18121 - A Punctured Pufferfish: Atmospheric Escape from a Neptune-mass Planet Inflated to the Size of Jupiter

Cycle: 33, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*
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Dr. Peter Gao (CoI)	Carnegie Institution of Washington

Name	*Institution*
Prof. Keivan G. Stassun (CoI)	Vanderbilt University

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) HD-120411	STIS/CCD STIS/NUV-MAMA	5	19-Feb-2026 14:00:16.0	yes
02	(1) HD-120411	STIS/CCD STIS/NUV-MAMA	5	19-Feb-2026 14:00:18.0	yes
03	(1) HD-120411	STIS/CCD STIS/NUV-MAMA	5	19-Feb-2026 14:00:20.0	yes
04	(1) HD-120411	STIS/CCD STIS/NUV-MAMA	5	19-Feb-2026 14:00:22.0	yes
05	(1) HD-120411	STIS/CCD STIS/NUV-MAMA	5	19-Feb-2026 14:00:24.0	yes

25 Total Orbits Used

ABSTRACT

We propose to observe 5 transits of HIP 67522 b, a Neptune-mass planet inflated to Jupiter's size orbiting a 17 Myr old solar analog, in the near ultraviolet to measure its mass loss rate, outflow velocity, and exospheric structure. HIP 67522 b is a planet where we can precisely measure transit depths with both Hubble and JWST and study a planet's atmosphere as a structure in its entirety instead of piecemeal. In fact, JWST has already measured this planet's infrared transmission spectrum. The goal is to use the metallicity constraint from JWST in tandem with HST near-ultraviolet transits to measure the rate of Fe+ and Mg+ mass-loss for HIP 67522 b, construct the most complete map of a young planet's escaping atmosphere thus far, and thereby anchor the initial stages of sub-Jovian-mass planet evolution.

OBSERVING DESCRIPTION

We will observe five transits of HIP 67522 b using the STIS/G230L instrument/grating centered at 2376 Angstroms. This near ultraviolet wavelength range will span transitions of Fe I, Fe II, and Mg II, enabling us to search for atsmopheric escape in these metal lines. We will observe the five transits with five visits of five orbits each, spaced out in phase to encompass a potentially extended ingress/egress and to account for the 20 minute

transit timing variation amplitude induced by the outer planet HIP 67522 c. Each visit will start with a target acquisition exposure using the F28X50OII filter for 1 second, a setting which was previously successful for this target. The remainder of the first orbit and the entirety of the next four orbits in each visit will filled with an exposure of STIS/G230L centered at 2376 Angstroms with a buffer time of 350s (as done for the previous out-of-transit G230L observation). The phase windows for the first exposure of each orbit are 0.011 phase units wide (6614 seconds / 1.837 hours), and defined such that the individual visit windows are spaced apart in phase relative to mid-transit as follows: 0.956 -- 0.967, 0.967 -- 0.978, 0.978 -- 0.989, 0.989 -- 1.0, and 0 -- 0.011. This means that the very first exposure of the earliest visit will be slightly greater than 1.5 transit durations before mid-transit, while the end of the last exposure will be slightly less than 2 transit durations after mid-transit.

Visit

Proposal 18121, Visit 01, implementation

Thu Feb 19 19:00:25 GMT 2026

Diagnostic Status: Warning

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

Special Requirements: Period 6.9594731 D AND ZERO-PHASE HJD2458604.02376

Diagnostics

(Visit 01) Warning (Orbit Planner): STIS TIME-TAG EXPOSURE GENERATES HEAVY DATA VOLUME

Fixed Targets

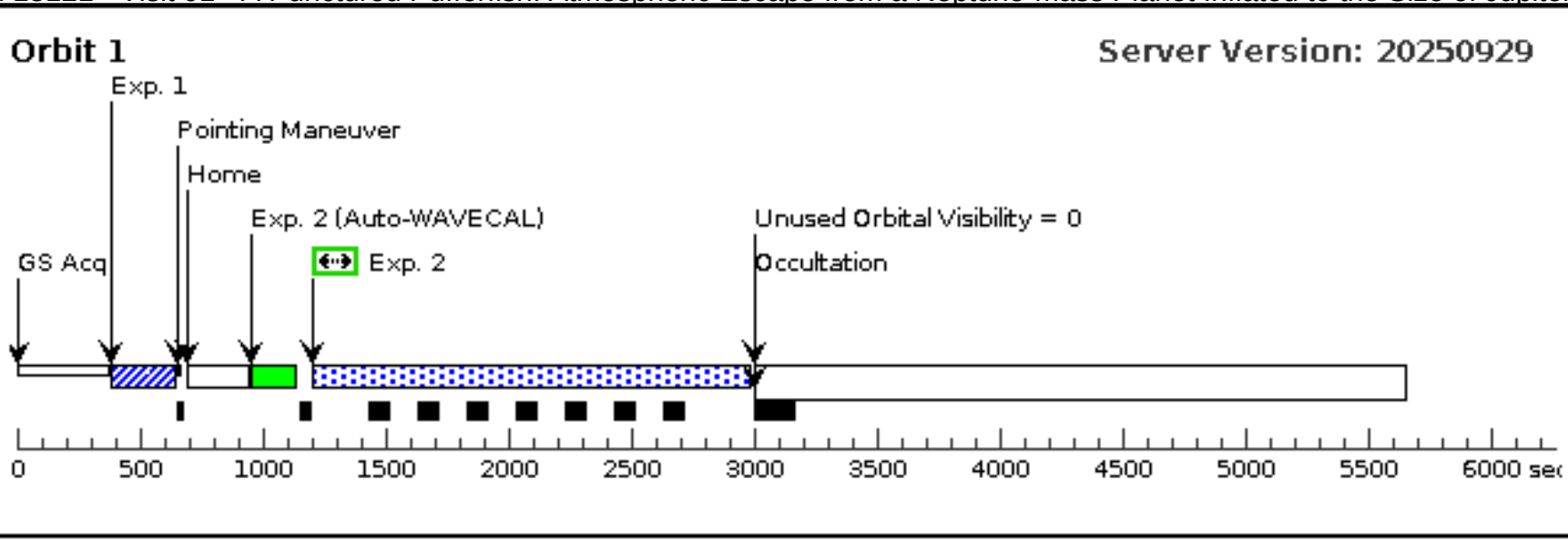
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	HD-120411	RA: 13 50 6.2797 (207.5261654d) Dec: -40 50 8.88 (-40.83580d) Equinox: J2000	Proper Motion RA: -28.907 mas/yr Proper Motion Dec: -22.24800005024008 mas/yr Parallax: 0.008017" Epoch of Position: 2000	V=9.8	Reference Frame: ICRS

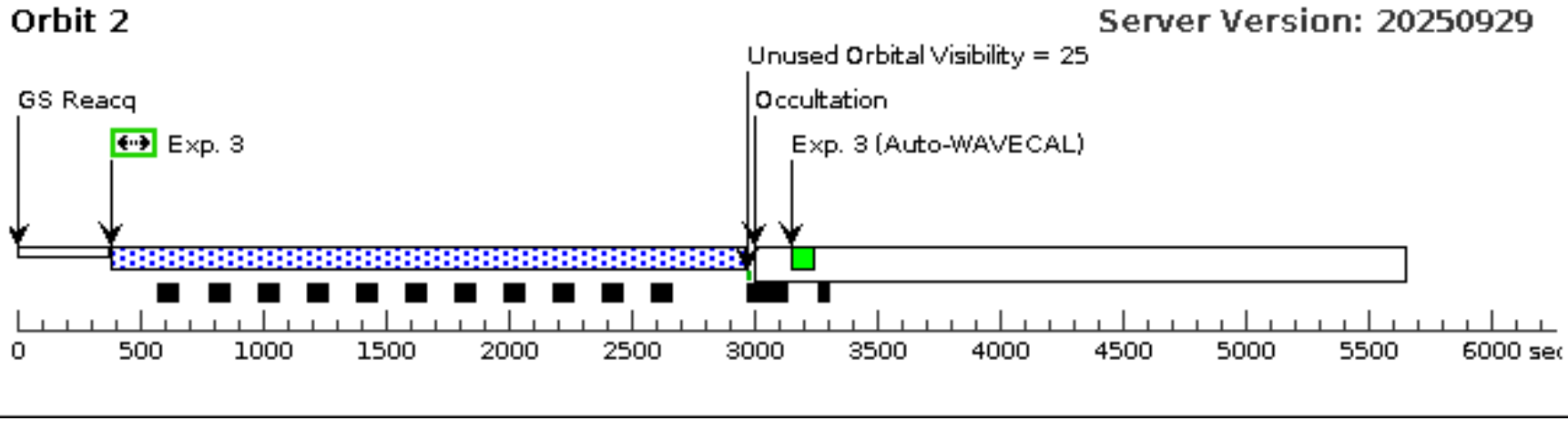
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.
Category=STAR
Description=[G V-IV]

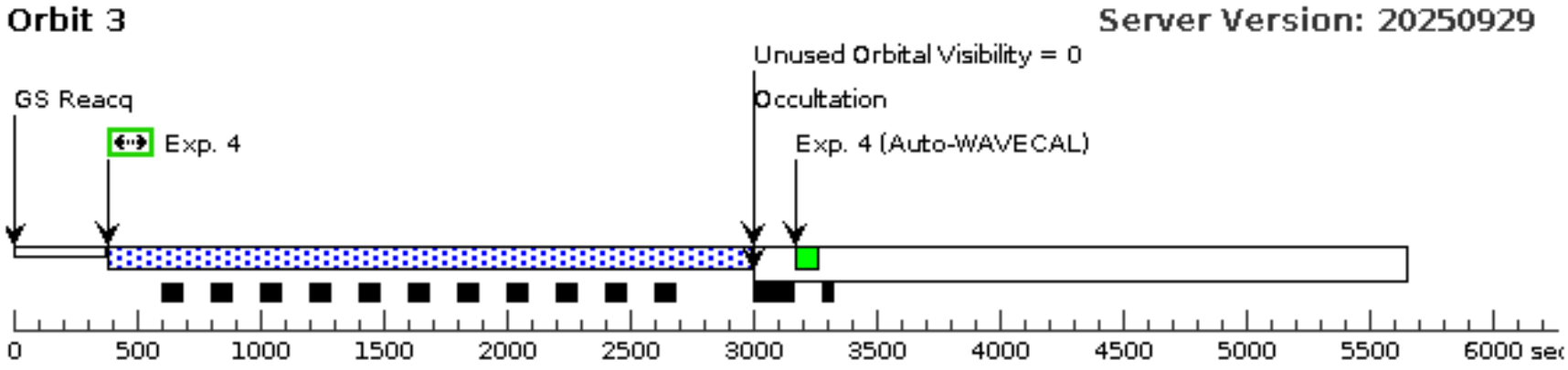
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(STIS.ta.2021499)	(1) HD-120411	STIS/CCD, ACQ, F28X50OII	MIRROR		PHASE 0.956 TO 0.967		1 Secs (1 Secs) *[==>]*	***[1]***
2	(STIS.sp.2278981)	(1) HD-120411	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=200	PHASE 0.956 TO 0.967		1739 Secs (1739 Secs) *[==>]*	***[1]***
3	(STIS.sp.2278981)	(1) HD-120411	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=200			2568 Secs (2568 Secs) *[==>]*	***[2]***
4	(STIS.sp.2278981)	(1) HD-120411	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=200			2568 Secs (2568 Secs) *[==>]*	***[3]***
5	(STIS.sp.2278981)	(1) HD-120411	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=200			2568 Secs (2568 Secs) *[==>]*	***[4]***
6	(STIS.sp.2278981)	(1) HD-120411	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=200			2568 Secs (2568 Secs) *[==>]*	***[5]***

Orbit Structure



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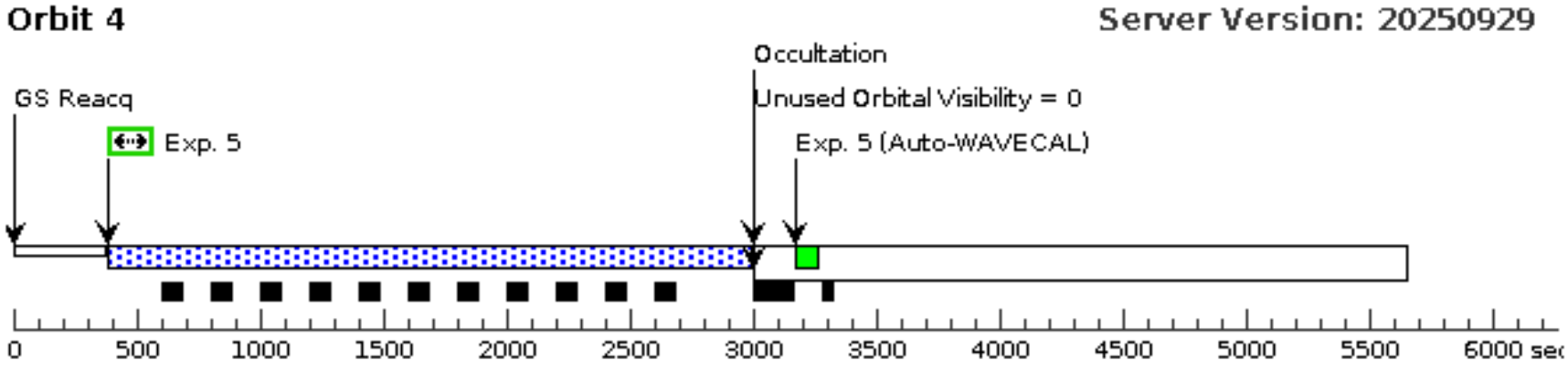
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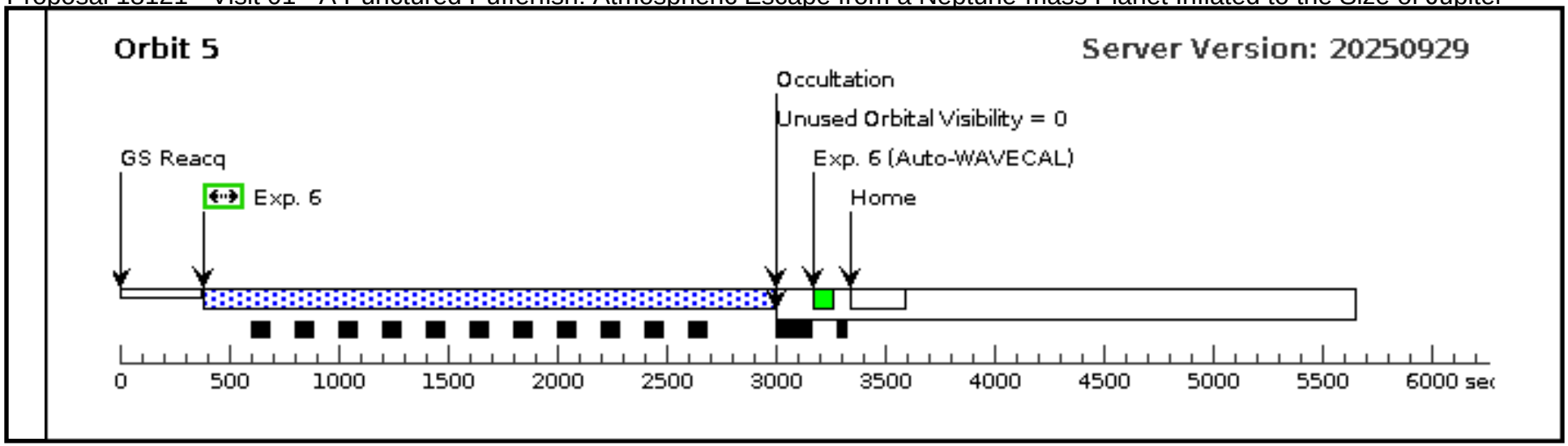
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5500
6000 sec

Visit

Proposal 18121, Visit 02, implementation

Thu Feb 19 19:00:25 GMT 2026

Diagnostic Status: Warning

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

Special Requirements: Period 6.9594731 D AND ZERO-PHASE HJD2458604.02376

Diagnostics

(Visit 02) Warning (Orbit Planner): STIS TIME-TAG EXPOSURE GENERATES HEAVY DATA VOLUME

Fixed Targets

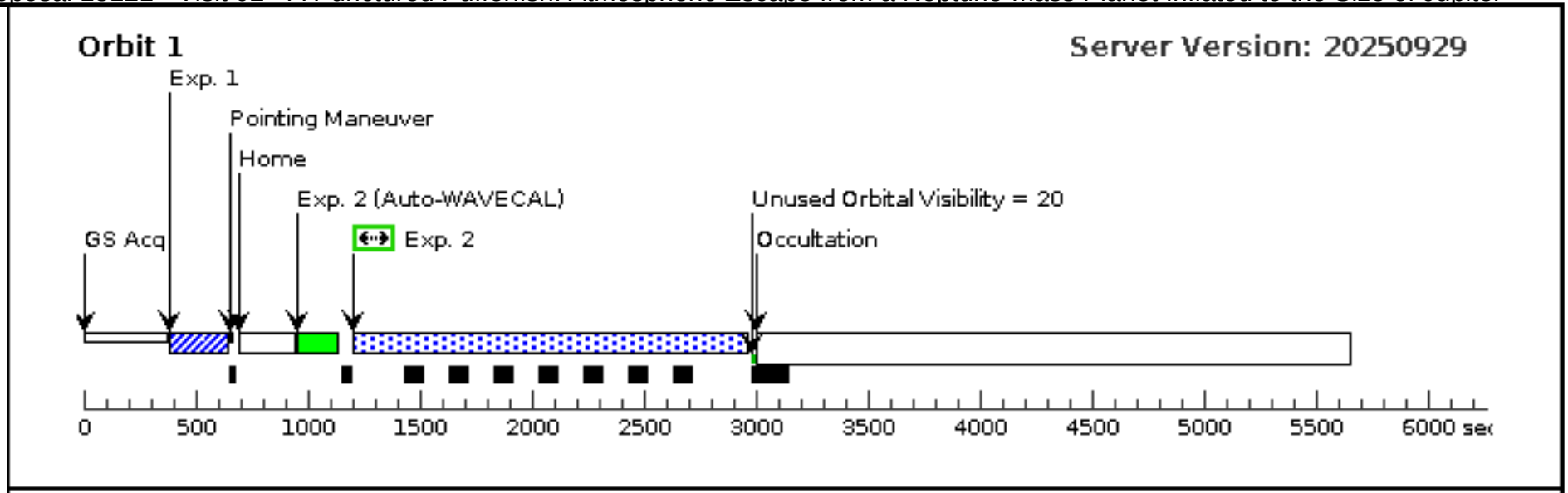
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	HD-120411	RA: 13 50 6.2797 (207.5261654d) Dec: -40 50 8.88 (-40.83580d) Equinox: J2000	Proper Motion RA: -28.907 mas/yr Proper Motion Dec: -22.24800005024008 mas/yr Parallax: 0.008017" Epoch of Position: 2000	V=9.8	Reference Frame: ICRS

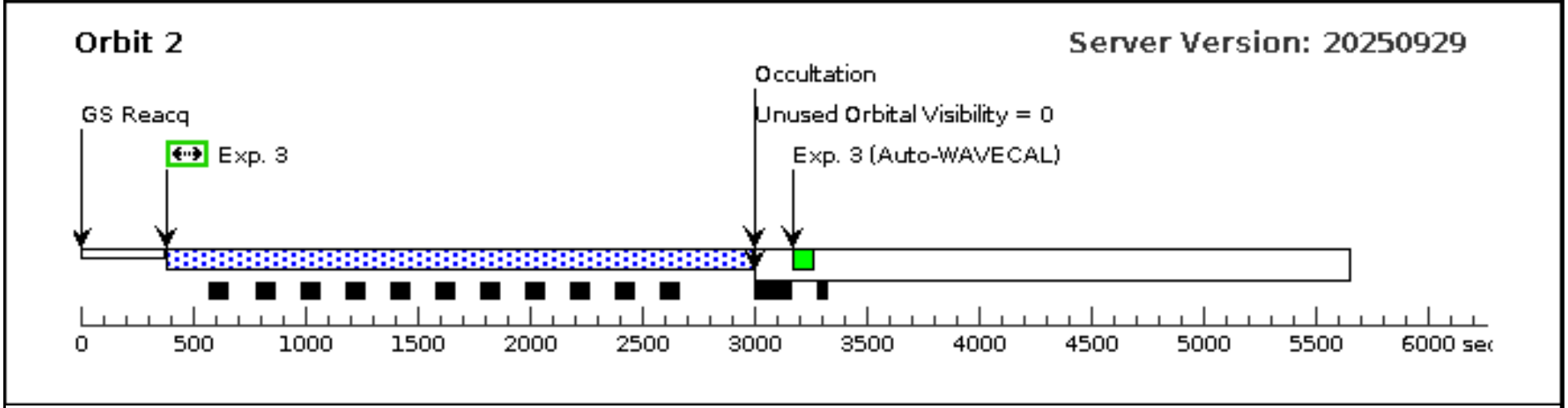
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.
Category=STAR
Description=[G V-IV]

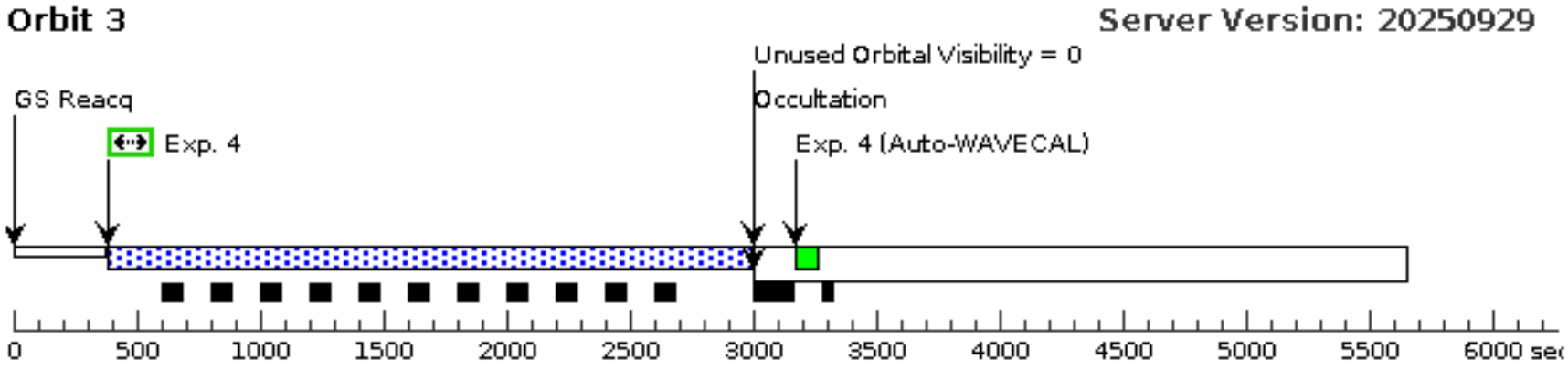
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(STIS.ta.2021499)	(1) HD-120411	STIS/CCD, ACQ, F28X50OII	MIRROR		PHASE 0.967 TO 0.978		1 Secs (1 Secs) *[==>]*	***[1]***
2	(STIS.sp.2278981)	(1) HD-120411	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=200	PHASE 0.967 TO 0.978		1719 Secs (1719 Secs) *[==>]*	***[1]***
3	(STIS.sp.2278981)	(1) HD-120411	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=200			2593 Secs (2593 Secs) *[==>]*	***[2]***
4	(STIS.sp.2278981)	(1) HD-120411	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=200			2568 Secs (2568 Secs) *[==>]*	***[3]***
5	(STIS.sp.2278981)	(1) HD-120411	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=200			2568 Secs (2568 Secs) *[==>]*	***[4]***
6	(STIS.sp.2278981)	(1) HD-120411	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=200			2568 Secs (2568 Secs) *[==>]*	***[5]***

Orbit Structure



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Occultation
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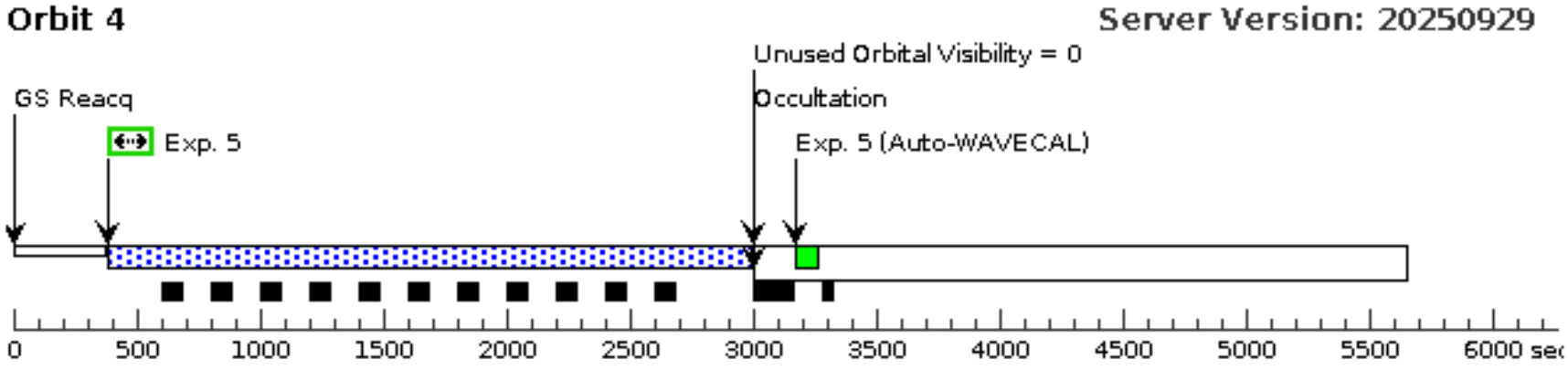
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Server Version: 20250929
Unused Orbital Visibility = 0
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Exp. 5 (Auto-WAVECAL)
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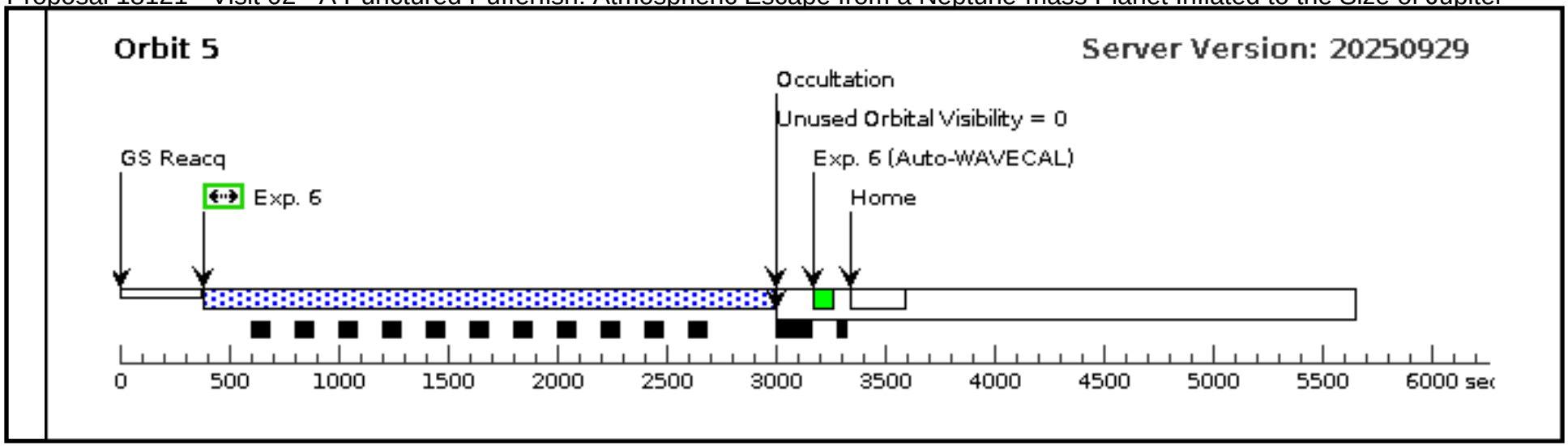
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6000 sec

Visit

Proposal 18121, Visit 03, implementation Thu Feb 19 19:00:25 GMT 2026

Diagnostic Status: Warning

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

Special Requirements: Period 6.9594731 D AND ZERO-PHASE HJD2458604.02376

Diagnostics

(Visit 03) Warning (Orbit Planner): STIS TIME-TAG EXPOSURE GENERATES HEAVY DATA VOLUME

Fixed Targets

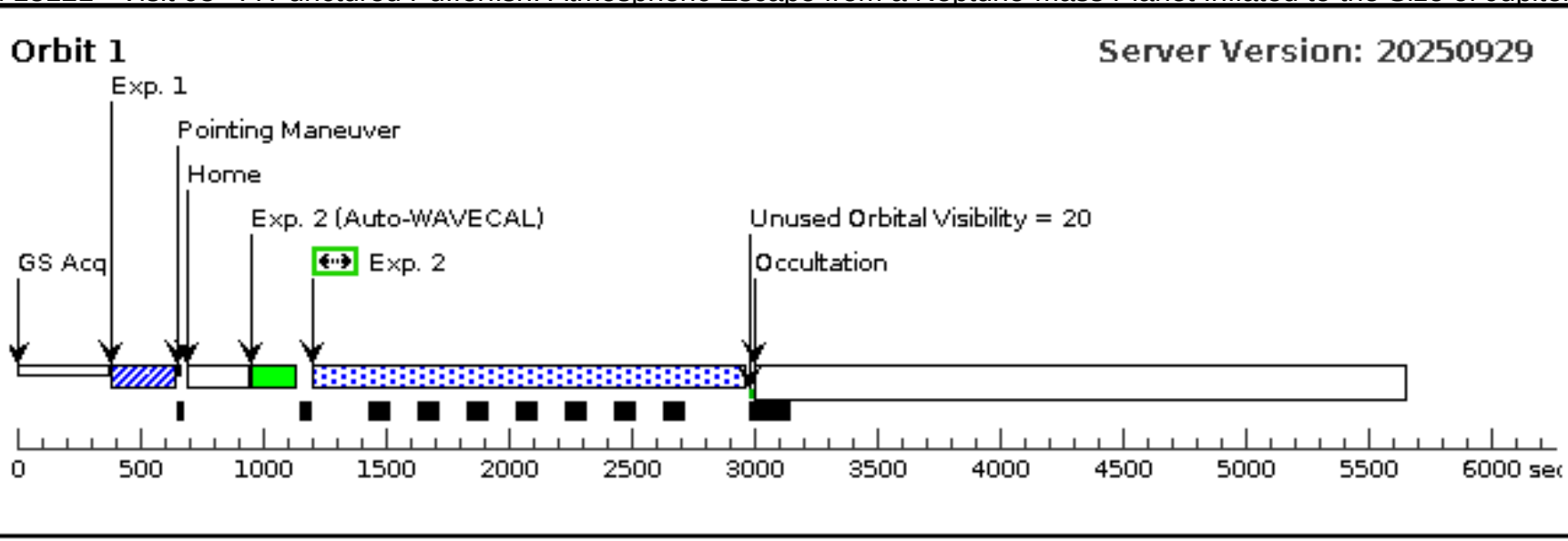
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	HD-120411	RA: 13 50 6.2797 (207.5261654d) Dec: -40 50 8.88 (-40.83580d) Equinox: J2000	Proper Motion RA: -28.907 mas/yr Proper Motion Dec: -22.24800005024008 mas/yr Parallax: 0.008017" Epoch of Position: 2000	V=9.8	Reference Frame: ICRS

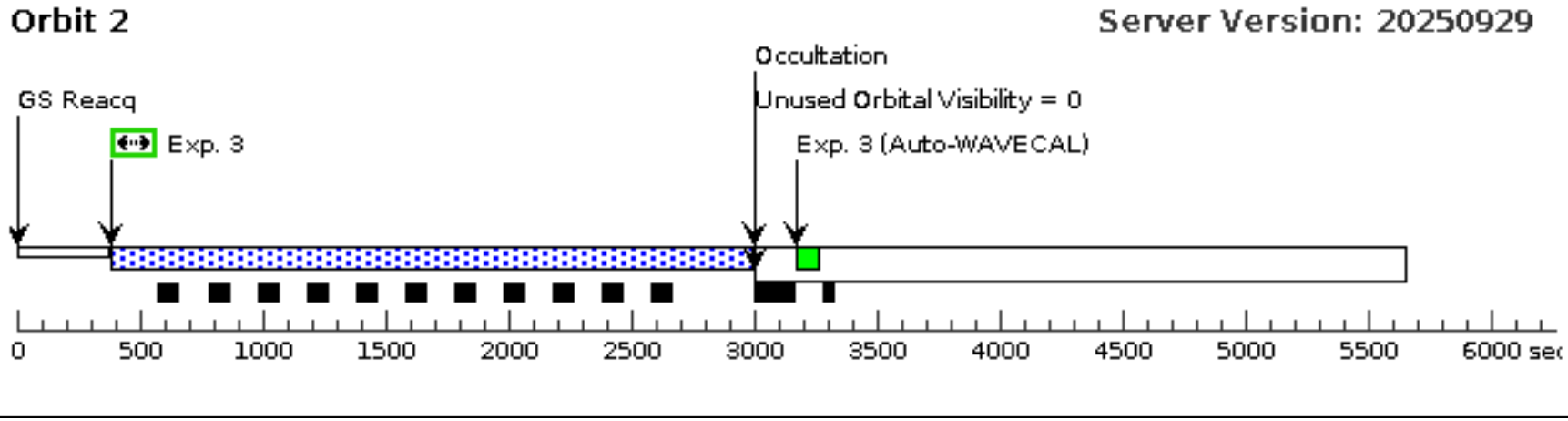
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.
Category=STAR
Description=[G V-IV]

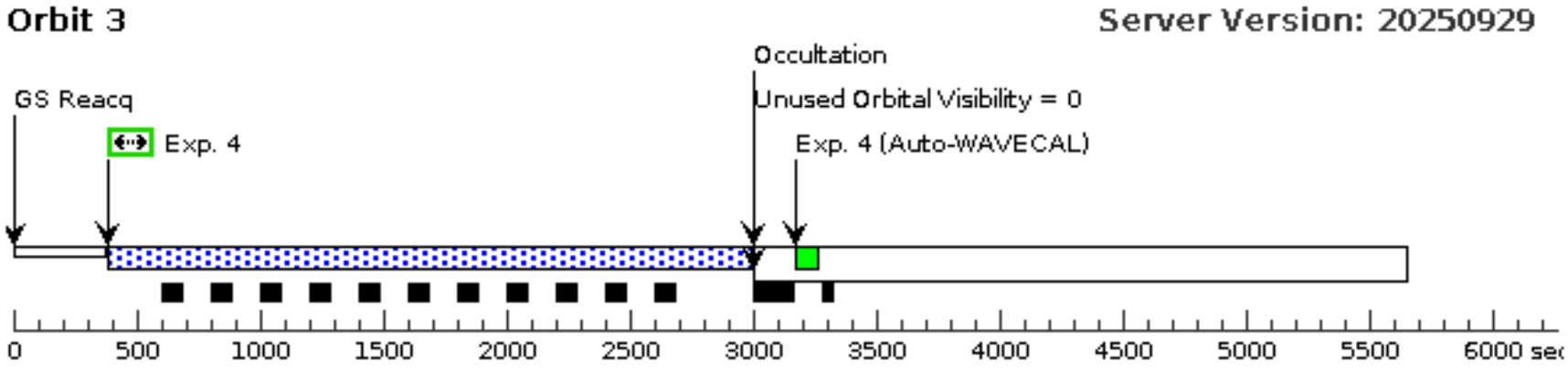
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(STIS.ta.2021499)	(1) HD-120411	STIS/CCD, ACQ, F28X50OII	MIRROR		PHASE 0.978 TO 0.989		1 Secs (1 Secs) *[==>]*	***[1]***
2	(STIS.sp.2278981)	(1) HD-120411	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=200	PHASE 0.978 TO 0.989		1719 Secs (1719 Secs) *[==>]*	***[1]***
3	(STIS.sp.2278981)	(1) HD-120411	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=200			2593 Secs (2593 Secs) *[==>]*	***[2]***
4	(STIS.sp.2278981)	(1) HD-120411	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=200			2568 Secs (2568 Secs) *[==>]*	***[3]***
5	(STIS.sp.2278981)	(1) HD-120411	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=200			2568 Secs (2568 Secs) *[==>]*	***[4]***
6	(STIS.sp.2278981)	(1) HD-120411	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=200			2568 Secs (2568 Secs) *[==>]*	***[5]***

Orbit Structure



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Exp. 4 (Auto-WAVECAL)
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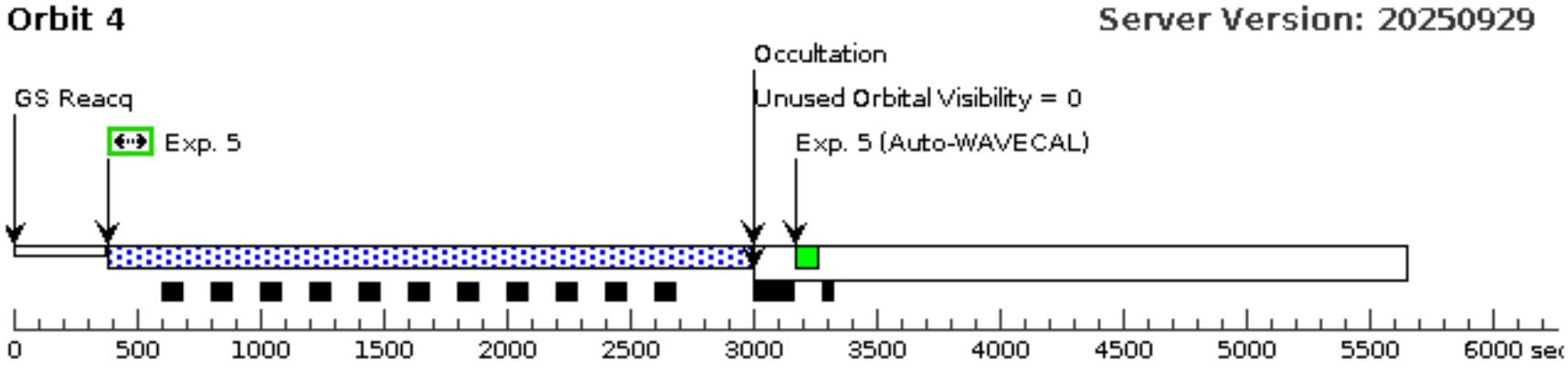
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Server Version: 20250929
Occultation
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Unused Orbital Visibility = 0
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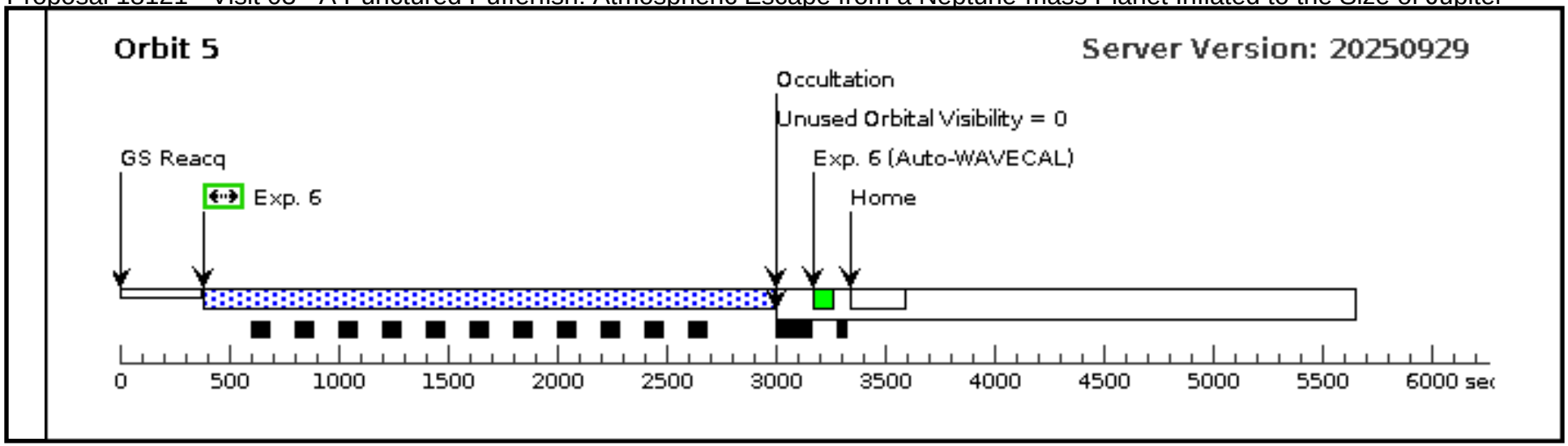
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Occultation
Unused Orbital Visibility = 0
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Exp. 6 (Auto-WAVECAL)
Exp. 6
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Visit

Proposal 18121, Visit 04, implementation Thu Feb 19 19:00:25 GMT 2026

Diagnostic Status: Warning

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

Special Requirements: Period 6.9594731 D AND ZERO-PHASE HJD2458604.02376

Diagnostics

(Visit 04) Warning (Orbit Planner): STIS TIME-TAG EXPOSURE GENERATES HEAVY DATA VOLUME

Fixed Targets

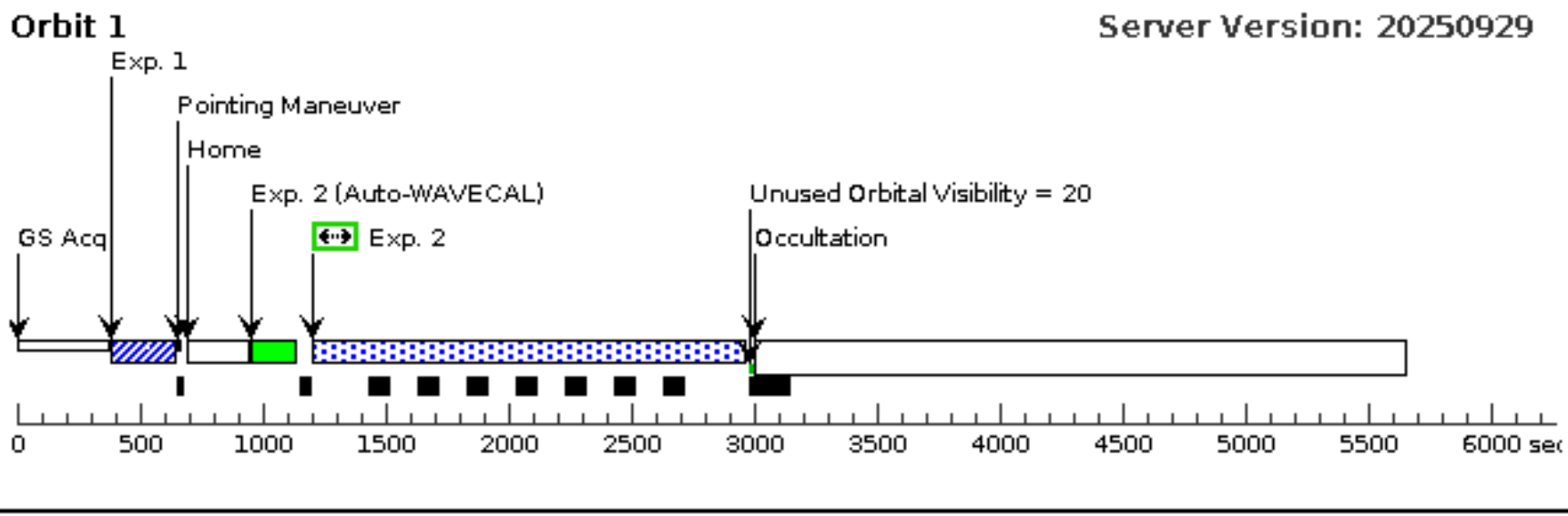
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	HD-120411	RA: 13 50 6.2797 (207.5261654d) Dec: -40 50 8.88 (-40.83580d) Equinox: J2000	Proper Motion RA: -28.907 mas/yr Proper Motion Dec: -22.24800005024008 mas/yr Parallax: 0.008017" Epoch of Position: 2000	V=9.8	Reference Frame: ICRS

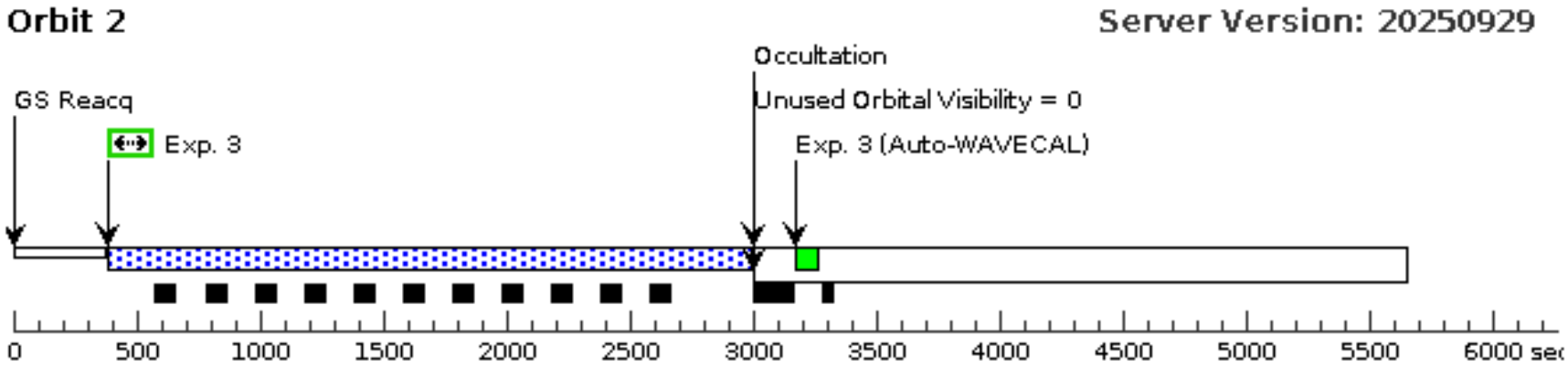
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.
Category=STAR
Description=[G V-IV]

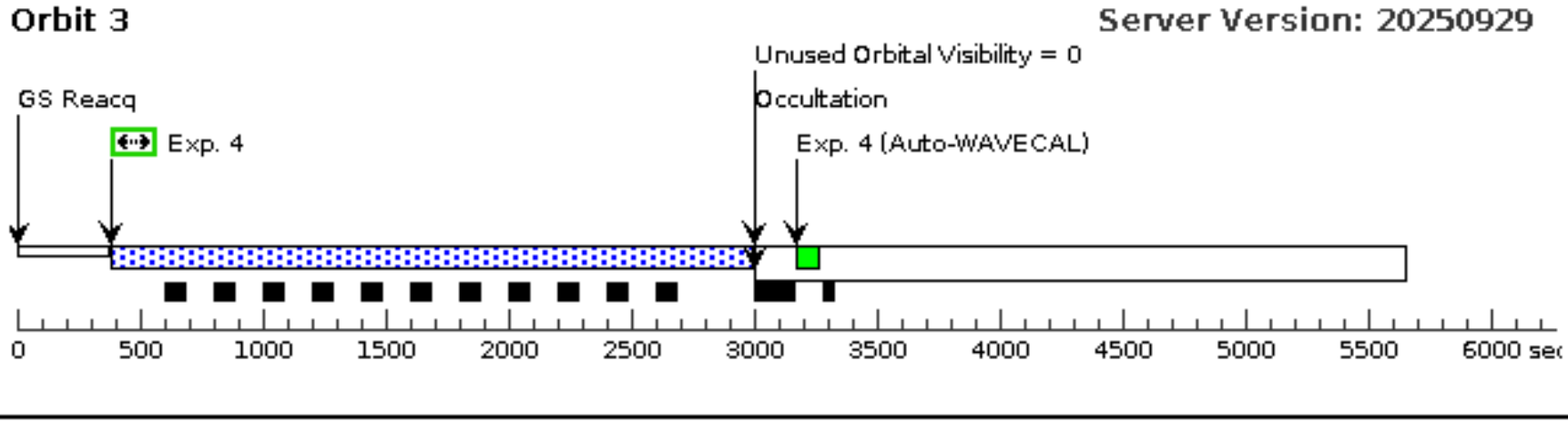
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(STIS.ta.2021499)	(1) HD-120411	STIS/CCD, ACQ, F28X50OII	MIRROR		PHASE 0.986 TO 1.0		1 Secs (1 Secs)	
								[==>]	***[1]***
2	(STIS.sp.2278981)	(1) HD-120411	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=200	PHASE 0.986 TO 1.0		1719 Secs (1719 Secs)	
								[==>]	***[1]***
3	(STIS.sp.2278981)	(1) HD-120411	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=200			2593 Secs (2593 Secs)	
								[==>]	***[2]***
4	(STIS.sp.2278981)	(1) HD-120411	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=200			2568 Secs (2568 Secs)	
								[==>]	***[3]***
5	(STIS.sp.2278981)	(1) HD-120411	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=200			2568 Secs (2568 Secs)	
								[==>]	***[4]***
6	(STIS.sp.2278981)	(1) HD-120411	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=200			2568 Secs (2568 Secs)	
								[==>]	***[5]***

Orbit Structure






Orbit 3
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Unused Orbital Visibility = 0
GS Reacq
Occultation
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Exp. 4 (Auto-WAVECAL)
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1000
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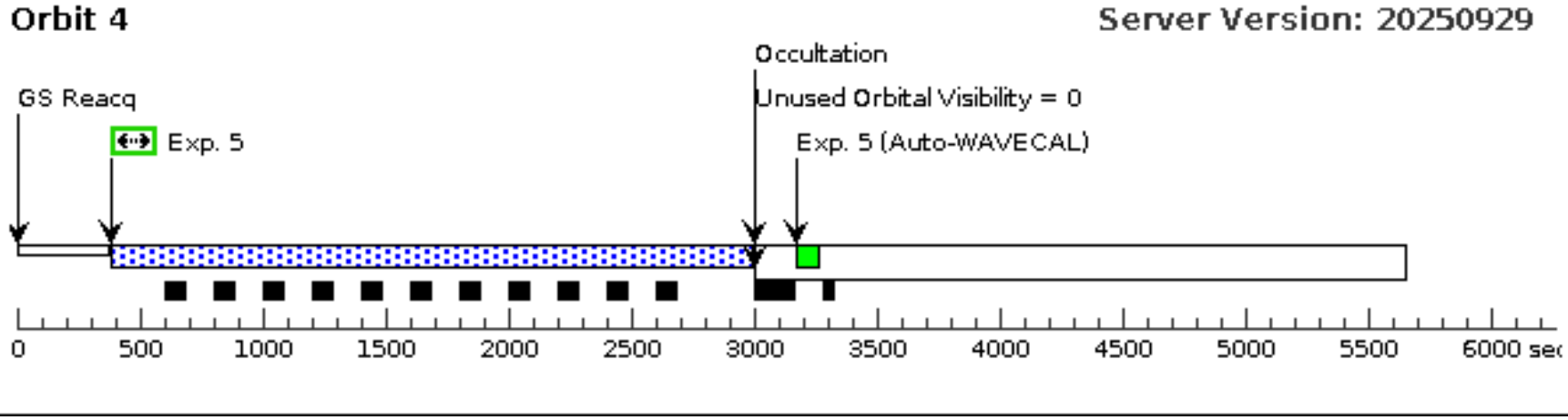
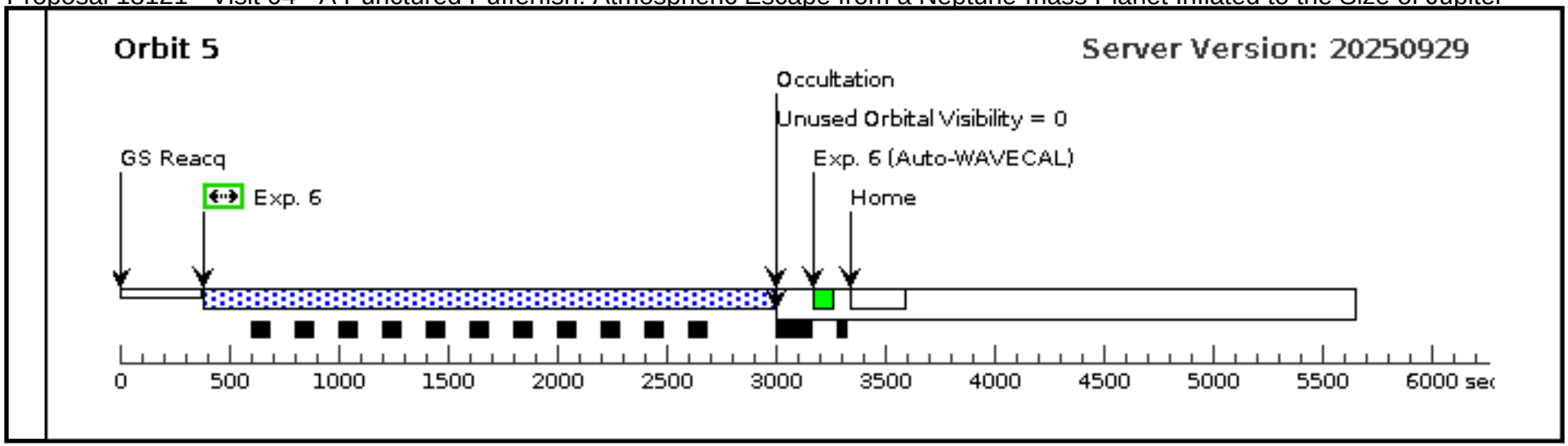
5500
6000 sec


Orbit 4
Server Version: 20250929
Occultation
GS Reacq
Unused Orbital Visibility = 0
Exp. 5
Exp. 5 (Auto-WAVECAL)
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec


Orbit 5
Server Version: 20250929
Occultation
Unused Orbital Visibility = 0
GS Reacq
Exp. 6 (Auto-WAVECAL)
Exp. 6
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec

Visit

Proposal 18121, Visit 05, implementation Thu Feb 19 19:00:25 GMT 2026

Diagnostic Status: Warning

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

Special Requirements: ORIENT 287D TO 293 D; Period 6.9594731 D AND ZERO-PHASE HJD2458604.02376

Diagnostics

(Visit 05) Warning (Orbit Planner): STIS TIME-TAG EXPOSURE GENERATES HEAVY DATA VOLUME

Fixed Targets

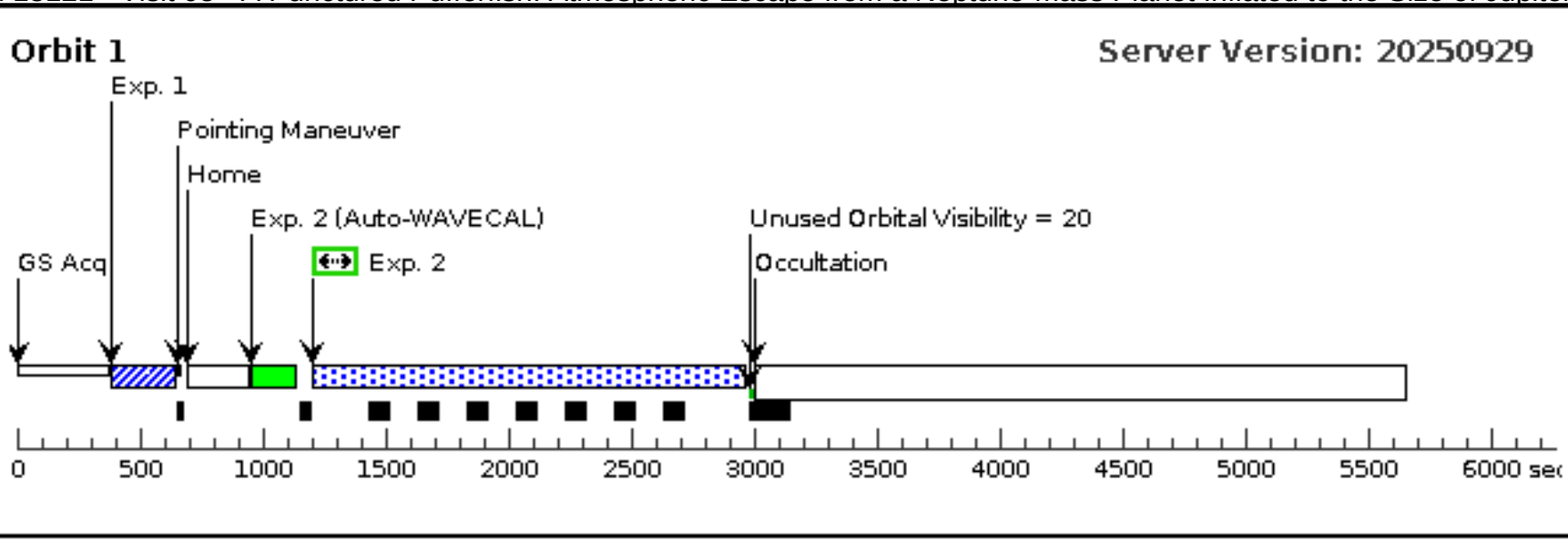
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	HD-120411	RA: 13 50 6.2797 (207.5261654d) Dec: -40 50 8.88 (-40.83580d) Equinox: J2000	Proper Motion RA: -28.907 mas/yr Proper Motion Dec: -22.24800005024008 mas/yr Parallax: 0.008017" Epoch of Position: 2000	V=9.8	Reference Frame: ICRS

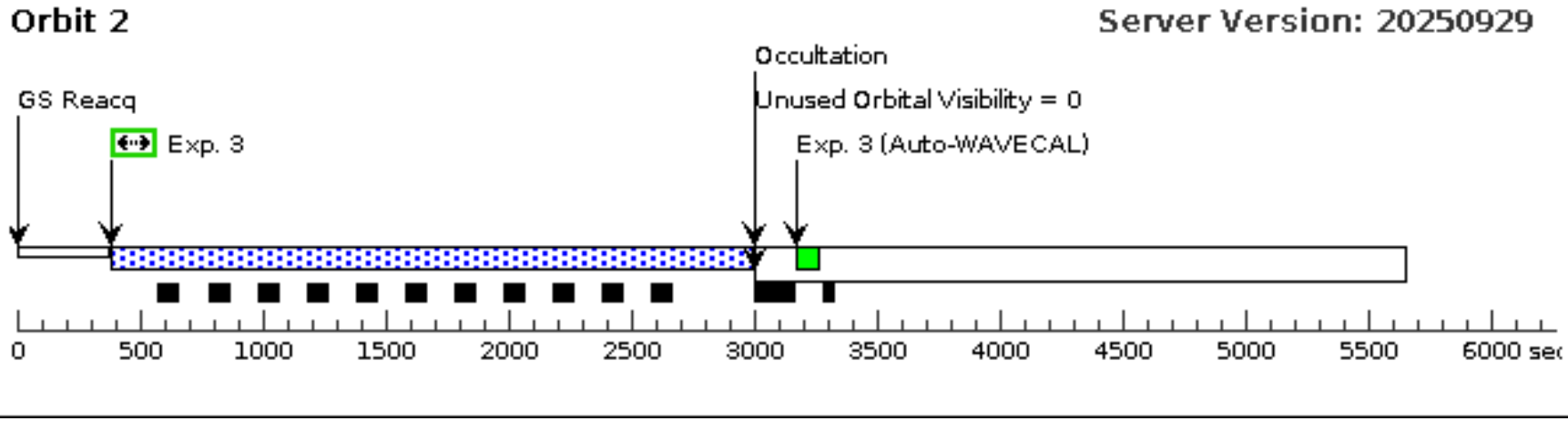
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database. SIMBAD listed proper motion for this target. When retrieving targets with PM from SIMBAD, APT requests the coordinates be calculated with an epoch of the year 2000. Do not modify this epoch. Always review coordinates using the Target Confirmation tool, which graphically displays the PM.
Category=STAR
Description=[G V-IV]

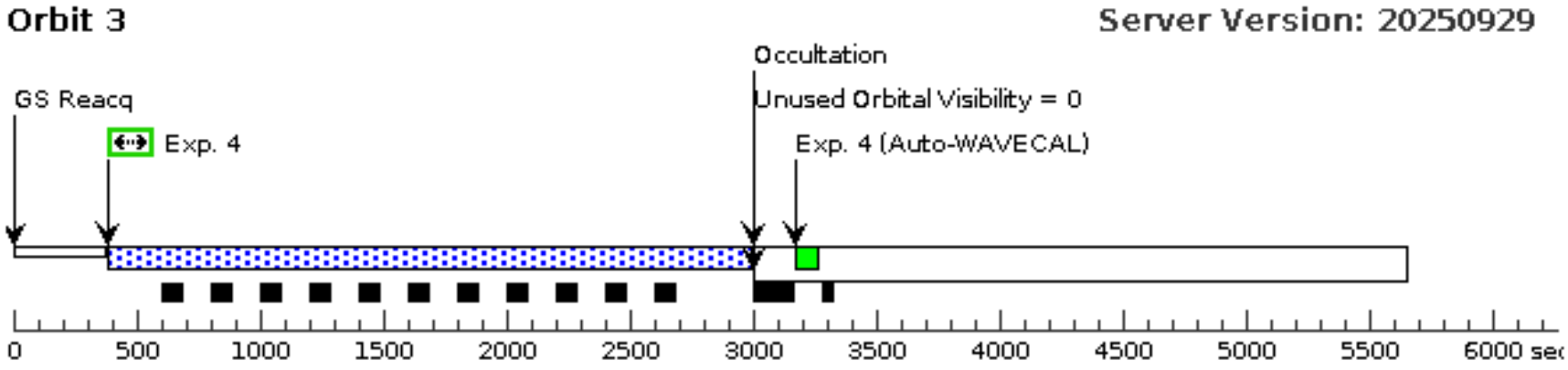
Exposures

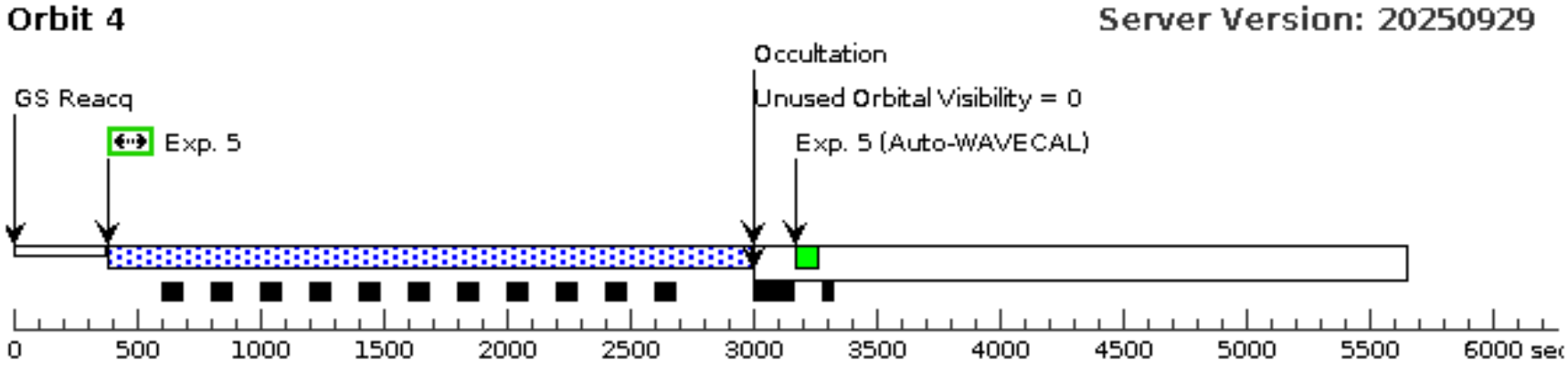
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	(STIS.ta.2021499)	(1) HD-120411	STIS/CCD, ACQ, F28X50OII	MIRROR		PHASE 0.0 TO 0.011		1 Secs (1 Secs) *[==>]*	***[1]***
2	(STIS.sp.2278981)	(1) HD-120411	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=200	PHASE 0.0 TO 0.011		1719 Secs (1719 Secs) *[==>]*	***[1]***
3	(STIS.sp.2278981)	(1) HD-120411	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=200			2593 Secs (2593 Secs) *[==>]*	***[2]***
4	(STIS.sp.2278981)	(1) HD-120411	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=200			2568 Secs (2568 Secs) *[==>]*	***[3]***
5	(STIS.sp.2278981)	(1) HD-120411	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=200			2568 Secs (2568 Secs) *[==>]*	***[4]***
6	(STIS.sp.2278981)	(1) HD-120411	STIS/NUV-MAMA, TIME-TAG, 52X2	G230L 2376 A	BUFFER-TIME=200			2568 Secs (2568 Secs) *[==>]*	***[5]***

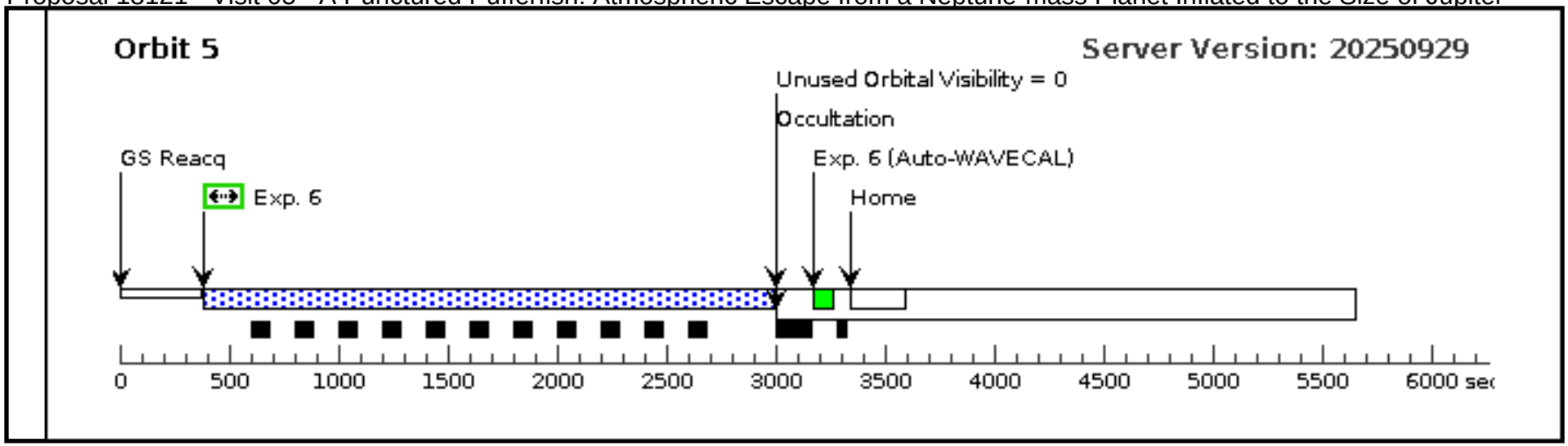
Orbit Structure






Orbit 3
Server Version: 20250929
Occultation
GS Reacq
Unused Orbital Visibility = 0
Exp. 4
Exp. 4 (Auto-WAVECAL)
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec


Orbit 4
Server Version: 20250929
Occultation
GS Reacq
Unused Orbital Visibility = 0
Exp. 5
Exp. 5 (Auto-WAVECAL)
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec


Orbit 5
Server Version: 20250929
Unused Orbital Visibility = 0
Occultation
GS Reacq
Exp. 6
Exp. 6 (Auto-WAVECAL)
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000 sec