16663 - Spectroscopic diagnosis of changing back yard giant exoplanets.

Cycle: 29, Proposal Category: GO

(Availability Mode: SUPPORTED)

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	(4) URANUS-G750L-INNER (5) URANUS (6) URANUS-G750M CCDFLAT WAVE	STIS/CCD	2	19-Oct-2022 12:00:34.0	yes
02	(1) URANUS-G750L-OUTER (3) URANUS-G750L-MIDDLE (5) URANUS CCDFLAT WAVE	STIS/CCD	2	19-Oct-2022 12:00:38.0	yes

4 Total Orbits Used

ABSTRACT

Uranus and Neptune, similar in size to the most abundant class of exoplanets, have been undergoing temporal changes, the causes of which we propose to investigate by measuring the informative spectral features of methane, which has special diagnostic significance on these ice giants

because it can condense in their cold atmospheres. Condensation makes methane's local abundance a function of vertical and horizontal atmospheric motions and thus serves as an important constraint on models of such motions. Prior HST/STIS observations of Uranus in 2002, 2012, and 2015 have revealed that both polar regions have been depleted in methane. But a subsequent and continued dramatic brightening of its north polar region raises questions about the relative roles of aerosols and methane in producing this change, an issue which new STIS observations can resolve. STIS observations of Neptune in 2003 suggest a methane depletion similar to that of Uranus, but one sample does little to constrain whatever seasonal changes may be present. We thus propose 8 STIS orbits to obtain spatially resolved 524-1027 nm image cubes of both planets. These capture an important spectral region near 825 nm where methane and hydrogen absorptions are competitive and thus constrain the mixing ratio of methane relative to that of the dominant gas (hydrogen). They also capture a wide range of methane band strengths to help constrain the vertical distribution and scattering properties of aerosols, especially aided by the additional constraint of center-to-limb variations. HST provides a combination of wavelength coverage, spatial resolution, and stability not available from any other facility.

OBSERVING DESCRIPTION

The following has been adapted from the Phase I proposal PDF.

OVERVIEW. We will use two STIS gratings to acquire spatial and spectral information on Uranus and Neptune. Our design for both planets is almost identical. We will use four orbits on each planet. Three orbits provide a scan of one hemisphere between central meridian and one limb to acquire an image cube that contains all observable emission angles for each latitude, very similar to previous STIS observations of both planets. This provides accurate constraints on physical changes but also views different latitudes due to the 77-degree motion of sub-Earth latitudes since the 2002 observations of Uranus. The fourth orbit contains a new observation: central meridian exposures of very high signal-to-noise ratio. Each four- orbit observation will be divided into two visits to satisfy the new Cycle 29 requirement of two orbits or less per visit for moving targets. This provides two full orbits (1st and 3rd G750L) and two orbits with shortened observation due to target acquisitions (G750M and 2nd G750L). Both full orbits and one of the short ones will be used for the image cubes.

OBSERVATION SEQUENCE FOR PRODUCING IMAGE CUBES. For each planet three orbits will be used to produce a mosaic of half the planet using the STIS G750L grating and the 52X0.1 slit. The grating has coverage at 524-1027 nm wavelength with 0.492 nm/pixel dispersion, which resolves numerous methane bands with various strengths and includes the key hydrogen absorption around 825 nm. This will provide an image cube of 1024 wavelengths and 38 slit positions containing up to 75 samples along the slit for Uranus, and 24 slit positions with up to 47 samples along the slit for Neptune (the opposition diameters of Uranus and Neptune will be 3.76" and 2.36", respectively). For both planets, the step size of the slit

displacement will be approximately 0.051", matching the pixel size in the perpendicular direction. All previous STIS observations of Uranus and Neptune had similar designs and produced image cubes of one hemisphere as intended.

For Uranus, we divide the 38 slit positions into three orbits of 14, 9, and 15 slit positions for the OUTER, MIDDLE, and INNER mosaic swaths, respectively. For Neptune, we use three orbits with <8, 7, and 9,update> slit positions.

SIGNAL-TO-NOISE RATIOS FOR DATA CUBES. Phase II APT yields exposure times of 96-110 s for Uranus and <255-294,update> s for Neptune. These exposure times are larger than those of previous image cubes (76-87 s for Uranus and 195 s for Neptune) and will give us <20-30,update> percent more S/N ratio. Single-pixel S/N ratios will be > 50:1 from around 520-700 nm, decreasing to around 25:1 near 825 nm to < 10:1 (strongest methane absorption bands). Exposures will not be CR-split because exposure times are relatively short and exposures at adjacent slit locations allow easy identification of cosmic ray hits.

NEW HIGH S/N OBSERVATIONS ON THE CENTRAL MERIDIAN. The remaining fourth orbit per planet will provide high S/N, increased spectral resolution, and spatially dithered samples with higher spatial resolution along the central meridian. It uses the G750M grating and the 52X0.5 slit (see Fig. 6), which will cover the 803-860 nm interval with a dispersion of 0.056 nm/pixel. This spectral band is the most important one as it has the greatest sensitivity to hydrogen absorption. The wide slit will limit spectral resolution to 0.56 nm (10 pixels), which is still almost twice as good as the 0.98 nm resolution for the image cube. Since the slit will be aligned on the central meridian, the wide slit will smear only data of the same latitude. The curvature of latitude lines within the slit is typically less than half a pixel and not significant, except near the pole.

CENTRAL MERIDIAN G750M EXPOSURES. We will take three exposures of the central meridian dithered by 5.33 pixels along the slit. This will improve spatial sampling and re- duce sensitivity to slit width variations. The smallest resolvable features will have spatial wavelengths or separations of 0.05", corresponding to 1.5 degrees in latitude at the center of the disk for Uranus (2.5 degrees for Neptune). This is twice as good as without dithering. Estimated exposure times are 616 s using the Cycle 29 Primer and 495 s using APT. We will split each exposure in two for better cosmic ray elimination. Because this combination of grating and slit provides a nine-fold throughput increase relative to the the proposed image cube observations, and because time spent on the central meridian is increased 13 fold for Uranus and 7 fold for Neptune, we expect about 10 times higher S/N ratios compared to the proposed image cube and even more compared to previous image cubes. For comparison, the improvement going from HST to JWST will be only a factor of 3 in S/N.

INSTRUMENT PARAMETERS. To avoid increased overhead time and buffer dumps, we will read out only a 7" (140 row) subarray. We will

request WAVECAL exposures for wave- length calibration to be acquired after each orbit during occultation, as will be fringe flats CCDFLAT. Target acquisition will be via a 10 s exposure with the F28X50LP aperture for Uranus, 20 s for Neptune. ACQ/PEAK will not be needed since the first acquisition previously located the central meridians to 0.01-0.02" using the same technique. Acquisition parameters are DIFFUSE, CHECKBOX = 33, and FLUX-CENTROID. We will employ the E2 apertures in order to maximize charge transfer efficiency (CTE). We will use the gain setting of 1 electron/data number since the highest recorded signal will be less than one third of the saturation for GAIN 1.

DATA REDUCTION AND CALIBRATION. First, images are cleaned of pixels affected by cosmic rays and other defects using all three dimensions of the data cube. Fringing is removed via division by the CCDFLATs, which also corrects for slit throughput variations along the slit. Next a column-by-column deconvolution corrects for imperfect Charge Transfer Efficiency (CTE). Then an image deconvolution reduces the effects of the "Red Halo" CCD substrate scattering. Geometric rectification is the next step. Navigation is accomplished by comparing spectral exposures convolved with the spectral function for the acquisition image with cuts across this image. The resulting data cube is spatially deconvolved at each wavelength, using monochromatic PSFs generated by Tiny Tim. The radiometric calibration uses STScI throughput tables. This is converted to I/F by division by the solar spectrum. A small correction is applied using publicly available calibrated WFC3 images acquired by the Outer Planets Legacy Program (OPAL) [22].

TIMING IN SUCCESSIVE CYCLES. Because Uranus and Neptune have never been observed with the G750M grating, we first want to thoroughly analyze the Uranus observations before we design Phase 2 for Neptune since that analysis might suggests slight improvements, such as changing the number of G750M exposures. Delaying Neptune observations into Cycle 30 will provide the time needed to discover and implement any improvements that are indicated.

NOTES ON COMPUTATION OF ANGLES, OFFSETS, STEPS, ETC.

The following three paragraphs are for STIS slit aligned with Uranus rotation pole:
-----URANUS PA AND SIZE, ANGLES AND OFFSETS. At oppsosition on 9 NOV 2022 (was 5 NOV 2021), Uranus pole has PA of 267.7 (was 265.06) degrees. Its apparent angular equatorial diameter is 3.7716" (was 3.7612"), radius 1.8858" (was 1.8806"). ORIENT for 52" long slit is PA+45.35 = 313.04 (was 310.41) deg. Angle to starting point of scans (limb) (PosAngle) is PA+90 = 357.7 (was 355.1) deg. Pattern direction for stepping is PosAngle-180 = 177.7 (was 175.1) deg.
-----STEP SIZE AND OFFSETS FOR G750L SCANNING. Uranus radius R=1.8858" (was 1.8806"). Total number of exposures T=38, which

includes one extra step on each side of central meridian (CM) and limb. Step size from center to limb is therefore S = R / [(T-2)-1] = 0.05388) (was 0.053731) arcsec. N1 is number of steps in OUTER orbit, stepping from just off limb towards center. N2 is number of steps in MIDDLE orbit of the hemisphere, and N3 is number of steps in last INNER swath stepping inward to just past CM. N1=9, N2=14, N3=15 equalizes the exposures fairly well. Starting point for OUTER limb swath orbit is therefore O1 = S * [(T-3)+1] = 1.93968 (was 1.93433) arcsec, which is the radius for the URANUS-G750L-OUTER target. Offset for the 2R/3 to R/3 MIDDLE mosaic swath orbit is then O2 = S * [(T-3)+1-N1] = 1.45476 (was 1.45074) arcsec (URANUS-G750L-MIDDLE target). And O3 for the INNER orbit of the R/3 to CM mosaic is O3 = S * [(T-3)+1-N1-N2] = 0.70044 (was 0.69850) arcsec (URANUS-G750L-INNER target).
-----STEP SIZE FOR G750M DITHER. Dither distance is to be 5.333 pixels. From section 14.6 of the STIS instrument handbook, the STIS CCD Y pixel scale is 0.050735 arcseconds/pixel. This results in a dither size of 0.27057 arcseconds.

Due to loss of FGS2 for moving target tracking, we have had to modify or program to use an ORIENT angle that is ~24 degrees from the angle that aligns the STIS slit with the rotation pole. The following changes have been made to the program:

1. Due to unavailable ORIENT of 313 degrees due to inability to use FGS2, new ORIENT has been set to 289.5+-0.1 degrees, per email from Weston Eck limit of 289.6.
2. This makes slit PA 244.15 deg (ORIENT - 43.35).
3. This makes target offset direction for starting point of patterns 334.15 (slit PA + 90) for evening limb.
4. This makes pattern direction 154.15 (slit PA - 90)
5. The INNER mosaic pattern for G750L has been modified to 0.1 arcsec spacing to extend past center of planet by ~0.75 arcsec, to cover Uranus southern central meridian (R * sin(slit-pole)) where R is Uranus radius 1.89", and pole-slit angle is 267.7-244.2=23.55 deg.
6. The G750M dither pattern has been changed to LINE pattern, centered on planet, with step -0.375, 0, 0.375 arcsec from planet center, to go through pole (pole dist is 0.939", 0.939*sin(23.55)=0.375").
7. An additional target (6) was added as the starting point for the G750M grating pattern.
8. Due to visibility overrun for G750M, presumably due to change in dither pattern, exposure had to be reduced from 495 sec to 414 sec, a 9% SNR reduction.

EXPLANATION FOR PROPOSAL ERRORS.
I am having trouble getting a new ephemeris from MOSS, so I cannot satisfy MOVING TARGET window in visit planner for visit 1, and schedulability for visit 2 is linked to visit 1. I am using APT 2022.5.2. Strangely, the visity planner is using two different ephemerides for the two visits, one of which does not cover this year's opposition period. I do not know how to force generation of a new ephemeris.

IMPACTS OF REDUCED GYRO OPERATIONS. The biggest impact would be if the observatory field of regard were reduced such that the observations could not be accomplished very near to opposition. This requirement is due to the specific roll angle which aligns the STIS slit with the rotation axis of the target. Since symmetry about the planet's rotation axis is assumed, we are able to acquire the needed observatons by only observing one hemisphere of the planet, as long as the aforementioned roll angle is achieved. The inability to specify this roll angle would make the observations impossible as now designed without the assignment of additional orbits. Increased time for guide star acquisitions and reacquistions can be handled by simultaneously reducing exposure times of all exposures, resulting a presumably small but acceptable reductions in signal-to-noise ratios.

NOTES FOR STSCI IMPLEMENTER. Phase II does not appear to allow WAVECAL exposures to occur during occultation, as FRINGE_FLAT exposures do. If it is possible for this to occur, we could then increase exposure times to improve signal-to-noise ratios slightly. Schedulability had to be increased to 80% to allow Target Visibility window to overlap Roll Angle window. Any increase in available orbital visibility could be apportioned to all exposures equally.

Visit

Proposal 16663, G750M_G750L1 (01), implementation Wed Oct 19 16:00:39 GMT 2022

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: SCHED 80%; ORIENT 289.4D TO 289.6 D; GROUP 01,02 WITHIN 30D; VISIBILITY INTERVAL NO GYRO BIAS UPDATE ON MOVING TARGET

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=LINE	Coordinate Frame=CELESTIAL		(5)
	Purpose=MOSAIC	Pattern Orientation=154.15		
	Number Of Points=15	Angle Between Sides=		
	Point Spacing=0.1	Center Pattern=false		
	Line Spacing=			
(4)	Pattern Type=LINE	Coordinate Frame=CELESTIAL		(2)
	Purpose=MOSAIC	Pattern Orientation=154.15		
	Number Of Points=3	Angle Between Sides=		
	Point Spacing=0.375	Center Pattern=false		
	Line Spacing=			

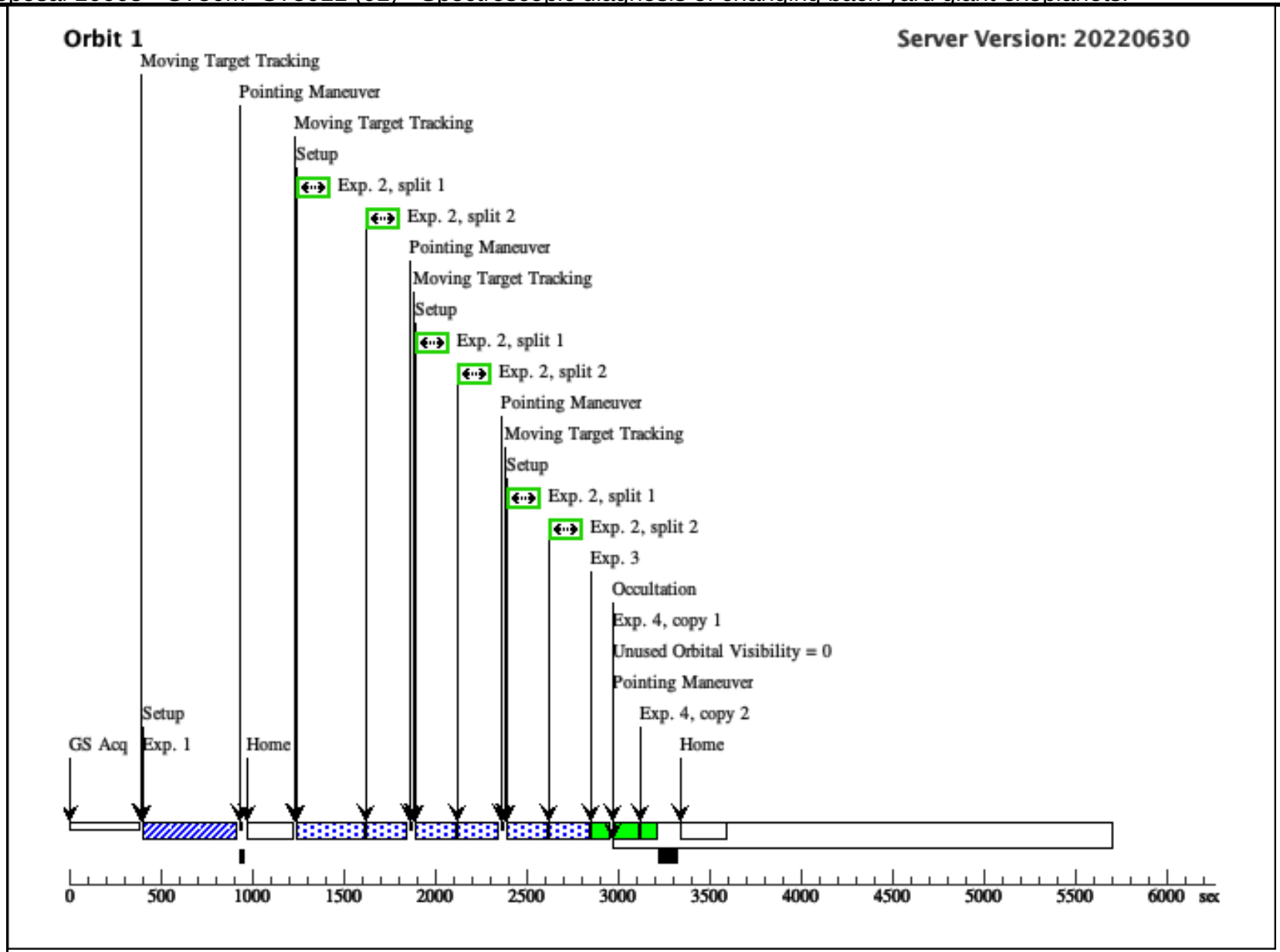
Solar System Targets

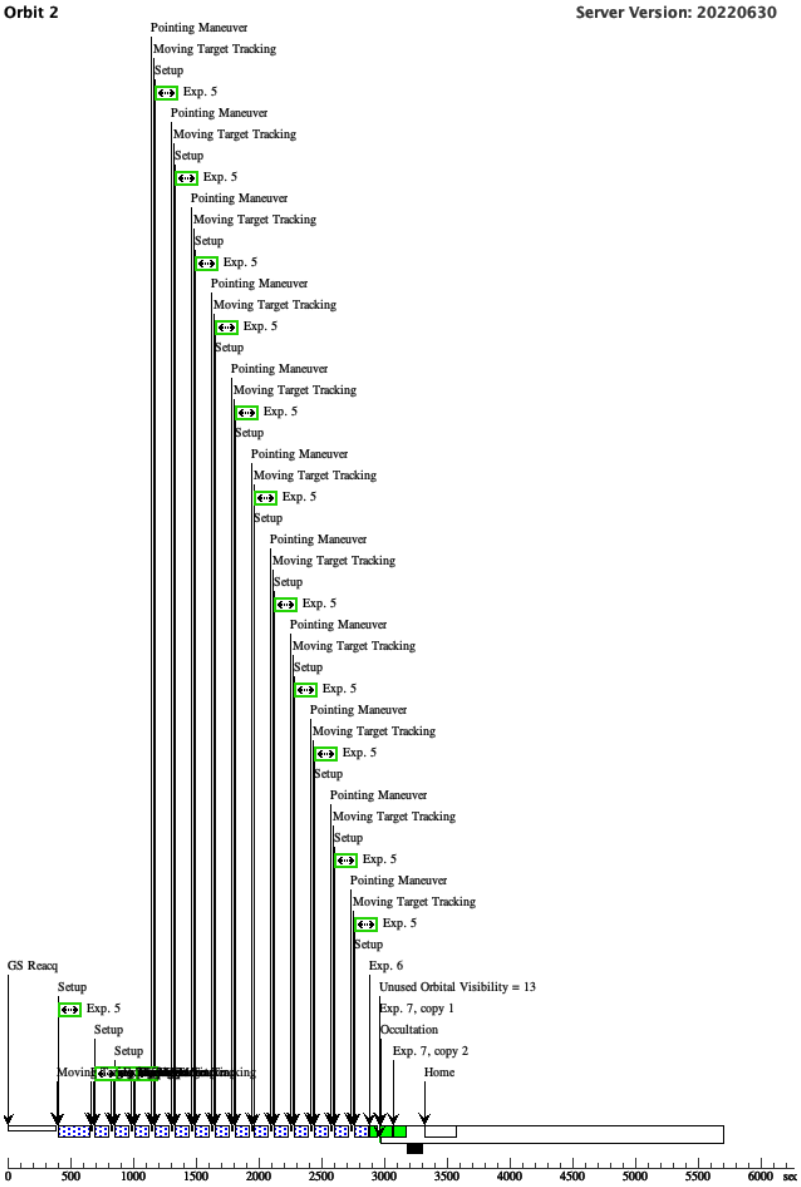
#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(4)	URANUS-G750L-INNER	STD=URANUS	TYPE=POS_ANGLE,RAD=0.65432, ANG=334.15,REF=NORTH			EARTH
Comments: DEFAULT WINDOW: NOT OCC OF URANUS-G750L-INNER BY URANUS FROM EARTH to be removed by PC or in implementation. Is not appropriate and results in unschedulable visit. This target is starting pointing for pattern 3, which steps from R/3 to just past central meridian, where R is radius of target, perpendicular to slit. *Description=Starting point for outer Uranus G750L mosaic.* *Extended=YES*						
(5)	URANUS	STD=URANUS				EARTH
Comments: Description=URANUS ACQ AND G750M TARGET *Extended=YES*						
(6)	URANUS-G750M	STD=URANUS	TYPE=POS_ANGLE,RAD=0.375,ANG=334.15,REF=NORTH			EARTH
Comments: Description=Starting point for G750M pattern, 0.4" from planet center, through pole *Extended=YES*						

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	VIS_1_ACQ	(5) URANUS	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=DIFFUSE; CHECKBOX=33; DIFFUSE-CENTER=FLUX-CENTROID	GS ACQ SCENARIO BASE1BE	Sequence 1-4 Non-Int in G750M_G750L1 (01)	5 Secs (5 Secs) *[==>]*	***[1]***
2	G750M	(6) URANUS-G750M	STIS/CCD, ACCUM, 52X0.5E1	G750M 8311 A	CR-SPLIT=2; GAIN=1; SIZEAXIS2=140; WAVECAL=NO		Sequence 1-4 Non-Int in G750M_G750L1 (01) Pattern 4, Exps 2-2 in Sequence 1-4 Non-Int in G750M_G750L1 (01) (4)	414 Secs (1242 Secs) *[==>(Pattern 1, Split 1)]* *[==>(Pattern 1, Split 2)]* *[==>(Pattern 2, Split 1)]* *[==>(Pattern 2, Split 2)]* *[==>(Pattern 3, Split 1)]* *[==>(Pattern 3, Split 2)]*	***[1]***
3	WAVECAL	WAVE	STIS/CCD, ACCUM, 52X0.1	G750M 8311 A			Sequence 1-4 Non-Int in G750M_G750L1 (01)	*[==>]*	***[1]***
Comments: Observer-specified WAVECAL inserted at end of orbit to run into occultation. This wavecal is to calibrate G750M 52X0.5 exposures, and is the aperture specified by GO WAVECAL APERTURE SELECTION page.									
4	FRINGE_FLAT	CCDFLAT	STIS/CCD, ACCUM, 52X0.5	G750M 8311 A			Sequence 1-4 Non-Int in G750M_G750L1 (01)	*[==>(Copy 1)]* *[==>(Copy 2)]*	***[1]***
Comments: Observer-specified FRINGE_FLAT to correct near-IR fringing to be run in occultation.									
5	G750L_INNER	(4) URANUS-G750L-INNER	STIS/CCD, ACCUM, 52X0.1E1	G750L 7751 A	CR-SPLIT=NO; GAIN=1; SIZEAXIS2=140; WAVECAL=NO		Sequence 5-7 Non-Int in G750M_G750L1 (01) Pattern 1, Exps 5-5 in Sequence 5-7 Non-Int in G750M_G750L1 (01) (1)	96 Secs (1440 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]* *[==>(Pattern 5)]* *[==>(Pattern 6)]* *[==>(Pattern 7)]* *[==>(Pattern 8)]* *[==>(Pattern 9)]* *[==>(Pattern 10)]* *[==>(Pattern 11)]* *[==>(Pattern 12)]* *[==>(Pattern 13)]* *[==>(Pattern 14)]* *[==>(Pattern 15)]*	***[2]***
6	WAVECAL	WAVE	STIS/CCD, ACCUM, 52X0.1	G750L 7751 A			Sequence 5-7 Non-Int in G750M_G750L1 (01)	*[==>]*	***[2]***
Comments: Observer-specified WAVECAL inserted at end of orbit to run into occultation.									
7	FRINGE_FLAT	CCDFLAT	STIS/CCD, ACCUM, 52X0.1	G750L 7751 A			Sequence 5-7 Non-Int in G750M_G750L1 (01)	*[==>(Copy 1)]* *[==>(Copy 2)]*	***[2]***
Comments: Observer-specified FRINGE_FLAT to correct near-IR fringing to be run in occultation.									

Orbit Structure

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sec

Visit

Proposal 16663, G750L2_G750L3 (02), implementation Wed Oct 19 16:00:40 GMT 2022

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/CCD

Special Requirements: SCHED 80%; ORIENT 289.4D TO 289.6 D; VISIBILITY INTERVAL NO GYRO BIAS UPDATE ON MOVING TARGET

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(2)	Pattern Type=LINE	Coordinate Frame=CELESTIAL		(2)
	Purpose=MOSAIC	Pattern Orientation=154.15		
	Number Of Points=9	Angle Between Sides=		
	Point Spacing=0.05388	Center Pattern=false		
	Line Spacing=			
(3)	Pattern Type=LINE	Coordinate Frame=CELESTIAL		(5)
	Purpose=MOSAIC	Pattern Orientation=154.15		
	Number Of Points=14	Angle Between Sides=		
	Point Spacing=0.05388	Center Pattern=false		
	Line Spacing=			

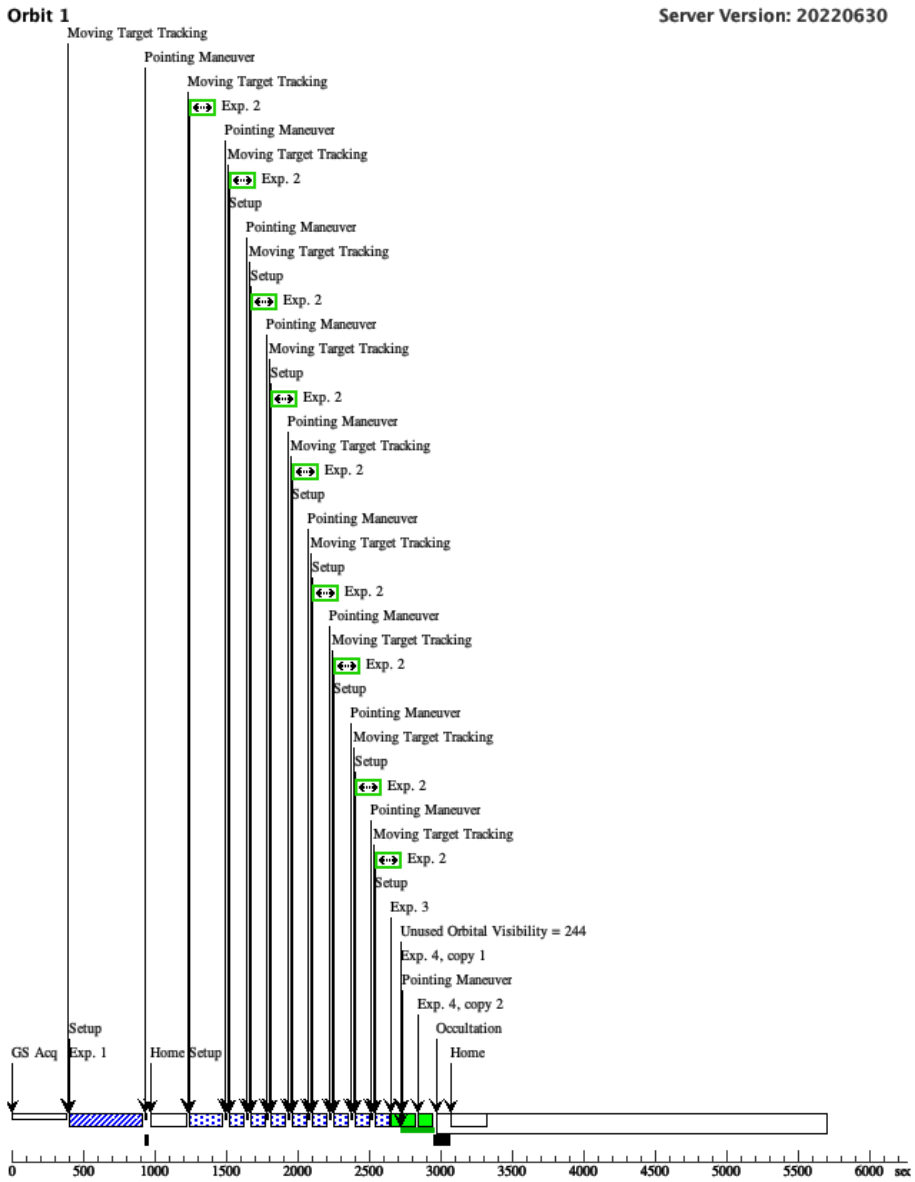
Solar System Targets

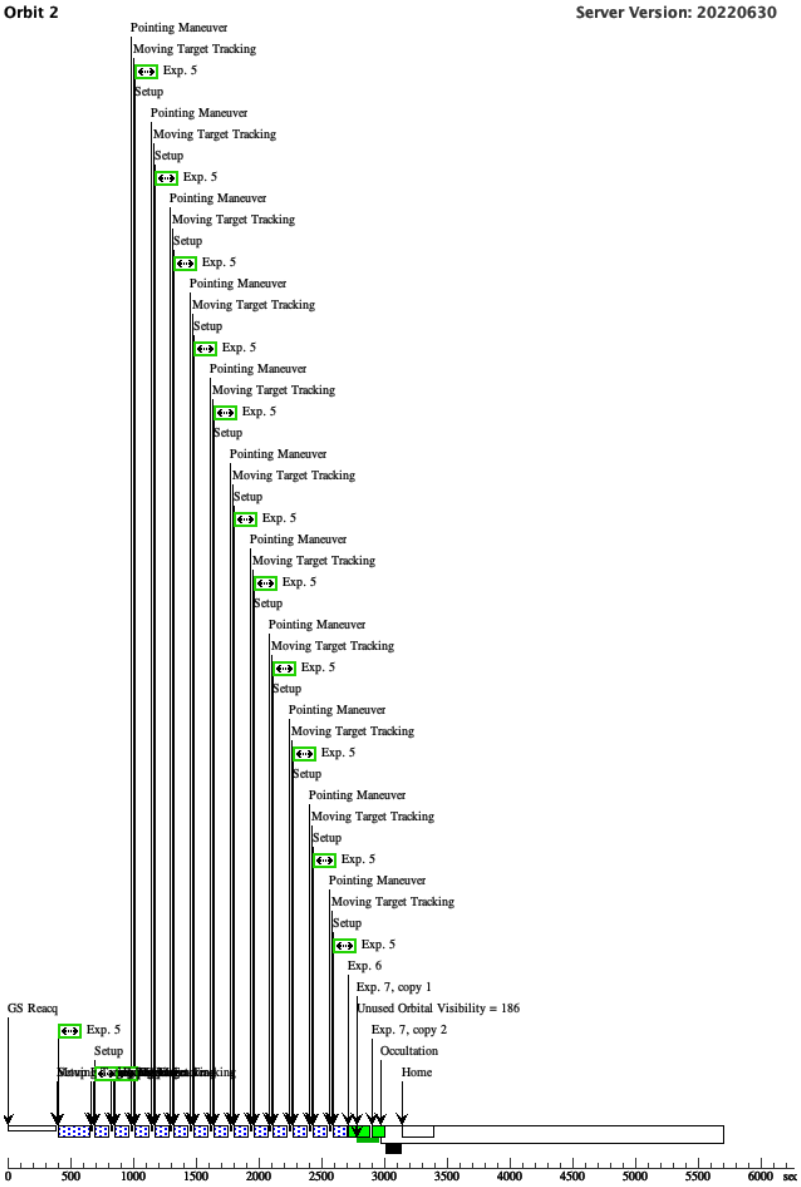
#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	URANUS-G750L-OUTER	STD=URANUS	TYPE=POS_ANGLE,RAD=1.93968, ANG=334.15,REF=NORTH			EARTH
Comments: DEFAULT WINDOW: NOT OCC OF URANUS-G750L-OUTER BY URANUS FROM EARTH to be removed by PC or in implementation. Is not appropriate and results in unschedulable visit. This target is starting pointing for pattern 2, which steps from just past limb to 2R/3, where R is radius of target, perpendicular to slit.						
Description=Starting point for outer Uranus G750L mosaic.						
Extended=YES						
(3)	URANUS-G750L-MIDDLE	STD=URANUS	TYPE=POS_ANGLE,RAD=1.45476, ANG=334.15,REF=NORTH			EARTH
Comments: DEFAULT WINDOW: NOT OCC OF URANUS-G750L-MIDDLE BY URANUS FROM EARTH to be removed by PC or in implementation. Is not appropriate and results in unschedulable visit. This target is starting pointing for pattern 2, which steps from 2R/3 to R/3, where R is radius of target, perpendicular to slit.						
Description=Starting point for middle Uranus G750L mosaic.						
Extended=YES						
(5)	URANUS	STD=URANUS				EARTH
Comments: Description=URANUS ACQ AND G750M TARGET						
Extended=YES						

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	VIS_1_ACQ	(5) URANUS	STIS/CCD, ACQ, F28X50LP	MIRROR	ACQTYPE=DIFFUSE; CHECKBOX=33; DIFFUSE-CENTER=FLUX-CENTROID	GS ACQ SCENARIO BASE1BE	Sequence 1-4 Non-Int in G750L2_G750L3 (02)	5 Secs (5 Secs) *[==>]*	*[1]*
2	G750L_OUTER	(1) URANUS-G750L-OUTER	STIS/CCD, ACCUM, 52X0.1E1	G750L 7751 A	GAIN=1; SIZEAXIS2=140; CR-SPLIT=NO		Sequence 1-4 Non-Int in G750L2_G750L3 (02) Pattern 2, Exps 2-2 in Sequence 1-4 Non-Int in G750L2_G750L3 (02) (2)	83 Secs (747 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]* *[==>(Pattern 5)]* *[==>(Pattern 6)]* *[==>(Pattern 7)]* *[==>(Pattern 8)]* *[==>(Pattern 9)]*	*[1]*
3	WAVECAL	WAVE	STIS/CCD, ACCUM, 52X0.1	G750L 7751 A			Sequence 1-4 Non-Int in G750L2_G750L3 (02)	*[==>]*	*[1]*
Comments: Observer-specified WAVECAL inserted at end of orbit to run into occultation.									
4	FRINGE_FLAT	CCDFLAT	STIS/CCD, ACCUM, 52X0.1	G750L 7751 A			Sequence 1-4 Non-Int in G750L2_G750L3 (02)	*[==>(Copy 1)]* *[==>(Copy 2)]*	*[1]*
Comments: Observer-specified FRINGE_FLAT to correct near-IR fringing to be run in occultation.									
5	G750L_MIDDLE	(3) URANUS-G750L-MIDDLE	STIS/CCD, ACCUM, 52X0.1E1	G750L 7751 A	CR-SPLIT=NO; GAIN=1; SIZEAXIS2=140; WAVECAL=NO		Sequence 5-7 Non-Int in G750L2_G750L3 (02) Pattern 3, Exps 5-5 in Sequence 5-7 Non-Int in G750L2_G750L3 (02) (3)	95 Secs (1330 Secs) *[==>(Pattern 1)]* *[==>(Pattern 2)]* *[==>(Pattern 3)]* *[==>(Pattern 4)]* *[==>(Pattern 5)]* *[==>(Pattern 6)]* *[==>(Pattern 7)]* *[==>(Pattern 8)]* *[==>(Pattern 9)]* *[==>(Pattern 10)]* *[==>(Pattern 11)]* *[==>(Pattern 12)]* *[==>(Pattern 13)]* *[==>(Pattern 14)]*	*[2]*
6	WAVECAL	WAVE	STIS/CCD, ACCUM, 52X0.1	G750L 7751 A			Sequence 5-7 Non-Int in G750L2_G750L3 (02)	*[==>]*	*[2]*
Comments: Observer-specified WAVECAL inserted at end of orbit to run into occultation.									
7	FRINGE_FLAT	CCDFLAT	STIS/CCD, ACCUM, 52X0.1	G750L 7751 A			Sequence 5-7 Non-Int in G750L2_G750L3 (02)	*[==>(Copy 1)]* *[==>(Copy 2)]*	*[2]*
Comments: Observer-specified FRINGE_FLAT to correct near-IR fringing to be run in occultation.									

Orbit Structure

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Exp. 6
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Occultation
Home
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6000
sec