# 16704 - Are the surfaces of the large moons of Uranus modified by charged particle bombardment?

Cycle: 29, Proposal Category: GO

(UV Initiative)

(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 | (1) ARIEL-LEADING | STIS/CCD<br>STIS/NUV-MAMA | 2 | 25-Jul-2022 11:01:38.0 | yes |
| 02 | (5) ARIEL-TRAILING | STIS/CCD<br>STIS/NUV-MAMA | 2 | 25-Jul-2022 11:01:39.0 | yes |
| 03 | (2) UMBRIEL-LEADING | STIS/CCD<br>STIS/NUV-MAMA | 2 | 25-Jul-2022 11:01:41.0 | yes |
| 04 | (6) UMBRIEL-TRAILING | STIS/CCD<br>STIS/NUV-MAMA | 2 | 25-Jul-2022 11:01:42.0 | yes |

| *Visit* | *Targets used in Visit* | *Configurations used in Visit* | *Orbits Used* | *Last Orbit Planner Run* | *OP Current with Visit?* |
|---|---|---|---|---|---|
| 05 | (3) TITANIA-LEADING | STIS/CCD<br>STIS/NUV-MAMA | 2 | 25-Jul-2022 11:01:43.0 | yes |
| 06 | (7) TITANIA-TRAILING | STIS/CCD<br>STIS/NUV-MAMA | 2 | 25-Jul-2022 11:01:45.0 | yes |
| 07 | (4) OBERON-LEADING | STIS/CCD<br>STIS/NUV-MAMA | 2 | 25-Jul-2022 11:01:46.0 | yes |
| 08 | (8) OBERON-TRAILING | STIS/CCD<br>STIS/NUV-MAMA | 2 | 25-Jul-2022 11:01:48.0 | yes |

16 Total Orbits Used

**ABSTRACT**

We propose to observe the large Uranian satellites Ariel, Umbriel, Titania, and Oberon, using the Space Telescope Imaging Spectrograph (STIS) on the Hubble Space Telescope (HST), to investigate whether their surface compositions are modified by charged particles trapped in Uranus' magnetosphere. The large Uranian moons are candidate ocean worlds, with surfaces that are rich in CO2 ice. The origin of CO2 ice on these moons is uncertain, but it could be formed by ongoing charged particle bombardment of native H2O ice and C-rich material on their surfaces. Alternatively, CO2 ice could be native to these moons and sourced from their interiors, hinting at recent geologic activity.

To investigate whether charged particles modify these four moons' surface compositions, we will collect UV spectra and conduct a series of measurements: (1) compare the near-UV (300 nm) albedos of each moon's leading and trailing hemisphere to characterize longitudinal and radial trends in charged particle irradiation; (2) measure an absorption band that spans 257 to 360 nm, attributed to trapped OH formed by charged particle irradiation of H2O ice, on each moon's leading and trailing hemisphere to characterize longitudinal and radial trends in the distribution of this feature; (3) compare the distribution of the 280-nm trapped OH band to the distribution of CO2 ice; (4) compare these new STIS spectra that would be collected over the northern hemispheres of these moons (sub-observer lat. 55 N) to archived HST/FOS spectra that were collected over their southern hemispheres (sub-observer lat. 45 S) to characterize any latitudinal trends in charged particle irradiation that might be present.

**OBSERVING DESCRIPTION**

This project requests 16 orbits (~9.8 hours of science time) to observe the leading and trailing hemispheres of the Uranian satellites Ariel, Umbriel, Titania, and Oberon with the STIS spectrograph on HST, using the G230L (NUV-MAMA) and G430L (CCD) gratings. Observations with both the G230L and G430L gratings are required to achieve sufficient wavelength coverage to complete our primary objectives of measuring the near-ultraviolet albedos of these four moons' leading and trailing hemispheres (centered at 300 nm) and measuring a previously detected trapped OH band that spans ~257 to 360 nm in archived HST/FOS spectra (program 6762).

The 16 orbits should be utilized as follows (text copied from selected proposal):
G230L observations of these four moons' leading hemispheres (4 orbits, 2220 s of exposure time per orbit); G230L observations of their trailing hemispheres (4 orbits, 2220 s of exposure time per orbit); G430L observations of their leading hemispheres (4 orbits, 2140 s of exposure time per orbit); G430L observations of their trailing hemispheres (4 orbits, 2140 s of exposure time per orbit). To ensure that we observe each hemisphere with the G230L and G430L close in time, we require observations of each moon's leading and trailing hemisphere to occur over two sequential orbits (i.e., one orbit for the G230L and the next sequential orbit for the G430L). Furthermore, we request that the exposure times be split into two dithered exposures: G230L orbits should be split into two dithered exposures each 1110 s in length; G430L orbits should be split into two dithered exposures eacg 1070 s in length.

Justify Duplications (text copied from selected proposal):
Ariel, Titania, and Oberon were observed using HST/FOS in 1996 (program ID 6762). This program only collected spectra of one hemisphere of these three moons. To investigate whether charged particle bombardment is modifying the surface compositions of the Uranian satellites, it is critical that we collect UV spectra of both their leading and trailing hemispheres, which was not done in Program 6762. Additionally, to determine whether charged particle bombardment operates differently at different latitudes, we require new UV spectra of these moons' currently observable northern hemispheres (55 degrees N) to compare to the UV spectra collected over their southern hemispheres (45 degrees S) in Program 6762. Thus, duplicate observations are needed to achieve our science goals.

## Visit

**Proposal 16704, Ariel-Leading (01), implementation** Mon Jul 25 15:01:49 GMT 2022

**Diagnostic Status: No Diagnostics**

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

Special Requirements: ORIENT 71.5D TO 95 D; ORIENT 253.86D TO 285 D

*Comments: An Orient Range for HST is required to assure maximum separation between the STIS slit and Uranus. The Orient Range will be added after this observation has been scheduled.*

## Patterns

| # | Primary Pattern | | Secondary Pattern | Exposures |
|---|---|---|---|---|
| (1) | Pattern Type=STIS-ALONG-SLIT | Coordinate Frame=POS-TARG | | (2), (3) |
| | Purpose=DITHER | Pattern Orientation=90.0 | | |
| | Number Of Points=3 | Angle Between Sides= | | |
| | Point Spacing=2 | Center Pattern=false | | |
| | Line Spacing= | | | |

## Solar System Targets

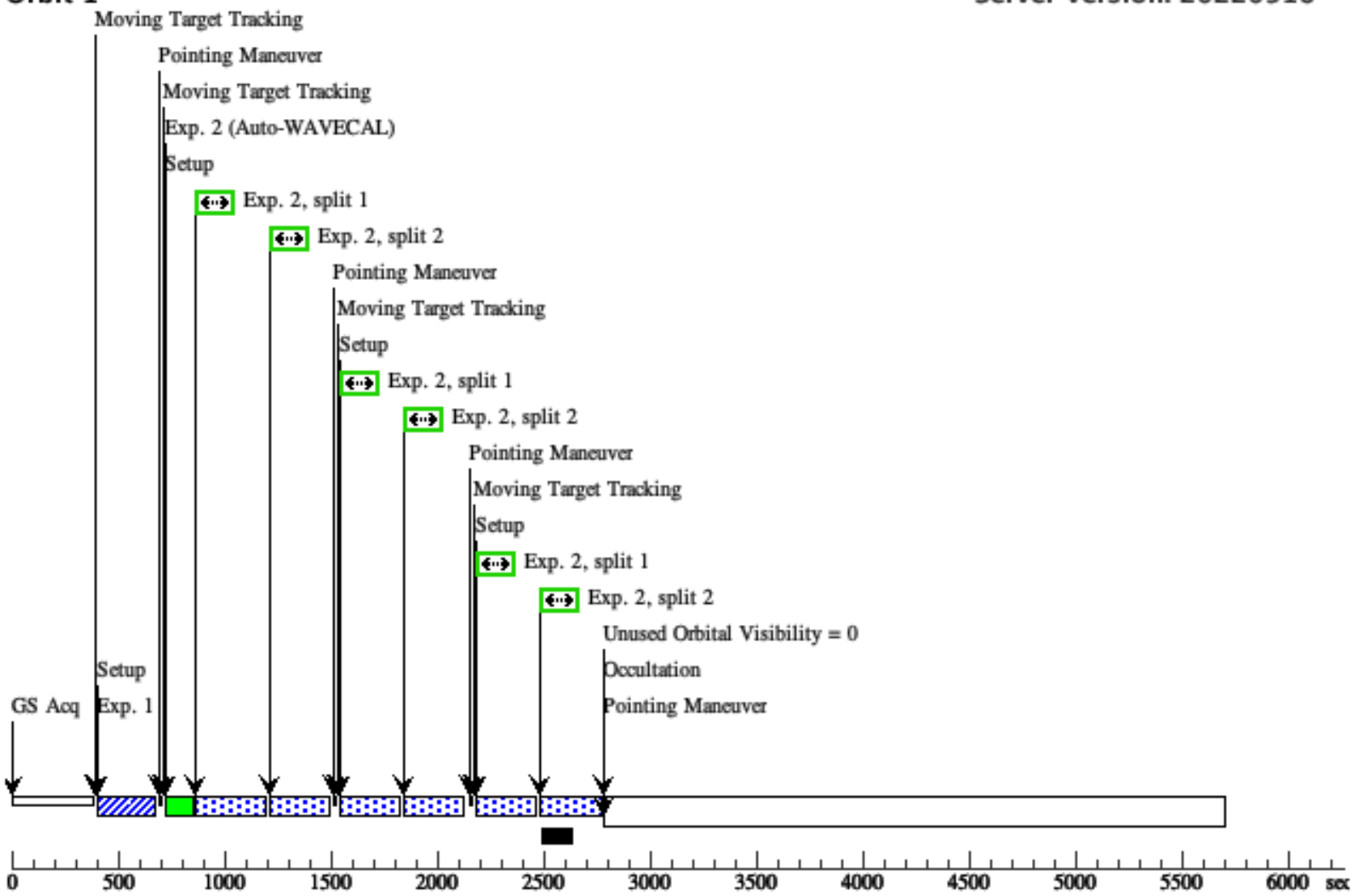
| # | Name | Level 1 | Level 2 | Level 3 | Window | Ephem Center |
|---|---|---|---|---|---|---|
| (1) | ARIEL-LEADING | STD=URANUS | STD=ARIEL | | NOT OCC OF ARIEL-LEADING BY URANUS FROM EARTH, RANGE ARIEL-LEADING EARTH LT 19.9, OLG OF ARIEL-LEADING FROM EARTH BETWEEN 60 120 | EARTH |

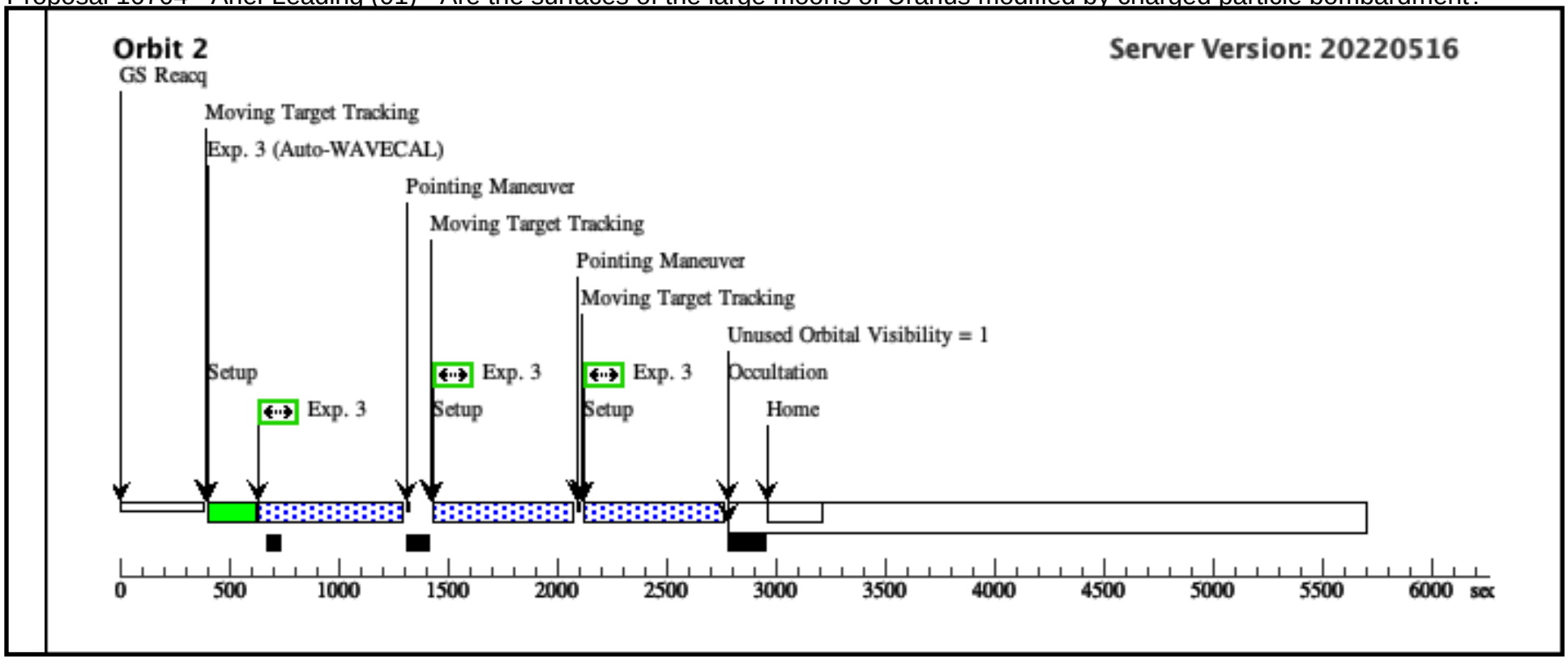
*Comments: Observation of Ariel's leading hemisphere.*
*Description=SATELLITE-ARIEL-LEADING-HEMISPHERE*
*Extended=NO*

## Exposures

| # | Label (ETC Run) | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | (STIS.ta.1524287) | (1) ARIEL-LEADING | STIS/CCD, ACQ, F28X50LP | MIRROR | | | | 0.8 Secs (0.8 Secs) | |
| | | | | | | | | *[==>]* | ***[1]*** |
| 2 | Ariel_Leading_G430L (STIS.sp.1524602) | (1) ARIEL-LEADING | STIS/CCD, ACCUM, 52X0.5 | G430L 4300 A | | | Pattern 1, Exps 2-2 in Ariel-Leading (01) (1) | 503 Secs (1509 Secs) | |
| | | | | | | | | *[==>(Pattern 1, Split 1)]* | ***[1]*** |
| | | | | | | | | *[==>(Pattern 1, Split 2)]* | |
| | | | | | | | | *[==>(Pattern 2, Split 1)]* | |
| | | | | | | | | *[==>(Pattern 2, Split 2)]* | |
| | | | | | | | | *[==>(Pattern 3, Split 1)]* | |
| | | | | | | | | *[==>(Pattern 3, Split 2)]* | |
| 3 | Ariel_Leading_G230L (STIS.sp.1524604) | (1) ARIEL-LEADING | STIS/NUV-MAMA, ACCUM, 52X0.5 | G230L 2376 A | | | Pattern 1, Exps 3-3 in Ariel-Leading (01) (1) | 628 Secs (1884 Secs) | |
| | | | | | | | | *[==>(Pattern 1)]* | ***[2]*** |
| | | | | | | | | *[==>(Pattern 2)]* | |
| | | | | | | | | *[==>(Pattern 3)]* | |

Orbit Structure




Orbit 2
Server Version: 20220516
GS Reacq
Moving Target Tracking
Exp. 3 (Auto-WAVECAL)
Pointing Maneuver
Moving Target Tracking
Pointing Maneuver
Moving Target Tracking
Unused Orbital Visibility = 1
Setup
Exp. 3
Exp. 3
Setup
Exp. 3
Setup
Occultation
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec

## Visit

**Proposal 16704, Ariel-Trailing (02), completed** Mon Jul 25 15:01:49 GMT 2022

**Diagnostic Status: No Diagnostics**

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

Special Requirements: ORIENT 73D TO 74 D

*Comments: An Orient Range for HST is required to assure maximum separation between the STIS slit and Uranus. The Orient Range will be added after this observation has been scheduled.*

## Patterns

| # | Primary Pattern | | Secondary Pattern | Exposures |
|---|---|---|---|---|
| (1) | Pattern Type=STIS-ALONG-SLIT | Coordinate Frame=POS-TARG | | (2), (3) |
| | Purpose=DITHER | Pattern Orientation=90.0 | | |
| | Number Of Points=3 | Angle Between Sides= | | |
| | Point Spacing=2 | Center Pattern=false | | |
| | Line Spacing= | | | |

## Solar System Targets

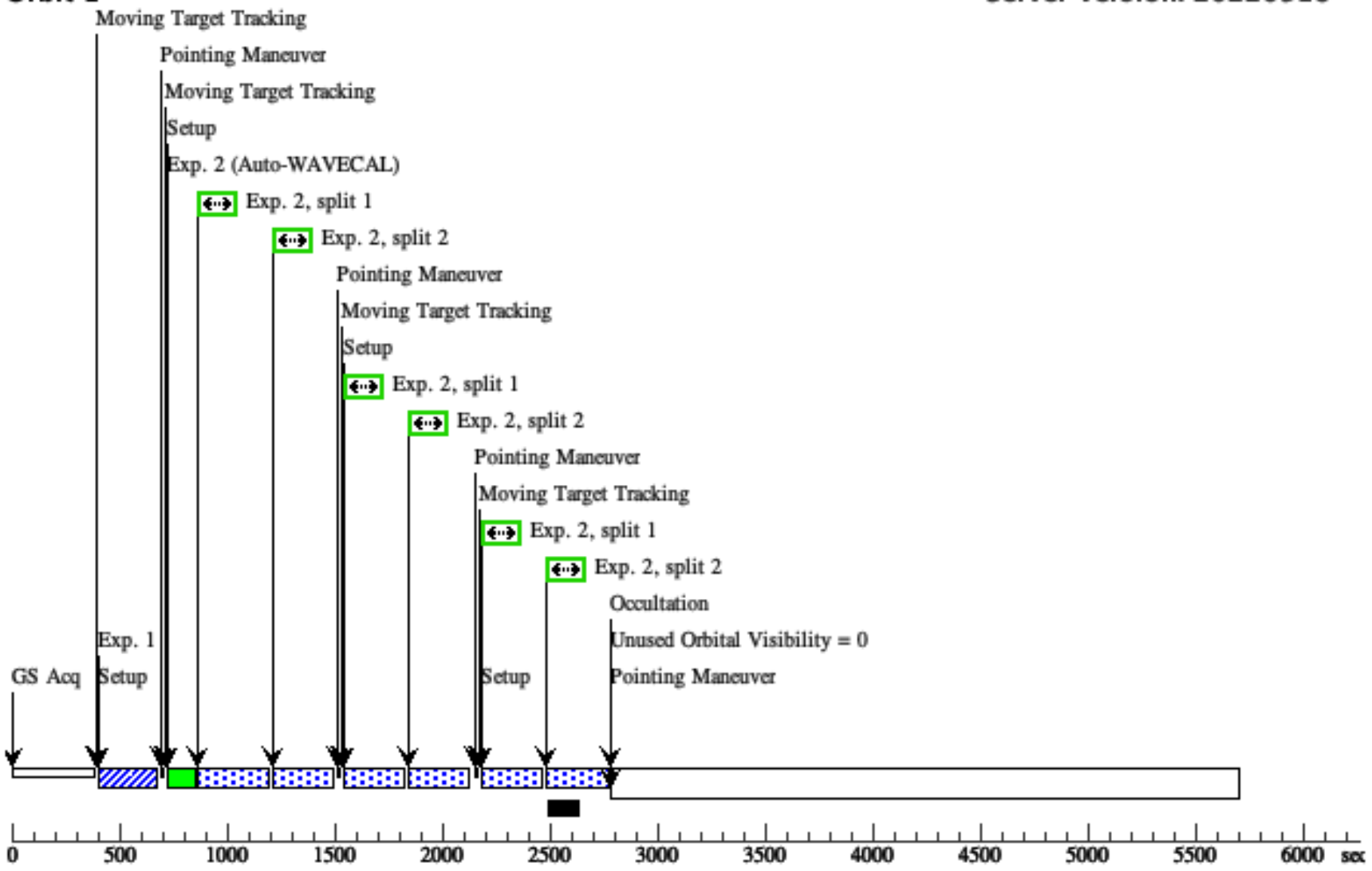
| # | Name | Level 1 | Level 2 | Level 3 | Window | Ephem Center |
|---|---|---|---|---|---|---|
| (5) | ARIEL-TRAILING | STD=URANUS | STD=ARIEL | | NOT OCC OF ARIEL-TRAILING BY URANUS FROM EARTH, OLG OF ARIEL-TRAILING FROM EARTH BETWEEN 240 300, RANGE ARIEL-TRAILING EARTH LT 19.9 | EARTH |

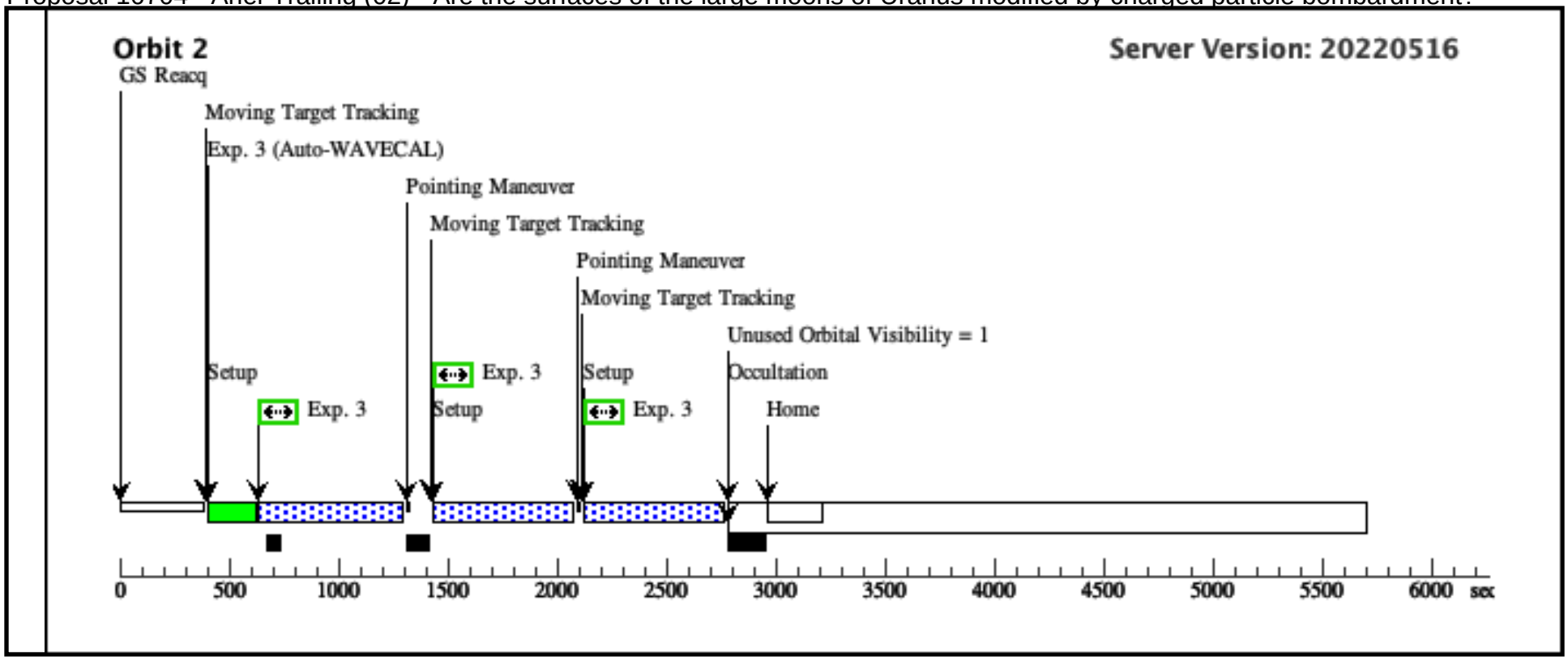
*Comments: Observation of Ariel's trailing hemisphere.*
*Description=SATELLITE-ARIEL-LEADING-HEMISPHERE*

## Exposures

| # | Label (ETC Run) | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | (STIS.ta.1524287) | (5) ARIEL-TRAILING | STIS/CCD, ACQ, F28X50LP | MIRROR | | | | 0.8 Secs (0.8 Secs) | |
| | | | | | | | | *[==>]* | ***[1]*** |
| 2 | Ariel_Trailing_G430L (STIS.sp.1524602) | (5) ARIEL-TRAILING | STIS/CCD, ACCUM, 52X0.5 | G430L 4300 A | | | Pattern 1, Exps 2-2 in Ariel-Trailing (02) (1) | 503 Secs (1509 Secs) | |
| | | | | | | | | *[==>(Pattern 1, Split 1)]* | ***[1]*** |
| | | | | | | | | *[==>(Pattern 1, Split 2)]* | |
| | | | | | | | | *[==>(Pattern 2, Split 1)]* | |
| | | | | | | | | *[==>(Pattern 2, Split 2)]* | |
| | | | | | | | | *[==>(Pattern 3, Split 1)]* | |
| | | | | | | | | *[==>(Pattern 3, Split 2)]* | |
| 3 | Ariel_Trailing_G230L (STIS.sp.1524604) | (5) ARIEL-TRAILING | STIS/NUV-MAMA, ACCUM, 52X0.5 | G230L 2376 A | | | Pattern 1, Exps 3-3 in Ariel-Trailing (02) (1) | 628 Secs (1884 Secs) | |
| | | | | | | | | *[==>(Pattern 1)]* | ***[2]*** |
| | | | | | | | | *[==>(Pattern 2)]* | |
| | | | | | | | | *[==>(Pattern 3)]* | |

Orbit Structure




Orbit 2
Server Version: 20220516
GS Reacq
Moving Target Tracking
Exp. 3 (Auto-WAVECAL)
Pointing Maneuver
Moving Target Tracking
Pointing Maneuver
Moving Target Tracking
Unused Orbital Visibility = 1
Setup
Exp. 3
Exp. 3
Setup
Setup
Exp. 3
Occultation
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec

## Visit

**Proposal 16704, Umbriel-Leading (03), implementation** Mon Jul 25 15:01:49 GMT 2022

**Diagnostic Status: No Diagnostics**

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

Special Requirements: ORIENT 71.5D TO 95 D; ORIENT 253.86D TO 285 D

*Comments: An Orient Range for HST is required to assure maximum separation between the STIS slit and Uranus. The Orient Range will be added after this observation has been scheduled.*

## Patterns

| # | Primary Pattern | | Secondary Pattern | Exposures |
|---|---|---|---|---|
| (1) | Pattern Type=STIS-ALONG-SLIT | Coordinate Frame=POS-TARG | | (2), (3) |
| | Purpose=DITHER | Pattern Orientation=90.0 | | |
| | Number Of Points=3 | Angle Between Sides= | | |
| | Point Spacing=2 | Center Pattern=false | | |
| | Line Spacing= | | | |

## Solar System Targets

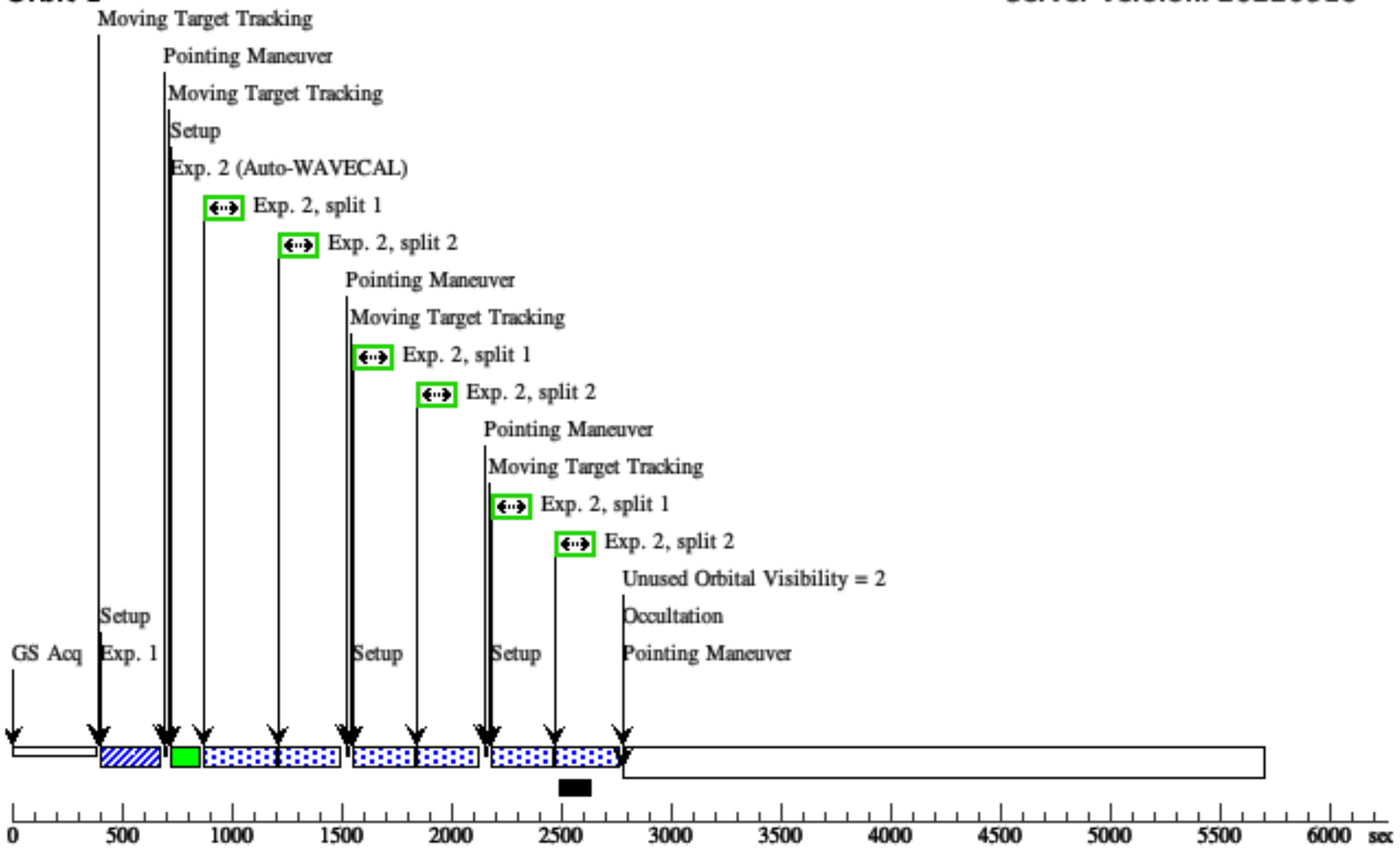
| # | Name | Level 1 | Level 2 | Level 3 | Window | Ephem Center |
|---|---|---|---|---|---|---|
| (2) | UMBRIEL-LEADING | STD=URANUS | STD=UMBRIEL | | NOT OCC OF UMBRIEL-LEADING BY URANUS FROM EARTH, RANGE UMBRIEL-LEADING EARTH LT 19.9, OLG OF UMBRIEL-LEADING FROM EARTH BETWEEN 60 120 | EARTH |

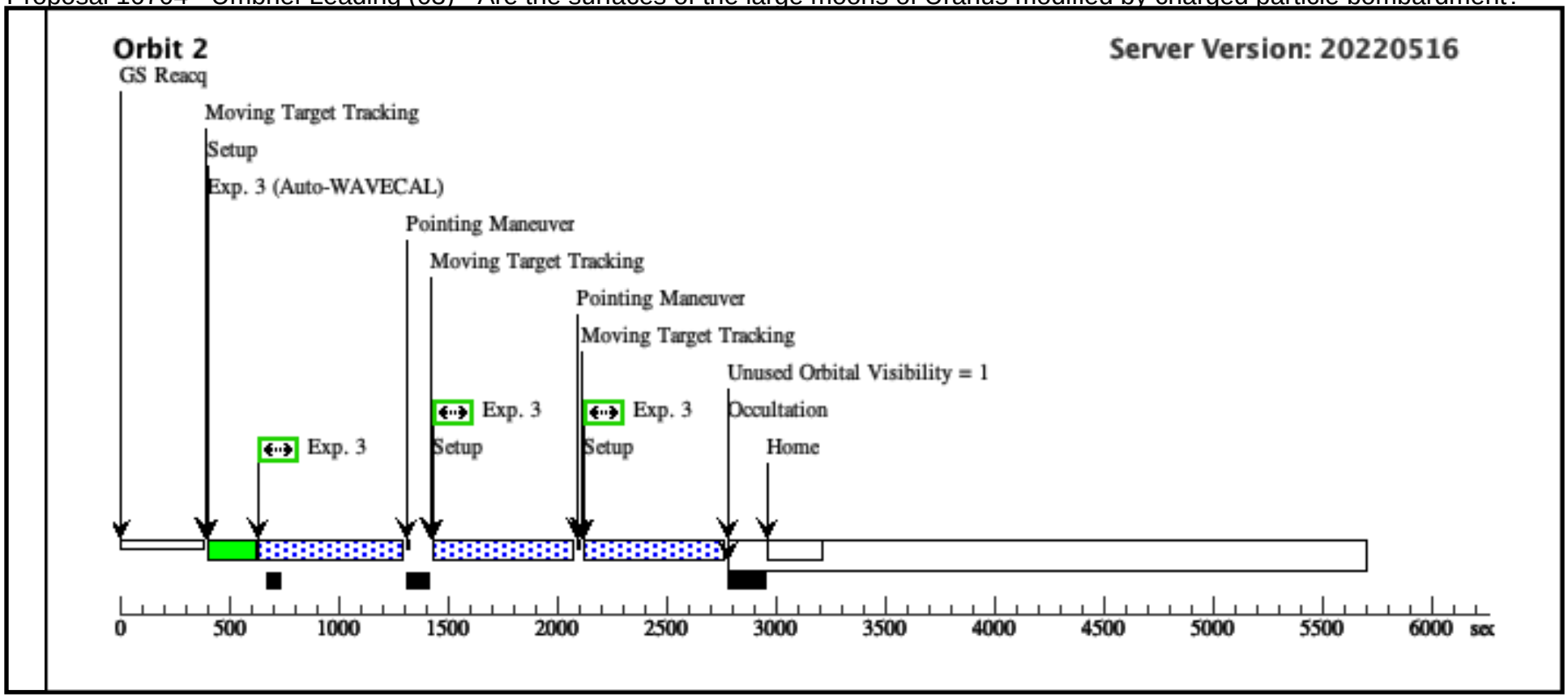
*Comments: Observation of Umbriel's leading hemisphere.*
*Description=SATELLITE-UMBRIEL-LEADING-HEMISPHERE*
*Extended=NO*

## Exposures

| # | Label (ETC Run) | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | (STIS.ta.1524709) | (2) UMBRIEL-LEADING | STIS/CCD, ACQ, F28X50LP | MIRROR | | | | 1.5 Secs (1.5 Secs) | |
| | | | | | | | | *[==>]* | ***[1]*** |
| 2 | Umbriel_Leading_G430L (STIS.sp.1524710) | (2) UMBRIEL-LEADING | STIS/CCD, ACCUM, 52X0.5 | G430L 4300 A | | | Pattern 1, Exps 2-2 in Umbriel-Leading (03) (1) | 502 Secs (1506 Secs) | |
| | | | | | | | | *[==>(Pattern 1, Split 1)]* | ***[1]*** |
| | | | | | | | | *[==>(Pattern 1, Split 2)]* | |
| | | | | | | | | *[==>(Pattern 2, Split 1)]* | |
| | | | | | | | | *[==>(Pattern 2, Split 2)]* | |
| | | | | | | | | *[==>(Pattern 3, Split 1)]* | |
| | | | | | | | | *[==>(Pattern 3, Split 2)]* | |
| 3 | Umbriel_Leading_G230L (STIS.sp.1524711) | (2) UMBRIEL-LEADING | STIS/NUV-MAMA, ACCUM, 52X0.5 | G230L 2376 A | | | Pattern 1, Exps 3-3 in Umbriel-Leading (03) (1) | 628 Secs (1884 Secs) | |
| | | | | | | | | *[==>(Pattern 1)]* | ***[2]*** |
| | | | | | | | | *[==>(Pattern 2)]* | |
| | | | | | | | | *[==>(Pattern 3)]* | |

Orbit Structure




Orbit 2
Server Version: 20220516
GS Reacq
Moving Target Tracking
Setup
Exp. 3 (Auto-WAVECAL)
Pointing Maneuver
Moving Target Tracking
Pointing Maneuver
Moving Target Tracking
Unused Orbital Visibility = 1
Exp. 3
Exp. 3
Exp. 3
Occultation
Setup
Setup
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec

## Visit

**Proposal 16704, Umbriel-Trailing (04), completed** Mon Jul 25 15:01:49 GMT 2022

**Diagnostic Status: No Diagnostics**

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

Special Requirements: (none)

*Comments: An Orient Range for HST is required to assure maximum separation between the STIS slit and Uranus. The Orient Range will be added after this observation has been scheduled.*

## Patterns

| # | Primary Pattern | | Secondary Pattern | Exposures |
|---|---|---|---|---|
| (1) | Pattern Type=STIS-ALONG-SLIT | Coordinate Frame=POS-TARG | | (2), (3) |
| | Purpose=DITHER | Pattern Orientation=90.0 | | |
| | Number Of Points=3 | Angle Between Sides= | | |
| | Point Spacing=2 | Center Pattern=false | | |
| | Line Spacing= | | | |

## Solar System Targets

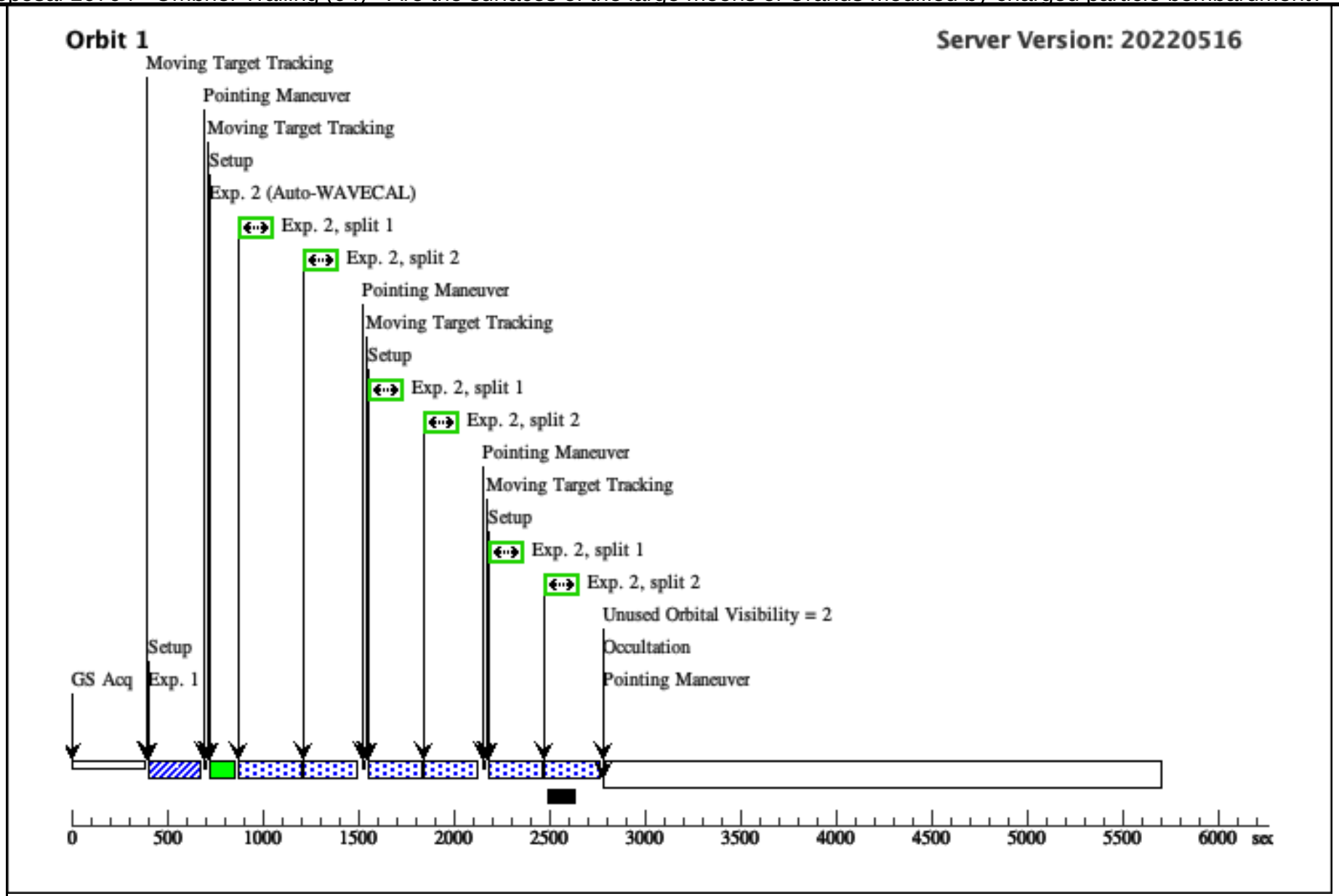
| # | Name | Level 1 | Level 2 | Level 3 | Window | Ephem Center |
|---|---|---|---|---|---|---|
| (6) | UMBRIEL-TRAILING | STD=URANUS | STD=UMBRIEL | | NOT OCC OF UMBRIEL-TRAILING BY URANUS FROM EARTH, RANGE UMBRIEL-LEADING EARTH LT 19.9, OLG OF UMBRIEL-TRAILING FROM EARTH BETWEEN 240 300 | EARTH |

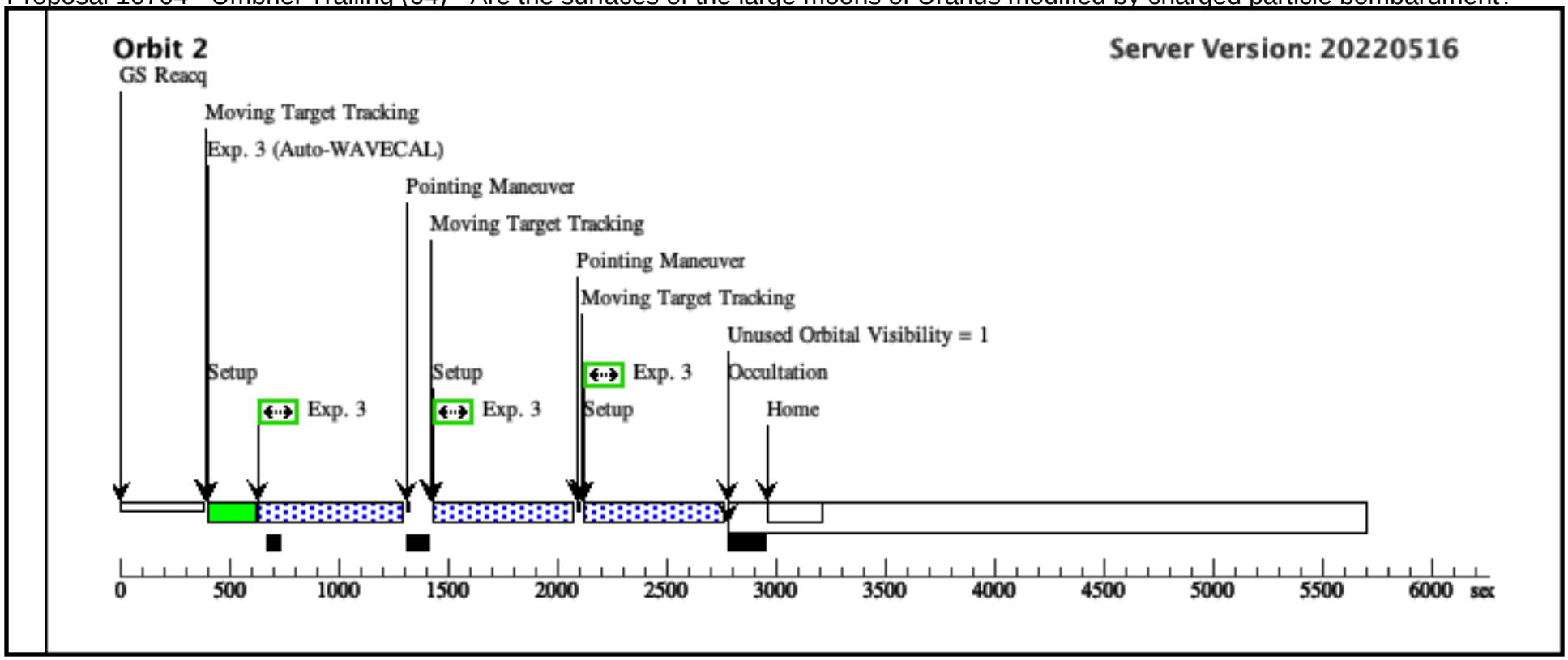
*Comments: Observation of Umbriel's trailing hemisphere.*
*Description=SATELLITE-UMBRIEL-TRAILING-HEMISPHERE*
*Extended=NO*

## Exposures

| # | Label (ETC Run) | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | (STIS.ta.1524287) | (6) UMBRIEL-TRAILING | STIS/CCD, ACQ, F28X50LP | MIRROR | | | | 1.5 Secs (1.5 Secs) | |
| | | | | | | | | *[==>]* | ***[1]*** |
| 2 | Umbriel_Trailing_G430L (STIS.sp.1524710) | (6) UMBRIEL-TRAILING | STIS/CCD, ACCUM, 52X0.5 | G430L 4300 A | | | Pattern 1, Exps 2-2 in Umbriel-Trailing (04) (1) | 502 Secs (1506 Secs) | |
| | | | | | | | | *[==>(Pattern 1, Split 1)]* | ***[1]*** |
| | | | | | | | | *[==>(Pattern 1, Split 2)]* | |
| | | | | | | | | *[==>(Pattern 2, Split 1)]* | |
| | | | | | | | | *[==>(Pattern 2, Split 2)]* | |
| | | | | | | | | *[==>(Pattern 3, Split 1)]* | |
| | | | | | | | | *[==>(Pattern 3, Split 2)]* | |
| 3 | Umbriel_Trailing_G230L (STIS.sp.1524711) | (6) UMBRIEL-TRAILING | STIS/NUV-MAMA, ACCUM, 52X0.5 | G230L 2376 A | | | Pattern 1, Exps 3-3 in Umbriel-Trailing (04) (1) | 628 Secs (1884 Secs) | |
| | | | | | | | | *[==>(Pattern 1)]* | ***[2]*** |
| | | | | | | | | *[==>(Pattern 2)]* | |
| | | | | | | | | *[==>(Pattern 3)]* | |

Orbit Structure




Orbit 2
Server Version: 20220516
GS Reacq
Moving Target Tracking
Exp. 3 (Auto-WAVECAL)
Pointing Maneuver
Moving Target Tracking
Pointing Maneuver
Moving Target Tracking
Unused Orbital Visibility = 1
Setup
Exp. 3
Setup
Exp. 3
Exp. 3
Setup
Occultation
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec

## Visit

**Proposal 16704, Titania-Leading (05), completed** Mon Jul 25 15:01:49 GMT 2022

**Diagnostic Status: No Diagnostics**

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

Special Requirements: ORIENT 71D TO 72 D

*Comments: We have added orient angles for these observations, which include an additional +45 deg offset for a STIS-specific requirement.*

## Patterns

| # | Primary Pattern | | Secondary Pattern | Exposures |
|---|---|---|---|---|
| (1) | Pattern Type=STIS-ALONG-SLIT | Coordinate Frame=POS-TARG | | (2), (3) |
| | Purpose=DITHER | Pattern Orientation=90.0 | | |
| | Number Of Points=3 | Angle Between Sides= | | |
| | Point Spacing=2 | Center Pattern=false | | |
| | Line Spacing= | | | |

## Solar System Targets

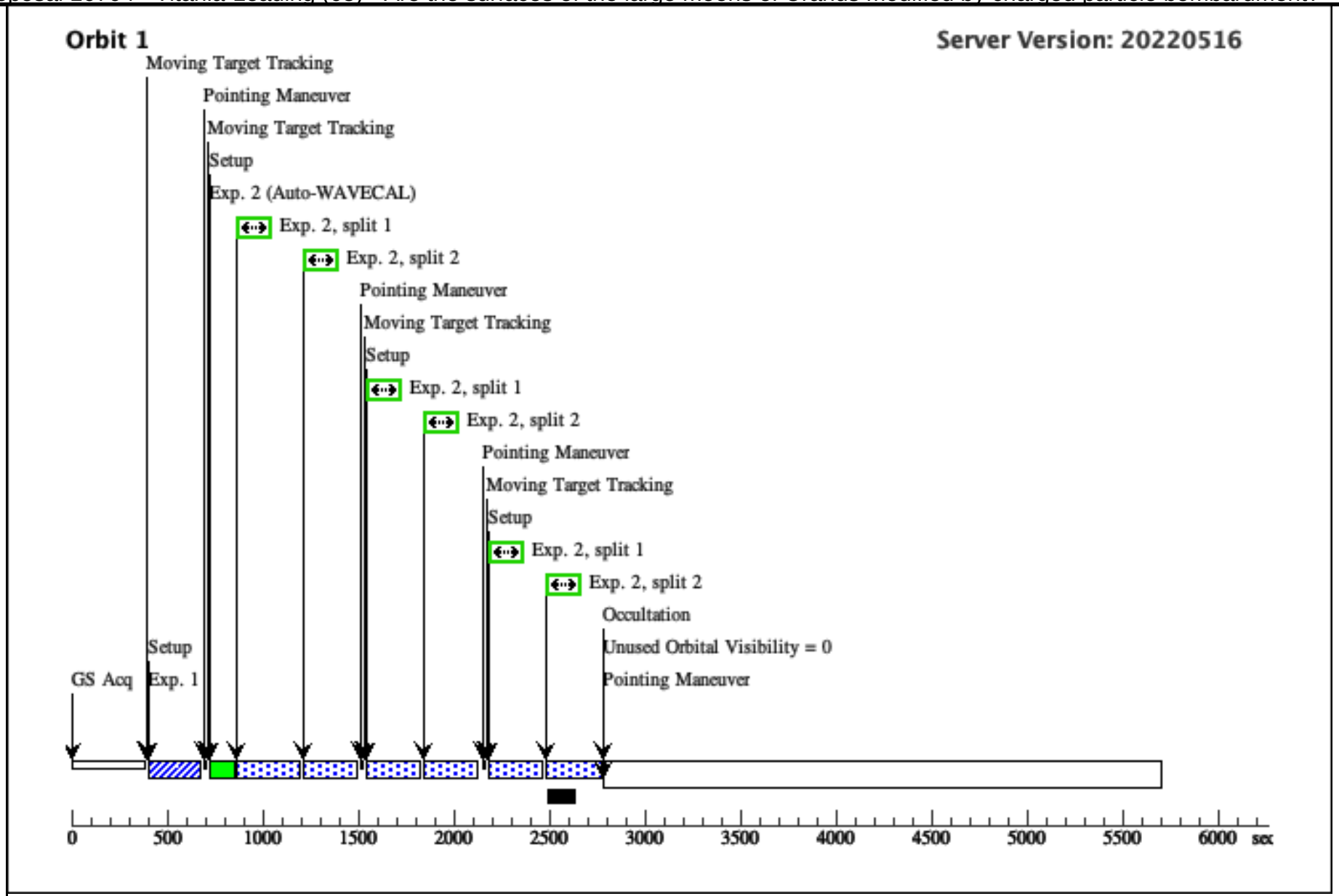
| # | Name | Level 1 | Level 2 | Level 3 | Window | Ephem Center |
|---|---|---|---|---|---|---|
| (3) | TITANIA-LEADING | STD=URANUS | STD=TITANIA | | NOT OCC OF TITANIA-LEADING BY URANUS FROM EARTH, RANGE TITANIA-LEADING EARTH LT 19.9, OLG OF TITANIA-LEADING FROM EARTH BETWEEN 60 120 | EARTH |

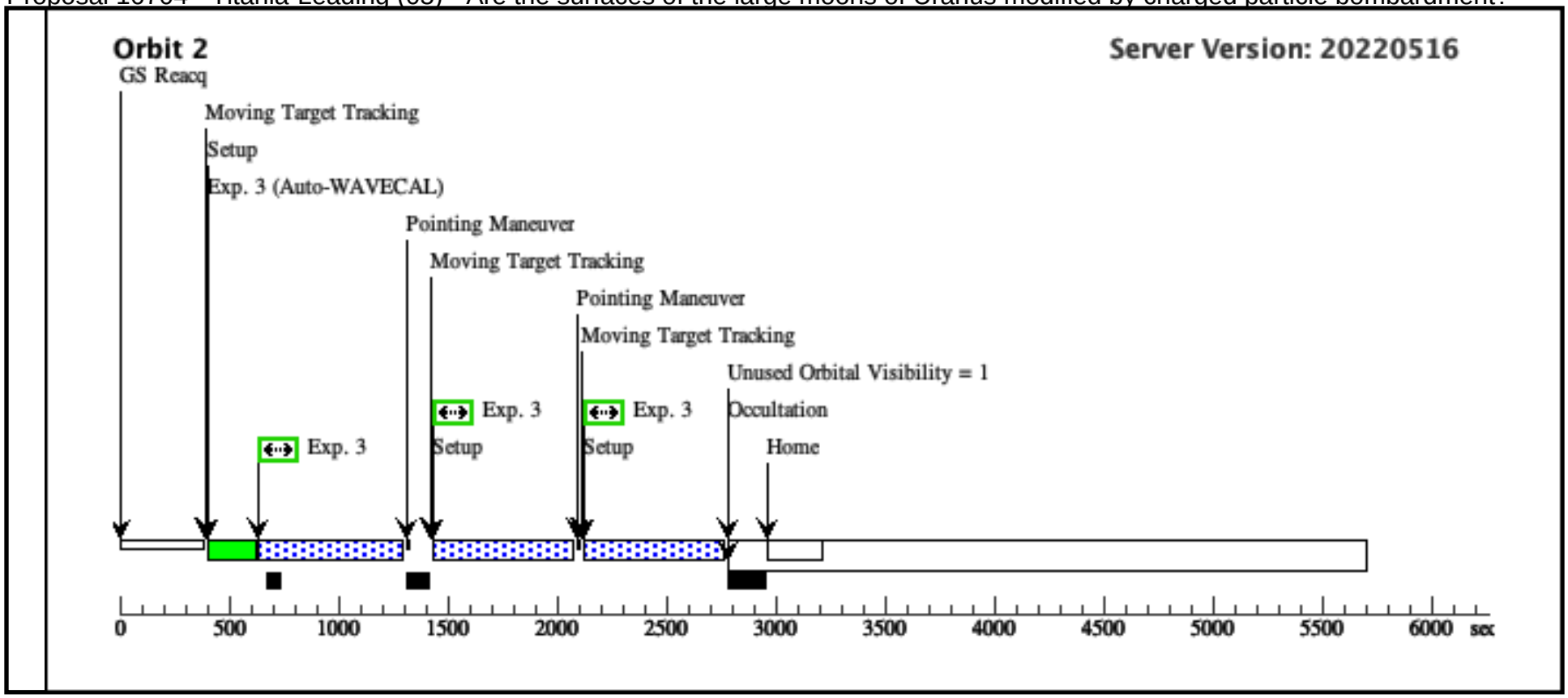
*Comments: Observation of Titania's leading hemisphere.*
*Description=SATELLITE-TITANIA-LEADING-HEMISPHERE*
*Extended=NO*

## Exposures

| # | Label (ETC Run) | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | (STIS.ta.1524713) | (3) TITANIA-LEADING | STIS/CCD, ACQ, F28X50LP | MIRROR | | | | 0.6 Secs (0.6 Secs) | |
| | | | | | | | | *[==>]* | ***[1]*** |
| 2 | Titania_Leading_G430L (STIS.sp.1524715) | (3) TITANIA-LEADING | STIS/CCD, ACCUM, 52X0.5 | G430L 4300 A | | | Pattern 1, Exps 2-2 in Titania-Leading (05) (1) | 504 Secs (1512 Secs) | |
| | | | | | | | | *[==>(Pattern 1, Split 1)]* | ***[1]*** |
| | | | | | | | | *[==>(Pattern 1, Split 2)]* | |
| | | | | | | | | *[==>(Pattern 2, Split 1)]* | |
| | | | | | | | | *[==>(Pattern 2, Split 2)]* | |
| | | | | | | | | *[==>(Pattern 3, Split 1)]* | |
| | | | | | | | | *[==>(Pattern 3, Split 2)]* | |
| 3 | Titania_Leading_G230L (STIS.sp.1524717) | (3) TITANIA-LEADING | STIS/NUV-MAMA, ACCUM, 52X0.5 | G230L 2376 A | | | Pattern 1, Exps 3-3 in Titania-Leading (05) (1) | 628 Secs (1884 Secs) | |
| | | | | | | | | *[==>(Pattern 1)]* | ***[2]*** |
| | | | | | | | | *[==>(Pattern 2)]* | |
| | | | | | | | | *[==>(Pattern 3)]* | |

Orbit Structure




Orbit 2
Server Version: 20220516
GS Reacq
Moving Target Tracking
Setup
Exp. 3 (Auto-WAVECAL)
Pointing Maneuver
Moving Target Tracking
Pointing Maneuver
Moving Target Tracking
Unused Orbital Visibility = 1
Exp. 3
Exp. 3
Exp. 3
Occultation
Setup
Setup
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec

## Visit

**Proposal 16704, Titania-Trailing (06), completed** Mon Jul 25 15:01:49 GMT 2022

**Diagnostic Status: No Diagnostics**

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

Special Requirements: ORIENT 71D TO 72 D

*Comments: An Orient Range for HST is required to assure maximum separation between the STIS slit and Uranus. The Orient Range will be added after this observation has been scheduled.*

## Patterns

| # | Primary Pattern | | Secondary Pattern | Exposures |
|---|---|---|---|---|
| (1) | Pattern Type=STIS-ALONG-SLIT | Coordinate Frame=POS-TARG | | (2), (3) |
| | Purpose=DITHER | Pattern Orientation=90.0 | | |
| | Number Of Points=3 | Angle Between Sides= | | |
| | Point Spacing=2 | Center Pattern=false | | |
| | Line Spacing= | | | |

## Solar System Targets

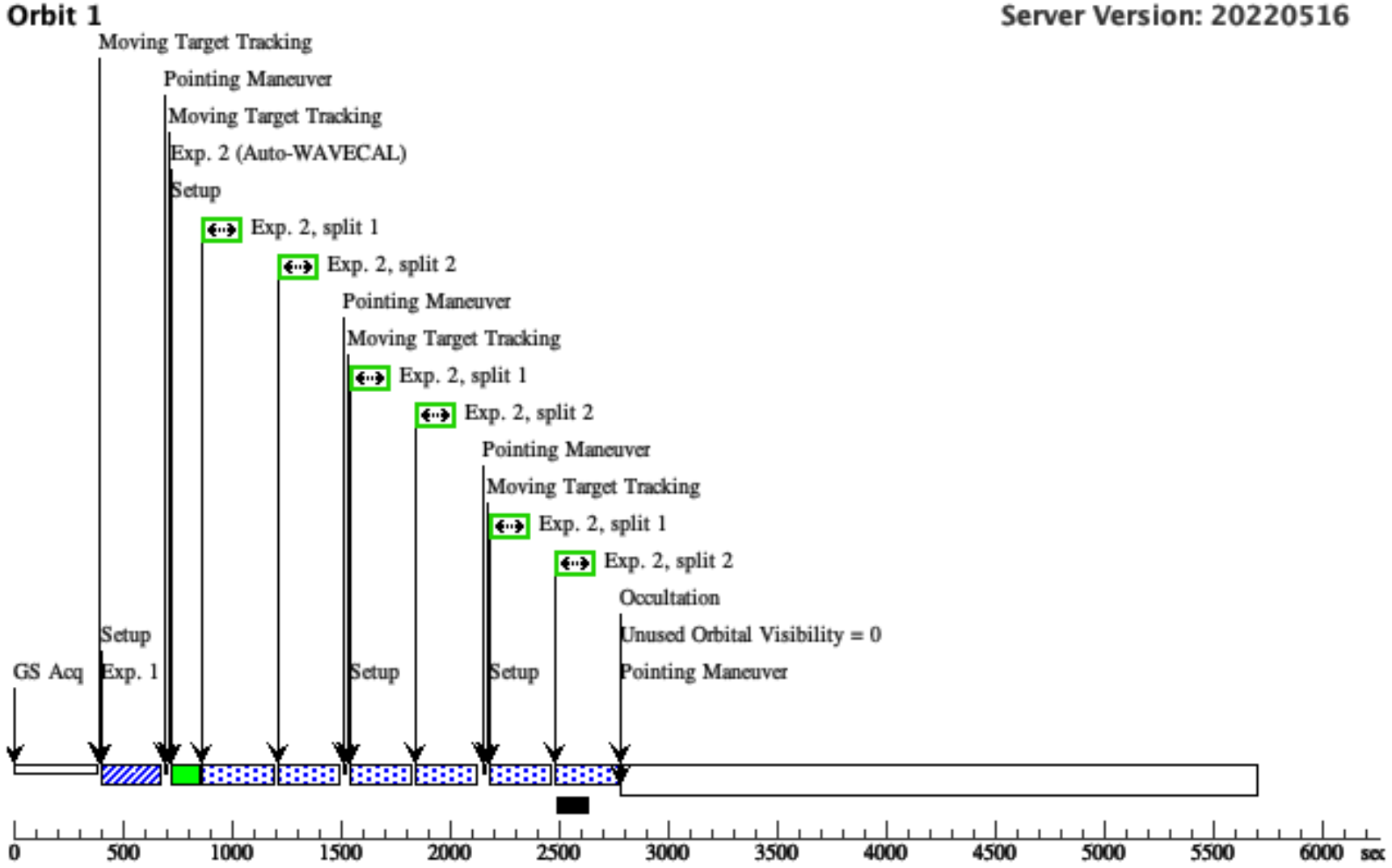
| # | Name | Level 1 | Level 2 | Level 3 | Window | Ephem Center |
|---|---|---|---|---|---|---|
| (7) | TITANIA-TRAILING | STD=URANUS | STD=TITANIA | | NOT OCC OF TITANIA-TRAILING BY URANUS FROM EARTH, RANGE TITANIA-LEADING EARTH LT 19.9, OLG OF TITANIA-TRAILING FROM EARTH BETWEEN 240 300 | EARTH |

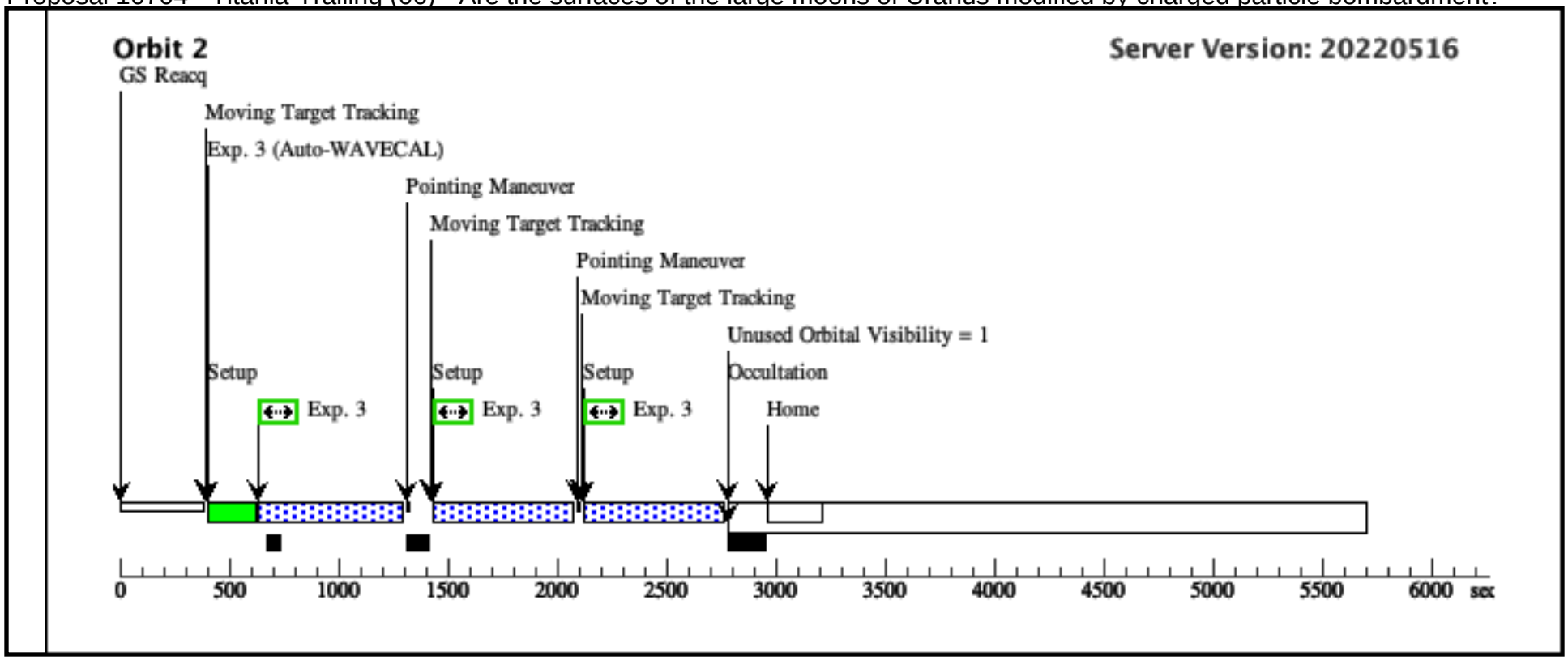
*Comments: Observation of Titania's trailing hemisphere.*
*Description=SATELLITE-TITANIA-TRAILING-HEMISPHERE*
*Extended=NO*

## Exposures

| # | Label (ETC Run) | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | (STIS.ta.1524713) | (7) TITANIA-TRAILING | STIS/CCD, ACQ, F28X50LP | MIRROR | | | | 0.6 Secs (0.6 Secs) | |
| | | | | | | | | *[==>]* | ***[1]*** |
| 2 | Titania_Trailing_G430L (STIS.sp.1524715) | (7) TITANIA-TRAILING | STIS/CCD, ACCUM, 52X0.5 | G430L 4300 A | | | Pattern 1, Exps 2-2 in Titania-Trailing (06) (1) | 504 Secs (1512 Secs) | |
| | | | | | | | | *[==>(Pattern 1, Split 1)]* | ***[1]*** |
| | | | | | | | | *[==>(Pattern 1, Split 2)]* | |
| | | | | | | | | *[==>(Pattern 2, Split 1)]* | |
| | | | | | | | | *[==>(Pattern 2, Split 2)]* | |
| | | | | | | | | *[==>(Pattern 3, Split 1)]* | |
| | | | | | | | | *[==>(Pattern 3, Split 2)]* | |
| 3 | Titania_Trailing_G230L (STIS.sp.1524717) | (7) TITANIA-TRAILING | STIS/NUV-MAMA, ACCUM, 52X0.5 | G230L 2376 A | | | Pattern 1, Exps 3-3 in Titania-Trailing (06) (1) | 628 Secs (1884 Secs) | |
| | | | | | | | | *[==>(Pattern 1)]* | ***[2]*** |
| | | | | | | | | *[==>(Pattern 2)]* | |
| | | | | | | | | *[==>(Pattern 3)]* | |

Orbit Structure




Orbit 2
Server Version: 20220516
GS Reacq
Moving Target Tracking
Exp. 3 (Auto-WAVECAL)
Pointing Maneuver
Moving Target Tracking
Pointing Maneuver
Moving Target Tracking
Unused Orbital Visibility = 1
Setup
Exp. 3
Setup
Exp. 3
Setup
Exp. 3
Occultation
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec

## Visit

**Proposal 16704, Oberon-Leading (07), completed** Mon Jul 25 15:01:49 GMT 2022

**Diagnostic Status: No Diagnostics**

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

Special Requirements: ORIENT 71.5D TO 95 D; ORIENT 253.86D TO 285 D

*Comments: An Orient Range for HST is required to assure maximum separation between the STIS slit and Uranus. The Orient Range will be added after this observation has been scheduled.*

## Patterns

| # | Primary Pattern | | Secondary Pattern | Exposures |
|---|---|---|---|---|
| (1) | Pattern Type=STIS-ALONG-SLIT | Coordinate Frame=POS-TARG | | (2), (3) |
| | Purpose=DITHER | Pattern Orientation=90.0 | | |
| | Number Of Points=3 | Angle Between Sides= | | |
| | Point Spacing=2 | Center Pattern=false | | |
| | Line Spacing= | | | |

## Solar System Targets

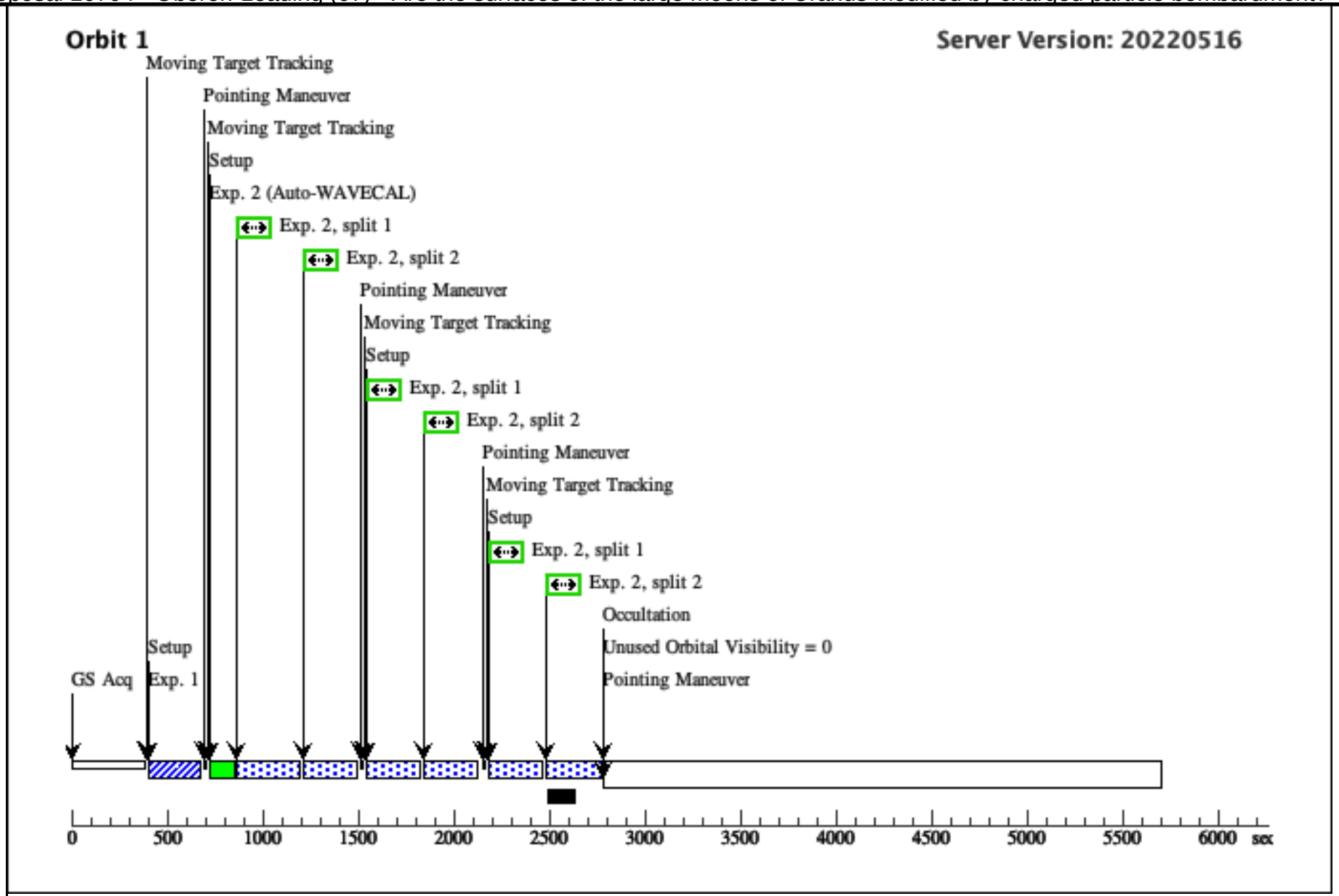
| # | Name | Level 1 | Level 2 | Level 3 | Window | Ephem Center |
|---|---|---|---|---|---|---|
| (4) | OBERON-LEADING | STD=URANUS | STD=OBERON | | NOT OCC OF OBERON-LEADING BY URANUS FROM EARTH, RANGE OBERON-LEADING EARTH LT 19.9, OLG OF OBERON-LEADING FROM EARTH BETWEEN 60 120 | EARTH |

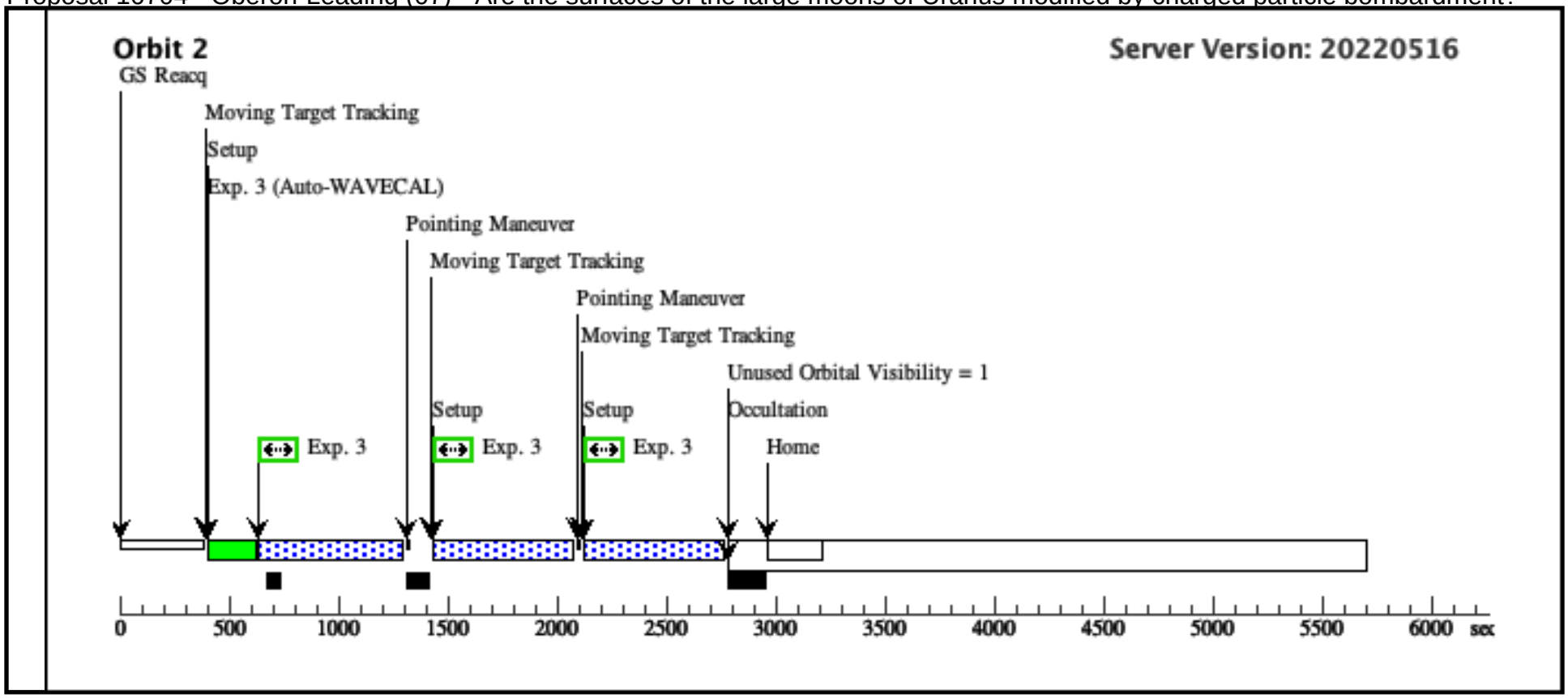
*Comments: Observation of Oberon's leading hemisphere.*
*Description=SATELLITE-OBERON-LEADING-HEMISPHERE*
*Extended=NO*

## Exposures

| # | Label (ETC Run) | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | (STIS.ta.1524719) | (4) OBERON-LEADING | STIS/CCD, ACQ, F28X50LP | MIRROR | | | | 0.7 Secs (0.7 Secs) | |
| | | | | | | | | *[==>]* | ***[1]*** |
| 2 | Oberon_Leading_G430L (STIS.sp.1524722) | (4) OBERON-LEADING | STIS/CCD, ACCUM, 52X0.5 | G430L 4300 A | | | Pattern 1, Exps 2-2 in Oberon-Leading (07) (1) | 504 Secs (1512 Secs) | |
| | | | | | | | | *[==>(Pattern 1, Split 1)]* | ***[1]*** |
| | | | | | | | | *[==>(Pattern 1, Split 2)]* | |
| | | | | | | | | *[==>(Pattern 2, Split 1)]* | |
| | | | | | | | | *[==>(Pattern 2, Split 2)]* | |
| | | | | | | | | *[==>(Pattern 3, Split 1)]* | |
| | | | | | | | | *[==>(Pattern 3, Split 2)]* | |
| 3 | Oberon_Leading_G230L (STIS.sp.1524720) | (4) OBERON-LEADING | STIS/NUV-MAMA, ACCUM, 52X0.5 | G230L 2376 A | | | Pattern 1, Exps 3-3 in Oberon-Leading (07) (1) | 628 Secs (1884 Secs) | |
| | | | | | | | | *[==>(Pattern 1)]* | ***[2]*** |
| | | | | | | | | *[==>(Pattern 2)]* | |
| | | | | | | | | *[==>(Pattern 3)]* | |

Orbit Structure




Orbit 2
Server Version: 20220516
GS Reacq
Moving Target Tracking
Setup
Exp. 3 (Auto-WAVECAL)
Pointing Maneuver
Moving Target Tracking
Pointing Maneuver
Moving Target Tracking
Unused Orbital Visibility = 1
Setup
Setup
Occultation
Exp. 3
Exp. 3
Exp. 3
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec

## Visit

**Proposal 16704, Oberon-Trailing (08), completed** Mon Jul 25 15:01:49 GMT 2022

**Diagnostic Status: No Diagnostics**

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

Special Requirements: ORIENT 71.5D TO 95 D; ORIENT 253.86D TO 285 D

*Comments: An Orient Range for HST is required to assure maximum separation between the STIS slit and Uranus. The Orient Range will be added after this observation has been scheduled.*

## Patterns

| # | Primary Pattern | | Secondary Pattern | Exposures |
|---|---|---|---|---|
| (1) | Pattern Type=STIS-ALONG-SLIT | Coordinate Frame=POS-TARG | | (2), (3) |
| | Purpose=DITHER | Pattern Orientation=90.0 | | |
| | Number Of Points=3 | Angle Between Sides= | | |
| | Point Spacing=2 | Center Pattern=false | | |
| | Line Spacing= | | | |

## Solar System Targets

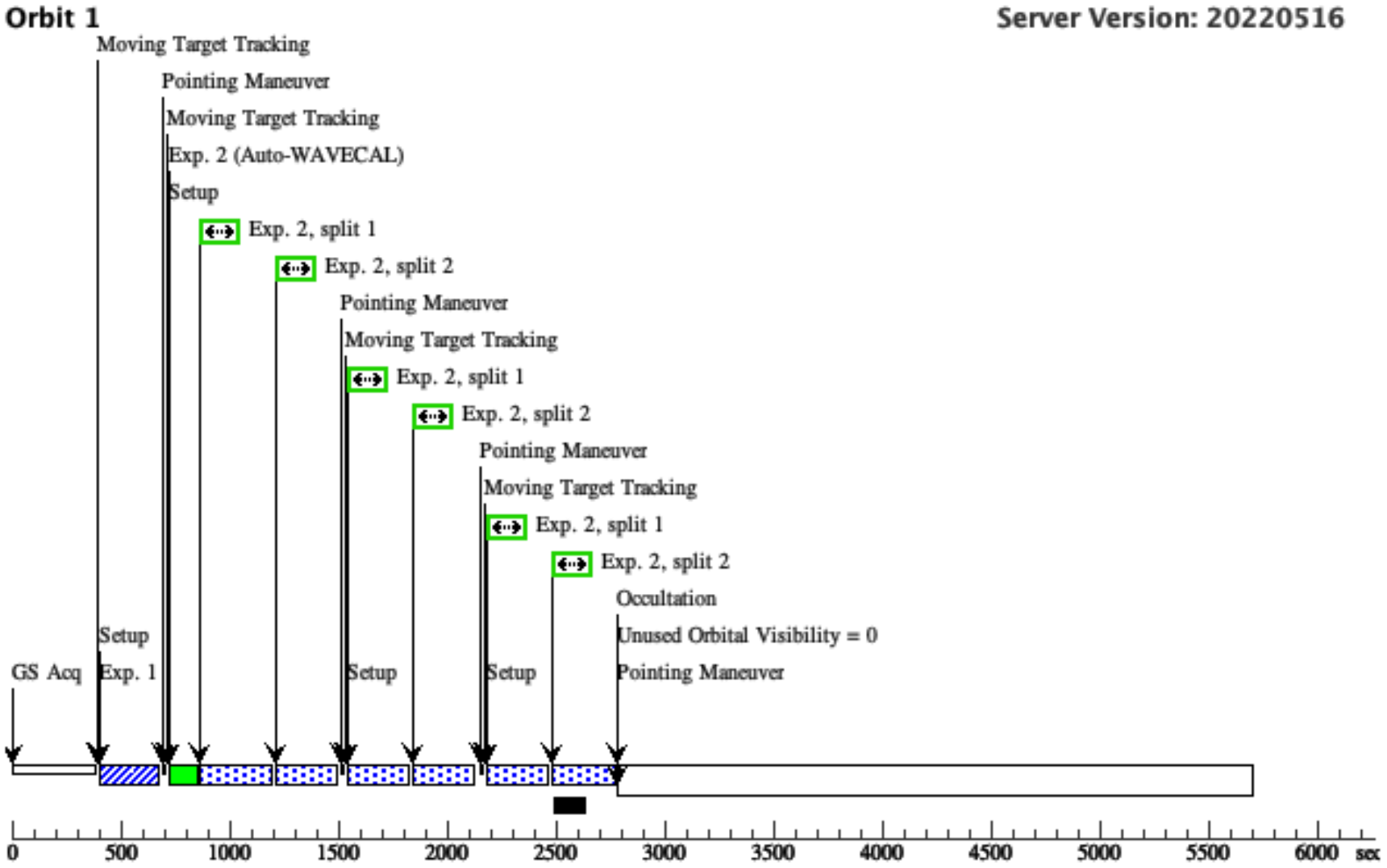
| # | Name | Level 1 | Level 2 | Level 3 | Window | Ephem Center |
|---|---|---|---|---|---|---|
| (8) | OBERON-TRAILING | STD=URANUS | STD=OBERON | | NOT OCC OF OBERON-TRAILING BY URANUS FROM EARTH, RANGE OBERON-LEADING EARTH LT 19.9, OLG OF OBERON-TRAILING FROM EARTH BETWEEN 240 300 | EARTH |

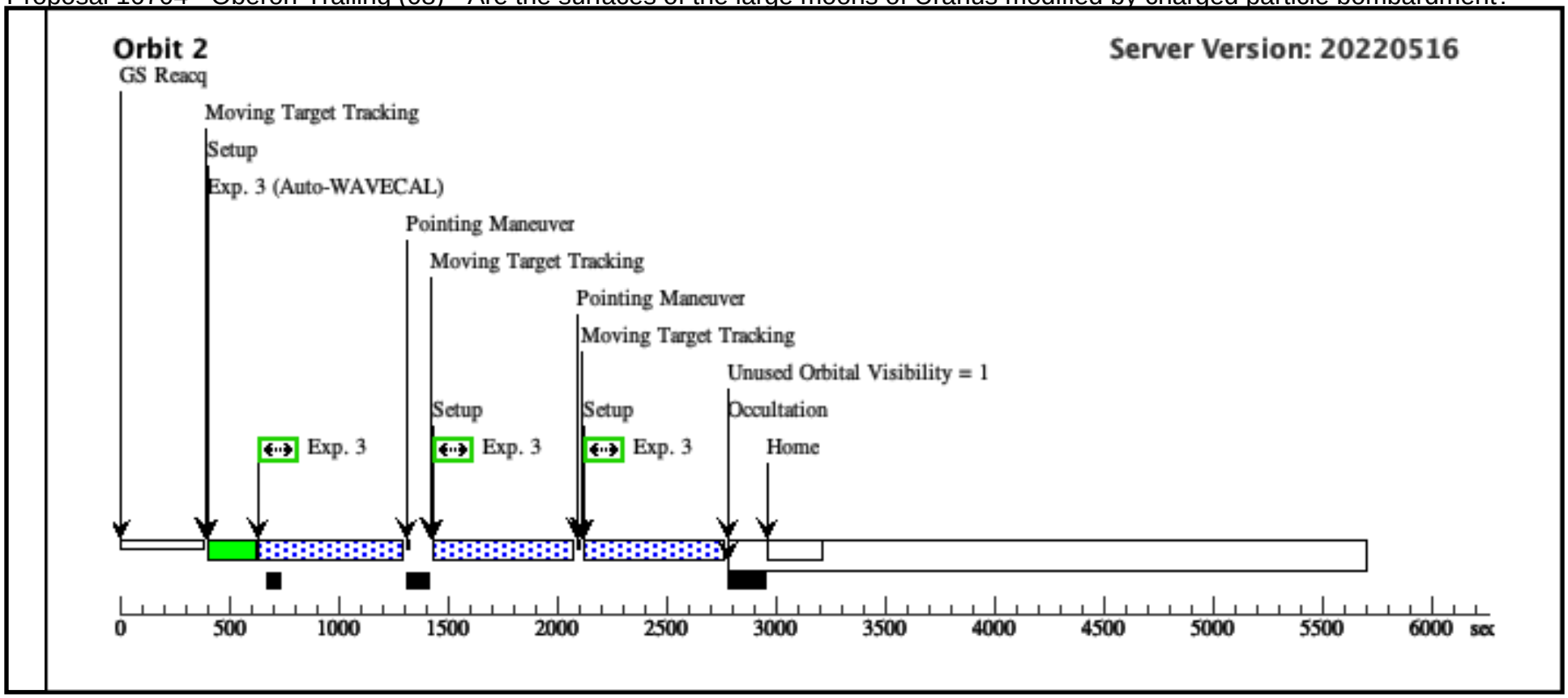
*Comments: Observation of Oberon's trailing hemisphere.*
*Description=SATELLITE-OBERON-TRAILING-HEMISPHERE*
*Extended=NO*

## Exposures

| # | Label (ETC Run) | Target | Config,Mode,Aperture | Spectral Els. | Opt. Params. | Special Reqs. | Groups | Exp. Time (Total)/[Actual Dur.] | Orbit |
|---|---|---|---|---|---|---|---|---|---|
| 1 | (STIS.ta.1524719) | (8) OBERON-TRAILING | STIS/CCD, ACQ, F28X50LP | MIRROR | | | | 0.7 Secs (0.7 Secs) | |
| | | | | | | | | *[==>]* | ***[1]*** |
| 2 | Oberon_Trailing_G430L (STIS.sp.1524722) | (8) OBERON-TRAILING | STIS/CCD, ACCUM, 52X0.5 | G430L 4300 A | | | Pattern 1, Exps 2-2 in Oberon-Trailing (08) (1) | 504 Secs (1512 Secs) | |
| | | | | | | | | *[==>(Pattern 1, Split 1)]* | ***[1]*** |
| | | | | | | | | *[==>(Pattern 1, Split 2)]* | |
| | | | | | | | | *[==>(Pattern 2, Split 1)]* | |
| | | | | | | | | *[==>(Pattern 2, Split 2)]* | |
| | | | | | | | | *[==>(Pattern 3, Split 1)]* | |
| | | | | | | | | *[==>(Pattern 3, Split 2)]* | |
| 3 | Oberon_Trailing_G230L (STIS.sp.1524720) | (8) OBERON-TRAILING | STIS/NUV-MAMA, ACCUM, 52X0.5 | G230L 2376 A | | | Pattern 1, Exps 3-3 in Oberon-Trailing (08) (1) | 628 Secs (1884 Secs) | |
| | | | | | | | | *[==>(Pattern 1)]* | ***[2]*** |
| | | | | | | | | *[==>(Pattern 2)]* | |
| | | | | | | | | *[==>(Pattern 3)]* | |

Orbit Structure




Orbit 2
Server Version: 20220516
GS Reacq
Moving Target Tracking
Setup
Exp. 3 (Auto-WAVECAL)
Pointing Maneuver
Moving Target Tracking
Pointing Maneuver
Moving Target Tracking
Unused Orbital Visibility = 1
Setup
Setup
Occultation
Exp. 3
Exp. 3
Exp. 3
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
sec