVAILABLE)

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) 2MASS-J23062928-0502285 WAVE	STIS/CCD STIS/FUV-MAMA	2	09-Nov-2016 11:01:50.0	yes
02	(1) 2MASS-J23062928-0502285 WAVE	STIS/CCD STIS/FUV-MAMA	1	09-Nov-2016 11:01:51.0	yes
03	(1) 2MASS-J23062928-0502285 WAVE	STIS/CCD STIS/FUV-MAMA	1	09-Nov-2016 11:01:52.0	yes

4 Total Orbits Used

ABSTRACT

We just discovered 3 short-period Earth-sized planets transiting a nearby ultracool dwarf star. The inner two planets receive four and two times Earth irradiation, placing them close to the inner edge of the habitable zone. With equilibrium temperatures between 250 - 400 K these planets likely present habitable regions, but the sustained activity of M dwarfs over hundreds of millions of years could impact their habitability. The system proximity (12 pc), its large planet-to-star radii ratios and high systemic velocity (-56 km/s) make it an amazing target to study the state and evolution of terrestrial planets atmospheres around a late M dwarf in the UV. Yet large uncertainties in the strength of M dwarfs Ly-alpha emission and hydrogen escape from small planets make it difficult to plan an efficient HST program to make such measurements. We thus propose a 4-orbit reconnaissance study to determine how HST unique UV capabilities can be optimally employed to observe this important exoplanet system in next cycles. Here we will observe the star with STIS at Ly-alpha to 1) try and measure the stellar line, and 2) search for signatures of hydrogen escape from the planets, which would hint at evaporating water oceans. Because several orbits remain possible for the third discovered planet, we will ensure the best scientific by focusing on the two inner ones. Objective (1) will be achieved by observing the star twice, ensuring that the signal is high enough to constrain the intrinsic Ly-alpha emission. Objective (2) will be achieved by observing the transit of each of the two inner planets, allowing us to detect possible absorption of the stellar line caused by hydrogen exospheres

OBSERVING DESCRIPTION

With this program, we will use the four allocated HST orbits to observe the TRAPPIST-1 star at Lyman-alpha wavelengths. This close (12pc) ultracool dwarf hosts two transiting planets 'b' and 'c'. Our goals are (a) to measure how bright the star is at Lyman-alpha and (b) to assess whether escaping gas from the planet is causing very deep Lyman-alpha eclipses of the star.

We define three visits:

Visit #01 (two HST orbits) will be scheduled at times when both planets are within respective orbital phases 0.5 to 0.85. The goal is to measure the strength of the intrinsic stellar Lyman-alpha line, unabsorbed by the putative exospheres trailing behind the planets. This visit must be scheduled before the two others.

Visit #02 (one HST orbit) will be scheduled at the time of planet 'b' transit, with the additional constraint that planet 'c' is within orbital phase 0.5 - 0.85. This will allow the measurement of a possible absorption signature from planet 'b' exosphere, with no contribution from planet 'c' exosphere.

Similarly, visit #03 (one HST orbit) will be scheduled at the time of planet 'c' transit, with the additional constraint that planet 'b' is within orbital

phase 0.5 - 0.85.

It is possible that the star is faint at Lyman-alpha. This would make difficult the measurement of absorption from the planets' exospheres. If Visit #01 shows a faint emission at Lyman-alpha, we will reschedule Visits #02 and #03 with the same phase constraints as Visit #01, so that the four orbits of our program can be coadded to better constrain the stellar Lyman-alpha emission.

We would like to request that our program be switched to available mode, so that the AUTO-WAVECAL can be moved to GO-WAVECAL during Earth occultation. Since each visit has a different objective, every minute that can be gained for the scientific exposure would be very useful, in particular because the star is faint, and the ACQ-PEAK takes a relatively long time to perform. In the present case, moving the wavecal during occultation would correspond to a gain of 4.4 mn. This has been done for past programs obtained by our team in agreement with the STScI (GO#13820 and #12681, PI: D. Ehrenreich; GO#14143, PI: V. Bourrier).

Visit

Proposal 14493, Out-of-Transit (01), completed Wed Nov 09 16:01:53 GMT 2016

Diagnostic Status: No Diagnostics

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

Special Requirements: BETWEEN 16-JUN-2016:10:39:00 AND 16-JUN-2016:14:52:00; BETWEEN 25-SEP-2016:15:59:00 AND 26-SEP-2016:02:57:00; BETWEEN 28-SEP-2016:16:33:00 AND 28-SEP-2016:18:09:00; BETWEEN 30-SEP-2016:09:37:00 AND 30-SEP-2016:15:48:00; BETWEEN 03-OCT-2016:05:18:00 AND 03-OCT-2016:14:24:00; BETWEEN 07-OCT-2016:18:03:00 AND 08-OCT-2016:05:07:00; BETWEEN 10-OCT-2016:18:37:00 AND 10-OCT-2016:20:47:00; BETWEEN 12-OCT-2016:12:15:00 AND 12-OCT-2016:17:53:00; BETWEEN 15-OCT-2016:07:23:00 AND 15-OCT-2016:17:02:00; BETWEEN 19-OCT-2016:20:14:00 AND 20-OCT-2016:07:12:00; BETWEEN 22-OCT-2016:20:42:00 AND 22-OCT-2016:23:25:00; BETWEEN 24-OCT-2016:14:54:00 AND 24-OCT-2016:19:58:00; BETWEEN 27-OCT-2016:09:28:00 AND 27-OCT-2016:19:41:00; BETWEEN 31-OCT-2016:22:19:00 AND 01-NOV-2016:09:17:00; BETWEEN 03-NOV-2016:22:47:00 AND 04-NOV-2016:02:04:00; BETWEEN 05-NOV-2016:17:33:00 AND 05-NOV-2016:22:03:00; BETWEEN 08-NOV-2016:11:39:00 AND 08-NOV-2016:22:20:00; BETWEEN 13-NOV-2016:00:24:00 AND 13-NOV-2016:11:22:00; BETWEEN 16-NOV-2016:00:58:00 AND 16-NOV-2016:04:43:00; BETWEEN 17-NOV-2016:20:12:00 AND 18-NOV-2016:00:14:00; BETWEEN 20-NOV-2016:13:44:00 AND 21-NOV-2016:00:42:00; BETWEEN 25-NOV-2016:02:35:00 AND 25-NOV-2016:13:33:00; BETWEEN 28-NOV-2016:03:04:00 AND 28-NOV-2016:07:23:00; BETWEEN 29-NOV-2016:22:51:00 AND 30-NOV-2016:02:19:00; Period 1.510848 D AND ZERO-PHASE HJD2457656.415058

Comments: This visit must be obtained far from the time of transit of either planets TRAPPIST 1b and 1c, to provide a clean estimate of the baseline UV flux from the star. Experience from GJ436b (GO #12965) suggests that, in an extreme case, it might be possible for Ly-alpha to be absorbed from the phase of transit all the way to anti-transit. We indicate in the timing requirements specific time windows, obtained by requiring that boths planets are between (respective) orbital phases 0.5 to 0.85. Observations can start at any time between the given UTC times. We cannot provide phase constraints common to all epochs, because the two planets will be at different orbital phases in each epoch. Except for one earlier epoch, the target visibility with HST as indicated in the Visit Planner is mostly limited to (end of September 2016 - end of January 2017). We provide all possible windows for October and November 2016, and will provide more if no observations can be scheduled by then.

Fixed Targets

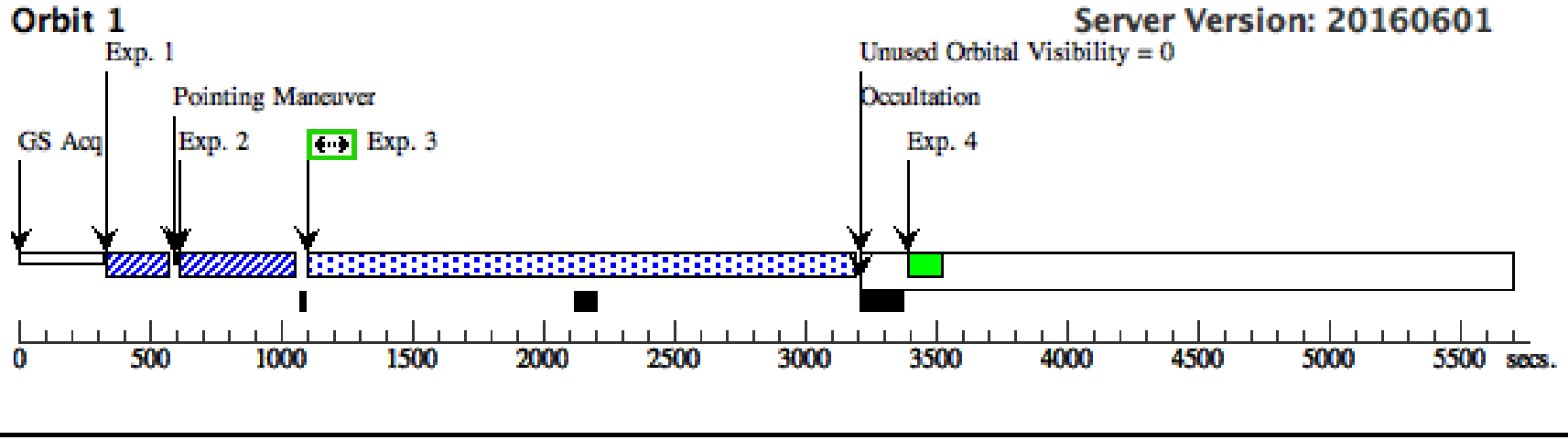
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	2MASS-J23062928-0502285 Alt Name1: TRAPPIST-1	RA: 23 06 30.3400 (346.6264167d) Dec: -05 02 36.44 (-5.04346d) Equinox: J2000	Proper Motion RA: 922.1 mas/yr Proper Motion Dec: -471.9 mas/yr Parallax: 0.08258" Epoch of Position: 2015.86 Radial Velocity: -51.688 km/sec	V=18.798+/-0.082 V=18.80+-0.08, R=16.47+-0.07, I=14.0+-0.1, J=11.35+-0.02, K=10.30+-0.02	Reference Frame: ICRS

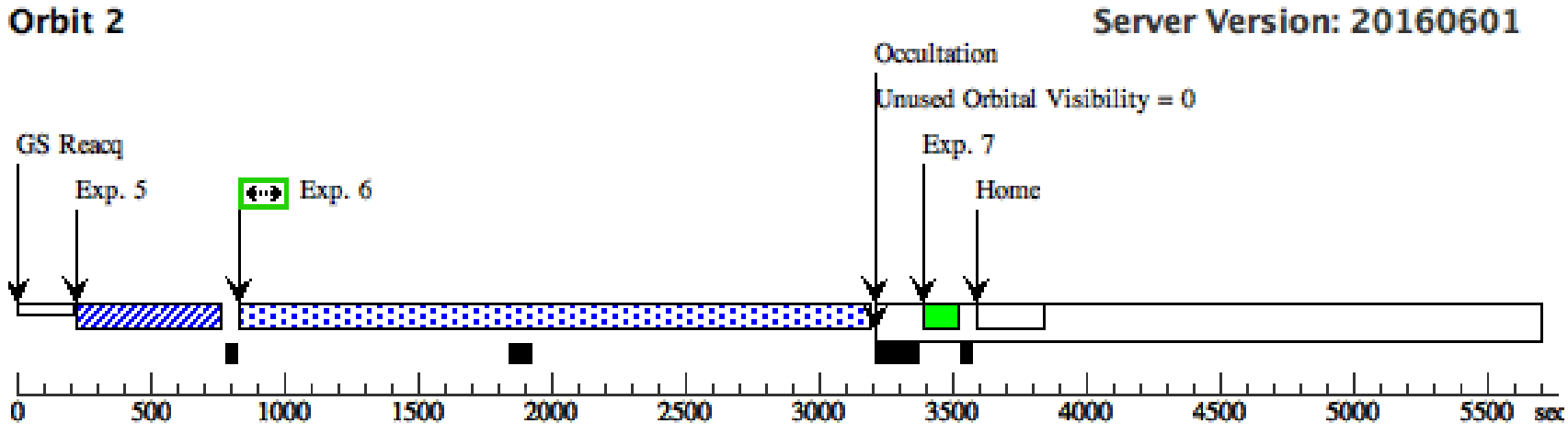
Comments: We measured the J2000 equatorial coordinates of TRAPPIST-1 in the 2015 TRAPPIST images, using 29 stars from the UCAC2 catalog and the Pulkovo Observatory Izmccd astrometric software (we use the mean epoch of these observations secured between September and December 2015). We adopt uncertainties on RA and Dec as those for 2MASS for this object.
We checked that the input coordinates and those given in SIMBAD at Epoch 2000 yield the same position in the APT target confirmation chart at Epoch 1991.68. We also checked independently that these coordinates and proper motion match with the position of the star in POSS image (1953) and 2MASS image (1998).
Radial velocity comes from Barnes et al. 2014

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ (STIS.ta.781643)	(1) 2MASS-J23062928-0502285	STIS/CCD, ACQ, F28X50LP	MIRROR		PHASE 0.7517124 TO 0.82508230	Sequence 1-4 Non-Int in Out-of-Transit (01)	5 Secs (5 Secs) *[==>]*	***[1]***
	Comments: We use the F28X50LP filter for this ACQ image, as recommended for this star with V magnitude of 18.8. It also ensures the brightness is weighted most strongly toward red wavelengths, where the target star is brightest. We estimated the exposure time for several stellar models close to the target star (STIS.ta.781640, STIS.ta.781641, STIS.ta.781643). Exposure times to reach a SNR of 40 range from 1.5 to 3.6s, and minimum saturation time is 290s. We thus choose an exposure time of 5s. *We used Aladin to check that the closest star is at a distance of more than 220 arcsec. There is thus no chance that STIS acquires another object in the 5x5 arcsec search area.*							
2	ACQ/PEAK (STIS.ta.783365)	(1) 2MASS-J23062928-0502285	STIS/CCD, ACQ/PEAK, 52X0.05	MIRROR			Sequence 1-4 Non-Int in Out-of-Transit (01)	10 Secs (10 Secs) *[==>]*	***[1]***
	Comments: The ETC lists a time to saturation through the 52X0.05 slit of 1086s (for a black body model with the same temperature as the star). With our 10s exposure, we should reach 5600 source electrons, above the 5000 required for peak-up with the mirror element.							
3	SCIENCE (STIS.sp.415432)	(1) 2MASS-J23062928-0502285	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=900; WAVECAL=NO		Sequence 1-4 Non-Int in Out-of-Transit (01)	1300 Secs (1953 Secs) *[==>1953.0 Secs]*	***[1]***
	Comments: The target star is a M8 ultracool dwarf from which we expect a much lower emission at Lyman-alpha than from GJ436 targeted in program GO#12965 (in the GJ140M spectral range, the stellar emission from these stars will arise from the Lyman-alpha line alone). We can thus use safely the same settings as program GO#12965.							
4	GO-WAVE CAL	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 1-4 Non-Int in Out-of-Transit (01)	*[==>]*	***[1]***
5	ACQ/PEAK (STIS.ta.783365)	(1) 2MASS-J23062928-0502285	STIS/CCD, ACQ/PEAK, 52X0.05	MIRROR			Sequence 5-7 Non-Int in Out-of-Transit (01)	10 Secs (10 Secs) *[==>]*	***[2]***
	Comments: The ETC lists a time to saturation through the 52X0.05 slit of 1086s (for a black body model with the same temperature as the star). With our 10s exposure, we should reach 5600 source electrons, above the 5000 required for peak-up with the mirror element.							
6	SCIENCE (STIS.sp.415432)	(1) 2MASS-J23062928-0502285	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=900		Sequence 5-7 Non-Int in Out-of-Transit (01)	2000 Secs (2234 Secs) *[==>2234.0 Secs]*	***[2]***
	Comments: The target star is a M8 ultracool dwarf from which we expect a much lower emission at Lyman-alpha than from GJ436 targeted in program GO#12965 (in the GJ140M spectral range, the stellar emission from these stars will arise from the Lyman-alpha line alone). We can thus use safely the same settings as program GO#12965.							
7	GO-WAVE CAL	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 5-7 Non-Int in Out-of-Transit (01)	*[==>]*	***[2]***

Orbit Structure





Visit

Proposal 14493, In-Transit TRAPPIST 1b (02), completed Wed Nov 09 16:01:53 GMT 2016

Diagnostic Status: No Diagnostics

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

Special Requirements: BETWEEN 10-AUG-2016:12:59:00 AND 10-AUG-2016:13:56:00; BETWEEN 30-SEP-2016:20:12:00 AND 30-SEP-2016:22:50:00; BETWEEN 05-OCT-2016:08:58:00 AND 05-OCT-2016:11:35:00; BETWEEN 12-OCT-2016:22:17:00 AND 13-OCT-2016:00:55:00; BETWEEN 17-OCT-2016:11:02:00 AND 17-OCT-2016:13:40:00; BETWEEN 25-OCT-2016:00:22:00 AND 25-OCT-2016:02:59:00; BETWEEN 29-OCT-2016:13:13:00 AND 29-OCT-2016:15:51:00; BETWEEN 01-NOV-2016:13:42:00 AND 01-NOV-2016:15:57:00; BETWEEN 06-NOV-2016:02:27:00 AND 06-NOV-2016:05:10:00; BETWEEN 13-NOV-2016:15:47:00 AND 13-NOV-2016:18:24:00; BETWEEN 18-NOV-2016:04:38:00 AND 18-NOV-2016:07:16:00; BETWEEN 22-NOV-2016:17:24:00 AND 22-NOV-2016:20:01:00; BETWEEN 25-NOV-2016:17:58:00 AND 25-NOV-2016:20:35:00; BETWEEN 30-NOV-2016:06:43:00 AND 30-NOV-2016:09:21:00; Period 1.510848 D AND ZERO-PHASE HJD2457322.51765

Comments: This visit targets the transit of planet TRAPPIST 1b, and we indicate relevant lower/upper phase constraints in the ACQ subexposure. Furthermore, the visit should be obtained at a time when planet TRAPPIST-1c is far after its own transit, so as not to contaminate the observation of planet 'b' transit. We thus indicate in the timing requirements the windows when planet 'b' transits and planet 'c' is between orbital phases 0.5 to 0.85. Finally, we also request that visit 2 be scheduled at least 15 days after visit 1. The first opportunity for visit 1 being on 16 June 2017, we thus provide all possible opportunities for visit 2 starting at least 15 days after this date, and until the end of November 2016.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	2MASS-J23062928-0502285 Alt Name1: TRAPPIST-1	RA: 23 06 30.3400 (346.6264167d) Dec: -05 02 36.44 (-5.04346d) Equinox: J2000	Proper Motion RA: 922.1 mas/yr Proper Motion Dec: -471.9 mas/yr Parallax: 0.08258" Epoch of Position: 2015.86 Radial Velocity: -51.688 km/sec	V=18.798+/-0.082 V=18.80+-0.08, R=16.47+-0.07, I=14.0+-0.1, J=11.35+-0.02, K=10.30+-0.02	Reference Frame: ICRS

Comments: We measured the J2000 equatorial coordinates of TRAPPIST-1 in the 2015 TRAPPIST images, using 29 stars from the UCAC2 catalog and the Pulkovo Observatory Izmccd astrometric software (we use the mean epoch of these observations secured between September and December 2015). We adopt uncertainties on RA and Dec as those for 2MASS for this object.
We checked that the input coordinates and those given in SIMBAD at Epoch 2000 yield the same position in the APT target confirmation chart at Epoch 1991.68. We also checked independently that these coordinates and proper motion match with the position of the star in POSS image (1953) and 2MASS image (1998).
Radial velocity comes from Barnes et al. 2014

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ (STIS.ta.781643)	(1) 2MASS-J23062928-0502285	STIS/CCD, ACQ, F28X50LP	MIRROR		PHASE 0.98 TO 1.	Sequence 1-4 Non-Int in In-Transit TRAPPIST 1b (02)	5 Secs (5 Secs) *[==>]*	*[1]*

Comments: We use the F28X50LP filter for this ACQ image, as recommended for this star with V magnitude of 18.8. It also ensures the brightness is weighted most strongly toward red wavelengths, where the target star is brightest. We estimated the exposure time for several stellar models close to the target star (STIS.ta.781640, STIS.ta.781641, STIS.ta.781643). Exposure times to reach a SNR of 40 range from 1.5 to 3.6s, and minimum saturation time is 290s. We thus choose an exposure time of 5s.
We used Aladin to check that the closest star is at a distance of more than 220 arcsec. There is thus no chance that STIS acquires another object in the 5x5 arcsec search area.

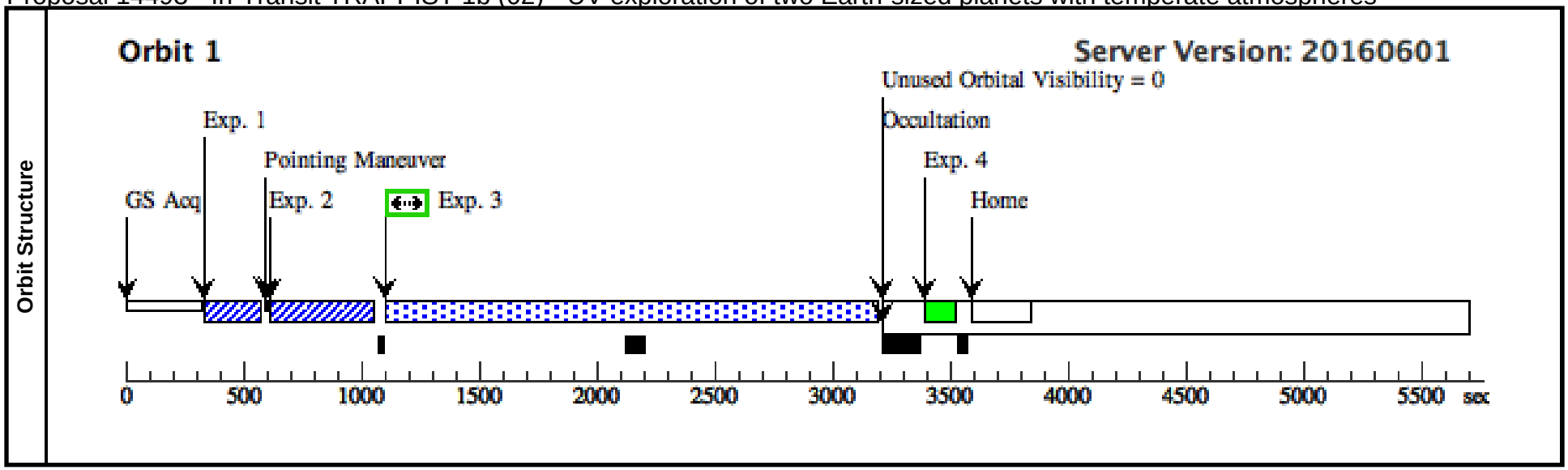
2	ACQ/PEAK (STIS.ta.783365)	(1) 2MASS-J23062928-0502285	STIS/CCD, ACQ/PEAK, 52X0.05	MIRROR			Sequence 1-4 Non-Int in In-Transit TRAPPIST 1b (02)	10 Secs (10 Secs) *[==>]*	*[1]*

Comments: The ETC lists a time to saturation through the 52X0.05 slit of 1086s (for a black body model with the same temperature as the star). With our 10s exposure, we should reach 5600 source electrons, above the 5000 required for peak-up with the mirror element.

3	SCIENCE (STIS.sp.415432)	(1) 2MASS-J23062928-0502285	STIS/FUV-MAMA, TIME-TAG, 52X0.05	G140M 1222 A	BUFFER-TIME=900; WAVECAL=NO		Sequence 1-4 Non-Int in In-Transit TRAPPIST 1b (02)	2095 Secs (1953 Secs) *[==>1953.0 Secs]*	*[1]*

Comments: The target star is a M8 ultracool dwarf from which we expect a much lower emission at Lyman-alpha than from GJ436 targeted in program GO#12965 (in the GJ140M spectral range, the stellar emission from these stars will arise from the Lyman-alpha line alone). We can thus use safely the same settings as program GO#12965.

4	GO-WAVE CAL	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 1-4 Non-Int in In-Transit TRAPPIST 1b (02)	*[==>]*	*[1]*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Exp. 1
Occultation
Pointing Maneuver
Exp. 4
GS Acq
Exp. 2
Exp. 3
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 14493, In-Transit TRAPPIST 1c (03), scheduling Wed Nov 09 16:01:53 GMT 2016

Diagnostic Status: No Diagnostics

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

Special Requirements: BETWEEN 11-AUG-2016:14:01:00 AND 11-AUG-2016:17:58:00; BETWEEN 06-OCT-2016:06:54:00 AND 06-OCT-2016:10:50:00; BETWEEN 18-OCT-2016:09:33:00 AND 18-OCT-2016:13:29:00; BETWEEN 30-OCT-2016:12:11:00 AND 30-OCT-2016:16:08:00; BETWEEN 11-NOV-2016:14:50:00 AND 11-NOV-2016:18:47:00; BETWEEN 23-NOV-2016:17:29:00 AND 23-NOV-2016:21:26:00; Period 2.421848 D AND ZERO-PHASE HJD2457362.80520

Comments: This visit targets the transit of planet TRAPPIST 1c, and we indicate relevant lower/upper phase constraints in the ACQ subexposure. Furthermore, the visit should be obtained at a time when planet TRAPPIST-1b is far after its own transit, so as not to contaminate the observation of planet 'c' transit. We thus indicate in the timing requirements the windows when planet 'c' transits and planet 'b' is between orbital phases 0.5 to 0.85. Finally, we also request that visit 3 be scheduled at least 15 days after visit 1. The first opportunity for visit 1 being on 16 June 2017, we thus provide all possible opportunities for visit 3 starting at least 15 days after this date, and until the end of November 2016.

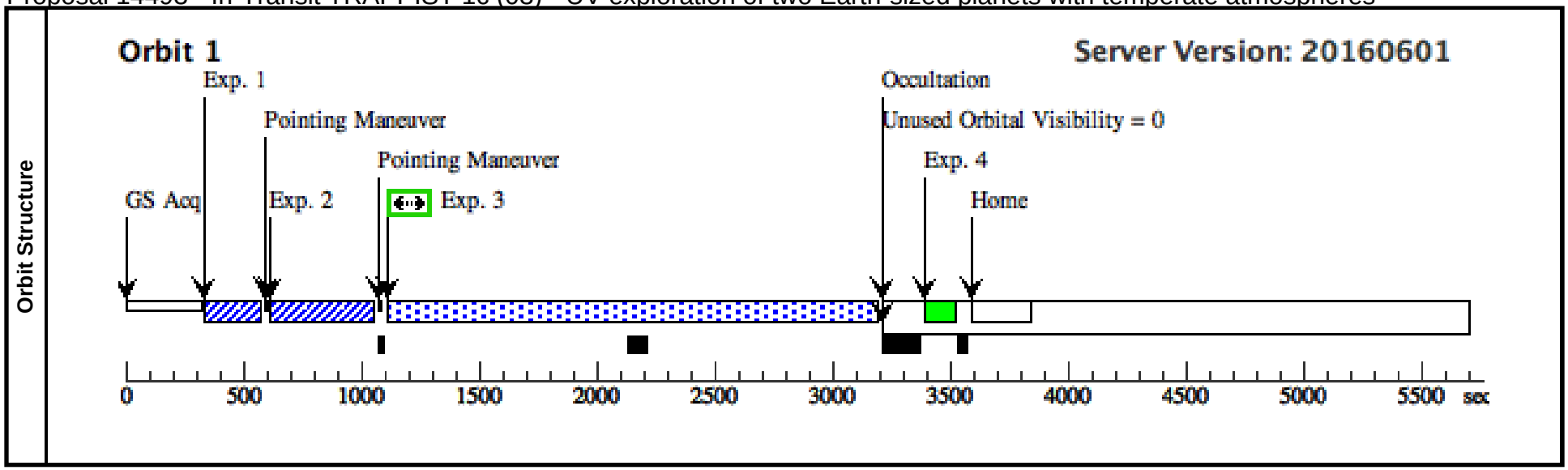
Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	2MASS-J23062928-0502285 Alt Name1: TRAPPIST-1	RA: 23 06 30.3400 (346.6264167d) Dec: -05 02 36.44 (-5.04346d) Equinox: J2000	Proper Motion RA: 922.1 mas/yr Proper Motion Dec: -471.9 mas/yr Parallax: 0.08258" Epoch of Position: 2015.86 Radial Velocity: -51.688 km/sec	V=18.798+/-0.082 V=18.80+-0.08, R=16.47+-0.07, I=14.0+-0.1, J=11.35+-0.02, K=10.30+-0.02	Reference Frame: ICRS

Comments: We measured the J2000 equatorial coordinates of TRAPPIST-1 in the 2015 TRAPPIST images, using 29 stars from the UCAC2 catalog and the Pulkovo Observatory Izmccd astrometric software (we use the mean epoch of these observations secured between September and December 2015). We adopt uncertainties on RA and Dec as those for 2MASS for this object.
We checked that the input coordinates and those given in SIMBAD at Epoch 2000 yield the same position in the APT target confirmation chart at Epoch 1991.68. We also checked independently that these coordinates and proper motion match with the position of the star in POSS image (1953) and 2MASS image (1998).
Radial velocity comes from Barnes et al. 2014

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ (STIS.ta.781643)	(1) 2MASS-J23062928-0502285	STIS/CCD, ACQ, F28X50LP	MIRROR		PHASE 0.986 TO 1.	Sequence 1-4 Non-Int in In-Transit TRAPPIST 1c (03)	5 Secs (5 Secs) *[==>]*	*[1]*
	Comments: We use the F28X50LP filter for this ACQ image, as recommended for this star with V magnitude of 18.8. It also ensures the brightness is weighted most strongly toward red wavelengths, where the target star is brightest. We estimated the exposure time for several stellar models close to the target star (STIS.ta.781640, STIS.ta.781641, STIS.ta.781643). Exposure times to reach a SNR of 40 range from 1.5 to 3.6s, and minimum saturation time is 290s. We thus choose an exposure time of 5s. *We used Aladin to check that the closest star is at a distance of more than 220 arcsec. There is thus no chance that STIS acquires another object in the 5x5 arcsec search area.*								
2	ACQ/PEAK (STIS.ta.783365)	(1) 2MASS-J23062928-0502285	STIS/CCD, ACQ/PEAK, 52X0.05D1	MIRROR			Sequence 1-4 Non-Int in In-Transit TRAPPIST 1c (03)	10 Secs (10 Secs) *[==>]*	*[1]*
	Comments: The ETC lists a time to saturation through the 52X0.05 slit of 1086s (for a black body model with the same temperature as the star). With our 10s exposure, we should reach 5600 source electrons, above the 5000 required for peak-up with the mirror element.								
3	SCIENCE (STIS.sp.415432)	(1) 2MASS-J23062928-0502285	STIS/FUV-MAMA, TIME-TAG, 52X0.05D1	G140M 1222 A	BUFFER-TIME=900; WAVECAL=NO		Sequence 1-4 Non-Int in In-Transit TRAPPIST 1c (03)	2095 Secs (1945 Secs) *[==>1945.0 Secs]*	*[1]*
	Comments: The target star is a M8 ultracool dwarf from which we expect a much lower emission at Lyman-alpha than from GJ436 targeted in program GO#12965 (in the GJ140M spectral range, the stellar emission from these stars will arise from the Lyman-alpha line alone). We can thus use safely the same settings as program GO#12965.								
4	GO-WAVE CAL	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 1-4 Non-Int in In-Transit TRAPPIST 1c (03)	*[==>]*	*[1]*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Server Version: 20160601
Exp. 1
Pointing Maneuver
Pointing Maneuver
GS Acq
Exp. 2
Exp. 3
Occultation
Unused Orbital Visibility = 0
Exp. 4
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec