17152 - Probing for the extended exosphere of a 100 Myr mini-Neptune

Cycle: 30, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

Name	*Institution*
Dr. George Zhou (PI) (Contact)	**University of Southern Queensland**
Dr. Chelsea Huang (CoI)	University of Southern Queensland
Dr. Elisabeth R. Newton (CoI) (AdminUSPI)	Dartmouth College
Keighley Elizabeth Rockcliffe (CoI)	Dartmouth College
Duncan Wright (CoI)	University of Southern Queensland
Nataliea Lowson (CoI)	University of Southern Queensland
Prof. Rob Wittenmyer (CoI)	University of Southern Queensland
Dr. Laura C Mayorga (CoI)	The Johns Hopkins University Applied Physics Laboratory

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) HD-178085 WAVE	STIS/CCD STIS/FUV-MAMA	5	19-Feb-2024 23:00:18.0	yes
02	(1) HD-178085 WAVE	STIS/CCD STIS/FUV-MAMA	5	19-Feb-2024 23:00:19.0	yes
03	(1) HD-178085 WAVE	STIS/CCD STIS/FUV-MAMA	5	19-Feb-2024 23:00:21.0	yes

15 Total Orbits Used

ABSTRACT

Photoevaporation shapes the Neptunes and super-Earths that we find in abundance around Sun-like stars. We will use STIS to probe for the escaping hydrogen exosphere of a mini-Neptune that is undergoing run-away mass-loss. HIP 94235b is a newly discovered planet around a 100 Myr old X-ray active Sun-like star in the AB Doradus moving group. It lies on the edge of the sub-Neptune desert that is thought to be sculpted by early photoevaporation. Unlike previous planets surveyed by HST with detected Lyman alpha escaping atmospheres, HIP 94235b is younger than its run-away mass-loss timescale, and is in the process of shedding the majority of its primordial hydrogen helium envelope. We will observe three Lyman alpha transits of HIP 94235b with STIS, and search for signatures of a significant neutral hydrogen exopshere. We expect transits with >10% transits to be detectable at high significance despite the stellar activity expected for such young stars. Comparing the true mass-loss rate against the energy-limited estimates will help us better understand the factors that govern the early evaporation history of young Neptunes. The extreme XUV environment HIP 94235b resides in will also help guide models of interactions between the stellar wind and escaping hydrogen atmospheres, crucial in interpreting all Lyman alpha transit results from past HST observations.

OBSERVING DESCRIPTION

Our program will observe three transits of HD178085b with STIS MAMA-FUV G140M 1222A to measure the planet's radius in Lyman alpha. Each visit will include five consecutive orbits. Visits 1 and 2 are timed to allow for orbit 1 to occur pre-ingress to establish the pre-transit baseline, orbits 2-3 in-transit, orbits 4-5 out of transit. Visit 3 is timed such that orbits 1-2 occur pre-ingress, 3-4 in-transit, and orbit 5 post-egress. Our timing requriement for the first exposure includes a 60 minute window to allow for scheduling flexibility. We can accept a wider phase window (upto 1 orbit) if required. With three visits, we are confident that the transit will be well sampled at the end of the program.

The first exposure of each visit includes an ACQ and an ACQ/peak exposure. Each orbit include a single science exposure and a wavecal exposure, with the science exposure of the first orbit made shorter to allow for acquisition.

Reduced gyro mode will impact the schedulability of the observations. We do not anticipate science impacts from 2-wheeled operations.

Proposal 17152 - Visit 01 - Probing for the extended exosphere of a 100 Myr mini-Neptune

Visit

Proposal 17152, Visit 01, completed Tue Feb 20 04:00:22 GMT 2024

Diagnostic Status: Warning

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

Special Requirements: SCHED 100%; Period 7.713057 D AND ZERO-PHASE HJD 2459037.8704

Diagnostics

(Visit 01) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(Visit 01) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(Visit 01) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(Visit 01) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(Visit 01) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

Fixed Targets

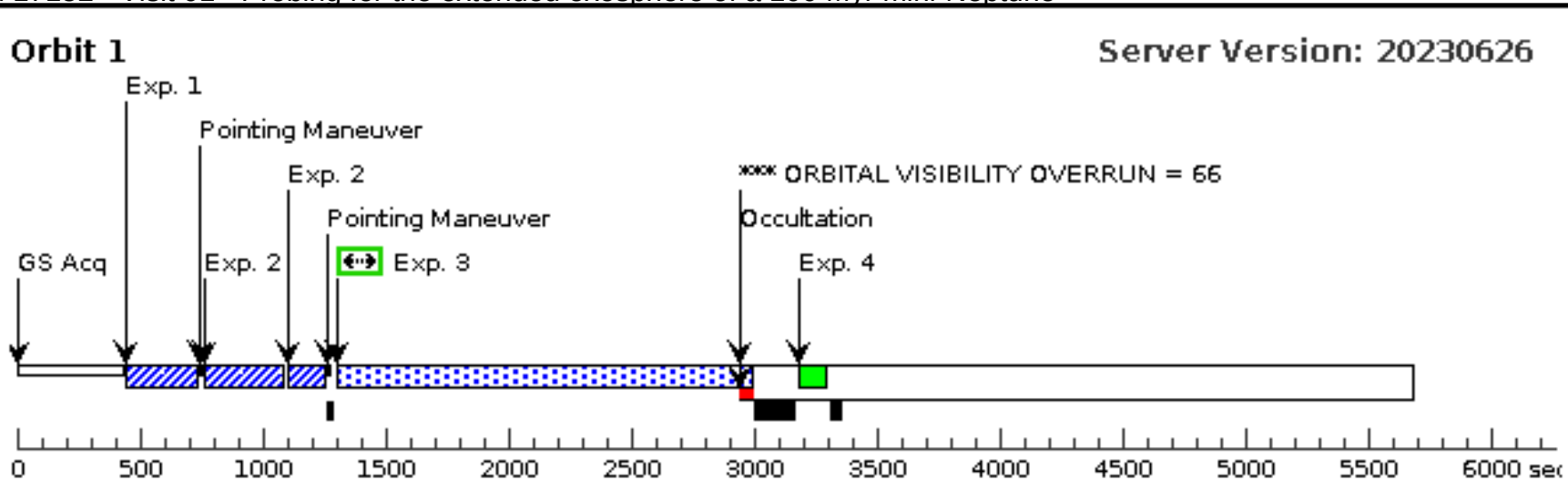
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	HD-178085 Alt Name1: HIP94235 Alt Name2: TIC464646604	RA: 19 10 57.8700 (287.7411250d) Dec: -60 16 21.49 (-60.27264d) Equinox: J2000	Proper Motion RA: 0.0015638398084429446 sec of time/yr Proper Motion Dec: -0.10083599997869896 arcsec/yr Parallax: 0.017080687478876836" Epoch of Position: 2015.5 Radial Velocity: 9.470981 km/sec	V=8.347+/-0.03	Reference Frame: ICRS

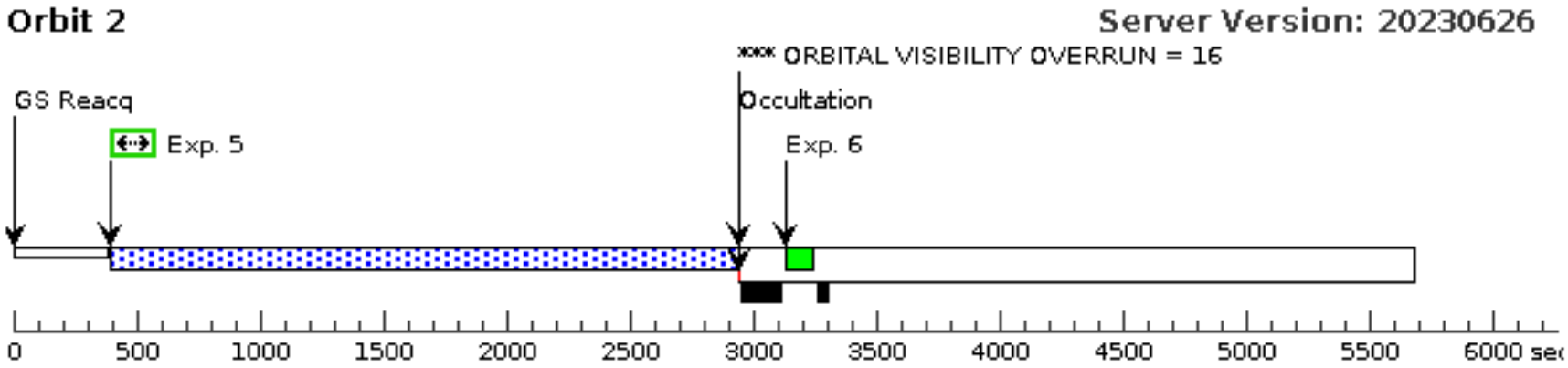
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=STAR
Description=[EXTRA-SOLAR PLANET, G V-IV]
Extended=NO

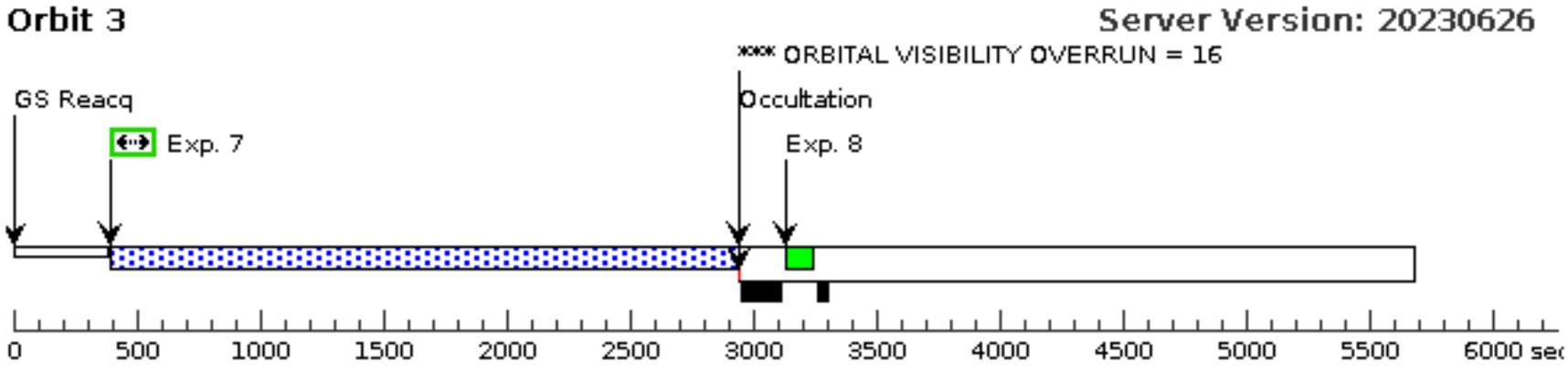
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ (STIS.ta.1808993)	(1) HD-178085	STIS/CCD, ACQ, F28X50OIII	MIRROR		PHASE 0.9829 TO 0.9884		5 Secs (5 Secs) *[==>]*	*[1]*
2	ACQ/PEAK (STIS.ta.1808998)	(1) HD-178085	STIS/CCD, ACQ/PEAK, 0.2X0.05ND	MIRROR				1.5 Secs (1.5 Secs) *[==>]*	*[1]*
3	SCIENCE (STIS.sp.1809002)	(1) HD-178085	STIS/FUV-MAMA, TIME-TAG, 52X0.1	G140M 1222 A	WAVECAL=NO; BUFFER-TIME=1500			1350 Secs (1528 Secs) *[==>1528.0 Secs]*	*[1]*
4	WAVECAL	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.1	G140M 1222 A				*[==>]*	*[1]*
5	SCIENCE (STIS.sp.1809133)	(1) HD-178085	STIS/FUV-MAMA, TIME-TAG, 52X0.1	G140M 1222 A	WAVECAL=NO; BUFFER-TIME=1300			2536 Secs (2536 Secs) *[==>]*	*[2]*
6	WAVECAL	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.1	G140M 1222 A				*[==>]*	*[2]*
7	SCIENCE (STIS.sp.1809133)	(1) HD-178085	STIS/FUV-MAMA, TIME-TAG, 52X0.1	G140M 1222 A	WAVECAL=NO; BUFFER-TIME=1300			2536 Secs (2536 Secs) *[==>]*	*[3]*
8	WAVECAL	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.1	G140M 1222 A				*[==>]*	*[3]*
9	SCIENCE (STIS.sp.1809133)	(1) HD-178085	STIS/FUV-MAMA, TIME-TAG, 52X0.1	G140M 1222 A	WAVECAL=NO; BUFFER-TIME=1300			2536 Secs (2536 Secs) *[==>]*	*[4]*
10	WAVECAL	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.1	G140M 1222 A				*[==>]*	*[4]*
11	SCIENCE (STIS.sp.1809133)	(1) HD-178085	STIS/FUV-MAMA, TIME-TAG, 52X0.1	G140M 1222 A	WAVECAL=NO; BUFFER-TIME=1300			2536 Secs (2536 Secs) *[==>]*	*[5]*
12	WAVECAL	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.1	G140M 1222 A				*[==>]*	*[5]*

Orbit Structure



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Occultation
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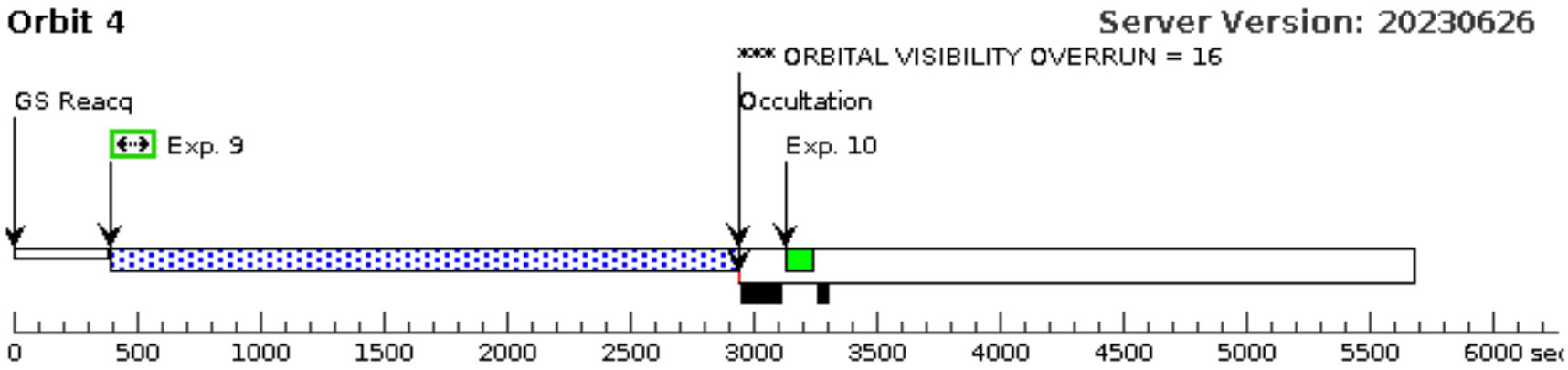
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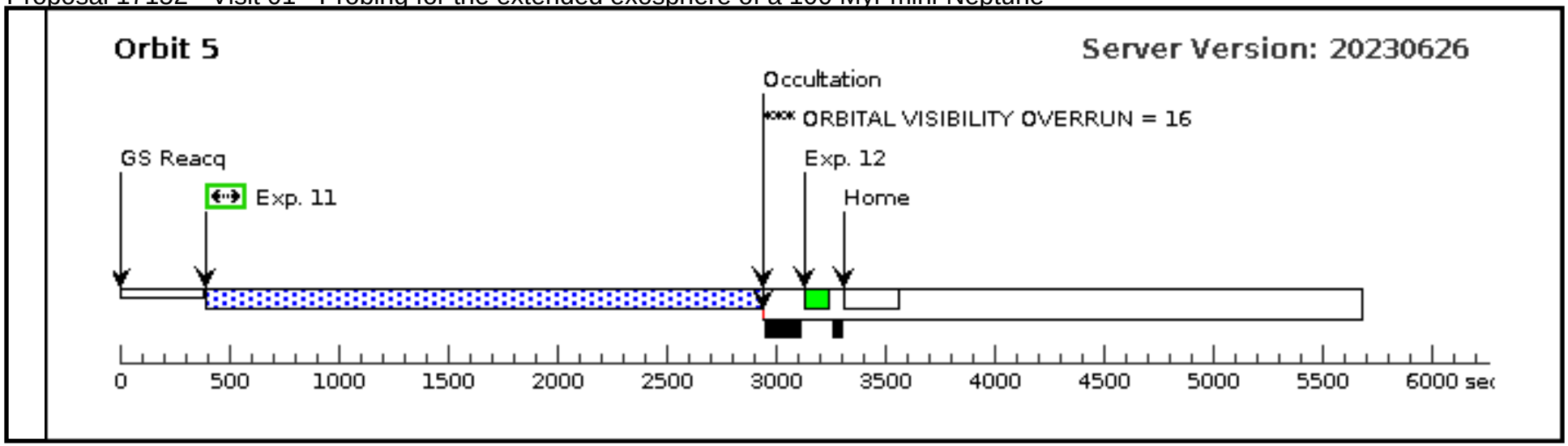
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Server Version: 20230626
Occultation
*** ORBITAL VISIBILITY OVERRUN = 16
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Exp. 12
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6000 sec

Proposal 17152 - Visit 02 - Probing for the extended exosphere of a 100 Myr mini-Neptune

Visit

Proposal 17152, Visit 02, completed Tue Feb 20 04:00:22 GMT 2024

Diagnostic Status: Warning

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

Special Requirements: SCHED 100%; Period 7.713057 D AND ZERO-PHASE HJD 2459037.8704

Diagnostics

(Visit 02) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(Visit 02) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(Visit 02) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(Visit 02) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

(Visit 02) Warning (Orbit Planner): ORBITAL VISIBILITY OVERRUN

Fixed Targets

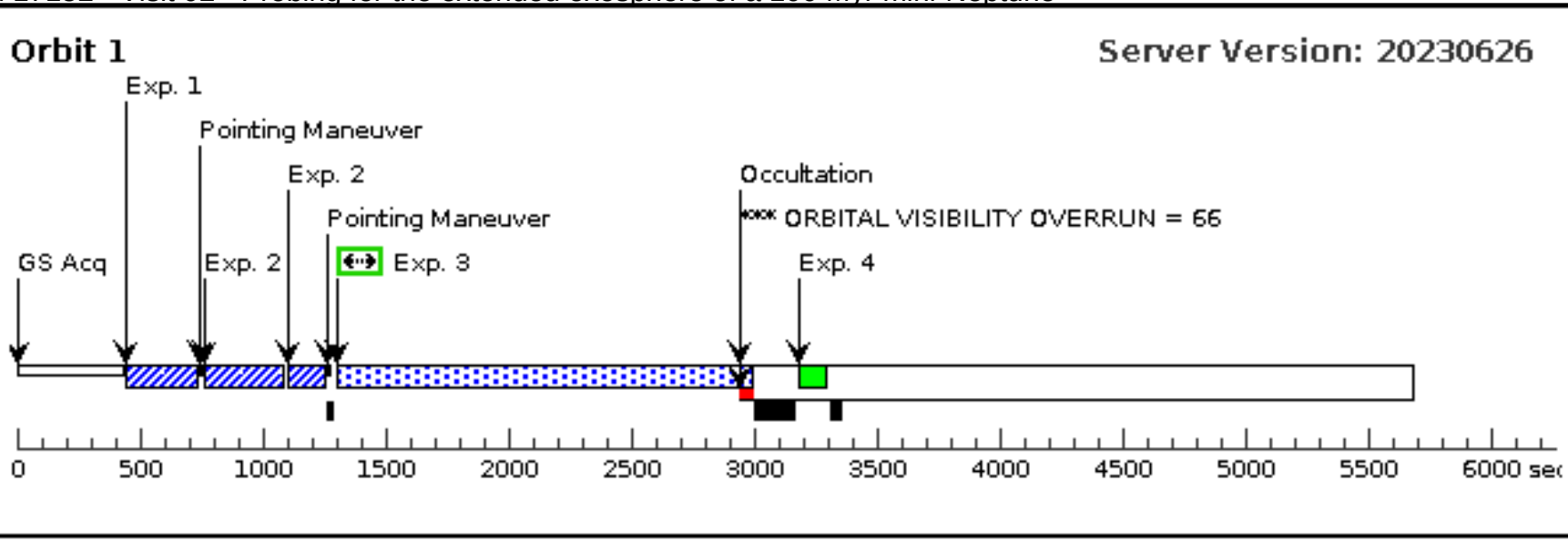
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	HD-178085 Alt Name1: HIP94235 Alt Name2: TIC464646604	RA: 19 10 57.8700 (287.7411250d) Dec: -60 16 21.49 (-60.27264d) Equinox: J2000	Proper Motion RA: 0.0015638398084429446 sec of time/yr Proper Motion Dec: -0.10083599997869896 arcsec/yr Parallax: 0.017080687478876836" Epoch of Position: 2015.5 Radial Velocity: 9.470981 km/sec	V=8.347+/-0.03	Reference Frame: ICRS

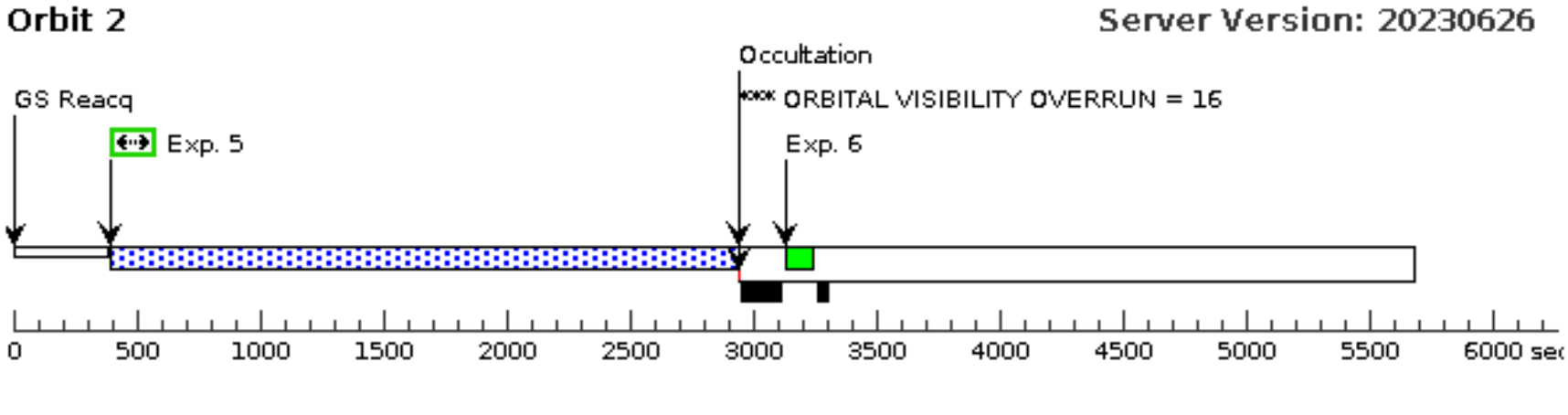
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=STAR
Description=[EXTRA-SOLAR PLANET, G V-IV]
Extended=NO

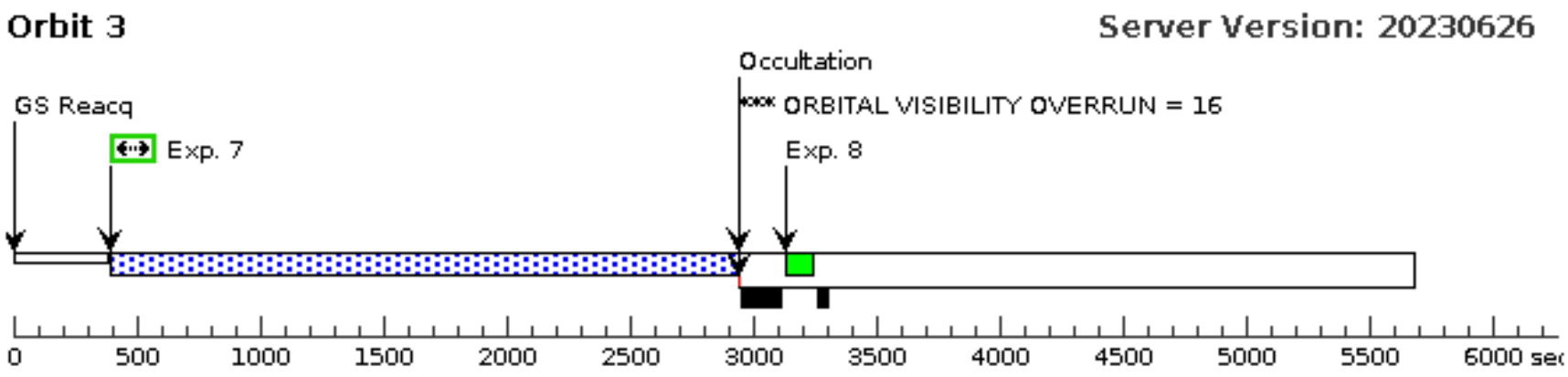
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ (STIS.ta.1808993)	(1) HD-178085	STIS/CCD, ACQ, F28X50OIII	MIRROR		PHASE 0.9829 TO 0.9884		5 Secs (5 Secs) *[==>]*	*[1]*
2	ACQ/PEAK (STIS.ta.1808998)	(1) HD-178085	STIS/CCD, ACQ/PEAK, 0.2X0.05ND	MIRROR				1.5 Secs (1.5 Secs) *[==>]*	*[1]*
3	SCIENCE (STIS.sp.1809002)	(1) HD-178085	STIS/FUV-MAMA, TIME-TAG, 52X0.1	G140M 1222 A	WAVECAL=NO; BUFFER-TIME=1500			1350 Secs (1528 Secs) *[==>1528.0 Secs]*	*[1]*
4	WAVECAL	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.1	G140M 1222 A				*[==>]*	*[1]*
5	SCIENCE (STIS.sp.1809133)	(1) HD-178085	STIS/FUV-MAMA, TIME-TAG, 52X0.1	G140M 1222 A	WAVECAL=NO; BUFFER-TIME=1300			2536 Secs (2536 Secs) *[==>]*	*[2]*
6	WAVECAL	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.1	G140M 1222 A				*[==>]*	*[2]*
7	SCIENCE (STIS.sp.1809133)	(1) HD-178085	STIS/FUV-MAMA, TIME-TAG, 52X0.1	G140M 1222 A	WAVECAL=NO; BUFFER-TIME=1300			2536 Secs (2536 Secs) *[==>]*	*[3]*
8	WAVECAL	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.1	G140M 1222 A				*[==>]*	*[3]*
9	SCIENCE (STIS.sp.1809133)	(1) HD-178085	STIS/FUV-MAMA, TIME-TAG, 52X0.1	G140M 1222 A	WAVECAL=NO; BUFFER-TIME=1300			2536 Secs (2536 Secs) *[==>]*	*[4]*
10	WAVECAL	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.1	G140M 1222 A				*[==>]*	*[4]*
11	SCIENCE (STIS.sp.1809133)	(1) HD-178085	STIS/FUV-MAMA, TIME-TAG, 52X0.1	G140M 1222 A	WAVECAL=NO; BUFFER-TIME=1300			2536 Secs (2536 Secs) *[==>]*	*[5]*
12	WAVECAL	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.1	G140M 1222 A				*[==>]*	*[5]*

Orbit Structure



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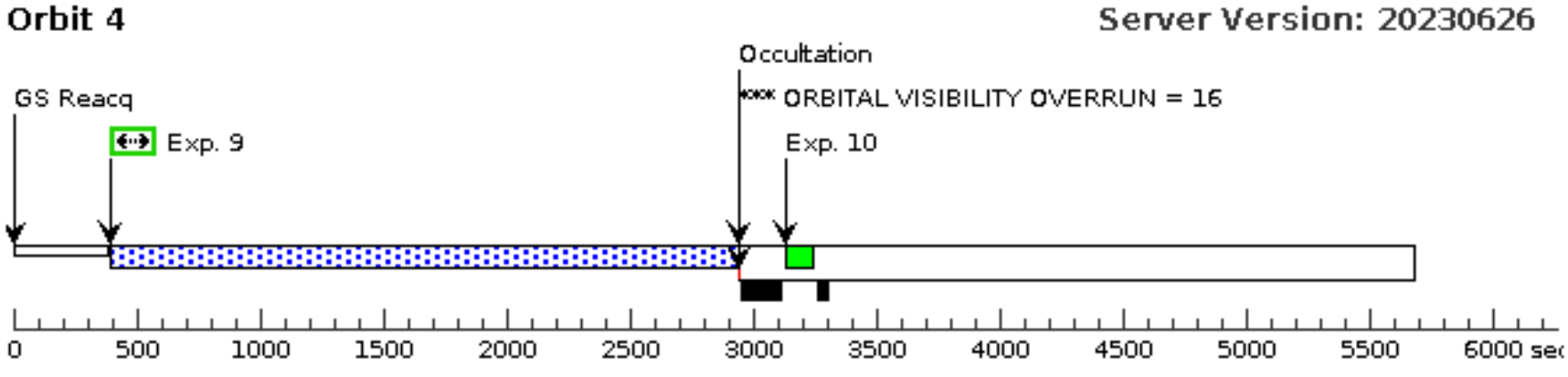
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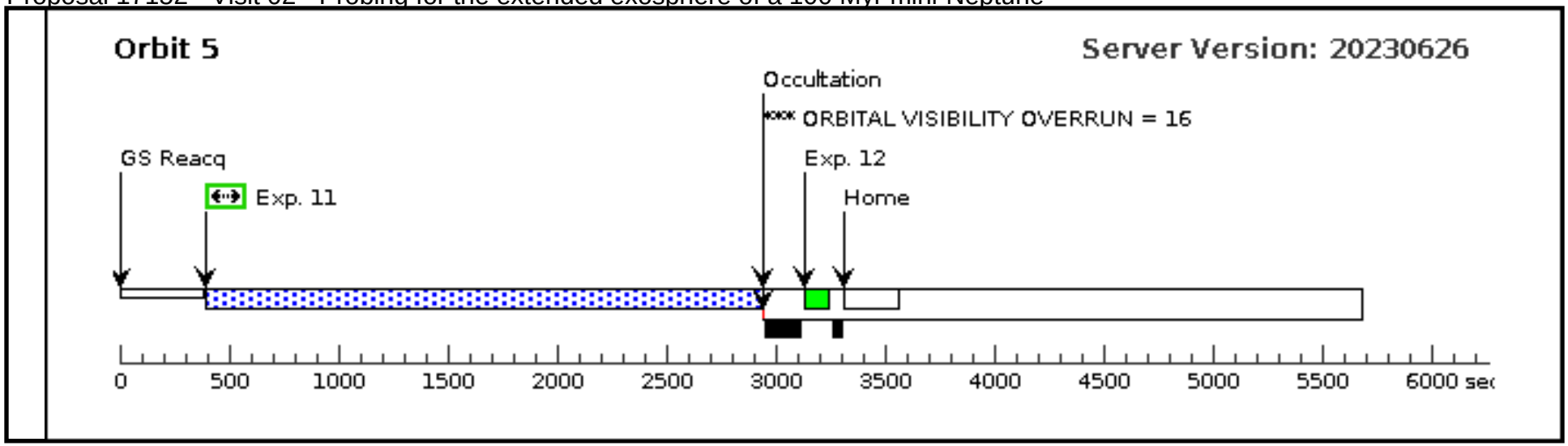
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Server Version: 20230626
Occultation
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Exp. 12
Home
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6000 sec

Visit

Proposal 17152, Visit 03, implementation

Tue Feb 20 04:00:22 GMT 2024

Diagnostic Status: No Diagnostics

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

Special Requirements: SCHED 100%

Fixed Targets

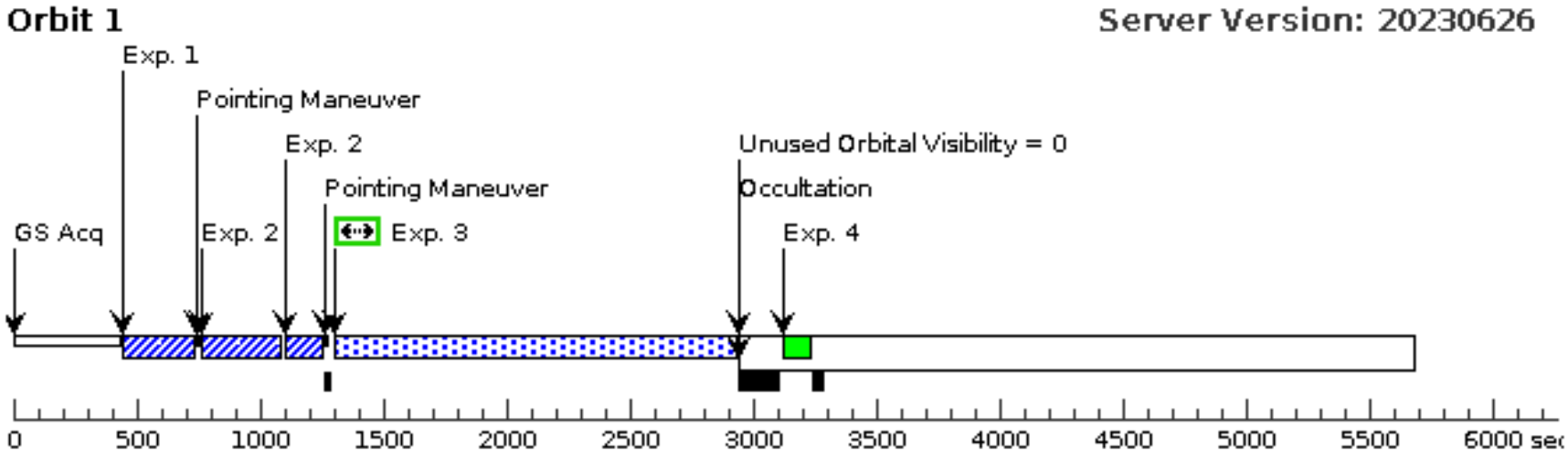
#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	HD-178085 Alt Name1: HIP94235 Alt Name2: TIC464646604	RA: 19 10 57.8700 (287.7411250d) Dec: -60 16 21.49 (-60.27264d) Equinox: J2000	Proper Motion RA: 0.0015638398084429446 sec of time/yr Proper Motion Dec: -0.10083599997869896 arcsec/yr Parallax: 0.017080687478876836" Epoch of Position: 2015.5 Radial Velocity: 9.470981 km/sec	V=8.347+/-0.03	Reference Frame: ICRS

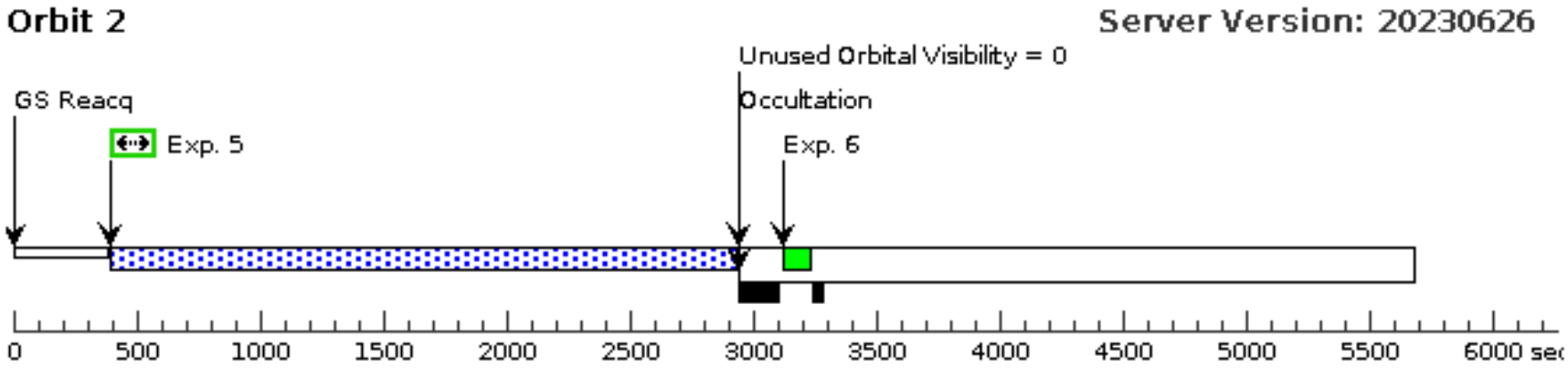
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=STAR
Description=[EXTRA-SOLAR PLANET, G V-IV]
Extended=NO

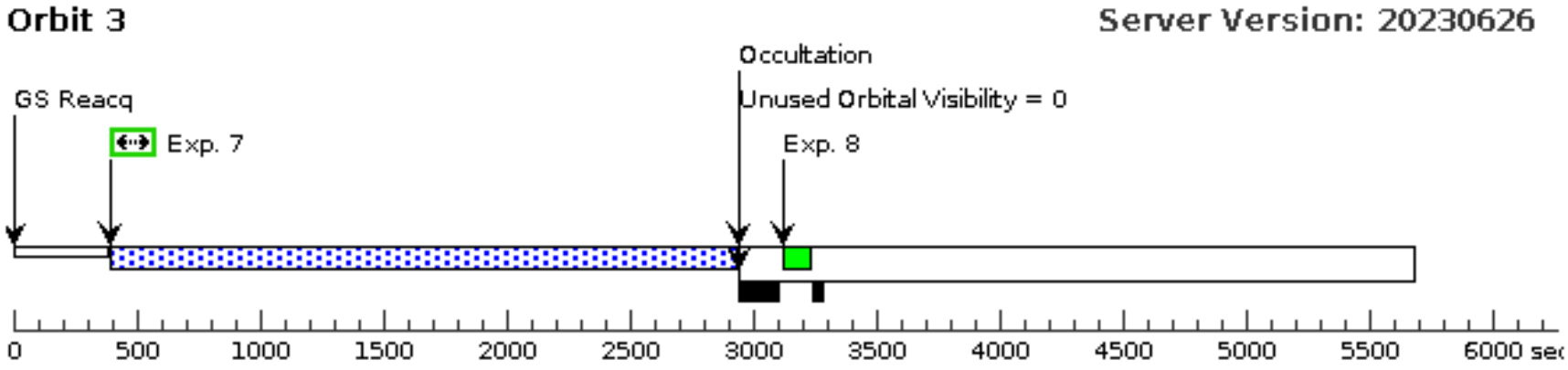
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ (STIS.ta.1808993)	(1) HD-178085	STIS/CCD, ACQ, F28X50OIII	MIRROR				5 Secs (5 Secs) *[==>]*	***[1]***
2	ACQ/PEAK (STIS.ta.1808998)	(1) HD-178085	STIS/CCD, ACQ/PEAK, 0.2X0.05ND	MIRROR				1.5 Secs (1.5 Secs) *[==>]*	***[1]***
3	SCIENCE (STIS.sp.1809002)	(1) HD-178085	STIS/FUV-MAMA, TIME-TAG, 52X0.1	G140M 1222 A	WAVECAL=NO; BUFFER-TIME=1500			1350 Secs (1462 Secs) *[==>1462.0 Secs]*	***[1]***
4	WAVECAL	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.1	G140M 1222 A				*[==>]*	***[1]***
5	SCIENCE (STIS.sp.1809133)	(1) HD-178085	STIS/FUV-MAMA, TIME-TAG, 52X0.1	G140M 1222 A	WAVECAL=NO; BUFFER-TIME=1300			2536 Secs (2520 Secs) *[==>2520.0 Secs]*	***[2]***
6	WAVECAL	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.1	G140M 1222 A				*[==>]*	***[2]***
7	SCIENCE (STIS.sp.1809133)	(1) HD-178085	STIS/FUV-MAMA, TIME-TAG, 52X0.1	G140M 1222 A	WAVECAL=NO; BUFFER-TIME=1300			2536 Secs (2520 Secs) *[==>2520.0 Secs]*	***[3]***
8	WAVECAL	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.1	G140M 1222 A				*[==>]*	***[3]***
9	SCIENCE (STIS.sp.1809133)	(1) HD-178085	STIS/FUV-MAMA, TIME-TAG, 52X0.1	G140M 1222 A	WAVECAL=NO; BUFFER-TIME=1300			2536 Secs (2520 Secs) *[==>2520.0 Secs]*	***[4]***
10	WAVECAL	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.1	G140M 1222 A				*[==>]*	***[4]***
11	SCIENCE (STIS.sp.1809133)	(1) HD-178085	STIS/FUV-MAMA, TIME-TAG, 52X0.1	G140M 1222 A	WAVECAL=NO; BUFFER-TIME=1300			2536 Secs (2520 Secs) *[==>2520.0 Secs]*	***[5]***
12	WAVECAL	WAVE	STIS/FUV-MAMA, ACCUM, 52X0.1	G140M 1222 A				*[==>]*	***[5]***

Orbit Structure



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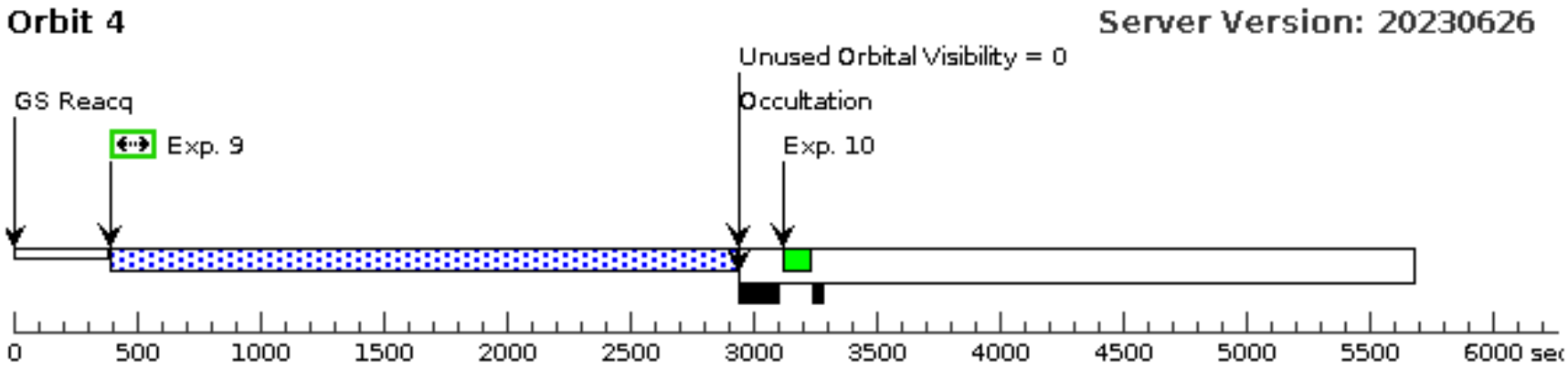
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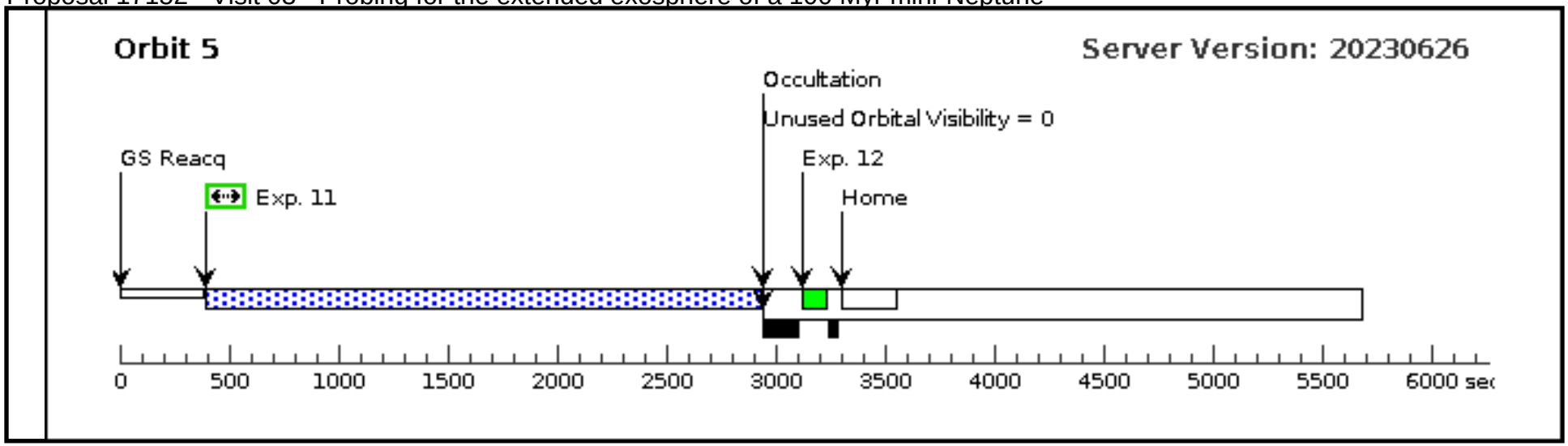
Orbit 5
Server Version: 20230626
Occultation
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Exp. 12
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