14874 - COS FUV Focus Sweep Program at LP4

Cycle: 24, Proposal Category: CAL/COS

(Availability Mode: RESTRICTED)

INVESTIGATORS

Name	*Institution*	*E-Mail*
Dr. Andrew J. Fox (PI) (ESA Member) (Contact)	**Space Telescope Science Institute - ESA**	**afox@stsci.edu**

VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) V-KL-UMA DARK NONE	COS COS/FUV COS/NUV S/C	3	01-Dec-2016 21:08:10.0	yes
02	(2) AZV75 DARK NONE	COS COS/FUV COS/NUV S/C	2	01-Dec-2016 21:08:16.0	yes

5 Total Orbits Used

ABSTRACT

This program is designed to determine the best focus at COS FUV Lifetime Position 4 (LP4) for the G160M/1600 and G140L/1105 settings. The focus sweeps will scan at 200 focus step increments from -800 to +1000 from the current LP3 focus, a strategy designed to determine the best focus position to <1% accuracy. This strategy is based on the LENA2 program at LP3 (ID 13635), and on the LP4 focus sweep exploratory program (ID 14527), which obtained sweeps for G130M/1309 and G130M/1222. Both these earlier programs executed successfully.

OBSERVING DESCRIPTION

This program performs a focus sweep at LP4 with G160M/1600 (Visit 01) and G140L/1105 (FUVA only; Visit 02). LP4 is located at -5.0" in the XD direction relative to LP1. In each visit, initialization exposures are included after the ACQ/IMAGE to set up the correct instrument mode for the focus sweep. For the G140L visit on AZV75 an ACQ/SEARCH is included.

The aperture has to be manually moved by -2.52" (the offset from LP3 to LP4) using an aperture-placement command (XAPER) after the ACQ/IMAGE and instrument initialization. Each subsequent exposure in the focus sweep is given a POSTARG of -2.52", to match the position of the aperture.

The program uses special commanding to set the high voltage to the expected LP4 level, FUVA=163/FUVB=163. The commands use QESIPARMS keywords under "Engineering Requirements". The voltages are returned to their nominal levels at the end of the visits (FUVA=167/FUVB=175). For the G140L visit, only the FUVA voltage is changed since FUVB is not used.

Ray-trace predictions (courtesy Steve Penton) predict that the best-fit LP4 focus for :
- G160M/1600 should be +140 relative to LP3
- G140L/1105 should be +300 relative to LP3

The focus sweep going up to +1000 relative to LP3 is designed to cover a broad-enough region determine the focus-curve minimum.

The *absolute* focus positions covered by the sweep were verified: at LP3, G140L/1105 has a focus of -673 and G160M/1600 has a focus of -30, as determined from the flight software table. Sweeping from -800 to +1000 around these central focus positions is within the allowed range.

Proposal 14874 - G160M_focus (01) - COS FUV Focus Sweep Program at LP4

Visit

Proposal 14874, G160M_focus (01), implementation Fri Dec 02 02:08:18 GMT 2016

Diagnostic Status: Warning

Scientific Instruments: COS, S/C, COS/FUV, COS/NUV

Special Requirements: SCHED 100%; BETWEEN 05-DEC-2016:00:00:00 AND 01-JAN-2017:00:00:00

Diagnostics

(G160M_focus (01)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

(G160M_focus (01)) Warning (Form): For the best data quality, it is strongly recommended that all four FP-POS positions be used when observing at a given COS CENWAVE setting.

(G160M_focus (01)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE NO ORIENT

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	V-KL-UMA	RA: 11 47 14.4900 (176.8103750d)	Proper Motion RA: 0.00333 sec of time/yr	V=13.28	Reference Frame: ICRS
	Alt Name1: FEIGE48	Dec: +61 15 31.80 (61.25883d)	Proper Motion Dec: 0		
		Equinox: J2000	Epoch of Position: 2000		

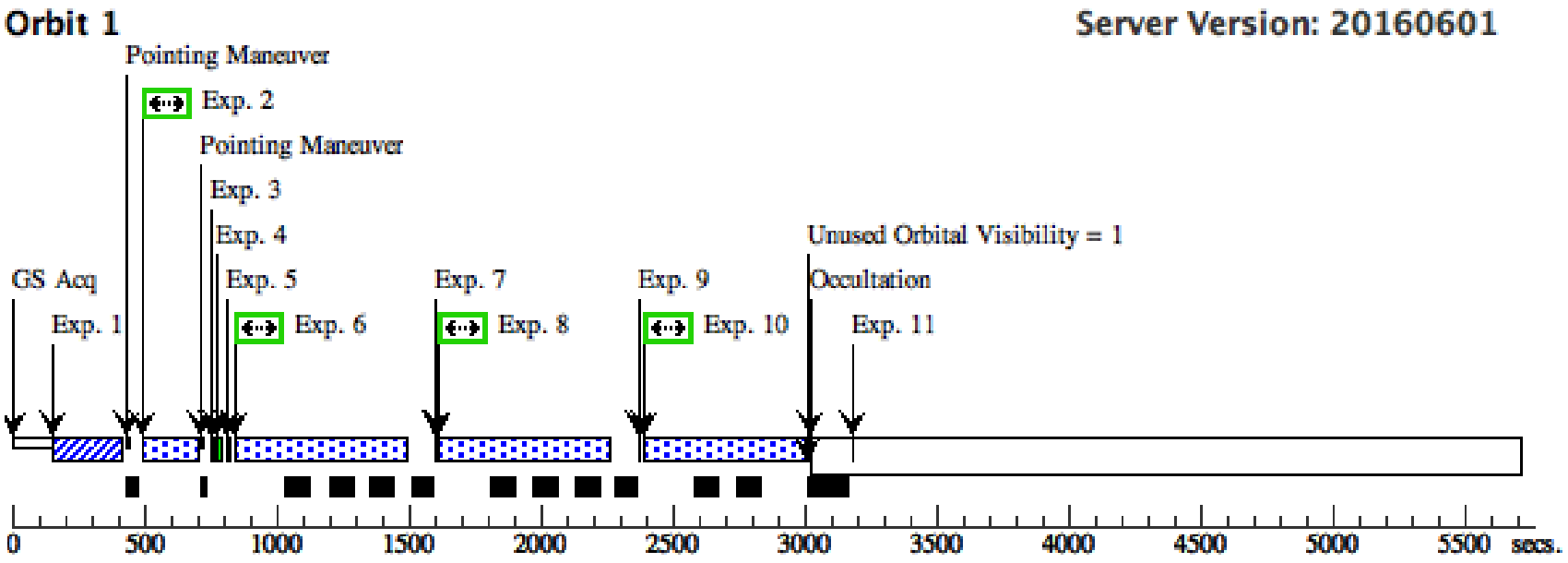
Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Extended=NO

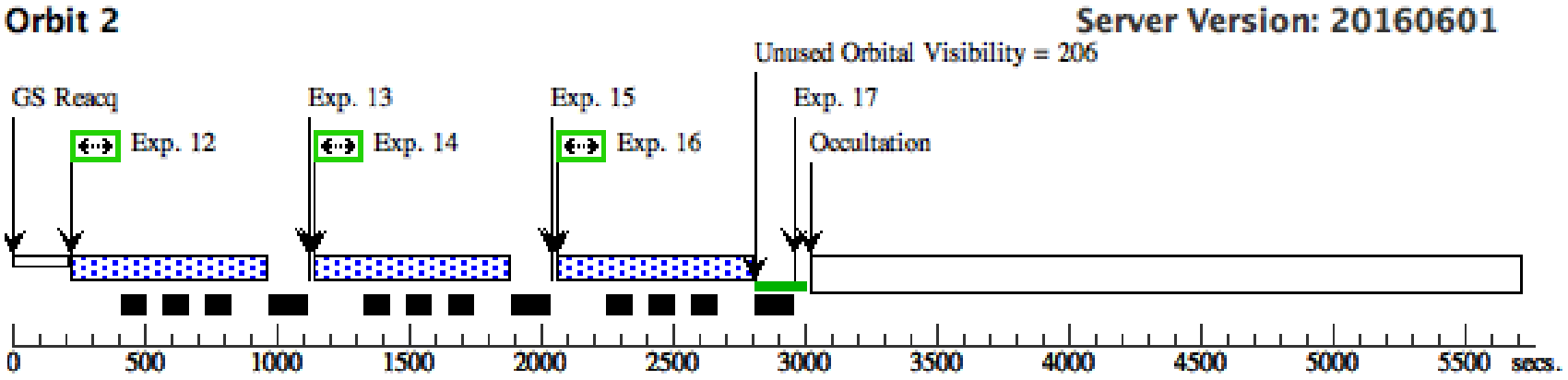
Exposures

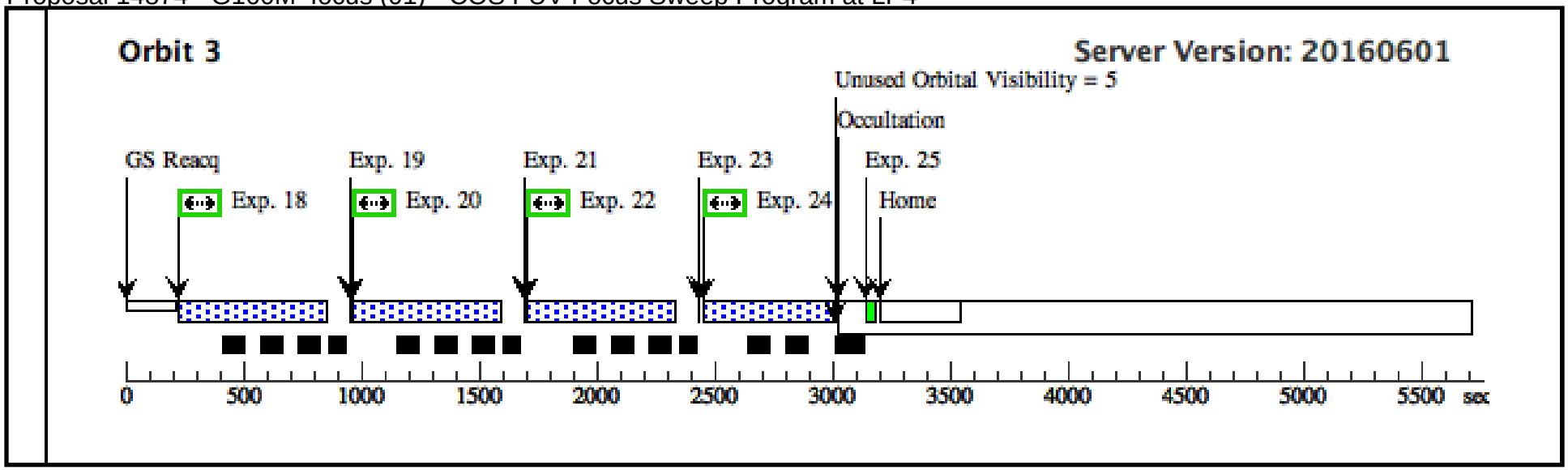
#	Label (ETC Run)	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1	ACQ/IMAGE (COS.ta.607556)	(1) V-KL-UMA	COS/NUV, ACQ/IMAGE, BOA	MIRRORA				16 Secs (16 Secs) *[==>]*	***[1]***
	Comments: S/N=60 *Exposure time and ETC calculation taken from LENA2 (Program 13635)*								
2	Initialize G160M/1600 at LP3 (COS.sp.608219)	(1) V-KL-UMA	COS/FUV, TIME-TAG, PSA	G160M 1600 A	FP-POS=3; BUFFER-TIME=1000; WAVECAL=NO; FLASH=NO			0.1 Secs (0.1 Secs) *[==>]*	***[1]***
	Comments: Initializing G160M/1600 at nominal aperture and focus position								
3	Place aperture at -5.0 arcsec in XD	NONE	COS, ALIGN/APER		XAPER=53; YAPER=0.0			0.0 Secs (0 Secs) *[==>]*	***[1]***
	Comments: XAPER=53 is the calculated offset from LP3 (at -2.5 arcsec) to LP4 (at -5.0 arcsec). *21 XAPER STEPS is 1", so an offset of -2.52" is commanded by XAPER=+53*								
4	Adjust HV to LP4 values	DARK	S/C, DATA, NONE			SAA CONTOUR 31; SPEC COM INSTR ELHVADJPROP; QESIPARM ENDCTSA 163; QESIPARM ENDCTSB 163		39 Secs (39 Secs) *[==>]*	***[1]***
	Comments: Adjust HV (from starting values FUVA=167, FUVB=175) to values appropriate for the beginning of LP4 (FUVA=163, FUVB=163). *HV is decreasing on both segments, so exposure time is 39 seconds.*								
5	Move to -800	NONE	COS, ALIGN/OSM		FOCUS=-800			0 Secs (0 Secs) *[==>]*	***[1]***
6	1600_f-800 (COS.sp.608219)	(1) V-KL-UMA	COS/FUV, TIME-TAG, PSA	G160M 1600 A	FP-POS=3; BUFFER-TIME=159	POS TARG 0.0,-2.52		600 Secs (600 Secs) *[==>]*	***[1]***
	Comments: S/N=36 expected at wavelength 1607 A *Exposure times taken from FENA3 and LENA2 programs (same configuration).*								
7	Move to -600	NONE	COS, ALIGN/OSM		FOCUS=-600			0 Secs (0 Secs) *[==>]*	***[1]***
8	1600_f-600 (COS.sp.608219)	(1) V-KL-UMA	COS/FUV, TIME-TAG, PSA	G160M 1600 A	FP-POS=3; BUFFER-TIME=159	SAME POS AS 6		600 Secs (600 Secs) *[==>]*	***[1]***
9	Move to -400	NONE	COS, ALIGN/OSM		FOCUS=-400			0 Secs (0 Secs) *[==>]*	***[1]***
10	1600_f-400 (COS.sp.608219)	(1) V-KL-UMA	COS/FUV, TIME-TAG, PSA	G160M 1600 A	FP-POS=3; BUFFER-TIME=159	SAME POS AS 6		564 Secs (564 Secs) *[==>]*	***[1]***
11	Move to -200	NONE	COS, ALIGN/OSM		FOCUS=-200			0 Secs (0 Secs) *[==>]*	***[1]***

12	1600_f-200 (COS.sp.608 220)	(1) V-KL-UMA	COS/FUV, TIME-TAG, PSA	G160M 1600 A	FP-POS=3; BUFFER-TIME=159	SAME POS AS 6	690 Secs (690 Secs) *[==>]*		***[2]***
Comments: S/N=38 at wavelength 1607 A									
13	Move to 0	NONE	COS, ALIGN/OSM		FOCUS=0		0 Secs (0 Secs) *[==>]*		***[2]***
14	1600_f-0 (COS.sp.608 220)	(1) V-KL-UMA	COS/FUV, TIME-TAG, PSA	G160M 1600 A	FP-POS=3; BUFFER-TIME=159	SAME POS AS 6	690 Secs (690 Secs) *[==>]*		***[2]***
15	Move to +200	NONE	COS, ALIGN/OSM		FOCUS=+200		0 Secs (0 Secs) *[==>]*		***[2]***
16	1600_f+200 (COS.sp.608 220)	(1) V-KL-UMA	COS/FUV, TIME-TAG, PSA	G160M 1600 A	FP-POS=3; BUFFER-TIME=159	SAME POS AS 6	690 Secs (690 Secs) *[==>]*		***[2]***
17	Move to +400	NONE	COS, ALIGN/OSM		FOCUS=+400		0 Secs (0 Secs) *[==>]*		***[2]***
18	1600_f+400 (COS.sp.608 221)	(1) V-KL-UMA	COS/FUV, TIME-TAG, PSA	G160M 1600 A	FP-POS=3; BUFFER-TIME=159	SAME POS AS 6	580 Secs (580 Secs) *[==>]*		***[3]***
Comments: S/N=35 at 1607 A									
19	Move to +600	NONE	COS, ALIGN/OSM		FOCUS=+600		0 Secs (0 Secs) *[==>]*		***[3]***
20	1600_f+600 (COS.sp.608 221)	(1) V-KL-UMA	COS/FUV, TIME-TAG, PSA	G160M 1600 A	FP-POS=3; BUFFER-TIME=159	SAME POS AS 6	580 Secs (580 Secs) *[==>]*		***[3]***
21	Move to +800	NONE	COS, ALIGN/OSM		FOCUS=+800		0 Secs (0 Secs) *[==>]*		***[3]***
22	1600_f+800 (COS.sp.608 221)	(1) V-KL-UMA	COS/FUV, TIME-TAG, PSA	G160M 1600 A	FP-POS=3; BUFFER-TIME=159	SAME POS AS 6	580 Secs (580 Secs) *[==>]*		***[3]***
23	Move to +1000	NONE	COS, ALIGN/OSM		FOCUS=+1000		0 Secs (0 Secs) *[==>]*		***[3]***
24	1600_f+1000 (COS.sp.608 221)	(1) V-KL-UMA	COS/FUV, TIME-TAG, PSA	G160M 1600 A	FP-POS=3; BUFFER-TIME=159	SAME POS AS 6	500 Secs (500 Secs) *[==>]*		***[3]***
25	Return to nominal HV	DARK	S/C, DATA, NONE			SAA CONTOUR 31; SPEC COM INSTR ELHVADJPROP; QESIPARM ENDC TSA 167; QESIPARM ENDC TSB 175	53 Secs (53 Secs) *[==>]*		***[3]***
Comments: Return from HV=163/163 to nominal HV=167/175.									
Max HV change is 175 - 163 = 12 *Exposure time = 39 + ceiling(1.1*12) = 53 seconds*									

Orbit Structure






Orbit 3
Server Version: 20160601
Unused Orbital Visibility = 5
Occultation
GS Reacq
Exp. 18
Exp. 19
Exp. 20
Exp. 21
Exp. 22
Exp. 23
Exp. 24
Exp. 25
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec

Visit

Proposal 14874, G140L_focus (02), implementation Fri Dec 02 02:08:18 GMT 2016

Diagnostic Status: Warning

Scientific Instruments: COS, S/C, COS/FUV, COS/NUV

Special Requirements: SCHED 80%; BETWEEN 05-DEC-2016:00:00:00 AND 01-JAN-2017:00:00:00

Comments: Target count rates:
*In the G140L/1105 setting the target's local count rate in each focus sweep exposure is 0.75 cts/sec/pix, above the local limit of 0.67 cts/sec/pix. This violation happens where the P-Cygni profile from N V falls. In this kind of star the strength of the P-Cygni emission does not tend to increase (the *absorption* is variable). This target was observed in safely in FENA3 with the same exposure time of 200s.*

Diagnostics

(G140L_focus (02)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE

(G140L_focus (02)) Warning (Orbit Planner): POS TARG OUTSIDE OF APERTURE NO ORIENT

(G140L_focus (02)) Warning (Form): For the best data quality, it is strongly recommended that all four FP-POS positions be used when observing at a given COS CENWAVE setting.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(2)	AZV75	RA: 00 50 32.3900 (12.6349583d) Dec: -72 52 36.50 (-72.87681d) Equinox: J2000	Epoch of Position: 2000	V=12.79	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
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/SEARCH (COS.ta.607440)	(2) AZV75	COS/NUV, ACQ/SEARCH, BOA	MIRRORA	SCAN-SIZE=2; STEP-SIZE=1.767; CENTER=FLUX-WT			7.3 Secs (7.3 Secs) *[==>]*	***[1]***
	Comments: Exposure time and ETC calculation taken from LENA2 (Program 13635)								
2	ACQ/IMAGE (COS.ta.607440)	(2) AZV75	COS/NUV, ACQ/IMAGE, BOA	MIRRORA				15 Secs (15 Secs) *[==>]*	***[1]***
	Comments: Exposure time and ETC calculation taken from LENA2 (Program 13635)								
3	Initialize G140L/1105 at LP3 (COS.sp.608224)	(2) AZV75	COS/FUV, TIME-TAG, PSA	G140L 1105 A	FP-POS=3; BUFFER-TIME=1000; WAVECAL=NO; FLASH=NO			0.1 Secs (0.1 Secs) *[==>]*	***[1]***
	Comments: Setting configuration of G140L/1105 at nominal aperture and focus position.								
4	Place aperture at -5.0 arcsec in XD	NONE	COS, ALIGN/APER		XAPER=53; YAPER=0.0			0.0 Secs (0 Secs) *[==>]*	***[1]***
	Comments: XAPER=53 is the calculated offset from LP3 (at -2.5 arcsec) to LP4 (at -5.0 arcsec). *21 XAPER STEPS is 1", so an offset of -2.52" is commanded by XAPER=+53*								
5	Adjust HV to LP4 values	DARK	S/C, DATA, NONE			SAA CONTOUR 31; SPEC COM INSTR ELHVADJPROP; QESIPARM ENDC TSA 163		39 Secs (39 Secs) *[==>]*	***[1]***
	Comments: Adjust HV from starting value FUVA=167 to value appropriate for the beginning of LP4 (FUVA=163). *HV is decreasing so exposure time is 39 seconds.*								
6	Move to -800	NONE	COS, ALIGN/OSM		FOCUS=-800			0 Secs (0 Secs) *[==>]*	***[1]***
7	1105_f-800 (COS.sp.608224)	(2) AZV75	COS/FUV, TIME-TAG, PSA	G140L 1105 A	BUFFER-TIME=100; FP-POS=3	POS TARG 0.0,-2.52		200 Secs (200 Secs) *[==>]*	***[1]***
	Comments: Exposure times taken from FENA3 and LENA2 programs (same configuration).								
8	Move to -600	NONE	COS, ALIGN/OSM		FOCUS=-600			0 Secs (0 Secs) *[==>]*	***[1]***
9	1105_f-600 (COS.sp.608224)	(2) AZV75	COS/FUV, TIME-TAG, PSA	G140L 1105 A	BUFFER-TIME=100; FP-POS=3	SAME POS AS 7		200 Secs (200 Secs) *[==>]*	***[1]***
10	Move to -400	NONE	COS, ALIGN/OSM		FOCUS=-400			0 Secs (0 Secs) *[==>]*	***[1]***
11	1105_f-400 (COS.sp.608224)	(2) AZV75	COS/FUV, TIME-TAG, PSA	G140L 1105 A	BUFFER-TIME=100; FP-POS=3	SAME POS AS 7		200 Secs (200 Secs) *[==>]*	***[1]***
12	Move to -200	NONE	COS, ALIGN/OSM		FOCUS=-200			0 Secs (0 Secs) *[==>]*	***[1]***

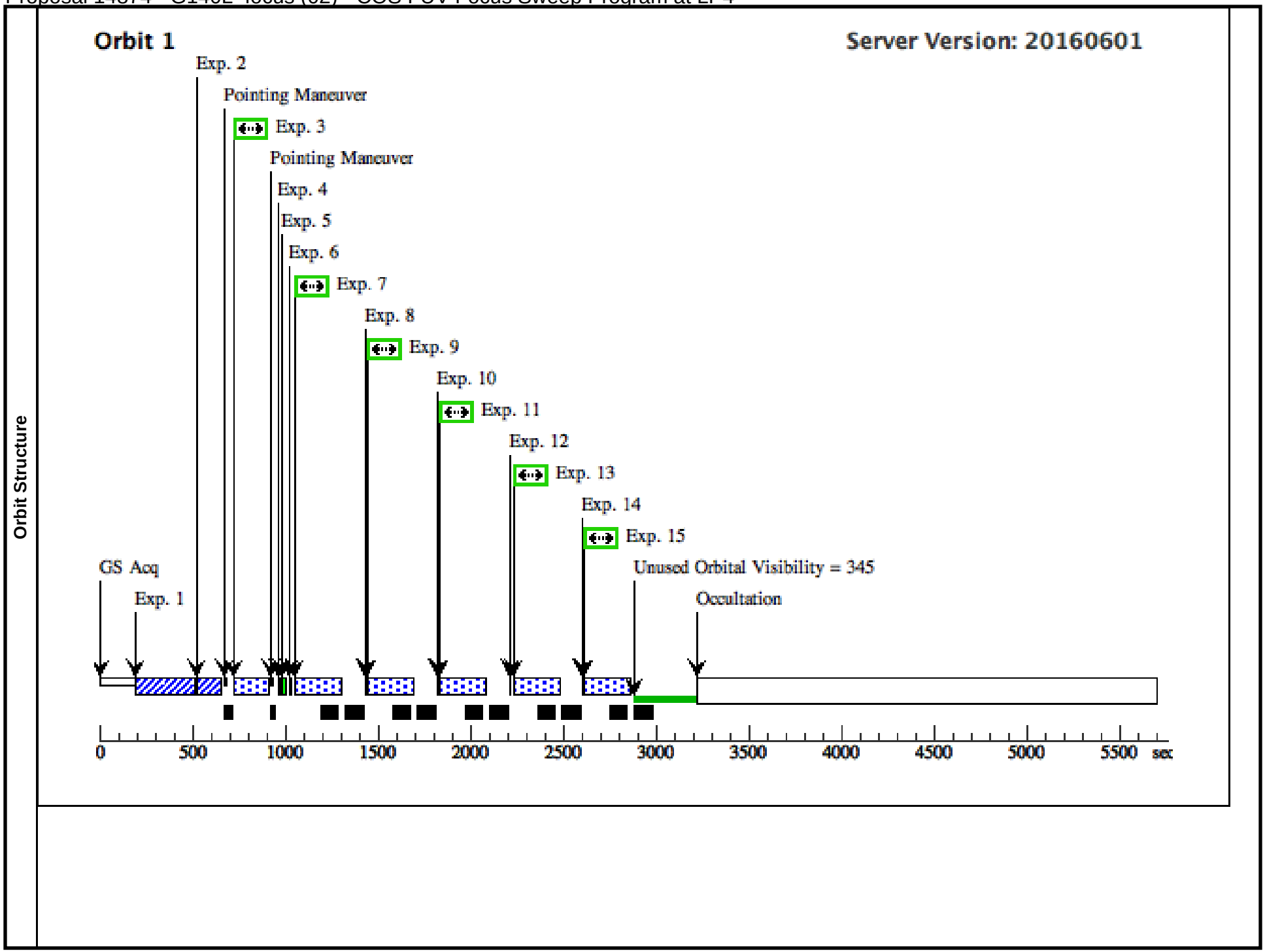
13	1105_f-200 (COS.sp.608224)	(2) AZV75	COS/FUV, TIME-TAG, PSA	G140L 1105 A	BUFFER-TIME=100; FP-POS=3	SAME POS AS 7	200 Secs (200 Secs) *[==>]*	 ***[1]***
14	Move to -100	NONE	COS, ALIGN/OSM		FOCUS=-100		0 Secs (0 Secs) *[==>]*	 ***[1]***
15	1105_f-100 (COS.sp.608224)	(2) AZV75	COS/FUV, TIME-TAG, PSA	G140L 1105 A	BUFFER-TIME=100; FP-POS=3	SAME POS AS 7	200 Secs (200 Secs) *[==>]*	 ***[1]***
16	Move to 0	NONE	COS, ALIGN/OSM		FOCUS=0		0 Secs (0 Secs) *[==>]*	 ***[2]***
17	1105_f-0 (COS.sp.608224)	(2) AZV75	COS/FUV, TIME-TAG, PSA	G140L 1105 A	BUFFER-TIME=100; FP-POS=3	SAME POS AS 7	200 Secs (200 Secs) *[==>]*	 ***[2]***
18	Move to +100	NONE	COS, ALIGN/OSM		FOCUS=+100		0 Secs (0 Secs) *[==>]*	 ***[2]***
19	1105_f+100 (COS.sp.608224)	(2) AZV75	COS/FUV, TIME-TAG, PSA	G140L 1105 A	BUFFER-TIME=100; FP-POS=3	SAME POS AS 7	200 Secs (200 Secs) *[==>]*	 ***[2]***
20	Move to +200	NONE	COS, ALIGN/OSM		FOCUS=+200		0 Secs (0 Secs) *[==>]*	 ***[2]***
21	1105_f+200 (COS.sp.608224)	(2) AZV75	COS/FUV, TIME-TAG, PSA	G140L 1105 A	BUFFER-TIME=100; FP-POS=3	SAME POS AS 7	200 Secs (200 Secs) *[==>]*	 ***[2]***
22	Move to +400	NONE	COS, ALIGN/OSM		FOCUS=+400		0 Secs (0 Secs) *[==>]*	 ***[2]***
23	1105_f+400 (COS.sp.608224)	(2) AZV75	COS/FUV, TIME-TAG, PSA	G140L 1105 A	BUFFER-TIME=100; FP-POS=3	SAME POS AS 7	200 Secs (200 Secs) *[==>]*	 ***[2]***
24	Move to +600	NONE	COS, ALIGN/OSM		FOCUS=+600		0 Secs (0 Secs) *[==>]*	 ***[2]***
25	1105_f+600 (COS.sp.608224)	(2) AZV75	COS/FUV, TIME-TAG, PSA	G140L 1105 A	BUFFER-TIME=100; FP-POS=3	SAME POS AS 7	200 Secs (200 Secs) *[==>]*	 ***[2]***
26	Move to +800	NONE	COS, ALIGN/OSM		FOCUS=+800		0 Secs (0 Secs) *[==>]*	 ***[2]***
27	1105_f+800 (COS.sp.608224)	(2) AZV75	COS/FUV, TIME-TAG, PSA	G140L 1105 A	BUFFER-TIME=100; FP-POS=3	SAME POS AS 7	200 Secs (200 Secs) *[==>]*	 ***[2]***
28	Move to +1000	NONE	COS, ALIGN/OSM		FOCUS=+1000		0 Secs (0 Secs) *[==>]*	 ***[2]***
29	1105_f+1000 (COS.sp.608224)	(2) AZV75	COS/FUV, TIME-TAG, PSA	G140L 1105 A	BUFFER-TIME=100; FP-POS=3	SAME POS AS 7	200 Secs (200 Secs) *[==>]*	 ***[2]***
30	Move to +0	NONE	COS, ALIGN/OSM		FOCUS=0		0 Secs (0 Secs) *[==>]*	 ***[2]***

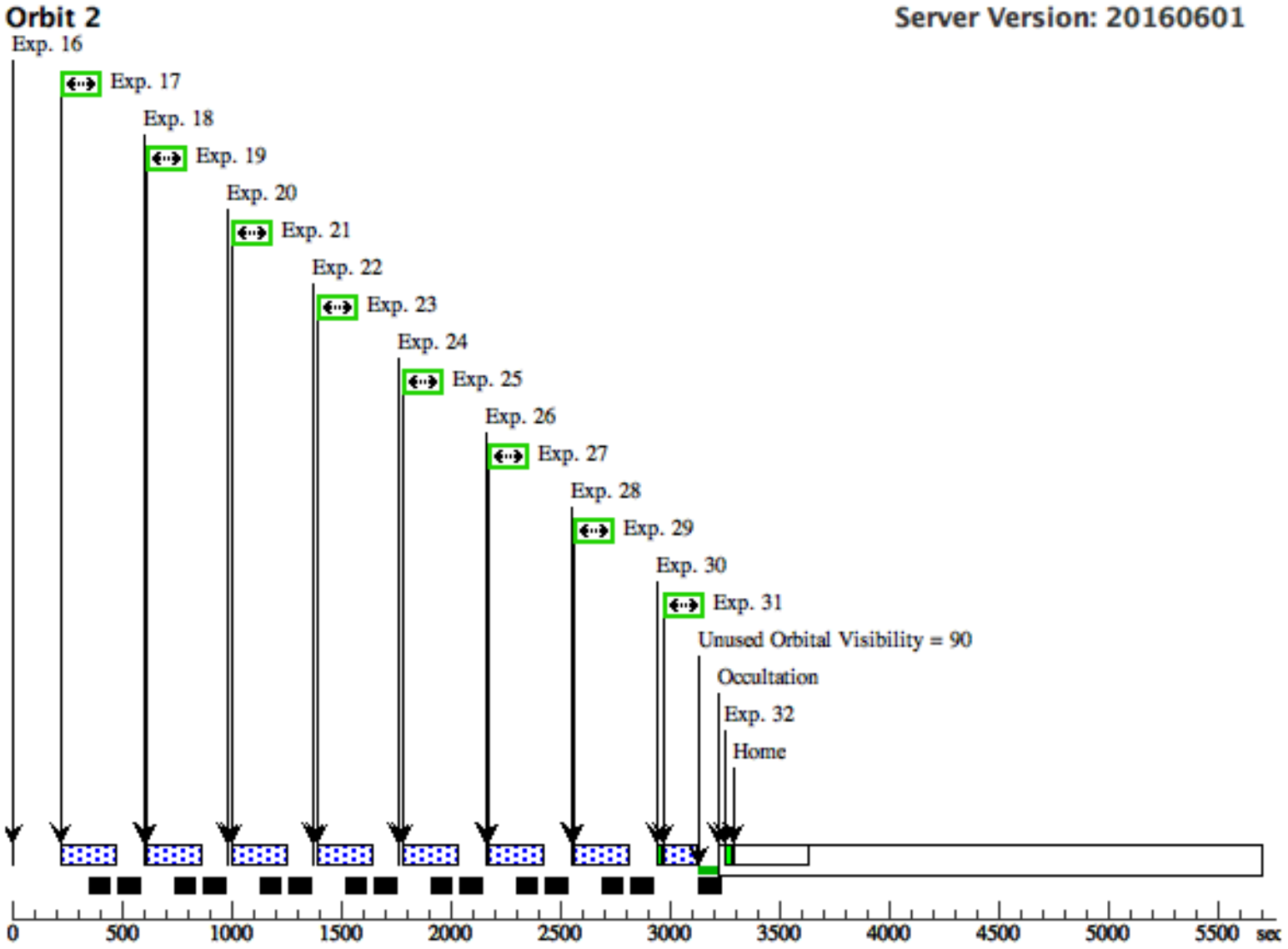
Comments: Return to focus offset=0 (LP3 focus) for extra exposure.

31	1105_f+0 (COS.sp.608 224)	(2) AZV75	COS/FUV, TIME-TAG, PSA	G140L 1105 A	BUFFER-TIME=100; FP-POS=3	SAME POS AS 7	100 Secs (100 Secs) *[==>]*	 ***[2]***
32	Return to nominal HV	DARK	S/C, DATA, NONE			SAA CONTOUR 31; SPEC COM INSTR ELHVADJPROP; QESIPARM ENDC TSA 167	44 Secs (44 Secs) *[==>]*	 ***[2]***

Comments: Return from FUVA HV=163 to nominal HV=167

Max HV change is 167 - 163 = 4
*Exposure time = 39 + ceiling(1.1*4) = 44 seconds*


Orbit 1
Server Version: 20160601
Orbit Structure
Exp. 2
Pointing Maneuver
Exp. 3
Pointing Maneuver
Exp. 4
Exp. 5
Exp. 6
Exp. 7
Exp. 8
Exp. 9
Exp. 10
Exp. 11
Exp. 12
Exp. 13
Exp. 14
Exp. 15
GS Acq
Exp. 1
Unused Orbital Visibility = 345
Occultation
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec


Orbit 2
Server Version: 20160601
Exp. 16
Exp. 17
Exp. 18
Exp. 19
Exp. 20
Exp. 21
Exp. 22
Exp. 23
Exp. 24
Exp. 25
Exp. 26
Exp. 27
Exp. 28
Exp. 29
Exp. 30
Exp. 31
Unused Orbital Visibility = 90
Occultation
Exp. 32
Home
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
sec