13012 - Near-equinox spectro-imaging of Uranus aurorae sampling two planetary rotations

Cycle: 20, Proposal Category: GO

(Availability Mode: SUPPORTED)

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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) URANUS	STIS/FUV-MAMA	1	08-Oct-2012 21:30:28.0	yes
02	(1) URANUS	STIS/FUV-MAMA	1	08-Oct-2012 21:30:37.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
03	(1) URANUS	STIS/FUV-MAMA	1	08-Oct-2012 21:30:43.0	yes
04	(1) URANUS	ACS/SBC	1	08-Oct-2012 21:30:49.0	yes
05	(1) URANUS	STIS/FUV-MAMA	1	08-Oct-2012 21:30:54.0	yes
06	(1) URANUS	STIS/FUV-MAMA	1	08-Oct-2012 21:31:00.0	yes
07	(1) URANUS	STIS/FUV-MAMA	1	08-Oct-2012 21:31:05.0	yes
08	(1) URANUS	STIS/FUV-MAMA	1	08-Oct-2012 21:31:11.0	yes
09	(1) URANUS	STIS/FUV-MAMA	1	08-Oct-2012 21:31:17.0	yes
10	(1) URANUS	STIS/FUV-MAMA	1	08-Oct-2012 21:31:23.0	yes
11	(1) URANUS	STIS/FUV-MAMA	1	08-Oct-2012 21:31:28.0	yes
12	(1) URANUS	STIS/FUV-MAMA	1	08-Oct-2012 21:31:33.0	yes

12 Total Orbits Used

ABSTRACT

A quarter of century after their discovery by Voyager 2 in 1986, HST sucessfully re-detected Uranus aurorae in 2011 (and also in 1998), providing the first images of these emissions. Overall, they differ from other well-known planetary aurorae, and their characteristics vary at very different timescales, from minutes to decades. These results have provided the first insights on the poorly known Uranian magnetosphere in 26 years, and opened a rich field of investigation, together with a set of open questions. In addition, while solstice conditions prevailed in 1986, Uranus lay close to equinox in 2011, with the S and N magnetic poles alternately facing the Sun every half a rotation. This unique configuration of an asymmetric magnetosphere, extremely variable over a single rotation, had never been investigated before and deserved to be fully analyzed. New observations of the Uranian aurorae are therefore vital for our understanding of planetary magnetospheres, and HST is the only tool able to remotely investigate these emissions. We thus propose to re-observe Uranus with STIS spectro-imaging at next opposition (29 Sept. 2012) over two planetary rotations, in order to enlarge the set of positive detections and to sample the rotational dynamics of auroral processes and magnetosphere/solar wind interaction. To increase the probability of any possible auroral brightening triggered by magnetospheric compressions, observations will be scheduled in advance during active solar wind conditions at Uranus, near the maximum of solar cycle 24. Additional objectives will include the characterization of the extended neutral corona and the spectral response of atmospheric species.

OBSERVING DESCRIPTION

Uranus will be observed through a sequence of 16 HST orbits distributed along 14 days (half a solar rotation), scheduled just after Uranus opposition (26 Sept. 2011) around the planned arrival time of an interplanetary shock. These observations will be scheduled more than 1 month in advance in the HST observing program. The arrival time of the interplanetary shock will be accurately predicted from robust MHD propagation codes.

HST orbits will be distributed 14 days with 2 groups of orbits. (1) 10 orbits will scan a core window covering 7 days (9.5 Uranian periods) centered on the predicted arrival time, among which 8 orbits will be placed every ~1.2 planetary periods, and 2 orbits will be added close to the center of the interval with a spacing of ~0.3 planetary periods. (2) 6 orbits will scan 7 days out of the core window (orange), spaced by ~1.8 periods. The total sequence will thus provide a continuous sampling of a full planetary rotation and a regular coverage of all Uranian longitudes over half a solar rotation.

To take advantage of both the STIS spectroscopic capability and of the ACS SBC imaging high sensitivity, the HST orbits will be alternately dedicated to STIS measurements (images and spectra) and to ACS SBC observations (images only). If one instrument is not operating normally, observations can be done with the other one. The spectra will be acquired by STIS with the G140L gratings and large slit of 2x52 arcsec. The images will provide the spatial distribution of auroral Ly (121.6 nm) and H2 Lyman bands (115-165 nm). Images will be obtained by STIS and ACS SBC, using MAMA and F115LP (clear), as well as FSRF2 and F125LP (Ly blocker) filters. To minimize contamination by geocoronal background brightness at Ly, clear images will be taken during the portion of the orbit when HST is in shadow, and filtered images otherwise. In addition, geocoronal contribution will be minimized by observing close to opposition.

REAL TIME JUSTIFICATION

This program requires observing Uranus (a weak FUV source) within a 14 days-long window centered on on the time t0 of enhanced solar wind activity at Uranus, that will be predicted by the observers >1 month in advance. Additionally, this window will be scheduled as close as possible from opposition, within 1 month to minimize the geocoronal background.

This program will be conducted in combination with other observations (see proposal).

Visit

Proposal 13012, Visit 01, completed Tue Oct 09 01:31:40 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/FUV-MAMA

Special Requirements: BETWEEN 01-SEP-2012:00:00:00 AND 01-NOV-2012:00:00:00; ON HOLD

Comments: This program requires observing Uranus (weak FUV source) within a window predicted by the observers >1 month in advance, and scheduled as close as possible from opposition.

On Hold Comments: Visit 01 needs to be scheduled at t0 +/- 0.05days.

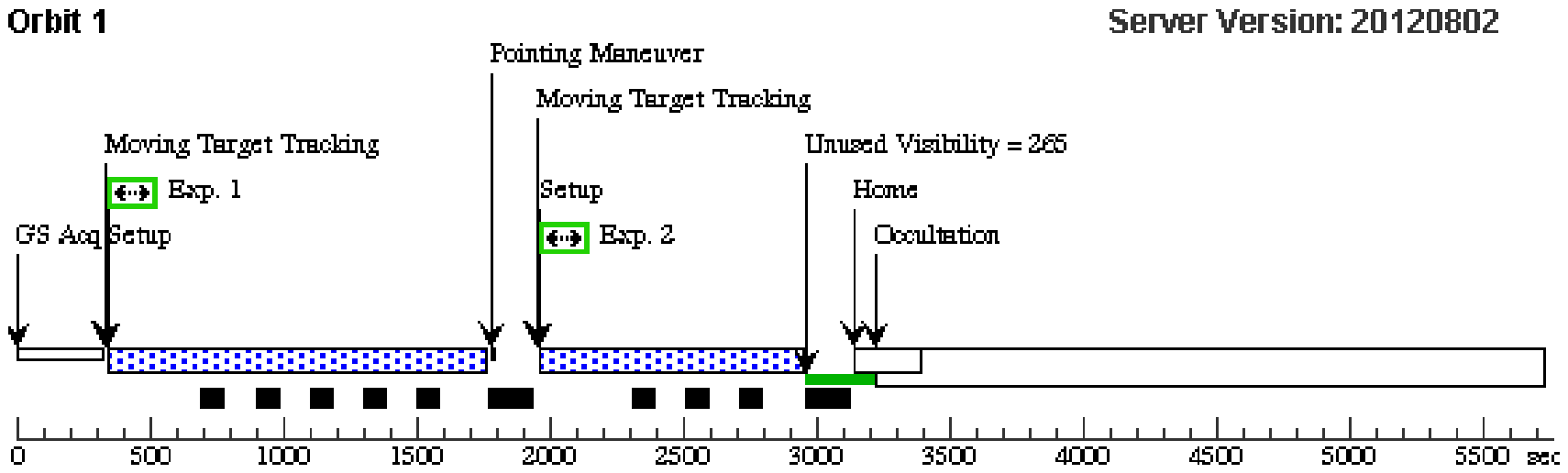
Solar System Targets

#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	URANUS	STD=URANUS				EARTH

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	Clear image (189449)	(1) URANUS	STIS/FUV-MAMA, TIME-TAG, 25MAMA	MIRROR	BUFFER-TIME=200	POS TARG null,-3		1250 Secs [==>]	[1]
	Comments: A POS TARG of -3arcsec in AXIS2 will move Uranus' signal away from the repeller wire shadow.								
2	Filtered image (189449)	(1) URANUS	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=200	POS TARG null,-3		820 Secs [==>]	[1]
	Comments: Expand exposure time if possible.								

Orbit Structure



Visit

Proposal 13012, Visit 02, completed Tue Oct 09 01:31:42 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/FUV-MAMA

Special Requirements: BETWEEN 01-SEP-2012:00:00:00 AND 01-NOV-2012:00:00:00; ON HOLD

Comments: This program requires observing Uranus (weak FUV source) within a window predicted by the observers >1 month in advance, and scheduled as close as possible from opposition.

On Hold Comments: Visit 02 needs to be scheduled at t0 + 0.18days +/- 0.05days.

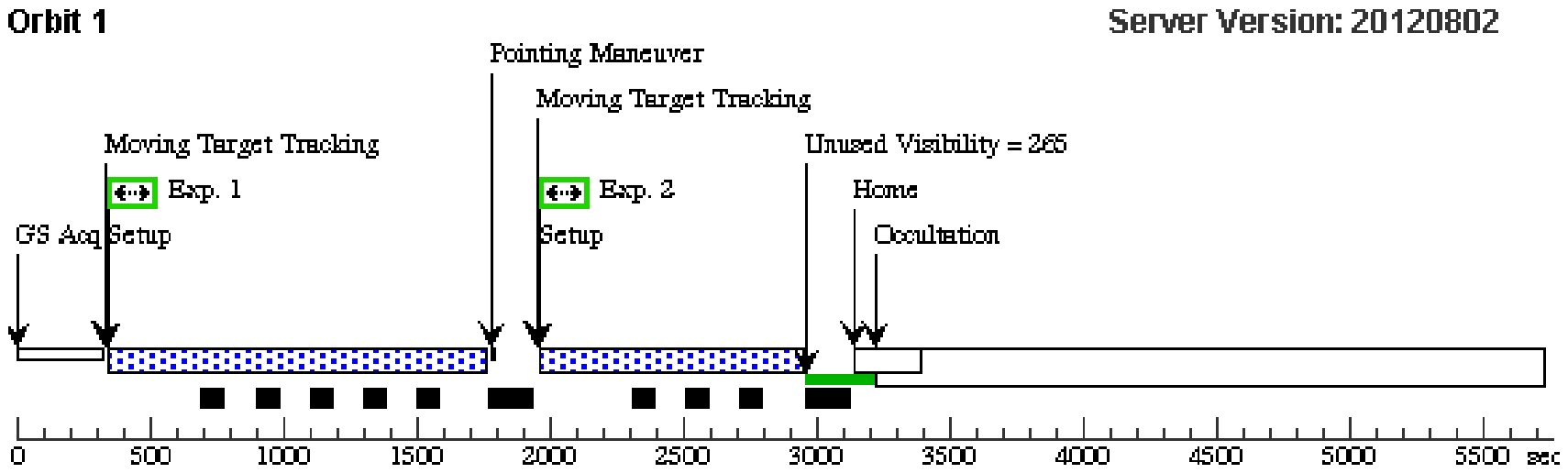
Solar System Targets

#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	URANUS	STD=URANUS				EARTH

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	Clear image (189449)	(1) URANUS	STIS/FUV-MAMA, TIME-TAG, 25MAMA	MIRROR	BUFFER-TIME=200	POS TARG null,-3		1250 Secs [==>]	[1]
	Comments: A POS TARG of -3arcsec in AXIS2 will move Uranus' signal away from the repeller wire shadow.								
2	Filtered image (189449)	(1) URANUS	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=200	POS TARG null,-3		820 Secs [==>]	[1]
	Comments: Expand exposure time if possible.								

Orbit Structure



Visit

Proposal 13012, Visit 03, completed Tue Oct 09 01:31:43 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/FUV-MAMA

Special Requirements: BETWEEN 01-SEP-2012:00:00:00 AND 01-NOV-2012:00:00:00; ON HOLD

Comments: This program requires observing Uranus (weak FUV source) within a window predicted by the observers >1 month in advance, and scheduled as close as possible from opposition.

On Hold Comments: Visit 03 needs to be scheduled at t0 + 0.36days +/- 0.05days.

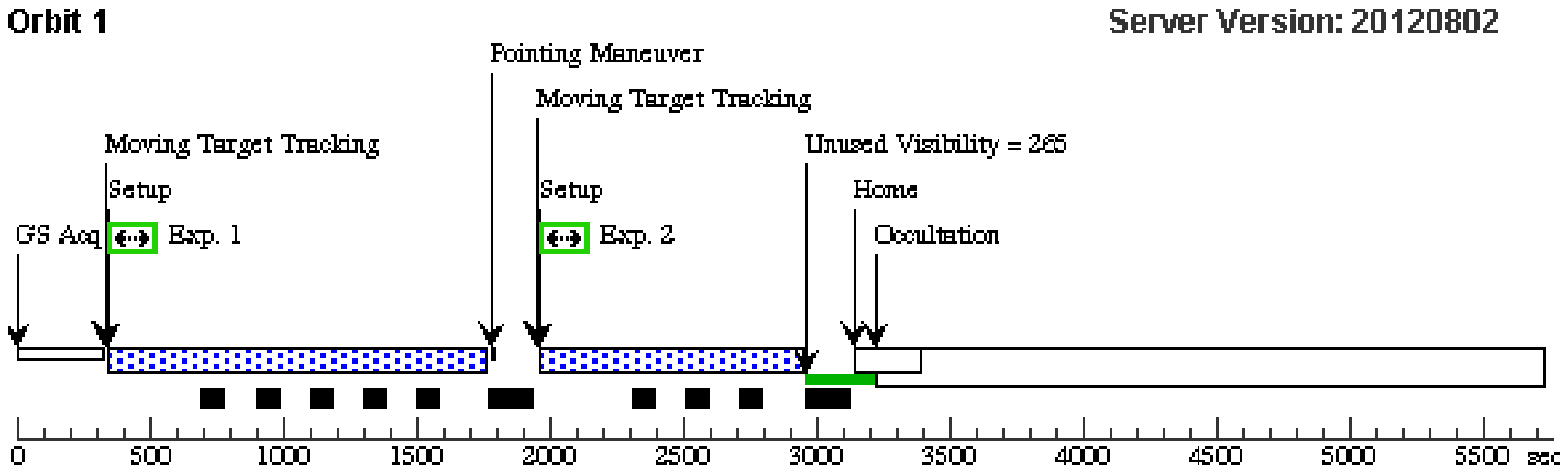
Solar System Targets

#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	URANUS	STD=URANUS				EARTH

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	Clear image (189449)	(1) URANUS	STIS/FUV-MAMA, TIME-TAG, 25MAMA	MIRROR	BUFFER-TIME=2000	POS TARG null,-3		1250 Secs [==>]	[1]
	Comments: A POS TARG of -3arcsec in AXIS2 will move Uranus' signal away from the repeller wire shadow.								
2	Filtered image (189449)	(1) URANUS	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=2000	POS TARG null,-3		820 Secs [==>]	[1]
	Comments: Expand exposure time if possible.								

Orbit Structure



Proposal 13012 - Visit 04 - Near-equinox spectro-imaging of Uranus aurorae sampling two planetary rotations

Visit

Proposal 13012, Visit 04, completed Tue Oct 09 01:31:44 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: ACS/SBC

Special Requirements: BETWEEN 01-SEP-2012:00:00:00 AND 15-NOV-2012:00:00:00; ON HOLD

Comments: This program requires observing Uranus (weak FUV source) within a window predicted by the observers >1 month in advance, and scheduled as close as possible from opposition.

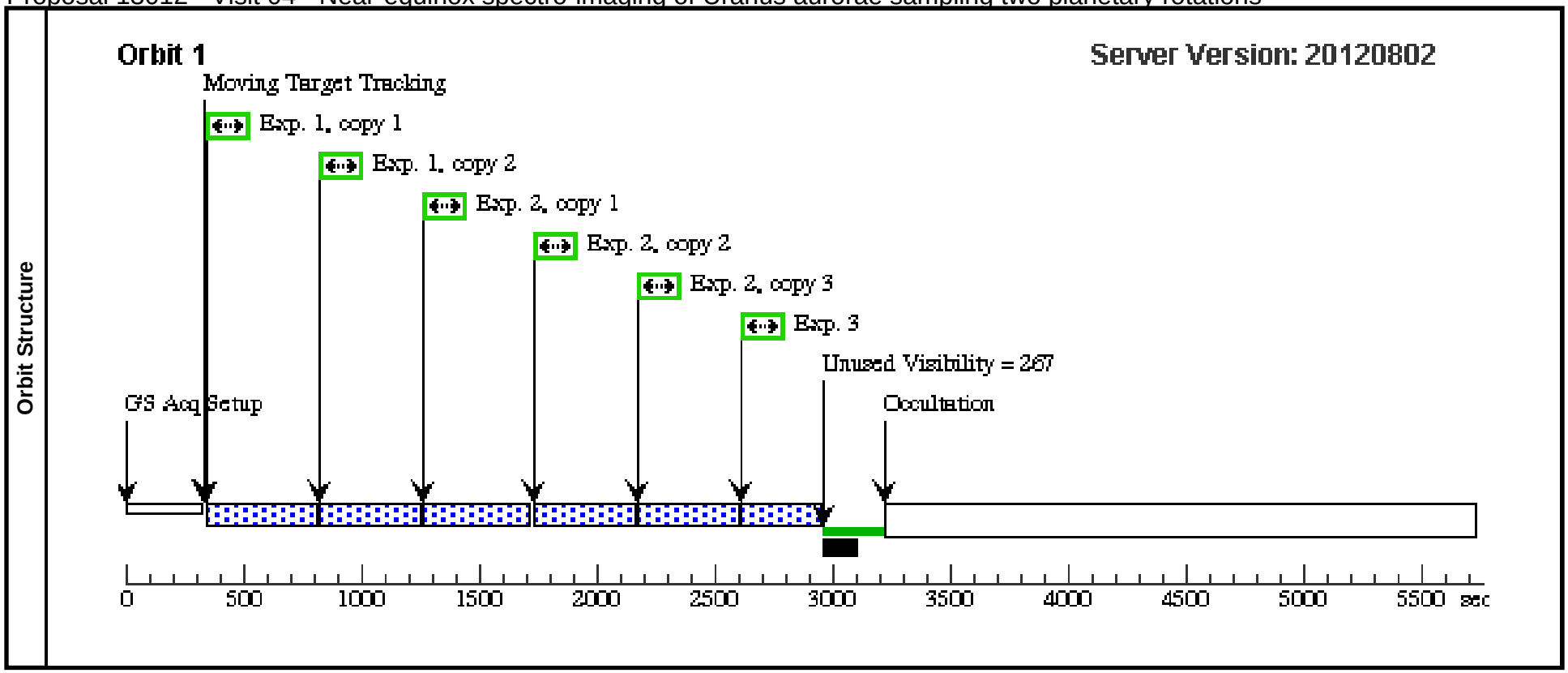
On Hold Comments: Visit 04 needs to be scheduled at t0 + 0.54days +/- 0.05days.

Solar System Targets

#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	URANUS	STD=URANUS				EARTH

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	F140LP image (186090)	(1) URANUS	ACS/SBC, ACCUM, SBC	F140LP		POS TARG -3,null		400 Secs X 2 *[==>(Copy 1)]* *[==>(Copy 2)]*	***[1]***
	Comments: Expand exposure time if possible. *A POS TARG of -3 arcsec in AXIS1 will move Uranus' signal away from the repeller wire shadow.*								
2	Clear image (186089)	(1) URANUS	ACS/SBC, ACCUM, SBC	F115LP		SAME POS AS 1		400 Secs X 3 *[==>(Copy 1)]* *[==>(Copy 2)]* *[==>(Copy 3)]*	***[1]***
3	F165LP image (186093)	(1) URANUS	ACS/SBC, ACCUM, SBC	F165LP		SAME POS AS 1		270 Secs *[==>]*	***[1]***


Orbit Structure
Orbit 1
Server Version: 20120802
Moving Target Tracking
Exp. 1, copy 1
Exp. 1, copy 2
Exp. 2, copy 1
Exp. 2, copy 2
Exp. 2, copy 3
Exp. 3
Unused Visibility = 267
GS Acq Setup
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 13012, Visit 05, completed Tue Oct 09 01:31:45 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/FUV-MAMA

Special Requirements: BETWEEN 01-SEP-2012:00:00:00 AND 01-NOV-2012:00:00:00; ON HOLD

Comments: This program requires observing Uranus (weak FUV source) within a window predicted by the observers >1 month in advance, and scheduled as close as possible from opposition.

On Hold Comments: Visit 05 needs to be scheduled at t0 + 0.72days +/- 0.05days.

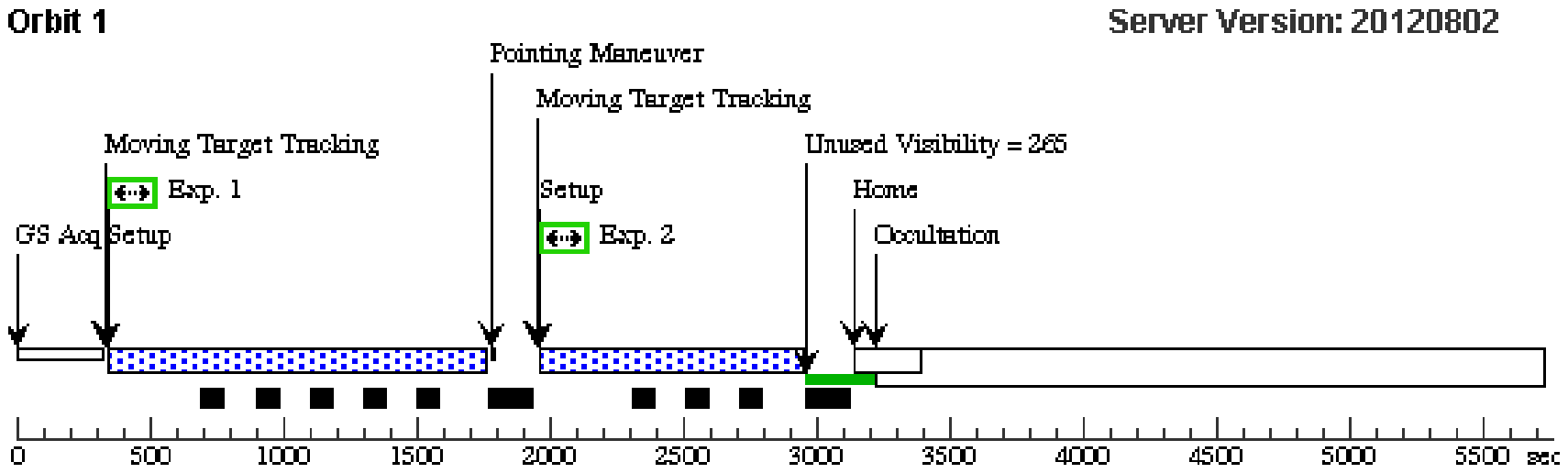
Solar System Targets

#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	URANUS	STD=URANUS				EARTH

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	Clear image (189449)	(1) URANUS	STIS/FUV-MAMA, TIME-TAG, 25MAMA	MIRROR	BUFFER-TIME=200	POS TARG null,-3		1250 Secs [==>]	[1]
	Comments: A POS TARG of -3arcsec in AXIS2 will move Uranus' signal away from the repeller wire shadow.								
2	Filtered image (189449)	(1) URANUS	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=200	POS TARG null,-3		820 Secs [==>]	[1]
	Comments: Expand exposure time if possible.								

Orbit Structure



Visit

Proposal 13012, Visit 06, completed Tue Oct 09 01:31:48 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/FUV-MAMA

Special Requirements: BETWEEN 01-SEP-2012:00:00:00 AND 01-NOV-2012:00:00:00; ON HOLD

Comments: This program requires observing Uranus (weak FUV source) within a window predicted by the observers >1 month in advance, and scheduled as close as possible from opposition.

On Hold Comments: Visit 06 needs to be scheduled at t0 + 0.90days +/- 0.05days.

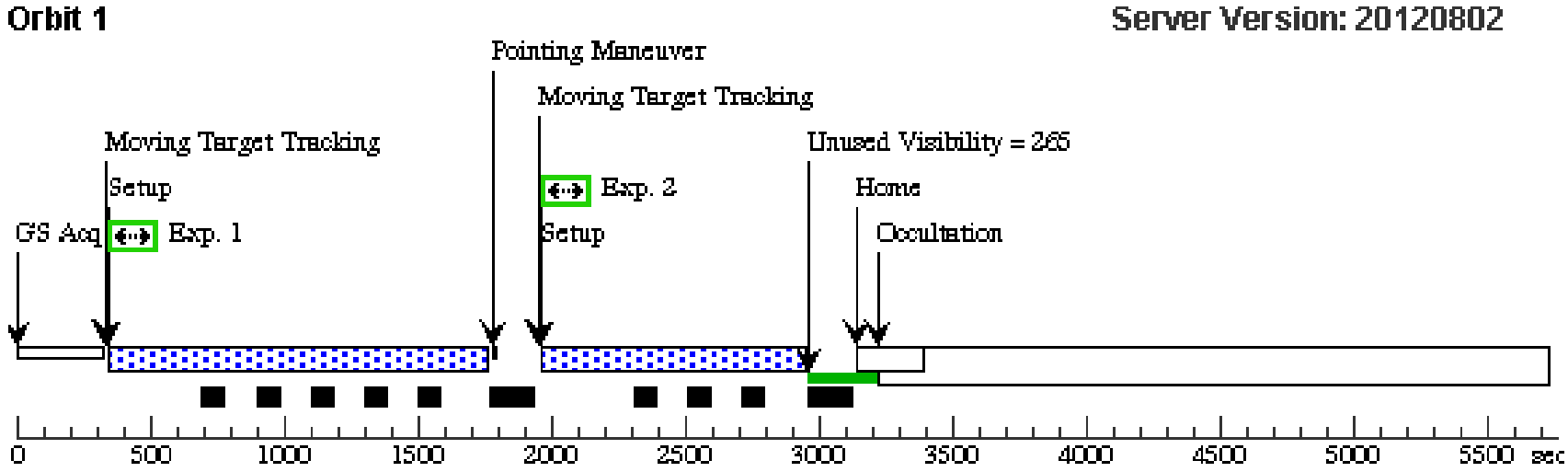
Solar System Targets

#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	URANUS	STD=URANUS				EARTH

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	Clear image (189449)	(1) URANUS	STIS/FUV-MAMA, TIME-TAG, 25MAMA	MIRROR	BUFFER-TIME=200	POS TARG null,-3		1250 Secs *[==>]*	*[1]*
	Comments: A POS TARG of -3arcsec in AXIS2 will move Uranus' signal away from the repeller wire shadow.								
2	Filtered image (189449)	(1) URANUS	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=200	POS TARG null,-3		820 Secs *[==>]*	*[1]*

Orbit Structure



Visit

Proposal 13012, Visit 07, completed Tue Oct 09 01:31:49 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/FUV-MAMA

Special Requirements: BETWEEN 01-SEP-2012:00:00:00 AND 01-NOV-2012:00:00:00; ON HOLD

Comments: This program requires observing Uranus (weak FUV source) within a window predicted by the observers >1 month in advance, and scheduled as close as possible from opposition.

On Hold Comments: Visit 07 needs to be scheduled at t0 + 1.08days +/- 0.05days.

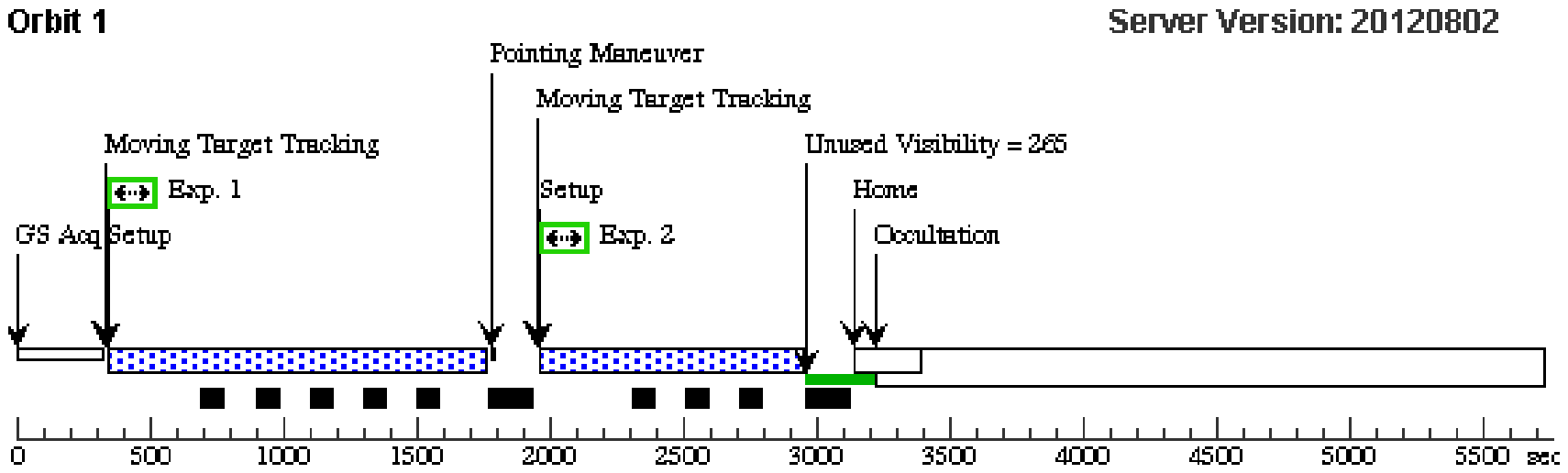
Solar System Targets

#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	URANUS	STD=URANUS				EARTH

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	Clear image (189449)	(1) URANUS	STIS/FUV-MAMA, TIME-TAG, 25MAMA	MIRROR	BUFFER-TIME=200	POS TARG null,-3		1250 Secs [==>]	[1]
	Comments: A POS TARG of -3arcsec in AXIS2 will move Uranus' signal away from the repeller wire shadow.								
2	Filtered image (189449)	(1) URANUS	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=200	POS TARG null,-3		820 Secs [==>]	[1]
	Comments: Expand exposure time if possible.								

Orbit Structure



Visit

Proposal 13012, Visit 08, completed Tue Oct 09 01:31:50 GMT 2012

Diagnostic Status: No Diagnostics

Scientific Instruments: STIS/FUV-MAMA

Special Requirements: BETWEEN 01-SEP-2012:00:00:00 AND 01-NOV-2012:00:00:00; ON HOLD

Comments: This program requires observing Uranus (weak FUV source) within a window predicted by the observers >1 month in advance, and scheduled as close as possible from opposition.

On Hold Comments: Visit 08 needs to be scheduled at t0 + 1.26days +/- 0.05days.

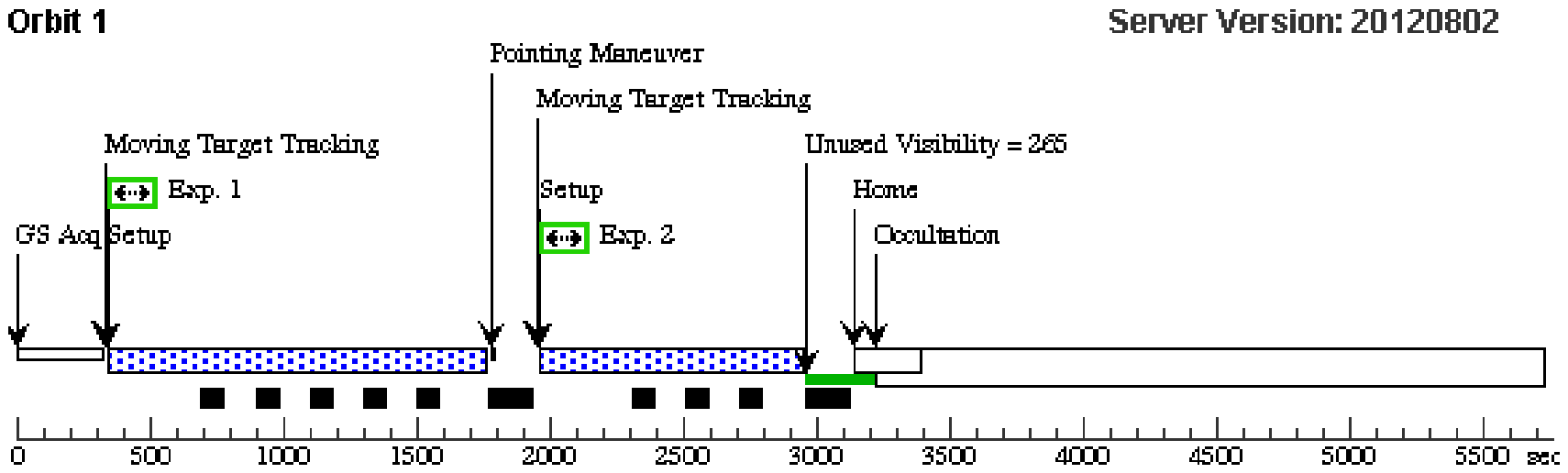
Solar System Targets

#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	URANUS	STD=URANUS				EARTH

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	Clear image (189449)	(1) URANUS	STIS/FUV-MAMA, TIME-TAG, 25MAMA	MIRROR	BUFFER-TIME=200	POS TARG null,-3		1250 Secs [==>]	[1]
	Comments: A POS TARG of -3arcsec in AXIS2 will move Uranus' signal away from the repeller wire shadow.								
2	Filtered image (189449)	(1) URANUS	STIS/FUV-MAMA, TIME-TAG, F25SRF2	MIRROR	BUFFER-TIME=200	POS TARG null,-3		820 Secs [==>]	[1]
	Comments: Expand exposure time if possible.								

Orbit Structure



Visit

Proposal 13012, Visit 09, completed Tue Oct 09 01:31:51 GMT 2012

Diagnostic Status: Warning

Scientific Instruments: STIS/FUV-MAMA

Special Requirements: BETWEEN 01-SEP-2012:00:00:00 AND 01-NOV-2012:00:00:00; ON HOLD

Comments: This program requires observing Uranus (weak FUV source) within a window predicted by the observers >1 month in advance, and scheduled as close as possible from opposition.

On Hold Comments: Visit 09 needs to be scheduled within the window [t0,t0+0.72 days].

Diagnostics

(Visit 09) Warning (Form): A target acquisition should probably be performed before doing spectroscopy or coronography with STIS or COS.

Solar System Targets

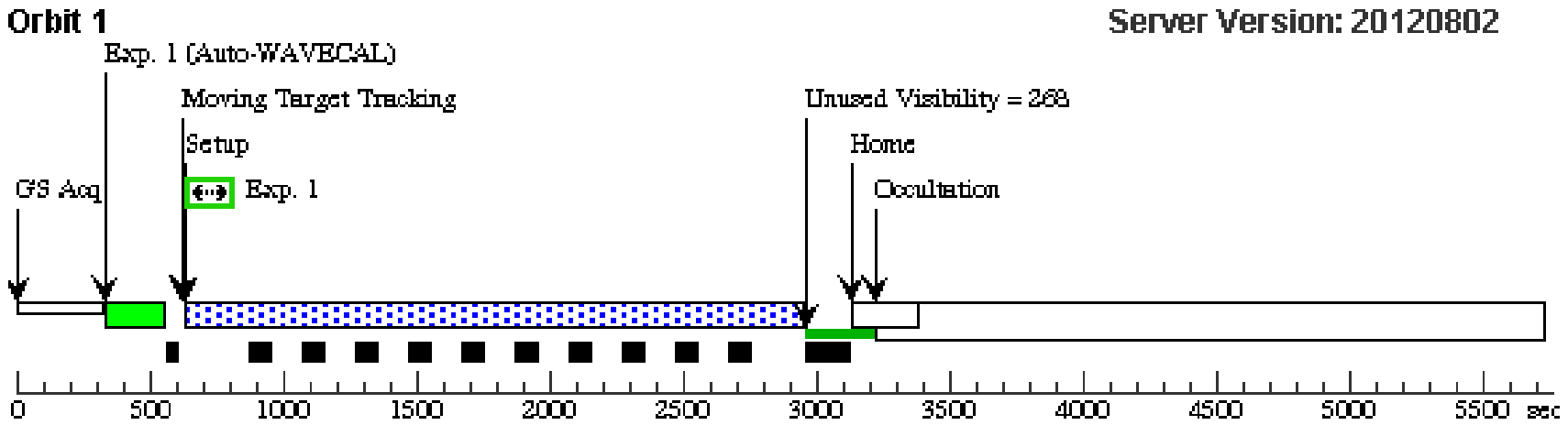
#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	URANUS	STD=URANUS				EARTH

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	Spectrum (189500)	(1) URANUS	STIS/FUV-MAMA, TIME-TAG, 52X0.5	G140L 1425 A	BUFFER-TIME=200			2260 Secs [==>]	[1]

Comments: Expand exposure time if possible.

Orbit Structure



Visit

Proposal 13012, Visit 10, failed Tue Oct 09 01:31:52 GMT 2012

Diagnostic Status: Warning

Scientific Instruments: STIS/FUV-MAMA

Special Requirements: BETWEEN 01-SEP-2012:00:00:00 AND 01-NOV-2012:00:00:00; ON HOLD

Comments: This program requires observing Uranus (weak FUV source) within a window predicted by the observers >1 month in advance, and scheduled as close as possible from opposition.

On Hold Comments: Visit 10 needs to be scheduled within the window [t0+0.72days,t0+1.26 days].

Diagnostics

(Visit 10) Warning (Form): A target acquisition should probably be performed before doing spectroscopy or coronography with STIS or COS.

Solar System Targets

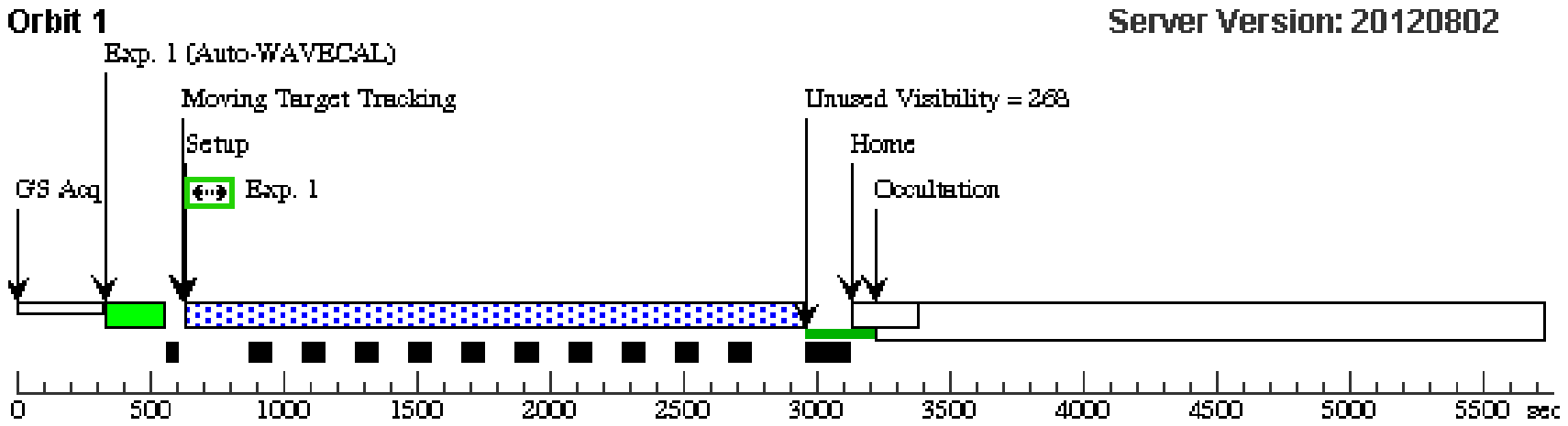
#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	URANUS	STD=URANUS				EARTH

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	Spectrum (189500)	(1) URANUS	STIS/FUV-MAMA, TIME-TAG, 52X0.5	G140L 1425 A	BUFFER-TIME=200			2260 Secs [==>]	[1]

Comments: Expand exposure time if possible.

Orbit Structure



Visit

Proposal 13012, Visit 11, completed Tue Oct 09 01:31:52 GMT 2012

Diagnostic Status: Warning

Scientific Instruments: STIS/FUV-MAMA

Special Requirements: ORIENT 244D TO 254 D; ORIENT 272D TO 290 D; BETWEEN 01-SEP-2012:00:00:00 AND 01-NOV-2012:00:00:00; ON HOLD

On Hold Comments: Visit 11 is aimed at observing the sky to provide high quality background measurements.

It needs to be scheduled close to the observing window including visits 01 to 10, but no accurate scheduling is required.

Diagnostics

(Visit 11) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

Solar System Targets

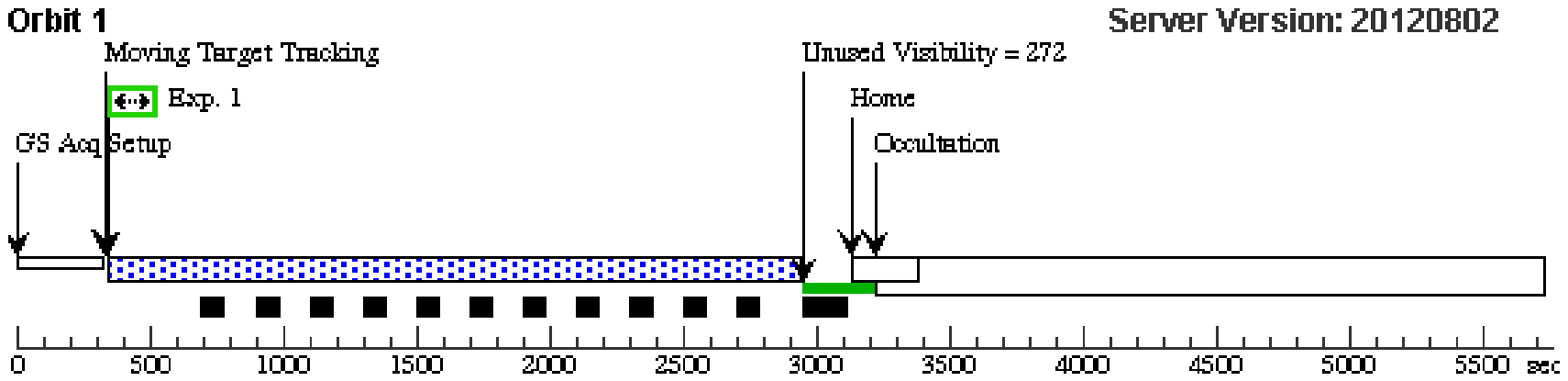
#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	URANUS	STD=URANUS				EARTH

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	Clear image (189449)	(1) URANUS	STIS/FUV-MAMA, TIME-TAG, 25MAMA	MIRROR	BUFFER-TIME=200	POS TARG null,-150		2430 Secs *[==>]*	*[1]*

Comments: Expand exposure time if possible.

Orbit Structure



Visit

Proposal 13012, Visit 12 Tue Oct 09 01:31:53 GMT 2012

Diagnostic Status: Warning

Scientific Instruments: STIS/FUV-MAMA

Special Requirements: BETWEEN 01-SEP-2012:00:00:00 AND 01-NOV-2012:00:00:00; ON HOLD

Comments: This program requires observing Uranus (weak FUV source) within a window predicted by the observers >1 month in advance, and scheduled as close as possible from opposition.

On Hold Comments: Visit 12 is a repeat observation of visit 10. It needs to be scheduled as soon as possible (i.e. as close as possible from opposition, and the rest of the observations).

A TAR POS of -3 arcsec has been applied to follow suggestions of the panel.

Diagnostics

(Visit 12) Warning (Form): A target acquisition should probably be performed before doing spectroscopy or coronography with STIS or COS.

Solar System Targets

#	Name	Level 1	Level 2	Level 3	Window	Ephem Center
(1)	URANUS	STD=URANUS				EARTH

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time/[Actual Dur.]	Orbit
1	Spectrum (189500)	(1) URANUS	STIS/FUV-MAMA, TIME-TAG, 52X0.5	G140L 1425 A	BUFFER-TIME=2000	POS TARG null,-3		2260 Secs [==>]	[1]

Comments: Expand exposure time if possible.

Orbit Structure