



14900 - Confirming the Presence of an Hydrogen Exosphere around the Earth-sized Temperate Planet TRAPPIST-1c

Cycle: 24, Proposal Category: GO/DD

(Availability Mode: AVAILABLE)

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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	(2) 2MASS-J23062928-0502285-COPY WAVE	STIS/CCD STIS/FUV-MAMA	5	13-Dec-2016 21:13:06.0	yes

5 Total Orbits Used

ABSTRACT

We have recently completed reconnaissance studies of the TRAPPIST-1 system with the Spitzer and Hubble Space Telescopes. Owing to a 20-d long follow-up with Spitzer, we have now constrained the system architecture up to the ice line. Thanks to 4 non-consecutive HST/STIS orbits, we have determined the potential for further studies of the system in the UV--notably to search for hydrogen exospheres--and characterized the UV environment of TRAPPIST-1's planets, which is an essential contributing factor to their potential habitability. These reconnaissance studies with the synergetic Great Observatories emphasize the system uniqueness for Earth-sized comparative planetology and for the search for extrasolar habitats.

We request here 5 consecutive HST/STIS orbits to build upon our UV exploratory program and confirm the presence of an extended exosphere around TRAPPIST-1~c. These observations will inform us on its volatile reservoir while complementing the insights gained with HST/WFC3 (GOs 14500 and 14873). Our request for immediate HST/STIS followup will fulfill the urgent need to inform the community about TRAPPIST-1 planets in order to guide their follow-up, notably in the context of the upcoming JWST Cycle 1 proposal.

OBSERVING DESCRIPTION

We propose to observe the transits of TRAPPIST-1's planets with WFC3 on Dec.4, Dec. 29, and Jan. 10 to obtain their transmission spectra and assess the presence of extended atmospheres.

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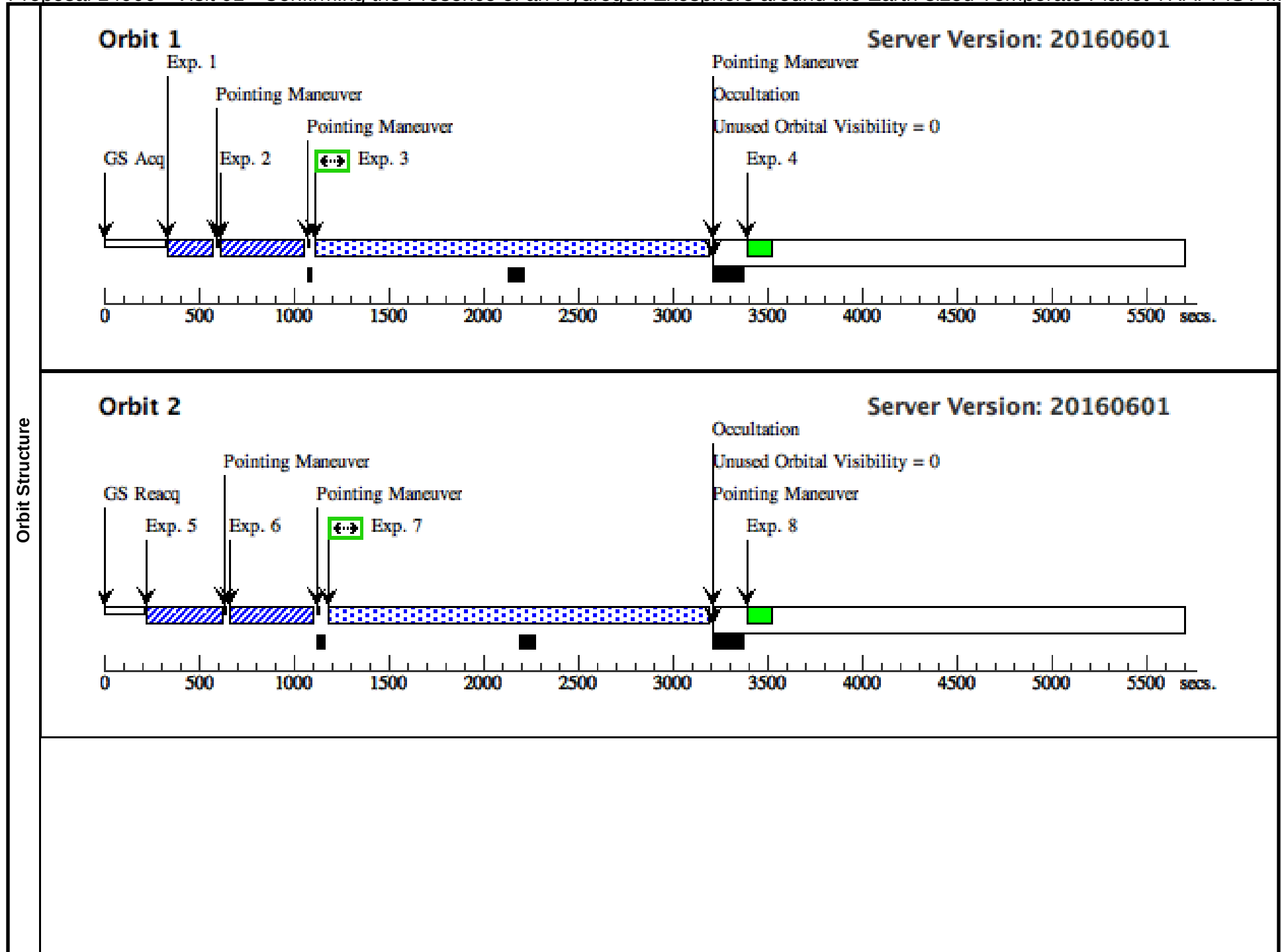
Visit	Proposal 14900, Visit 01, implementation Diagnostic Status: No Diagnostics Scientific Instruments: STIS/CCD, STIS/FUV-MAMA Special Requirements: BETWEEN 25-DEC-2016:03:00:00 AND 25-DEC-2016:11:00:00					Wed Dec 14 02:13:08 GMT 2016
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(2)	2MASS-J23062928-0502285-COPY 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						

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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.781 643)	(2) 2MASS-J230629 28-0502285-COPY	STIS/CCD, ACQ, F28X50LP	MIRROR			Sequence 1-4 Non-Int in Visit 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.783 365)	(2) 2MASS-J230629 28-0502285-COPY	STIS/CCD, ACQ/PEAK, 52X0.05D1	MIRROR			Sequence 1-4 Non-Int in Visit 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.41 5432)	(2) 2MASS-J230629 28-0502285-COPY	STIS/FUV-MAMA, TIME-TAG, 52X0.05D1	G140M 1222 A	BUFFER-TIME=90 0; WAVECAL=NO		Sequence 1-4 Non-Int in Visit 01	1945 Secs (1945 Secs) [==>]	[1]
	Comments: Following the same observational strategy as GO14493 for this target.									
	4	GO-WAVE CAL	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 1-4 Non-Int in Visit 01	[==>]	[1]
	5	ACQ (STIS.ta.781 643)	(2) 2MASS-J230629 28-0502285-COPY	STIS/CCD, ACQ, F28X50LP	MIRROR			Sequence 5-8 Non-Int in Visit 01	5 Secs (5 Secs) [==>]	[2]
	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.									
	6	ACQ/PEAK (STIS.ta.783 365)	(2) 2MASS-J230629 28-0502285-COPY	STIS/CCD, ACQ/PEAK, 52X0.05D1	MIRROR			Sequence 5-8 Non-Int in Visit 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.									
	7	SCIENCE (STIS.sp.41 5432)	(2) 2MASS-J230629 28-0502285-COPY	STIS/FUV-MAMA, TIME-TAG, 52X0.05D1	G140M 1222 A	BUFFER-TIME=90 0; WAVECAL=NO		Sequence 5-8 Non-Int in Visit 01	1888 Secs (1888 Secs) [==>]	[2]
	Comments: Following the same observational strategy as GO14493 for this target.									
	8	GO-WAVE CAL	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A			Sequence 5-8 Non-Int in Visit 01	[==>]	[2]
	9	ACQ (STIS.ta.781 643)	(2) 2MASS-J230629 28-0502285-COPY	STIS/CCD, ACQ, F28X50LP	MIRROR			Sequence 9-12 Non-Int in Visit 01	5 Secs (5 Secs) [==>]	[3]
	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.									
	10	ACQ/PEAK (STIS.ta.783 365)	(2) 2MASS-J230629 28-0502285-COPY	STIS/CCD, ACQ/PEAK, 52X0.05D1	MIRROR			Sequence 9-12 Non-Int in Visit 01	10 Secs (10 Secs) [==>]	[3]
	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.									
	11	SCIENCE (STIS.sp.41 5432)	(2) 2MASS-J230629 28-0502285-COPY	STIS/FUV-MAMA, TIME-TAG, 52X0.05D1	G140M 1222 A	BUFFER-TIME=90 0; WAVECAL=NO		Sequence 9-12 Non-Int in Visit 01	1888 Secs (1888 Secs) [==>]	[3]
	Comments: Following the same observational strategy as GO14493 for this target.									

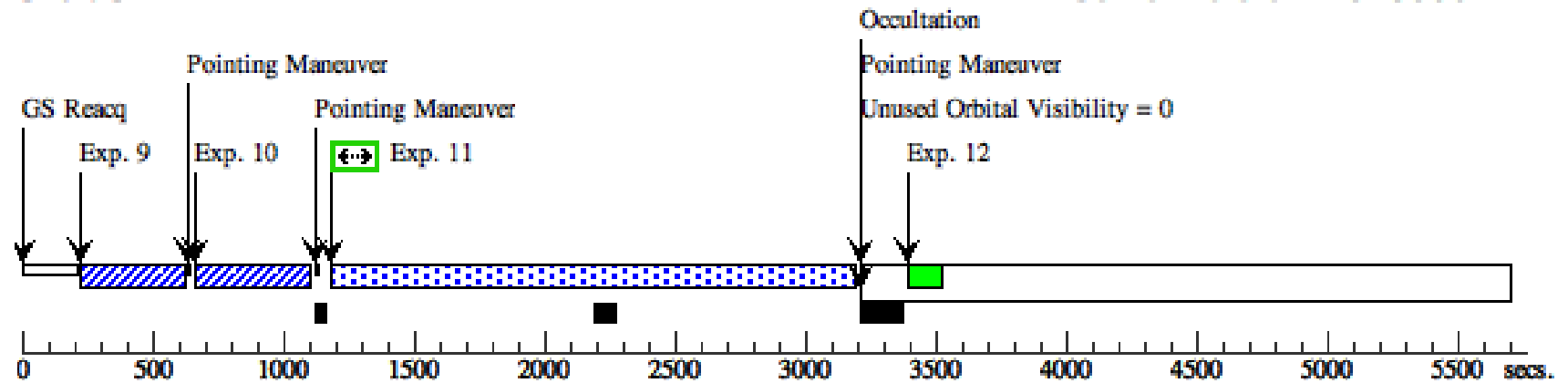
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12	GO-WAVE CAL	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A	Sequence 9-12 Non-Int in Visit 01	[==>]	[3]	
13	ACQ (STIS.ta.781 643)	(2) 2MASS-J230629 28-0502285-COPY	STIS/CCD, ACQ, F28X50LP	MIRROR	Sequence 13-16 Non-Int in Visit 01	5 Secs (5 Secs) [==>]	[4]	
<i>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.</i>								
14	ACQ/PEAK (STIS.ta.783 365)	(2) 2MASS-J230629 28-0502285-COPY	STIS/CCD, ACQ/PEAK, 52X0.05D1	MIRROR	Sequence 13-16 Non-Int in Visit 01	10 Secs (10 Secs) [==>]	[4]	
<i>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.</i>								
15	SCIENCE (STIS.sp.41 5432)	(2) 2MASS-J230629 28-0502285-COPY	STIS/FUV-MAMA, TIME-TAG, 52X0.05D1	G140M 1222 A	BUFFER-TIME=90 0; WAVECAL=NO	Sequence 13-16 Non-Int in Visit 01	1888 Secs (1888 Secs) [==>]	[4]
<i>Comments: Following the same observational strategy as GO14493 for this target.</i>								
16	GO-WAVE CAL	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A	Sequence 13-16 Non-Int in Visit 01	[==>]	[4]	
17	ACQ (STIS.ta.781 643)	(2) 2MASS-J230629 28-0502285-COPY	STIS/CCD, ACQ, F28X50LP	MIRROR	Sequence 17-20 Non-Int in Visit 01	5 Secs (5 Secs) [==>]	[5]	
<i>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.</i>								
18	ACQ/PEAK (STIS.ta.783 365)	(2) 2MASS-J230629 28-0502285-COPY	STIS/CCD, ACQ/PEAK, 52X0.05D1	MIRROR	Sequence 17-20 Non-Int in Visit 01	10 Secs (10 Secs) [==>]	[5]	
<i>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.</i>								
19	SCIENCE (STIS.sp.41 5432)	(2) 2MASS-J230629 28-0502285-COPY	STIS/FUV-MAMA, TIME-TAG, 52X0.05D1	G140M 1222 A	BUFFER-TIME=90 0; WAVECAL=NO	Sequence 17-20 Non-Int in Visit 01	1888 Secs (1888 Secs) [==>]	[5]
<i>Comments: Following the same observational strategy as GO14493 for this target.</i>								
20	GO-WAVE CAL	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.05	G140M 1222 A	Sequence 17-20 Non-Int in Visit 01	[==>]	[5]	



Orbit 3

Server Version: 20160601



Orbit 4

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