17582 - Cycle 31 COS FUV Target Acquisition Monitor

Cycle: 31, Proposal Category: CAL/COS

(Availability Mode: RESTRICTED)

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) WD-1657+343	COS/FUV COS/NUV	1	05-Oct-2023 17:01:01.0	yes
02	(1) WD-1657+343	COS/FUV COS/NUV	1	05-Oct-2023 17:01:02.0	yes
03	(1) WD-1657+343	COS/FUV COS/NUV	2	05-Oct-2023 17:01:05.0	yes

4 Total Orbits Used

ABSTRACT

This program verifies that FUV spectroscopic target acquisitions are working nominally for the modes allowed in cycle 31: G130M at LP5, G140L at LP4, and G160M at LP4 and LP6. For each grating the cenwave with the widest cross dispersion profile in which acquisitions are done is used,

yielding the combinations G130M/1291, G140L/1280, and G160M/1600. After the standard target WD 1657+343 is centered using ACQ/IMAGE we take spectra at the NUM-POS positions used by the PEAKXD and PEAKD algorithms to inspect those regions of the detector and check the vignetted flux. We then perform a PEAKXD and/or PEAKD acquisition and take a spectrum to verify centering. We test PEAKXD with NUM-POS=3 (default) and 5, and PEAKD with NUM-POS=5 (default). A detailed description of the observations is given in the visit level comments. This program follows the prescription used in the last several cycles, and is most recently adapted from cycle 29 and 30 programs 16831 and 16942, respectively. Note that 16942 included a repeat of the LP6 enabling test for peakxd, which has been removed for this program.

OBSERVING DESCRIPTION

This program consists of four orbits, each with a non-interrupt sequence. The program is divided into three visits to allows the last three orbits to have schedulability 100, whereas the first orbit needs schedulability 80. The last three orbits are split into two visits to facilitate scheduling, and the two orbit visit can also be separated if necessary.

We request that this program execute in January of 2024 (via a BETWEEN), and within 30 days of Visit PB of Program 17321 (via a visit-level comment).

The program is divided into 3 parts, one for each FUV grating. The central wavelengths tested are G130M/1291 at LP5, G140L/1280 at LP4, and G160M/1600 at LP4 and LP6. These cenwaves were chosen because they provide the widest cross-dispersion profile allowed for acquisitions.

For each grating, we first acquire the target using ACQ/IMAGE, take a spectrum to verify the ACQ/IMAGE centering, take off-centered spectra using POSTARG, and then run an acquisition sequence. The visit level comments contain a detailed description of the observations.

Comments for each exposure give the Buffer Time calculations. However, in most cases we use slighter shorter buffer times in case the targets are brighter than expected. The logic being that if any of the PEAKXDs are not exactly perfect, the followup POS-TARGs may be off and give different count rates than expected.

Visit

Proposal 17582, PSA/MIRRORB ACQ/IMAGE then G130M FUV TA Monitoring (01) Thu Oct 05 21:01:06 GMT 2023

Diagnostic Status: Warning

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: SCHED 80%; BETWEEN 01-JAN-2024:00:00:00 AND 31-JAN-2024:00:00:00

Comments: This visit is separated from visits 2 and 3 because this visit needs schedulability 80, whereas visits 2 and 3 can use 100.
This visit has the following timing requirement:
** It should execute between 1/1/24 and 1/31/24*
** It should execute within 30 days of visit PB of program 17321*

This visit tests spectroscopic target acquisition using FUV G130M/1291. The sequence of events is as follows
01.001 - NUV ACQ/IMAGE
01.002 - NUV Image with WCA lamps, to check alignment later on.
01.003 - G130M/1291 spectrum to establish center position after ACQ/IMAGE
01.004, 01.005 - +/-1.3" XD POSTARGS to simmulate NUM-POS=3 PEAKXD
01.006 - PEAKXD with NUM-POS=3
01.007 - Verification spectrum
01.008 to 01.011 - Simulates PEAKXD with NUM-POS=5, STEP-SIZE=0.9
01.012 - PEAKXD with NUM-POS=5
01.013 - Verification spectrum
01.014 - PEAKD
01.015 - Verification spectrum

Diagnostics

(PSA/MIRRORB ACQ/IMAGE then G130M FUV TA Monitoring (01)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

(PSA/MIRRORB ACQ/IMAGE then G130M FUV TA Monitoring (01)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

(PSA/MIRRORB ACQ/IMAGE then G130M FUV TA Monitoring (01)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

(PSA/MIRRORB ACQ/IMAGE then G130M FUV TA Monitoring (01)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

(PSA/MIRRORB ACQ/IMAGE then G130M FUV TA Monitoring (01)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE NO ORIENT

(PSA/MIRRORB ACQ/IMAGE then G130M FUV TA Monitoring (01)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE NO ORIENT

(PSA/MIRRORB ACQ/IMAGE then G130M FUV TA Monitoring (01)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE NO ORIENT

(PSA/MIRRORB ACQ/IMAGE then G130M FUV TA Monitoring (01)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE NO ORIENT

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	WD-1657+343	RA: 16 58 51.1202 (254.7130008d)	Proper Motion RA: 11 mas/yr	V=16.1	Reference Frame: ICRS
		Dec: +34 18 53.29 (34.31480d)	Proper Motion Dec: -31 mas/yr		
		Equinox: J2000	Epoch of Position: 2000		
			Radial Velocity: 78 km/sec		

Comments: COS.ta.1032496 indicates S/N = 40 in 5.2s. SIMBAD cordinates are 16 58 51.1202 +34 18 53.293
Proper Motion from SIMBAD is Proper motions mas/yr : 11 -31 [3 3 133] C 2011MNRAS.417.1210G, RV=78

B 16.12 [~] D ~
u (AB) 15.749 [0.005] B 2013yCat.5139....0A
g (AB) 16.139 [0.003] B 2013yCat.5139....0A
r (AB) 16.691 [0.004] B 2013yCat.5139....0A
i (AB) 17.054 [0.005] B 2013yCat.5139....0A
z (AB) 17.388 [0.015] C 2013yCat.5139....0A
Category=STAR
Description=[DA]
Extended=NO

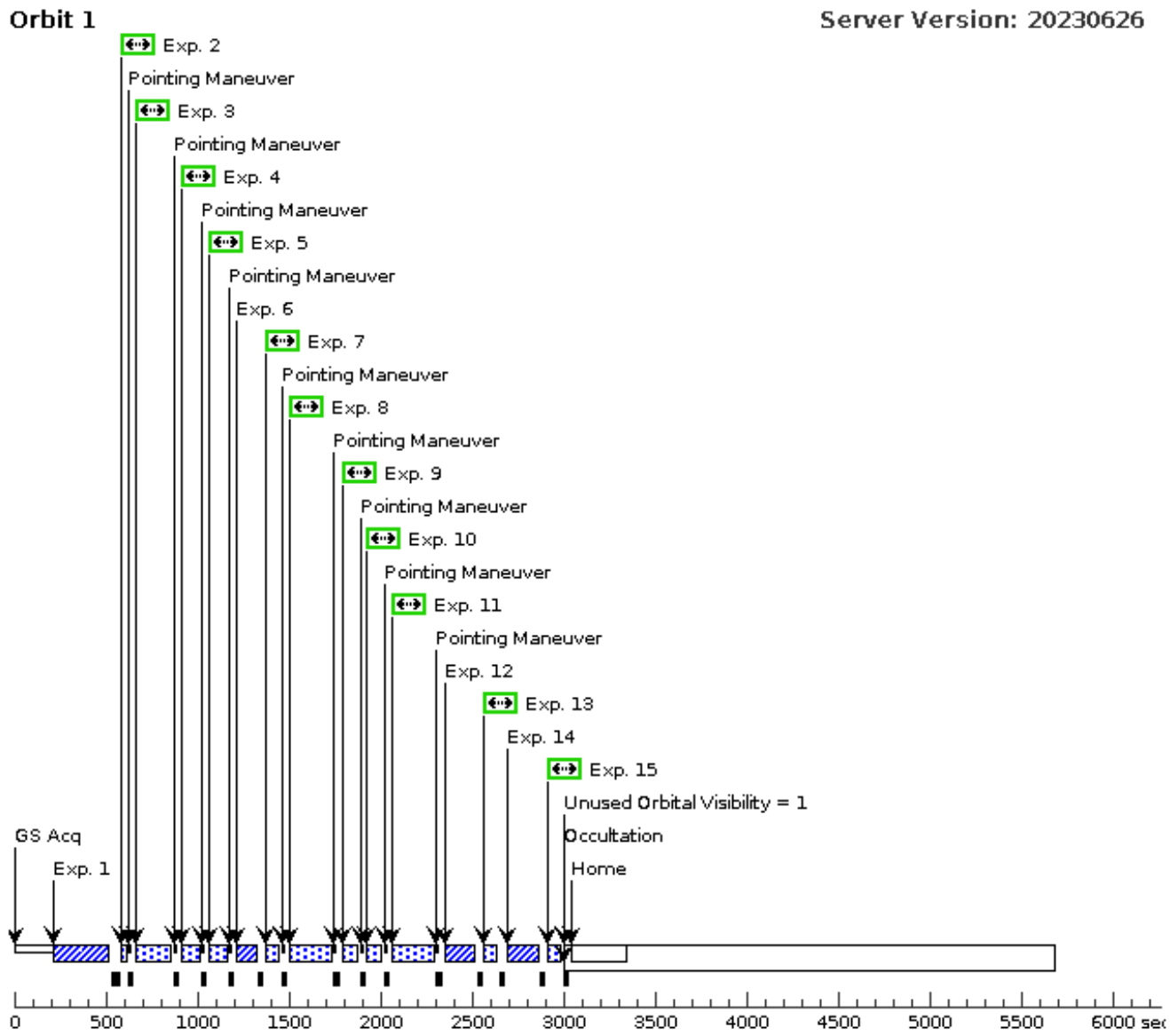
Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	PSA/MIRRORB ACQ/IMAGE (COS.ta.1540223)	(1) WD-1657+343	COS/NUV, ACQ/IMAGE, PSA	MIRRORB			Sequence 1-15 Non-Int in PSA/MIRRORB ACQ/IMAGE then G130M FUV TA Monitoring (01)	7 Secs (7 Secs) *[==>]*	***[1]***
2	PSA/MIRRORB LAMP+TARGET IMAGE (P2/MEDIUM) (COS.im.1540224)	(1) WD-1657+343	COS/NUV, TIME-TAG, PSA	MIRRORB	BUFFER-TIME=150; FLASH=S0060D015; CURRENT=MEDIUM	QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-15 Non-Int in PSA/MIRRORB ACQ/IMAGE then G130M FUV TA Monitoring (01)	15.0 Secs (15 Secs) *[==>]*	***[1]***
	Comments: PSA/MIRRORB/P2/MED current, see above for expected count rates. To get PtNe Lamp 2, there are 2 QESIPARMs set: *USELAMP = LINE2* *CURRENT = MEDIUM* *This target was used in Visit BA of 14857 (ldozbadhq). Bck subtracted counts in second image = 5430 ; S/N = 73.69, ET=13s* *For the Lamp, LAMP/CURRENT USED = P2/Medium, LAMP EXPTIME = 12.000 s* *Reported Lamp Events = 3316 counts : Rate = 276.33334 counts/s* *Lamp Background events in 50x300 TA BOX for lampflash time (12s) = 112 cts : Rate = 9.308 counts/s* *Actual Lamp Events = 3204 counts : Rate = 267.026 counts/s*								
3	PSA/C1291/3 - CENTER (COS.sp.1540225)	(1) WD-1657+343	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=300; LIFETIME-POS=DEF	QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-15 Non-Int in PSA/MIRRORB ACQ/IMAGE then G130M FUV TA Monitoring (01)	25 Secs (25 Secs) *[==>]*	***[1]***
	Comments: HST Standard Star, S/N ~ 5 in 25s								
4	PSA/C1291/3 +1.3arcseconds in XD (COS.sp.1540225)	(1) WD-1657+343	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=500; LIFETIME-POS=DEF	POS TARG null,1.3; QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-15 Non-Int in PSA/MIRRORB ACQ/IMAGE then G130M FUV TA Monitoring (01)	50 Secs (50 Secs) *[==>]*	***[1]***
	Comments: At R=1.3", the throughput is ~45%. To get the same counts, we need to increase the exposure time to 55s. *(exp time reduced from 55 to 50 due to overrun in cycle 31)*								
5	PSA/C1291/3 -1.3arcseconds in XD (COS.sp.1540225)	(1) WD-1657+343	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=500; LIFETIME-POS=DEF	POS TARG null,-1.3; QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-15 Non-Int in PSA/MIRRORB ACQ/IMAGE then G130M FUV TA Monitoring (01)	50 Secs (50 Secs) *[==>]*	***[1]***
	Comments: At R=1.3", the throughput is ~45%. To get the same counts, we need to increase the exposure time to 55s. *(exp time reduced from 55 to 50 due to overrun in cycle 31)*								
6	PSA/C1291/PEAKXD/NP=3/DEF (COS.sa.1540226)	(1) WD-1657+343	COS/FUV, ACQ/PEAKXD, PSA	G130M 1291 A	LIFETIME-POS=DEF	QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-15 Non-Int in PSA/MIRRORB ACQ/IMAGE then G130M FUV TA Monitoring (01)	2 Secs (2 Secs) *[==>]*	***[1]***
	Comments: The NUM_POS and STEP_SIZE are not included to make sure that the correct DEFAULTS of NUM_POS=3 and STEP_SIZE=1.3", and CENTER = FLUX-WT are still inserted. *Target is the HST Standard Star:WD-1657+343* *Requested Signal/Noise Ratio = 40.000 for Segment A and Segment B combined* *gives: Time = 0.4205 seconds* *Time Required for Requested SNR in Segment A only: 1.2676* *Time Required for Requested SNR in Segment B only: 0.6292*								

7	PSA/C1291/3 - After NUM_POS=3 PEAKXD (COS.sp.1540225)	(1) WD-1657+343	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=300; LIFETIME-POS=DEF	QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-15 Non-Int in PSA/MIRRORB ACQ/IMAGE then G130M FUV TA Monitoring (01)	25 Secs (25 Secs) *[==>]*	***[1]***
8	PSA/C1291/3 +1.8arcseconds in XD (COS.sp.1540225)	(1) WD-1657+343	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=1000; LIFETIME-POS=DEF	POS TARG null,1.8; QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-15 Non-Int in PSA/MIRRORB ACQ/IMAGE then G130M FUV TA Monitoring (01)	180 Secs (180 Secs) *[==>]*	***[1]***
Comments: At R=1.8", the throughput is ~13%. To get the same counts, we need to increase the exposure time. (exp time reduced from 192 to 180 due to overrun in cycle 31)									
9	PSA/C1291/3 +0.9arcseconds in XD (COS.sp.1540225)	(1) WD-1657+343	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=400; LIFETIME-POS=DEF	POS TARG null,0.9; QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-15 Non-Int in PSA/MIRRORB ACQ/IMAGE then G130M FUV TA Monitoring (01)	32 Secs (32 Secs) *[==>]*	***[1]***
Comments: At R=0.9", the throughput is ~71%. To get the same counts, we need to increase the exposure time. (exp time reduced from 35 to 32 due to overrun in cycle 31)									
10	PSA/C1291/3 -0.9arcseconds in XD (COS.sp.1540225)	(1) WD-1657+343	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=400; LIFETIME-POS=DEF	POS TARG null,-0.9; QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-15 Non-Int in PSA/MIRRORB ACQ/IMAGE then G130M FUV TA Monitoring (01)	32 Secs (32 Secs) *[==>]*	***[1]***
Comments: At R=0.9", the throughput is ~71%. To get the same counts, we need to increase the exposure time. (exp time reduced from 35 to 32 due to overrun in cycle 31)									
11	PSA/C1291/3 -1.8arcseconds in XD (COS.sp.1540225)	(1) WD-1657+343	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=1000; LIFETIME-POS=DEF	POS TARG null,-1.8; QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-15 Non-Int in PSA/MIRRORB ACQ/IMAGE then G130M FUV TA Monitoring (01)	180 Secs (180 Secs) *[==>]*	***[1]***
Comments: At R=1.8", the throughput is ~13%. To get the same counts, we need to increase the exposure time. (exp time reduced from 192 to 180 due to overrun in cycle 31)									
12	PSA/C1291/PEAKXD/NP=5/DEF (COS.sa.1540226)	(1) WD-1657+343	COS/FUV, ACQ/PEAKXD, PSA	G130M 1291 A	LIFETIME-POS=DEF; NUM-POS=5; STEP-SIZE=0.9	QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-15 Non-Int in PSA/MIRRORB ACQ/IMAGE then G130M FUV TA Monitoring (01)	2 Secs (2 Secs) *[==>]*	***[1]***
Comments: The default STEP-SIZE is 1.0", but at +/- 2", the POS_TARGS would not create enough counts to track the operation of the NUM_POS=5 PEAKXD. 5x0.9" is used instead. Double check that the DEFAULT CENTER=FLUX-WT-FLR is used. It is left unspecified to test that the default APT logic is still correctly choosing the correct CENTER algorithm.									
13	PSA/C1291/3 - After NUM_POS=5 PEAKXD (COS.sp.1540225)	(1) WD-1657+343	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=300; LIFETIME-POS=DEF	QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-15 Non-Int in PSA/MIRRORB ACQ/IMAGE then G130M FUV TA Monitoring (01)	25 Secs (25 Secs) *[==>]*	***[1]***
Comments: HST Standard Star, S/N ~ 5 in 25s									

	14	PSA/C1291/ PEAKD/NP =5/DEF (COS.sa.154 0226)	(1) WD-1657+343	COS/FUV, ACQ/PEAKD, PSA	G130M 1291 A	LIFETIME-POS=DEF; NUM-POS=5; STEP-SIZE=0.9	QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-15 Non-Int in PSA/MIRRORB ACQ/IMAGE then G130M FUV TA Monitoring (01)	3 Secs (3 Secs) *[==>]*	**[1]**
		Comments: We want to check the AD NUV to FUV SIAF alignment, so perform a good PEAKD. Double check that the DEFAULT CENTER=FLUX-WT-FLR is used. It is left unspecified to test that the default APT logic is still correctly choosing the correct CENTER algorithm.								
	15	PSA/C1291/ 3 - After PEAKD (COS.sp.154 0225)	(1) WD-1657+343	COS/FUV, TIME-TAG, PSA	G130M 1291 A	FP-POS=3; BUFFER-TIME=3000; LIFETIME-POS=DEF	QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-15 Non-Int in PSA/MIRRORB ACQ/IMAGE then G130M FUV TA Monitoring (01)	25 Secs (25 Secs) *[==>]*	**[1]**
		Comments: HST Standard Star, S/N ~ 5 in 25s.								

Orbit Structure



Visit

Proposal 17582, PSA/MIRRORB ACQ/IMAGE then LP4 G160M FUV TA monitor (02) Thu Oct 05 21:01:06 GMT 2023

Diagnostic Status: Warning

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: SCHED 100%; BETWEEN 01-JAN-2024:00:00:00 AND 31-JAN-2024:00:00:00

Comments: This orbit is separated from visit 01 because it can use schedulability 100. The orbit in visit 01 requires schedulability 80.

This visit has the following timing requirement:
** It should execute between 1/1/24 and 1/31/24*
** It should execute within 30 days of visit PB of program 17321*

This visit has one orbit, structured as follows

Tests FUV G160M/1600 spectroscopic acquisitionat LP4
02.001 - ACQ/IMAGE
02.002 - NUV image with WCA lamps to verify alignment
02.003 - spectrum centered after ACQ/IMAGE, for comparison
02.004, 02.005 - simulate PEAKXD with NUM-POS=3
02.006 - PEAKXD with NUM-POS=3
02.007 - verification spectrum
02.008 - PEAKD with NUM-POS=5
02.009 - verification spectrum

Diagnostics

(PSA/MIRRORB ACQ/IMAGE then LP4 G160M FUV TA monitor (02)) Warning (Form): For the best data quality, it is generally required to use all four FP-POS positions when observing at a given COS cenwave.

(PSA/MIRRORB ACQ/IMAGE then LP4 G160M FUV TA monitor (02)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

(PSA/MIRRORB ACQ/IMAGE then LP4 G160M FUV TA monitor (02)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

(PSA/MIRRORB ACQ/IMAGE then LP4 G160M FUV TA monitor (02)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE NO ORIENT

(PSA/MIRRORB ACQ/IMAGE then LP4 G160M FUV TA monitor (02)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE NO ORIENT

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	WD-1657+343	RA: 16 58 51.1202 (254.7130008d)	Proper Motion RA: 11 mas/yr	V=16.1	Reference Frame: ICRS
		Dec: +34 18 53.29 (34.31480d)	Proper Motion Dec: -31 mas/yr		
		Equinox: J2000	Epoch of Position: 2000		
			Radial Velocity: 78 km/sec		

Comments: COS.ta.1032496 indicates S/N = 40 in 5.2s. SIMBAD cordinates are 16 58 51.1202 +34 18 53.293
Proper Motion from SIMBAD is Proper motions mas/yr : 11 -31 [3 3 133] C 2011MNRAS.417.1210G, RV=78

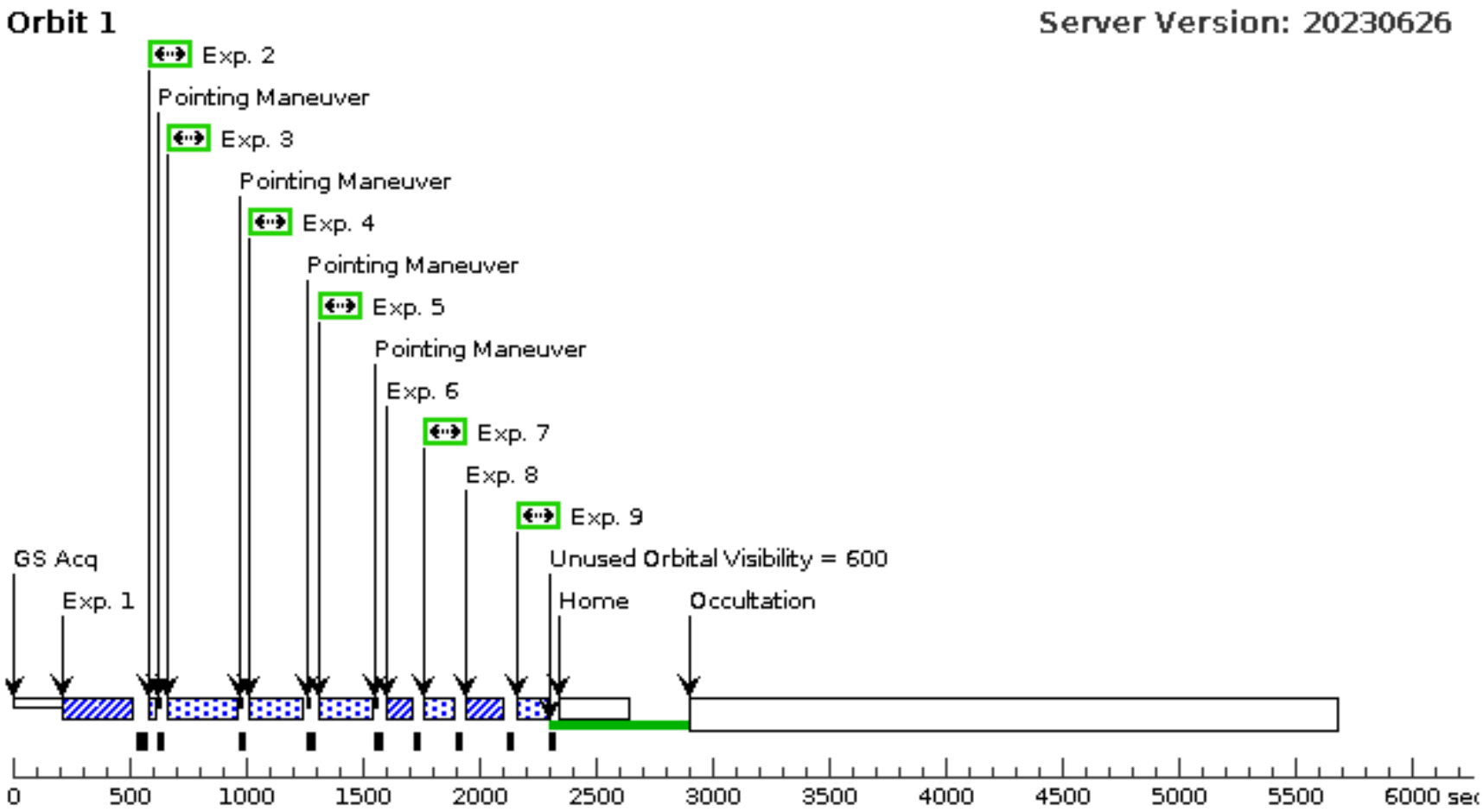
B 16.12 [~] D ~
u (AB) 15.749 [0.005] B 2013yCat.5139....0A
g (AB) 16.139 [0.003] B 2013yCat.5139....0A
r (AB) 16.691 [0.004] B 2013yCat.5139....0A
i (AB) 17.054 [0.005] B 2013yCat.5139....0A
z (AB) 17.388 [0.015] C 2013yCat.5139....0A
Category=STAR
Description=[DA]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	PSA/MIRRORB ACQ/IMAGE (COS.ta.1540223)	(1) WD-1657+343	COS/NUV, ACQ/IMAGE, PSA	MIRRORB			Sequence 1-9 Non-Int in PSA/MIRRORB ACQ/IMAGE then LP4 G160M FUV TA monitor (02)	7 Secs (7 Secs) *[==>]*	*[1]*
2	PSA/MIRRORB LAMP+TARGET IMAGE (P2/MEDIUM) (COS.im.1540224)	(1) WD-1657+343	COS/NUV, TIME-TAG, PSA	MIRRORB	BUFFER-TIME=150; FLASH=S0060D015; CURRENT=MEDIUM	QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-9 Non-Int in PSA/MIRRORB ACQ/IMAGE then LP4 G160M FUV TA monitor (02)	15.0 Secs (15 Secs) *[==>]*	*[1]*
	Comments: Identical to 01.002 PSA/MIRRORB/P2/MED current. To get PtNe Lamp 2, there are 2 QESIPARMs set: USELAMP = LINE2 CURRENT = MEDIUM								
3	PSA/G160M/1600/3 - CENTER (COS.sp.1540231)	(1) WD-1657+343	COS/FUV, TIME-TAG, PSA	G160M 1600 A	FP-POS=3; BUFFER-TIME=800; LIFETIME-POS=LP4	QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-9 Non-Int in PSA/MIRRORB ACQ/IMAGE then LP4 G160M FUV TA monitor (02)	82 Secs (82 Secs) *[==>]*	*[1]*
	Comments: Exposure time (seconds) = 82.0000 at wavelength 1602.00 gives: SNR = 3.9389 (per resolution element)								
4	PSA/G160M/1600/3 + 1.3arcseconds in XD (COS.sp.1540231)	(1) WD-1657+343	COS/FUV, TIME-TAG, PSA	G160M 1600 A	FP-POS=3; BUFFER-TIME=1000; LIFETIME-POS=LP4	POS TARG null,1.3; QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-9 Non-Int in PSA/MIRRORB ACQ/IMAGE then LP4 G160M FUV TA monitor (02)	182 Secs (182 Secs) *[==>]*	*[1]*
	Comments: At R=1.3", the throughput is ~45%. To get the same counts, we need to increase the exposure time.								
5	PSA/G160M/1600/3 -1.3arcseconds in XD (COS.sp.1540231)	(1) WD-1657+343	COS/FUV, TIME-TAG, PSA	G160M 1600 A	FP-POS=3; BUFFER-TIME=1000; LIFETIME-POS=LP4	POS TARG null,-1.3; QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-9 Non-Int in PSA/MIRRORB ACQ/IMAGE then LP4 G160M FUV TA monitor (02)	182 Secs (182 Secs) *[==>]*	*[1]*
	Comments: At R=1.3", the throughput is ~45%. To get the same counts, we need to increase the exposure time.								
6	PSA/G160M/PEAKXD/NP=3/DEF (COS.sa.1540232)	(1) WD-1657+343	COS/FUV, ACQ/PEAKXD, PSA	G160M 1600 A	LIFETIME-POS=LP4; NUM-POS=3; STEP-SIZE=1.3	QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-9 Non-Int in PSA/MIRRORB ACQ/IMAGE then LP4 G160M FUV TA monitor (02)	3 Secs (3 Secs) *[==>]*	*[1]*
	Comments: Requested Signal/Noise Ratio = 40.000 for Segment A and Segment B combined gives: Time = 1.0474 seconds Time Required for Requested SNR in Segment A only: 5.7791 Time Required for Requested SNR in Segment B only: 1.2792								
7	PSA/G160M/1600/3 (COS.sp.1540231)	(1) WD-1657+343	COS/FUV, TIME-TAG, PSA	G160M 1600 A	FP-POS=3; BUFFER-TIME=800; LIFETIME-POS=LP4	QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-9 Non-Int in PSA/MIRRORB ACQ/IMAGE then LP4 G160M FUV TA monitor (02)	82 Secs (82 Secs) *[==>]*	*[1]*

	8	PSA/G160M/1600/PEAKD/NP=5/DEF (COS.sa.1540232)	(1) WD-1657+343	COS/FUV, ACQ/PEAKD, PSA	G160M 1600 A	LIFETIME-POS=LP4; NUM-POS=5; STEP-SIZE=0.9		Sequence 1-9 Non-Int in PSA/MIRRORB ACQ/IMAGE then LP4 G160M FUV TA monitor (02)	3 Secs (3 Secs) *[==>]*	***[1]***
		Comments: Analogous to exposure 01.014 carried over from previous cycles, but this time to test PEAKD at LP4.								
	9	PSA/G160M/1600/3 (COS.sp.1540231)	(1) WD-1657+343	COS/FUV, TIME-TAG, PSA	G160M 1600 A	FP-POS=3; BUFFER-TIME=800; LIFETIME-POS=LP4	QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-9 Non-Int in PSA/MIRRORB ACQ/IMAGE then LP4 G160M FUV TA monitor (02)	82 Secs (82 Secs) *[==>]*	***[1]***

Orbit Structure



Visit

Proposal 17582, PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03) Thu Oct 05 21:01:06 GMT 2023

Diagnostic Status: Warning

Scientific Instruments: COS/FUV, COS/NUV

Special Requirements: SCHED 100%; BETWEEN 01-JAN-2024:00:00:00 AND 31-JAN-2024:00:00:00

Comments: These two orbits are in a different visit because they can use schedulability 100. The orbit in visit 01 requires schedulability 80. the 2 orbits in this visit may also be placed into individual visits if it helps with scheduling, so long as the non-interrupt sequences and the BETWEEN are respected.

This visit has the following timing requirement:
** It should execute between 1/1/24 and 1/31/24*
** It should execute within 30 days of visit PB of program 17321*

This visit has two orbits, each with a non-interrupt sequence. Each orbit is structured as follows

First orbit, tests FUV G140L/1280 spectroscopic acquisition
03.001 - ACQ/IMAGE
03.002 - NUV image with WCA lamps to verify alignment
03.003 - spectrum centered after ACQ/IMAGE, for comparison
03.004, 02.005 - simulate PEAKXD with NUM-POS=3
03.006 - PEAKXD with NUM-POS=3
03.007 - Verification spectrum
03.008 to 03.011 - Simulate PEAKXD with NUM-POS=5
03.012 - PEAKXD with NUM-POS=5
03.013 - Verification spectrum

Orbit 2, tests FUV G160M/1600 spectroscopic acquisition at LP6
03.014 - ACQ/IMAGE
03.015 - NUV image with WCA lamps to verify alignment
03.016 - spectrum centered after ACQ/IMAGE, for comparison
03.017, 03.018 - simulate PEAKXD with NUM-POS=3
03.019 - PEAKXD with NUM-POS=3
03.020 - verification spectrum
03.021 - PEAKD with NUM-POS=5
03.022 - verification spectrum

Diagnostics

(PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)) Warning (Form): For the best data quality, it is generally required to use all four FP-POS positions when observing at a given COS cenwave.

(PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

(PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

(PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

(PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

(PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

(PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

(PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE NO ORIENT

(PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE NO ORIENT

(PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE NO ORIENT

(PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE NO ORIENT

(PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE NO ORIENT

(PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE NO ORIENT

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	WD-1657+343	RA: 16 58 51.1202 (254.7130008d)	Proper Motion RA: 11 mas/yr	V=16.1	Reference Frame: ICRS
		Dec: +34 18 53.29 (34.31480d)	Proper Motion Dec: -31 mas/yr		
		Equinox: J2000	Epoch of Position: 2000		
			Radial Velocity: 78 km/sec		

Comments: COS.ta.1032496 indicates S/N = 40 in 5.2s. SIMBAD cordinates are 16 58 51.1202 +34 18 53.293
Proper Motion from SIMBAD is Proper motions mas/yr : 11 -31 [3 3 133] C 2011MNRAS.417.1210G, RV=78

B 16.12 [~] D ~
u (AB) 15.749 [0.005] B 2013yCat.5139....0A
g (AB) 16.139 [0.003] B 2013yCat.5139....0A
r (AB) 16.691 [0.004] B 2013yCat.5139....0A
i (AB) 17.054 [0.005] B 2013yCat.5139....0A
z (AB) 17.388 [0.015] C 2013yCat.5139....0A
Category=STAR
Description=[DA]
Extended=NO

Exposures

#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	PSA/MIRRORB ACQ/IMAGE (COS.ta.1540223)	(1) WD-1657+343	COS/NUV, ACQ/IMAGE, PSA	MIRRORB			Sequence 1-13 Non-Int in PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)	7 Secs (7 Secs) *[==>]*	***[1]***
2	PSA/MIRRORB LAMP+TARGET IMAGE (P2/MEDIUM) (COS.im.1540224)	(1) WD-1657+343	COS/NUV, TIME-TAG, PSA	MIRRORB	BUFFER-TIME=150; FLASH=S0060D015; CURRENT=MEDIUM	QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-13 Non-Int in PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)	15.0 Secs (15 Secs) *[==>]*	***[1]***
	Comments: Identical to 01.002 PSA/MIRRORB/P2/ME. To get PtNe Lamp 2, there are 2 QESIPARMs set: USELAMP = LINE2 CURRENT = MEDIUM								
3	PSA/G140L/1280/3 - CENTER (COS.sp.1540229)	(1) WD-1657+343	COS/FUV, TIME-TAG, PSA	G140L 1280 A	FP-POS=3; BUFFER-TIME=400; LIFETIME-POS=LP4	QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-13 Non-Int in PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)	20 Secs (20 Secs) *[==>]*	***[1]***
	Comments: COS.sp.11440229 S/N Ratio = 10 at wavelength 1310. (per RE) : Time = 20 sec. *In cycle 31 default G140L observing is at LP3, while default acquisition for G140L is at LP4. Specify all TIME-TAG exposures to be at LP4 so that acqs and test exposures are done at the same place.*								
4	PSA/G140L/1280/3 +1.3 arcseconds in XD (COS.sp.1540229)	(1) WD-1657+343	COS/FUV, TIME-TAG, PSA	G140L 1280 A	FP-POS=3; BUFFER-TIME=800; LIFETIME-POS=LP4	POS TARG null,1.3; QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-13 Non-Int in PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)	44 Secs (44 Secs) *[==>]*	***[1]***
	Comments: At R=1.3", the throughput is ~45%. To get the same counts, we need to increase the exposure time. *In cycle 31 default G140L observing is at LP3, while default acquisition for G140L is at LP4. Specify all TIME-TAG exposures to be at LP4 so that acqs and test exposures are done at the same place.*								
5	PSA/G140L/1280/3 -1.3 arcseconds in XD (COS.sp.1540229)	(1) WD-1657+343	COS/FUV, TIME-TAG, PSA	G140L 1280 A	FP-POS=3; BUFFER-TIME=800; LIFETIME-POS=LP4	POS TARG null,-1.3; QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-13 Non-Int in PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)	44 Secs (44 Secs) *[==>]*	***[1]***
	Comments: At R=1.3", the throughput is ~45%. To get the same counts, we need to increase the exposure time. *In cycle 31 default G140L observing is at LP3, while default acquisition for G140L is at LP4. Specify all TIME-TAG exposures to be at LP4 so that acqs and test exposures are done at the same place.*								
6	PSA/G140L/PEAKXD/NP=3/DEF (COS.sa.1540230)	(1) WD-1657+343	COS/FUV, ACQ/PEAKXD, PSA	G140L 1280 A	LIFETIME-POS=DEF; NUM-POS=3; STEP-SIZE=1.3	QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-13 Non-Int in PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)	3 Secs (3 Secs) *[==>]*	***[1]***
	Comments: COS.sa.1540230 Requested Signal/Noise Ratio = 40.000 for Segment A and Segment B combined gives: Time = 1.7369 seconds Time Required for Requested SNR in Segment A only: 1.7369 (only A is used)								

7	PSA/G140L /1280/3 (COS.sp.103 2431)	(1) WD-1657+343	COS/FUV, TIME-TAG, PSA	G140L 1280 A	FP-POS=3; BUFFER-TIME=400; LIFETIME-POS=LP4	QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-13 Non-Int in PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)	20 Secs (20 Secs) *[==>]*		***[1]***

Comments: In cycle 31 default G140L observing is at LP3, while default acquisition for G140L is at LP4. Specify all TIME-TAG exposures to be at LP4 so that acqs and test exposures are done at the same place.

8	PSA/G140L /1280/3 +1.8 arcseconds in XD (COS.sp.1540229)	(1) WD-1657+343	COS/FUV, TIME-TAG, PSA	G140L 1280 A	FP-POS=3; BUFFER-TIME=400; LIFETIME-POS=LP4	POS TARG null,1.8; QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-13 Non-Int in PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)	154 Secs (154 Secs) *[==>]*		***[1]***

Comments: 13% flux at 1.8". 20s/.13 = 154s

In cycle 31 default G140L observing is at LP3, while default acquisition for G140L is at LP4. Specify all TIME-TAG exposures to be at LP4 so that acqs and test exposures are done at the same place.

9	PSA/G140L /1280/3 +0.9 arcseconds in XD (COS.sp.1540229)	(1) WD-1657+343	COS/FUV, TIME-TAG, PSA	G140L 1280 A	FP-POS=3; BUFFER-TIME=400; LIFETIME-POS=LP4	POS TARG null,0.9; QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-13 Non-Int in PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)	23 Secs (23 Secs) *[==>]*		***[1]***

Comments: 71% flux at 0.9". 20s/.71 ~ 23s

In cycle 31 default G140L observing is at LP3, while default acquisition for G140L is at LP4. Specify all TIME-TAG exposures to be at LP4 so that acqs and test exposures are done at the same place.

10	PSA/G140L /1280/3 -0.9 arcseconds in XD (COS.sp.1540229)	(1) WD-1657+343	COS/FUV, TIME-TAG, PSA	G140L 1280 A	FP-POS=3; BUFFER-TIME=400; LIFETIME-POS=LP4	POS TARG null,-0.9; QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-13 Non-Int in PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)	23 Secs (23 Secs) *[==>]*		***[1]***

Comments: 71% flux at 0.9". 20s/.71 ~ 23s

In cycle 31 default G140L observing is at LP3, while default acquisition for G140L is at LP4. Specify all TIME-TAG exposures to be at LP4 so that acqs and test exposures are done at the same place.

11	PSA/G140L /1280/3 -1.8 arcseconds in XD (COS.sp.103 2431)	(1) WD-1657+343	COS/FUV, TIME-TAG, PSA	G140L 1280 A	FP-POS=3; BUFFER-TIME=400; LIFETIME-POS=LP4	POS TARG null,-1.8; QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-13 Non-Int in PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)	154 Secs (154 Secs) *[==>]*		***[1]***

Comments: 13% flux at 1.8". 20s/.13 = 154s

In cycle 31 default G140L observing is at LP3, while default acquisition for G140L is at LP4. Specify all TIME-TAG exposures to be at LP4 so that acqs and test exposures are done at the same place.

12	PSA/G140L /PEAKXD/ NP=5/DEF (COS.sa.1540230)	(1) WD-1657+343	COS/FUV, ACQ/PEAKXD, PSA	G140L 1280 A	LIFETIME-POS=DEF; NUM-POS=5; STEP-SIZE=0.9	QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-13 Non-Int in PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)	3 Secs (3 Secs) *[==>]*		***[1]***

Comments: COS.sa.1032455 Requested Signal/Noise Ratio = 40.000 for Segment A and Segment B combined gives: Time = 1.6519 seconds Time Required for Requested SNR in Segment A only: 1.6519

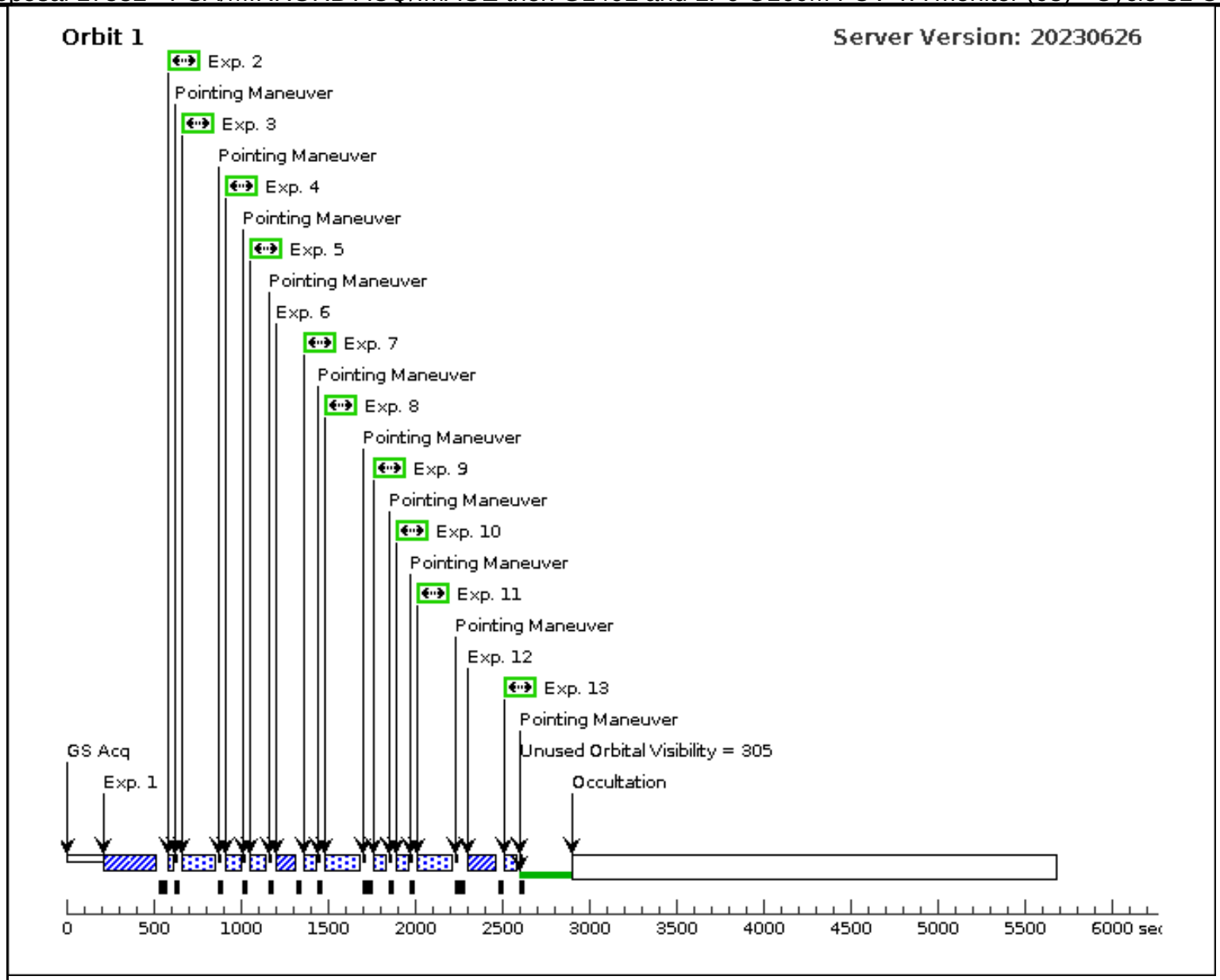
13	PSA/G140L /1280/3 (COS.sp.103 2431)	(1) WD-1657+343	COS/FUV, TIME-TAG, PSA	G140L 1280 A	FP-POS=3; BUFFER-TIME=400; LIFETIME-POS=LP4	QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 1-13 Non-Int in PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)	20 Secs (20 Secs) *[==>]*		***[1]***

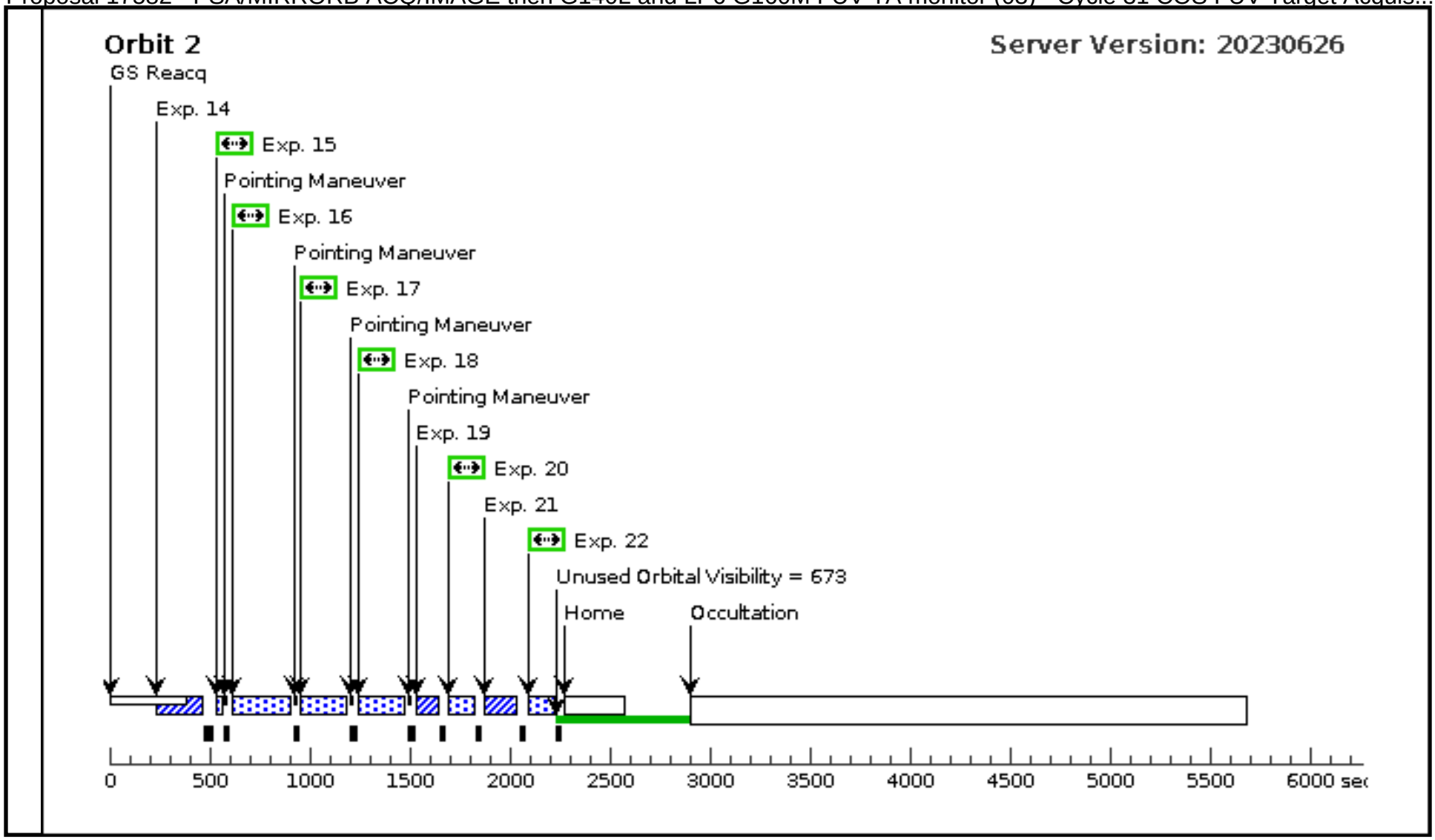
Comments: In cycle 31 default G140L observing is at LP3, while default acquisition for G140L is at LP4. Specify all TIME-TAG exposures to be at LP4 so that acqs and test exposures are done at the same place.

14	PSA/MIRRORB ACQ/IMAGE (COS.ta.1540223)	(1) WD-1657+343	COS/NUV, ACQ/IMAGE, PSA	MIRRORB			Sequence 14-22 Non-Int in PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)	7 Secs (7 Secs) *[==>]*		***[2]***
15	PSA/MIRRORB LAMP+TARGET IMAGE (P2/MEDIUM) (COS.im.1540224)	(1) WD-1657+343	COS/NUV, TIME-TAG, PSA	MIRRORB	BUFFER-TIME=150; FLASH=S0060D015; CURRENT=MEDIUM	QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 14-22 Non-Int in PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)	15.0 Secs (15 Secs) *[==>]*		***[2]***
Comments: Identical to 01.002 *PSA/MIRRORB/P2/MED current. To get PtNe Lamp 2, there are 2 QESIPARMs set:* *USELAMP = LINE2* *CURRENT = MEDIUM*										
16	PSA/G160M/1600/3 - CENTER (COS.sp.1540231)	(1) WD-1657+343	COS/FUV, TIME-TAG, PSA	G160M 1600 A	FP-POS=3; BUFFER-TIME=800; LIFETIME-POS=DEF; FLASH=NO; WAVECAL=NO	QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 14-22 Non-Int in PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)	82 Secs (82 Secs) *[==>]*		***[2]***
Comments: Exposure time (seconds) = 82.0000 at wavelength 1602.00 *gives: SNR = 3.9389 (per resolution element)*										
17	PSA/G160M/1600/3 + 1.3arcseconds in XD (COS.sp.1540231)	(1) WD-1657+343	COS/FUV, TIME-TAG, PSA	G160M 1600 A	FP-POS=3; BUFFER-TIME=1000; LIFETIME-POS=DEF; FLASH=NO; WAVECAL=NO	POS TARG null,1.3; QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 14-22 Non-Int in PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)	182 Secs (182 Secs) *[==>]*		***[2]***
Comments: At R=1.3", the throughput is ~45%. To get the same counts, we need to increase the exposure time.										
18	PSA/G160M/1600/3 -1.3arcseconds in XD (COS.sp.1540231)	(1) WD-1657+343	COS/FUV, TIME-TAG, PSA	G160M 1600 A	FP-POS=3; BUFFER-TIME=1000; LIFETIME-POS=DEF; FLASH=NO; WAVECAL=NO	POS TARG null,-1.3; QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 14-22 Non-Int in PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)	182 Secs (182 Secs) *[==>]*		***[2]***
Comments: At R=1.3", the throughput is ~45%. To get the same counts, we need to increase the exposure time.										
19	PSA/G160M/PEAKXD/NP=3/DEF (COS.sa.1540232)	(1) WD-1657+343	COS/FUV, ACQ/PEAKXD, PSA	G160M 1600 A	LIFETIME-POS=DEF; NUM-POS=3; STEP-SIZE=1.3	QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 14-22 Non-Int in PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)	3 Secs (3 Secs) *[==>]*		***[2]***
Comments: Requested Signal/Noise Ratio = 40.000 for Segment A and Segment B combined *gives: Time = 1.0474 seconds* *Time Required for Requested SNR in Segment A only: 5.7791* *Time Required for Requested SNR in Segment B only: 1.2792*										

	20	PSA/G160M/1600/3 (COS.sp.1540231)	(1) WD-1657+343	COS/FUV, TIME-TAG, PSA	G160M 1600 A	FP-POS=3; BUFFER-TIME=800; LIFETIME-POS=DEF; FLASH=NO; WAVECAL=NO	QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 14-22 Non-Int in PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)	82 Secs (82 Secs) *[==>]*	***[2]***
	21	PSA/G160M/1600/PEAKD/NP=5/DEF (COS.sa.1540232)	(1) WD-1657+343	COS/FUV, ACQ/PEAKD, PSA	G160M 1600 A	LIFETIME-POS=DEF; NUM-POS=5; STEP-SIZE=0.9		Sequence 14-22 Non-Int in PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)	3 Secs (3 Secs) *[==>]*	***[2]***
	Comments: Analogous to exposure 01.014 carried over from previous cycles, but this time to test PEAKD at LP6.									
	22	PSA/G160M/1600/3 (COS.sp.1540231)	(1) WD-1657+343	COS/FUV, TIME-TAG, PSA	G160M 1600 A	FP-POS=3; BUFFER-TIME=800; LIFETIME-POS=DEF; FLASH=NO; WAVECAL=NO	QESIPARM USELAMP LINE2; QESIPARM CURRENT MEDIUM	Sequence 14-22 Non-Int in PSA/MIRRORB ACQ/IMAGE then G140L and LP6 G160M FUV TA monitor (03)	82 Secs (82 Secs) *[==>]*	***[2]***

Orbit Structure

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GS Reacq
Exp. 14
Exp. 15
Pointing Maneuver
Exp. 16
Pointing Maneuver
Exp. 17
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Exp. 18
Pointing Maneuver
Exp. 19
Exp. 20
Exp. 21
Exp. 22
Unused Orbital Visibility = 673
Home
Occultation
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500
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1500
2000
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5500
6000 sec