



18357 - Domain expansion: Detecting the first extrasolar UV aurora with deep COS observations

Cycle: 34, Proposal Category: GO

(UV Initiative)

(Availability Mode: SUPPORTED)

INVESTIGATORS

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Dr. Joshua Kammer (CoI)	Southwest Research Institute

VISITS

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
01	(1) SIMP0136 (2) SIMP0136-OFFSET	COS/FUV COS/NUV	3	03-Aug-2026 14:01:33.0	yes
02	(1) SIMP0136 (2) SIMP0136-OFFSET	COS/FUV COS/NUV	3	03-Aug-2026 14:01:34.0	yes
03	(1) SIMP0136 (2) SIMP0136-OFFSET	COS/FUV COS/NUV	3	03-Aug-2026 14:01:34.0	yes
04	(1) SIMP0136 (2) SIMP0136-OFFSET	COS/FUV COS/NUV	3	03-Aug-2026 14:01:35.0	yes

<i>Visit</i>	<i>Targets used in Visit</i>	<i>Configurations used in Visit</i>	<i>Orbits Used</i>	<i>Last Orbit Planner Run</i>	<i>OP Current with Visit?</i>
05	(1) SIMP0136 (2) SIMP0136-OFFSET	COS/FUV COS/NUV	3	03-Aug-2026 14:01:35.0	yes

15 Total Orbits Used

ABSTRACT

Aurora is the main thermodynamic driver in the upper atmospheres of our magnetized solar system planets, but its study here is complicated by the influence of an unpredictable solar wind. Free-floating brown dwarfs are powerful auroral engines suitable for testing aurora physics without this interference. However, existing radio and infrared observations cannot directly probe the results of the auroral precipitation process: for this the FUV emission produced by electrons impacting the hydrogen atmosphere is required. The FUV is the main emission mechanism and diagnostic tool for solar system aurora, and without this component the study of brown dwarf aurorae has reached a natural barrier. We propose deep observations of an extremely well studied auroral brown dwarf with HST/COS, in order to detect and study an extrasolar aurora in FUV for the first time. Because of the extensive atmospheric modelling for this target, we will be able to test multiple auroral luminosity predictions, compare it to Jupiter-based expectations, and measure the energetics and depth of the electron impact process. This discovery would have wide-ranging impacts in auroral, planetary, and brown dwarf physics at large, as well as permanently expanding the domain of UV astronomy.

OBSERVING DESCRIPTION

We request 15 orbits of HST/COS at G140L/800 to observe the aurora of SIMP J0136+0933 in the far-UV. The emission bands of interest are the Werner band at 95-130 nm and the Lyman band at 155-165 nm. FUV aurora has never been observed outside the solar system and the target is not known to be a UV source. There is a suitable NUV source for blind offset acquisition located 30" south of the target.

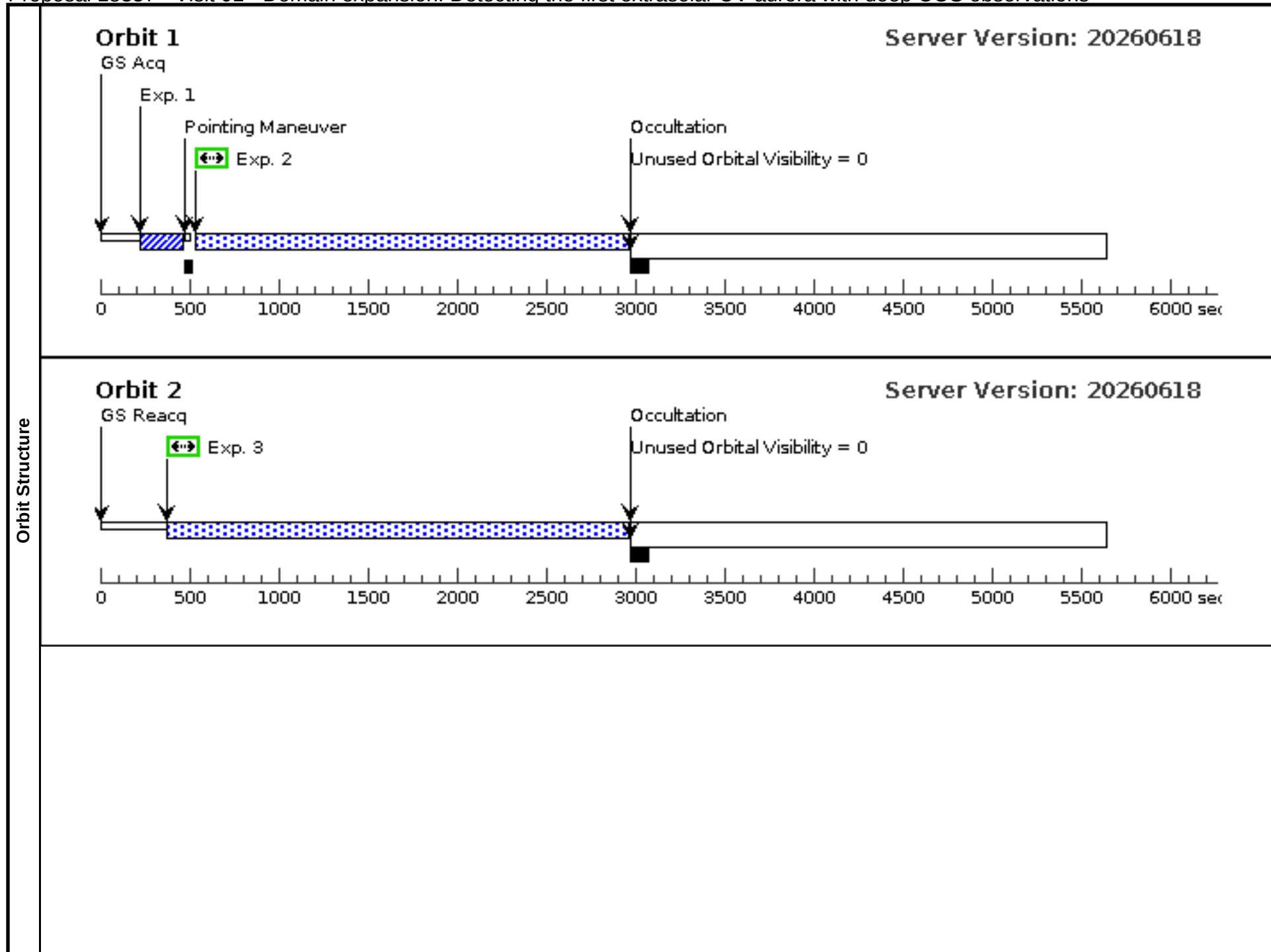
SCHEDULING: Program is divided into five 3-orbit visits that need to be executed within the span of about one week. There is a near-perfect 3:2 ratio between the target's rotation period and the HST's orbital period, so any 3 consecutive orbits ensures full phase coverage over 2 consecutive rotations. The constraint is so that the visits can be accurately phase folded: the target accumulates one radian of rotation phase error per week.

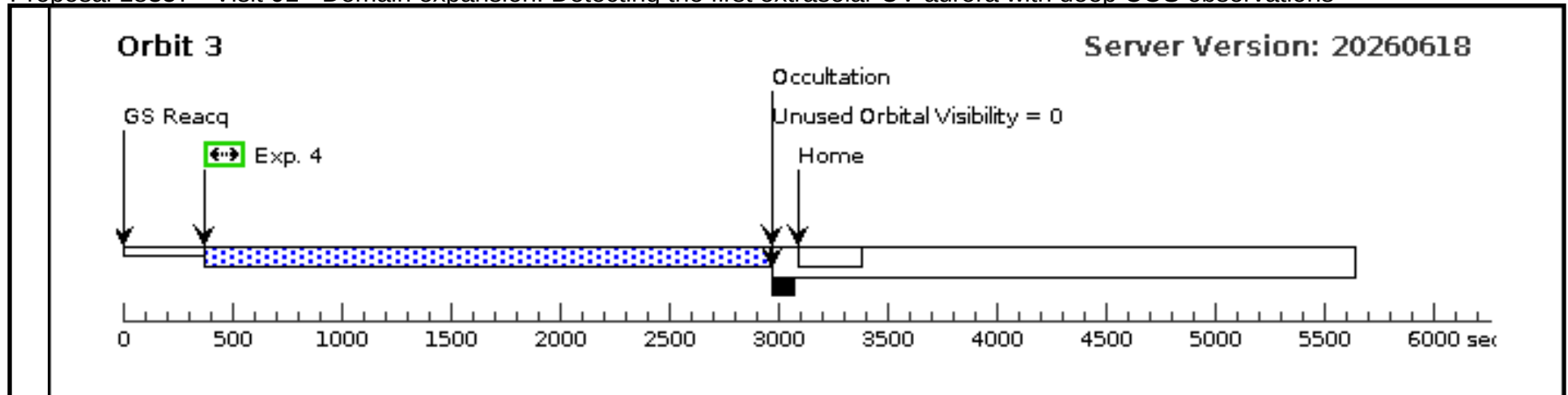
Proposal 18357 - Visit 01 - Domain expansion: Detecting the first extrasolar UV aurora with deep COS observations

Visit	Proposal 18357, Visit 01					Mon Aug 03 18:01:36 GMT 2026
	Diagnostic Status: Warning					
	Scientific Instruments: COS/FUV, COS/NUV					
	Special Requirements: GROUP 01,02,03,04,05 WITHIN 7D					
Comments: 5 visits of 3 orbits each. Only requirement needed is group timing.						
This visit uses FP-POS 1,2,3						
Diagnostics	(Visit 01) Warning (Form): For the best data quality, it is generally required to use all four FP-POS positions at a given COS cenwave (or 2 positions for certain exception cases). See extended explanation in the diagnostic browser.					
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	SIMP0136	RA: 01 36 57.8999 (24.2412496d)	Proper Motion RA: 1238.349 mas/yr	V=25	Reference Frame: ICRS
		Alt Name1: SIMP-J013656.5+093347.3	Dec: +09 33 47.05 (9.56307d)	Proper Motion Dec: -16.156 mas/yr	For acquisition purposes only. G=19.41197 J=13.252	
		Alt Name2: GAIA-DR3-2572901021957789568	Equinox: J2000	Parallax: 0.1634478"		
		Epoch of Position: 2016.0				
Comments:						
Category=STAR						
Description=[BROWN DWARF, T]						
Extended=NO						
(2)	SIMP0136-OFFSET	RA: 01 36 58.3978 (24.2433242d)	Proper Motion RA: 20.877 mas/yr	V=16.08+/-0.4	Reference Frame: ICRS	
	Alt Name1: GALEX-J013658.3+093320	Dec: +09 33 19.94 (9.55554d)	Proper Motion Dec: -9.205 mas/yr	G=15.975 GALEX NUVmag 19.89(8) FUVmag N/A		
	Alt Name2: GAIA-DR3-2572900948943068288	Equinox: J2000	Parallax: 0.0002962"			
	Epoch of Position: 2016.0					
Comments: ETC used Vmag and Pickles spectrum F8V based on Gaia Teff=6175.3 logg=4.2254						
Category=CALIBRATION						
Description=[TARGET ACQUISITION TEST]						
Extended=NO						

Proposal 18357 - Visit 01 - Domain expansion: Detecting the first extrasolar UV aurora with deep COS observations

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	acq (COS.ta.236 0431)	(2) SIMP0136-OFFS ET	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				12 Secs (12 Secs)	
									[==>]	[1]
	2	science (COS.sp.231 4743)	(1) SIMP0136	COS/FUV, TIME-TAG, PSA	G140L 800 A	BUFFER-TIME=22 24; SEGMENT=A; FP-POS=1; LIFETIME-POS=L P11			1890 Secs (2224 Secs)	
									[==>2224.0 Secs]	[1]
	3	science (COS.sp.231 4743)	(1) SIMP0136	COS/FUV, TIME-TAG, PSA	G140L 800 A	BUFFER-TIME=25 33; SEGMENT=A; FP-POS=2; LIFETIME-POS=L P11			1890 Secs (2533 Secs)	
									[==>2533.0 Secs]	[2]
	4	science (COS.sp.231 4743)	(1) SIMP0136	COS/FUV, TIME-TAG, PSA	G140L 800 A	BUFFER-TIME=25 33; SEGMENT=A; FP-POS=3; LIFETIME-POS=L P11			1890 Secs (2533 Secs)	
									[==>2533.0 Secs]	[3]



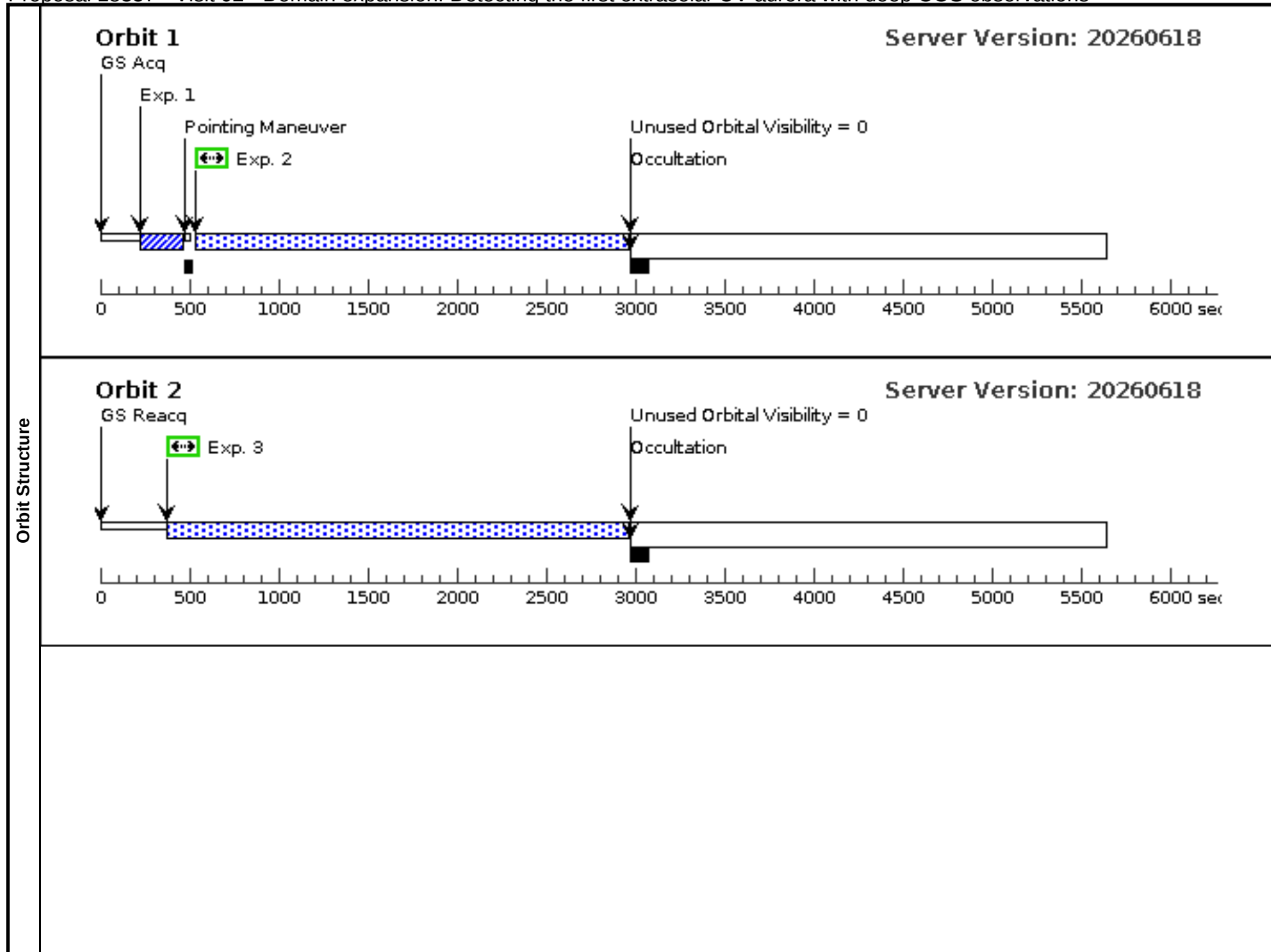


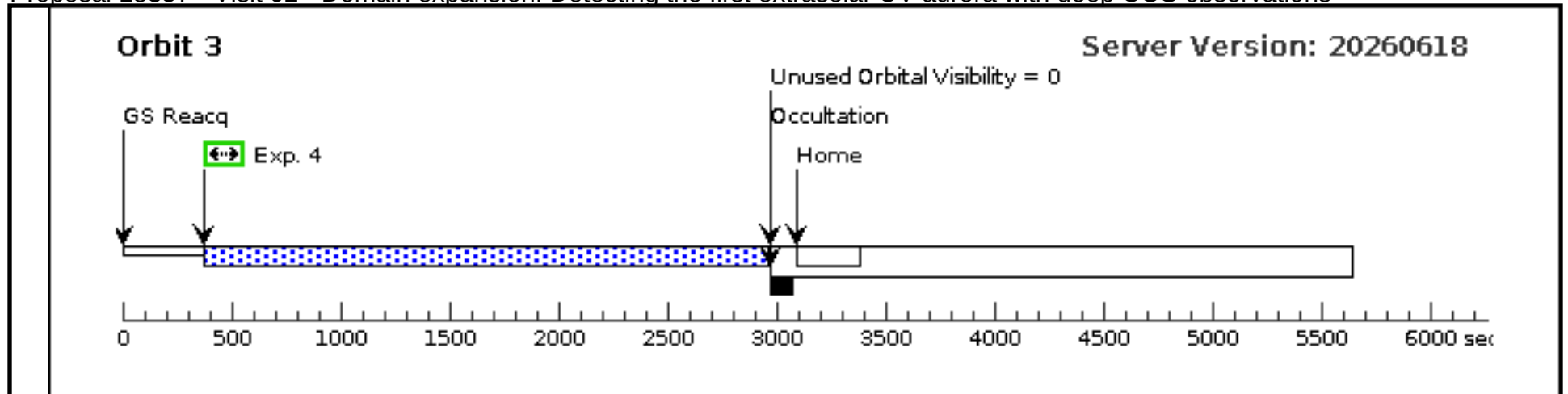
Proposal 18357 - Visit 02 - Domain expansion: Detecting the first extrasolar UV aurora with deep COS observations

Visit	Proposal 18357, Visit 02					Mon Aug 03 18:01:36 GMT 2026
	Diagnostic Status: Warning					
	Scientific Instruments: COS/FUV, COS/NUV					
	Special Requirements: GROUP 02,01,03,04,05 WITHIN 7D					
Comments: 5 visits of 3 orbits each. Only requirement needed is group timing. This visit uses FP-POS 2,3,4						
Diagnostics	(Visit 02) Warning (Form): For the best data quality, it is generally required to use all four FP-POS positions at a given COS cenwave (or 2 positions for certain exception cases). See extended explanation in the diagnostic browser.					
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	SIMP0136	RA: 01 36 57.8999 (24.2412496d)	Proper Motion RA: 1238.349 mas/yr	V=25	Reference Frame: ICRS
		Alt Name1: SIMP-J013656.5+093347.3	Dec: +09 33 47.05 (9.56307d)	Proper Motion Dec: -16.156 mas/yr	For acquisition purposes only. G=19.41197 J=13.252	
		Alt Name2: GAIA-DR3-2572901021957789568	Equinox: J2000	Parallax: 0.1634478"		
Comments: Category=STAR Description=[BROWN DWARF, T] Extended=NO						
(2)	SIMP0136-OFFSET	RA: 01 36 58.3978 (24.2433242d)	Proper Motion RA: 20.877 mas/yr	V=16.08+/-0.4	Reference Frame: ICRS	
	Alt Name1: GALEX-J013658.3+093320	Dec: +09 33 19.94 (9.55554d)	Proper Motion Dec: -9.205 mas/yr	G=15.975 GALEX NUVmag 19.89(8) FUVmag N/A		
	Alt Name2: GAIA-DR3-2572900948943068288	Equinox: J2000	Parallax: 0.0002962"			
Epoch of Position: 2016.0						
Comments: ETC used Vmag and Pickles spectrum F8V based on Gaia Teff=6175.3 logg=4.2254 Category=CALIBRATION Description=[TARGET ACQUISITION TEST] Extended=NO						

Proposal 18357 - Visit 02 - Domain expansion: Detecting the first extrasolar UV aurora with deep COS observations

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	acq (COS.ta.236 0431)	(2) SIMP0136-OFFS ET	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				12 Secs (12 Secs)	
									[==>]	[1]
	2	science (COS.sp.231 4743)	(1) SIMP0136	COS/FUV, TIME-TAG, PSA	G140L 800 A	BUFFER-TIME=22 24; SEGMENT=A; FP-POS=2; LIFETIME-POS=L P11			1890 Secs (2224 Secs)	
									[==>2224.0 Secs]	[1]
	3	science (COS.sp.231 4743)	(1) SIMP0136	COS/FUV, TIME-TAG, PSA	G140L 800 A	BUFFER-TIME=25 33; SEGMENT=A; FP-POS=3; LIFETIME-POS=L P11			1890 Secs (2533 Secs)	
									[==>2533.0 Secs]	[2]
	4	science (COS.sp.231 4743)	(1) SIMP0136	COS/FUV, TIME-TAG, PSA	G140L 800 A	BUFFER-TIME=25 33; SEGMENT=A; FP-POS=4; LIFETIME-POS=L P11			1890 Secs (2533 Secs)	
									[==>2533.0 Secs]	[3]



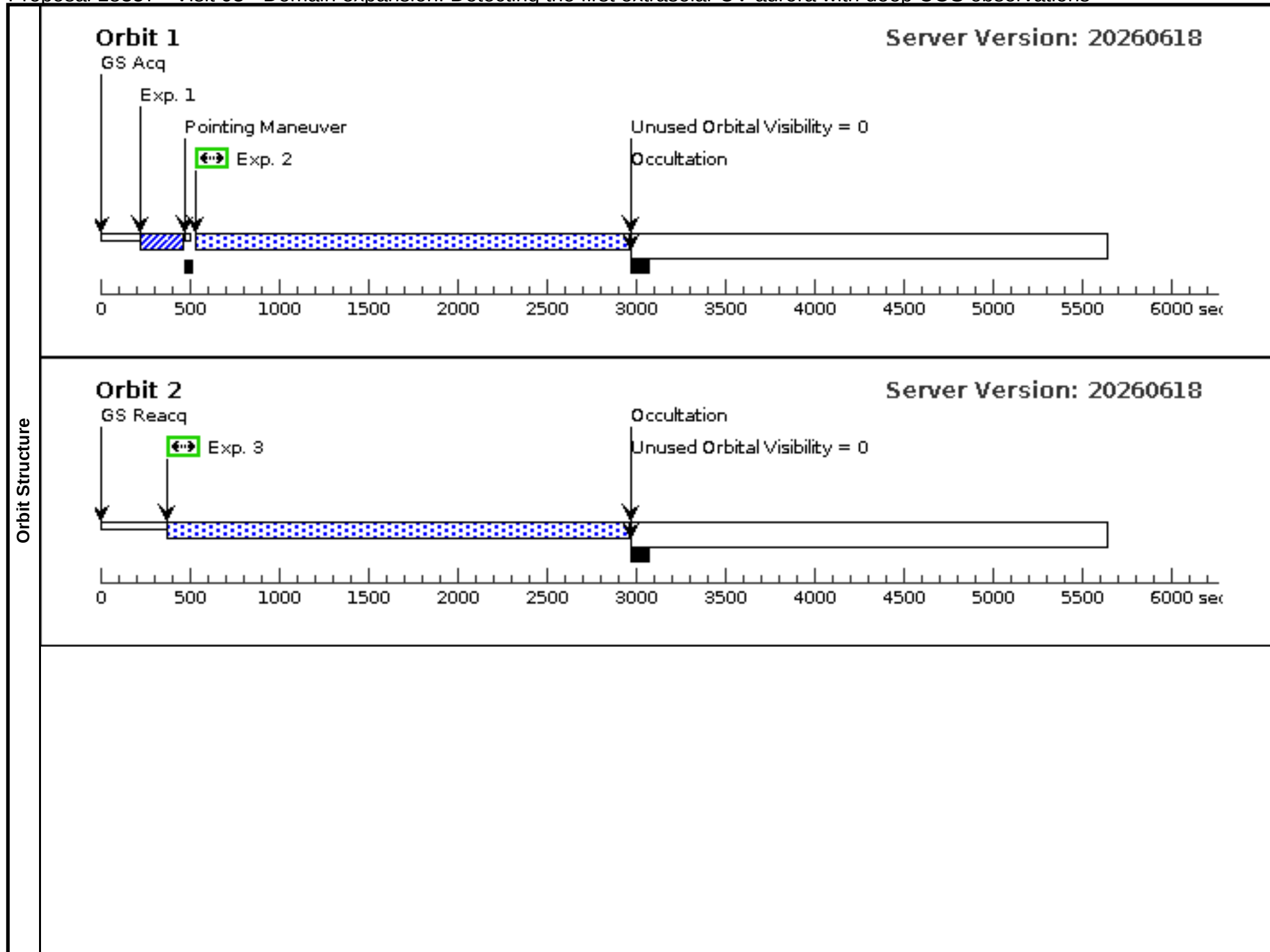


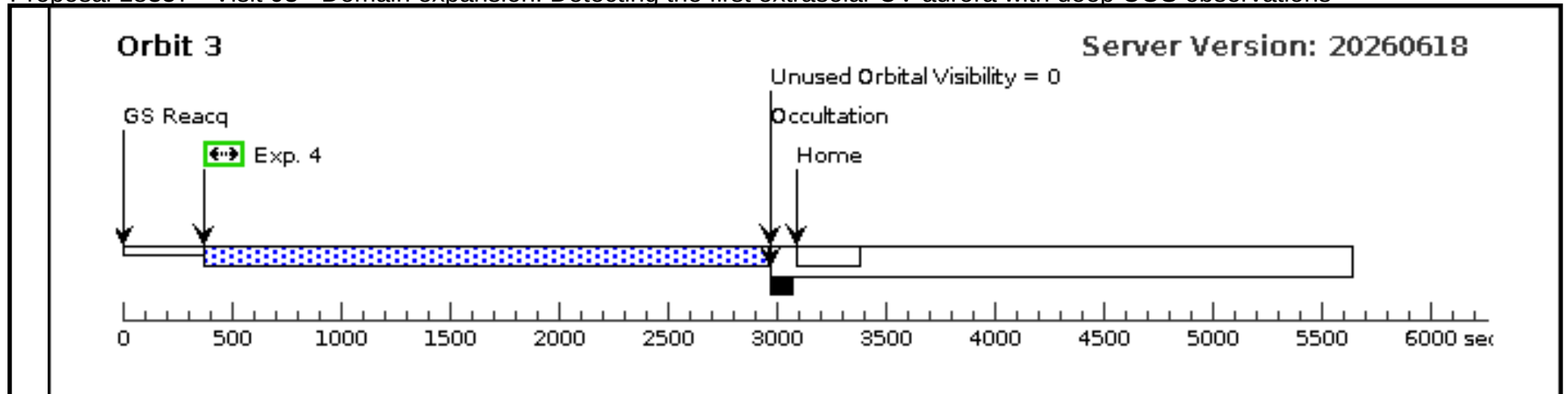
Proposal 18357 - Visit 03 - Domain expansion: Detecting the first extrasolar UV aurora with deep COS observations

Visit	Proposal 18357, Visit 03					Mon Aug 03 18:01:36 GMT 2026
	Diagnostic Status: Warning					
	Scientific Instruments: COS/FUV, COS/NUV					
	Special Requirements: GROUP 03,01,02,04,05 WITHIN 7D					
Comments: 5 visits of 3 orbits each. Only requirement needed is group timing. This visit uses FP-POS 1,2,4						
Diagnostics	(Visit 03) Warning (Form): For the best data quality, it is generally required to use all four FP-POS positions at a given COS cenwave (or 2 positions for certain exception cases). See extended explanation in the diagnostic browser.					
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	SIMP0136	RA: 01 36 57.8999 (24.2412496d)	Proper Motion RA: 1238.349 mas/yr	V=25	Reference Frame: ICRS
		Alt Name1: SIMP-J013656.5+093347.3	Dec: +09 33 47.05 (9.56307d)	Proper Motion Dec: -16.156 mas/yr	For acquisition purposes only. G=19.41197 J=13.252	
		Alt Name2: GAIA-DR3-2572901021957789568	Equinox: J2000	Parallax: 0.1634478"		
Comments: Category=STAR Description=[BROWN DWARF, T] Extended=NO						
(2)	SIMP0136-OFFSET	RA: 01 36 58.3978 (24.2433242d)	Proper Motion RA: 20.877 mas/yr	V=16.08+/-0.4	Reference Frame: ICRS	
	Alt Name1: GALEX-J013658.3+093320	Dec: +09 33 19.94 (9.55554d)	Proper Motion Dec: -9.205 mas/yr	G=15.975 GALEX NUVmag 19.89(8) FUVmag N/A		
	Alt Name2: GAIA-DR3-2572900948943068288	Equinox: J2000	Parallax: 0.0002962"			
Epoch of Position: 2016.0						
Comments: ETC used Vmag and Pickles spectrum F8V based on Gaia Teff=6175.3 logg=4.2254 Category=CALIBRATION Description=[TARGET ACQUISITION TEST] Extended=NO						

Proposal 18357 - Visit 03 - Domain expansion: Detecting the first extrasolar UV aurora with deep COS observations

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	acq (COS.ta.236 0431)	(2) SIMP0136-OFFS ET	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				12 Secs (12 Secs)	
									[==>]	[1]
	2	science (COS.sp.231 4743)	(1) SIMP0136	COS/FUV, TIME-TAG, PSA	G140L 800 A	BUFFER-TIME=22 24; SEGMENT=A; FP-POS=1; LIFETIME-POS=L P11			1890 Secs (2224 Secs)	
									[==>2224.0 Secs]	[1]
	3	science (COS.sp.231 4743)	(1) SIMP0136	COS/FUV, TIME-TAG, PSA	G140L 800 A	BUFFER-TIME=25 33; SEGMENT=A; FP-POS=2; LIFETIME-POS=L P11			1890 Secs (2533 Secs)	
									[==>2533.0 Secs]	[2]
	4	science (COS.sp.231 4743)	(1) SIMP0136	COS/FUV, TIME-TAG, PSA	G140L 800 A	BUFFER-TIME=25 33; SEGMENT=A; FP-POS=4; LIFETIME-POS=L P11			1890 Secs (2533 Secs)	
									[==>2533.0 Secs]	[3]



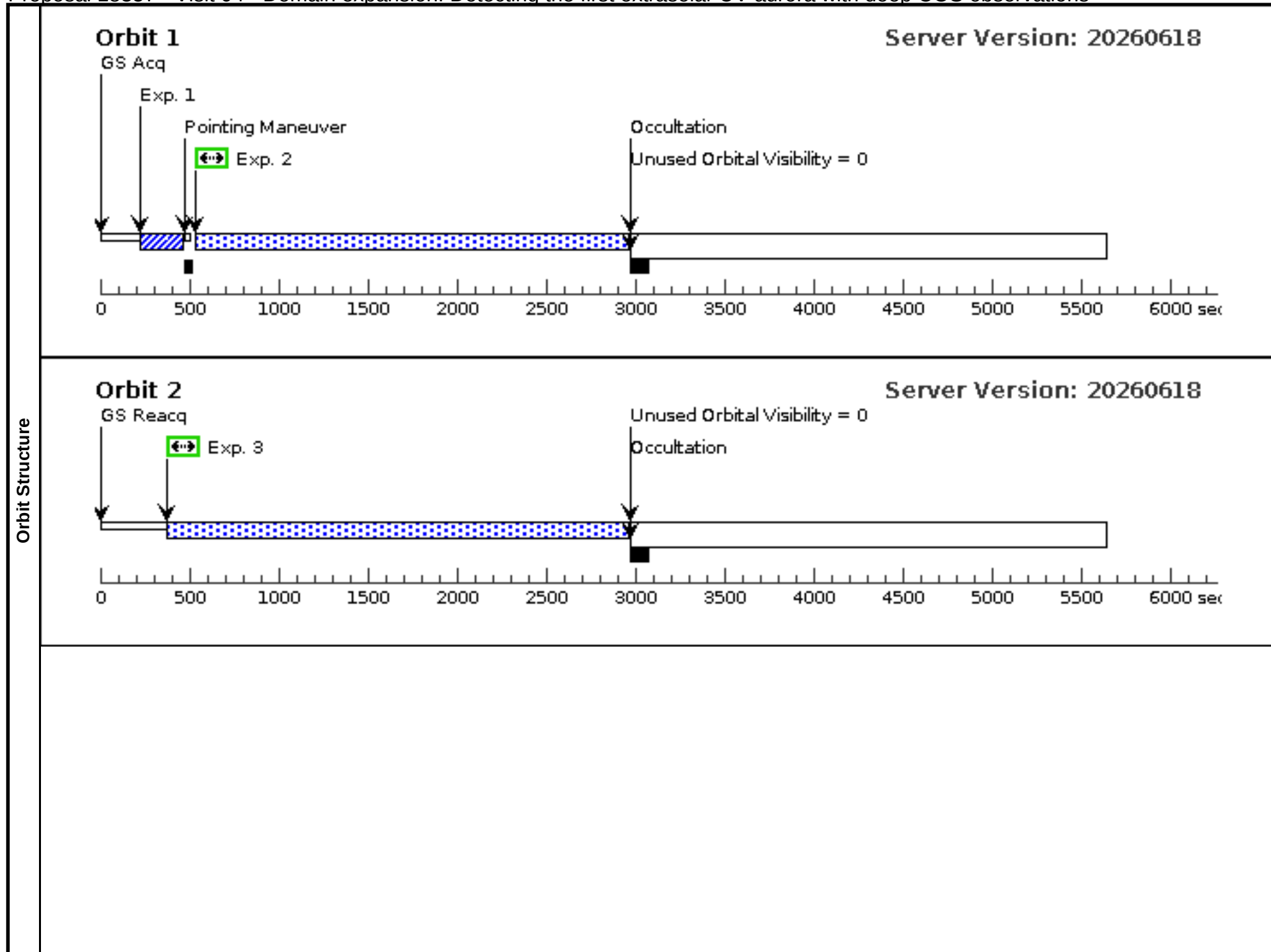


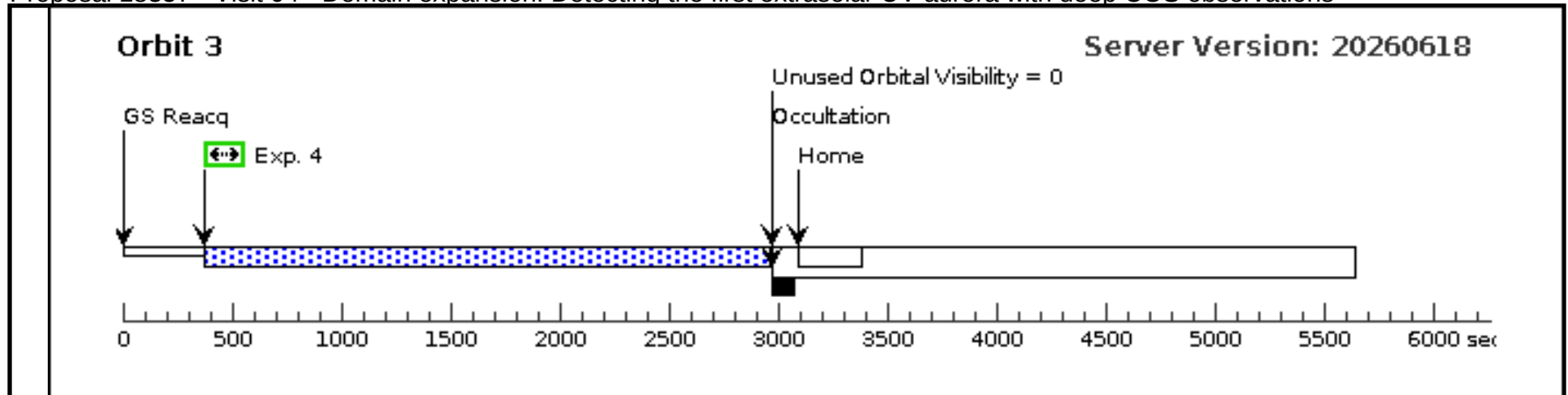
Proposal 18357 - Visit 04 - Domain expansion: Detecting the first extrasolar UV aurora with deep COS observations

Visit	Proposal 18357, Visit 04					Mon Aug 03 18:01:36 GMT 2026
	Diagnostic Status: Warning					
	Scientific Instruments: COS/FUV, COS/NUV					
	Special Requirements: GROUP 04,01,02,03,05 WITHIN 7D					
	Comments: 5 visits of 3 orbits each. Only requirement needed is group timing. This visit uses FP-POS 1,3,4					
Diagnostics	(Visit 04) Warning (Form): For the best data quality, it is generally required to use all four FP-POS positions at a given COS cenwave (or 2 positions for certain exception cases). See extended explanation in the diagnostic browser.					
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	SIMP0136	RA: 01 36 57.8999 (24.2412496d)	Proper Motion RA: 1238.349 mas/yr	V=25	Reference Frame: ICRS
		Alt Name1: SIMP-J013656.5+093347.3	Dec: +09 33 47.05 (9.56307d)	Proper Motion Dec: -16.156 mas/yr	For acquisition purposes only. G=19.41197 J=13.252	
		Alt Name2: GAIA-DR3-2572901021957789568	Equinox: J2000	Parallax: 0.1634478"		
		Epoch of Position: 2016.0				
	Comments: Category=STAR Description=[BROWN DWARF, T] Extended=NO					
(2)	SIMP0136-OFFSET	RA: 01 36 58.3978 (24.2433242d)	Proper Motion RA: 20.877 mas/yr	V=16.08+/-0.4	Reference Frame: ICRS	
	Alt Name1: GALEX-J013658.3+093320	Dec: +09 33 19.94 (9.55554d)	Proper Motion Dec: -9.205 mas/yr	G=15.975 GALEX NUVmag 19.89(8) FUVmag N/A		
	Alt Name2: GAIA-DR3-2572900948943068288	Equinox: J2000	Parallax: 0.0002962"			
	Epoch of Position: 2016.0					
	Comments: ETC used Vmag and Pickles spectrum F8V based on Gaia Teff=6175.3 logg=4.2254 Category=CALIBRATION Description=[TARGET ACQUISITION TEST] Extended=NO					

Proposal 18357 - Visit 04 - Domain expansion: Detecting the first extrasolar UV aurora with deep COS observations

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	acq (COS.ta.236 0431)	(2) SIMP0136-OFFS ET	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				12 Secs (12 Secs)	
									[==>]	[1]
	2	science (COS.sp.231 4743)	(1) SIMP0136	COS/FUV, TIME-TAG, PSA	G140L 800 A	BUFFER-TIME=22 24; SEGMENT=A; FP-POS=1; LIFETIME-POS=L P11			1890 Secs (2224 Secs)	
									[==>2224.0 Secs]	[1]
	3	science (COS.sp.231 4743)	(1) SIMP0136	COS/FUV, TIME-TAG, PSA	G140L 800 A	BUFFER-TIME=25 33; SEGMENT=A; FP-POS=3; LIFETIME-POS=L P11			1890 Secs (2533 Secs)	
									[==>2533.0 Secs]	[2]
	4	science (COS.sp.231 4743)	(1) SIMP0136	COS/FUV, TIME-TAG, PSA	G140L 800 A	BUFFER-TIME=25 33; SEGMENT=A; FP-POS=4; LIFETIME-POS=L P11			1890 Secs (2533 Secs)	
									[==>2533.0 Secs]	[3]





Proposal 18357 - Visit 05 - Domain expansion: Detecting the first extrasolar UV aurora with deep COS observations

Visit	Proposal 18357, Visit 05					Mon Aug 03 18:01:36 GMT 2026
	Diagnostic Status: Warning					
	Scientific Instruments: COS/FUV, COS/NUV					
	Special Requirements: GROUP 05,01,02,03,04 WITHIN 7D					
Comments: 5 visits of 3 orbits each. Only requirement needed is group timing.						
This visit uses FP-POS 2,3,4						
Diagnostics	(Visit 05) Warning (Form): For the best data quality, it is generally required to use all four FP-POS positions at a given COS cenwave (or 2 positions for certain exception cases). See extended explanation in the diagnostic browser.					
Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
	(1)	SIMP0136	RA: 01 36 57.8999 (24.2412496d)	Proper Motion RA: 1238.349 mas/yr	V=25	Reference Frame: ICRS
		Alt Name1: SIMP-J013656.5+093347.3	Dec: +09 33 47.05 (9.56307d)	Proper Motion Dec: -16.156 mas/yr	For acquisition purposes only. G=19.41197 J=13.252	
		Alt Name2: GAIA-DR3-2572901021957789568	Equinox: J2000	Parallax: 0.1634478"		
Comments:						
Category=STAR						
Description=[BROWN DWARF, T]						
Extended=NO						
(2)	SIMP0136-OFFSET	RA: 01 36 58.3978 (24.2433242d)	Proper Motion RA: 20.877 mas/yr	V=16.08+/-0.4	Reference Frame: ICRS	
	Alt Name1: GALEX-J013658.3+093320	Dec: +09 33 19.94 (9.55554d)	Proper Motion Dec: -9.205 mas/yr	G=15.975 GALEX NUVmag 19		
	Alt Name2: GAIA-DR3-2572900948943068288	Equinox: J2000	Parallax: 0.0002962"	.89(8) FUVmag N/A		
Epoch of Position: 2016.0						
Comments: ETC used Vmag and Pickles spectrum F8V based on Gaia Teff=6175.3 logg=4.2254						
Category=CALIBRATION						
Description=[TARGET ACQUISITION TEST]						
Extended=NO						

Proposal 18357 - Visit 05 - Domain expansion: Detecting the first extrasolar UV aurora with deep COS observations

Exposures	#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
	1	acq (COS.ta.236 0431)	(2) SIMP0136-OFFS ET	COS/NUV, ACQ/IMAGE, PSA	MIRRORA				12 Secs (12 Secs)	
									[==>]	[1]
	2	science (COS.sp.231 4743)	(1) SIMP0136	COS/FUV, TIME-TAG, PSA	G140L 800 A	BUFFER-TIME=22 24; SEGMENT=A; FP-POS=2; LIFETIME-POS=L P11			1890 Secs (2224 Secs)	
									[==>2224.0 Secs]	[1]
	3	science (COS.sp.231 4743)	(1) SIMP0136	COS/FUV, TIME-TAG, PSA	G140L 800 A	BUFFER-TIME=25 33; SEGMENT=A; FP-POS=3; LIFETIME-POS=L P11			1890 Secs (2533 Secs)	
									[==>2533.0 Secs]	[2]
	4	science (COS.sp.231 4743)	(1) SIMP0136	COS/FUV, TIME-TAG, PSA	G140L 800 A	BUFFER-TIME=25 33; SEGMENT=A; FP-POS=4; LIFETIME-POS=L P11			1890 Secs (2533 Secs)	
									[==>2533.0 Secs]	[3]

